



Legislative Assembly for the Australian Capital Territory

Standing Committee on Environment,
Climate Change and Biodiversity

Inquiry into renewable energy innovation in the ACT

Legislative Assembly for the Australian Capital Territory
Standing Committee on Environment, Climate Change and Biodiversity

Approved for publication

Report 4
10th Assembly
June 2022

About the committee

Establishing resolution

Pursuant to resolution, the Assembly established the Standing Committee on the Environment, Climate Change and Biodiversity (ECCB) on 2 December 2020.¹ The purpose of a general-purpose standing committees such as the ECCB committee is to:

...enhance the scrutiny of the Executive, to examine and suggest improvements to any bills referred to it, to enable the citizens of the Territory to engage and to participate in law-making and policy review, to enable financial scrutiny of the Executive's budget proposals and to review annual reports of taxpayer funded agencies.²

Committees may also inquire and report on matters referred to them by the Assembly or matters that are considered by the committee to be of concern to the community and within the nominated areas of responsibility. The ECCB committee is responsible for examining the following areas:

- climate change;
- climate action;
- environment;
- heritage;
- water and energy policy and programs;
- emissions reductions;
- environment and ecological sustainability;
- Commissioner for the Environment; and
- Environment Protection Agency.

You can read the full establishing resolution [on our website](#).

Committee members

Dr Marisa Paterson MLA, Chair

Mr Andrew Braddock MLA, Deputy Chair (to 9 December 2021)

Ms Leanne Castley MLA

Ms Jo Clay MLA, Deputy Chair (from 9 December 2021)

¹ Legislative Assembly for the ACT, Minutes of Proceedings No 2, 2 December 2020, pp 17, 20, (as amended 11 February 2021, 30 March 2021, 22 April 2021, 16 September 2021, 9 November 2021, and 10 February 2022) available at: <https://www.parliament.act.gov.au/parliamentary-business/in-committees/committees/eccb>

² Legislative Assembly for the ACT, Minutes of Proceedings No 2, 2 December 2020, pp 17, 20, (as amended 11 February 2021, 30 March 2021, 22 April 2021, 16 September 2021, 9 November 2021, and 10 February 2022) available at: <https://www.parliament.act.gov.au/parliamentary-business/in-committees/committees/eccb>

Secretariat

Ms Aleshia Westgate, Committee Secretary (to 15 April 2021)

Dr Frieda Scott, A/g Committee Secretary (from 16 April 2021 to 11 March 2022)

Ms Joanne Cullen Committee Secretary (from 15 March 2022)

Ms Kate Mickelson, Assistant Secretary (from 27 June 2022)

Mr Samuel Thompson, Senior Research Officer (to 27 August 2021)

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About this inquiry

Under Standing Order 216, standing committees can self-initiate an inquiry into any subject area it is given responsibility for by the establishing resolution. On 23 February 2021, the ECCB resolved to:

Inquire into and report on matters relating to renewable energy innovation in the Australian Capital Territory, with particular reference to:

- a. opportunities and challenges to boost renewable energy research, technology development and new zero emissions industries in the ACT;
- b. opportunities and challenges to establish the ACT as a national hub for renewable energy technologies and industries including zero emissions vehicles;
- c. opportunities and challenges to innovatively finance and/or manage renewable energy in the ACT;
- d. strategies to address limitations to collaboration and innovation between renewable energy stakeholders;
- e. the effectiveness of administration and funding of Australian Capital Territory Government policy and regulatory settings relating to renewable energy, climate action and emissions reduction;
- f. opportunities and challenges in battery storage including neighbourhood-scale batteries and vehicle-to-grid technologies; and
- g. any other relevant matters.

The committee informed the Assembly of its intention to conduct this inquiry on 30 March 2021.

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Acronyms

Acronym	Long form
ABS	Australian Bureau of Statistics
ACCC	Australian Competition and Consumer Commission
ACLA	Australian Council of Learned Academics
ACT	Australian Capital Territory
ACTCOSS	ACT Council of Social Services
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
ANU	Australian National University
API	Australian Power Institute
APGA	Australian Pipelines and Gas Association
ARC	Australian Research Council
ARENA	Australian Renewable Energy Agency
ARR	Australian Road Rules
BEB	Battery electric bus
BSGIP	Battery Storage and Grid Integration Program
CEC	Clean Energy Council
CER	Clean Energy Regulator
CEFC	Clean Energy Finance Corporation
CESCR	Committee on Economic, Social and Cultural Rights
CIT	Canberra Institute of Technology
CMTEDD	Chief Ministers, Treasury and Economic Development Directorate
CO ₂ -e	carbon dioxide equivalent
CORE	Cooperative of Organisations for Renewable Energy
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DER	Distributed Energy Resources
DSO	Distribution System Operator
DUOS	distribution use of service
ECA	Energy Consumers Australia
ECCB	Environment, Climate Change and Biodiversity
EPSDD	Environment, Planning and Sustainable Development Directorate

ETU	Electrical Trades Union
EV	Electric Vehicle
FCAS	Frequency Control Ancillary Services
FIT	Feed-in Tariff
GCPV	Grid connected Photovoltaic
GWh	Gigawatt hours
GWO	Global Wind Organisation
HETS	hydrogen equipment, technology and services
HPWH	heat pump water heater
HQ	Headquarters
ICE	Internal Combustion Engine
ICEDS	Institute for Climate, Energy Disaster and Solutions (ANU)
ICRC	Independent Competition and Regulatory Commission
IEA	International Energy Agency
IRENA	International Renewable Energy Agency
ISP	Integrated System Plan
kt	kilotonne
MPA	Master Plumbers Association ACT
Mt	million tonnes
MW	Megawatt
MWh	Megawatt hour
NERA	National Energy Resources Australia
NEM	National Electricity Market
NGER	National Greenhouse and Energy Reporting
OECD	Organisation for Economic Cooperation and Development (OECD)
PAGA	Parliamentary and Governing Agreement
PILA	Plumbing Industry Leadership Alliance
PV	Photovoltaic
R&D	Research and Development
RCAC	reverse cycle air conditioner
REC	renewable energy certificates
REIF	Renewable Energy Innovation Fund
RET	Renewable Energy Target
REVS	Realising electric vehicle-to-grid services

SEEA	System of Environmental-Economic Accounting
TCCSD	Transport Canberra and City Services Directorate
TUOS	transmission use of service
UC	University of Canberra
V2G	<i>Vehicle-to-grid</i>
VPP	<i>Virtual Power Plant</i>
WCCC	Weston Creek Community Council
WtE	waste-to-energy
ZEV	zero emission vehicle

Recommendations

Recommendation 1

The committee recommends that the ACT Government continue to strongly pursue its target of zero net emissions by 30 June 2045 at the latest by setting strong interim targets across a broad range of policy areas and ensure adequate budget expenditure to meet these targets.

Recommendation 2

The committee recommends that the ACT Government seek to improve co-ordination and collaboration of Territory, Federal and International plans/targets/agreements to ensure that the ACT remains a leader in renewable energy innovation in Australia and internationally.

Recommendation 3

The committee recommends that the ACT Government explores enhanced mechanisms for coordination between directorates to ensure that renewable energy efforts across the ACT government are consistent and integrated.

Recommendation 4

The committee recommends that the ACT Government commission innovative social science research and methodologies to understand how to transition sectors (i.e. transport, gas for cooking) or parts of the community that may have significant infrastructure and behaviour change barriers to reducing their emissions.

Recommendation 5

The committee recommends that the ACT Government consider providing an update of the ACT's carbon budget and the latest estimate of when it will be spent.

Recommendation 6

The committee recommends that the ACT Government reports to the Assembly on the status of its 2020-25 Sustainable Energy Policy and provide more detail on the progress of the ACT goal to net Zero emissions against its carbon budget in reports produced under the *Climate Change and Greenhouse Gas Reduction Act 2010*.

Recommendation 7

The Committee recommends the ACT Government support the ACT Renewables Hub to have long term objectives and projects that focus on outcomes to address social, technological, environmental, and labour market barriers and innovation to support ACT leadership in the renewable energy field.

Recommendation 8

The committee recommends that the ACT Renewables Hub be funded to conduct future mapping of the ACT renewable ecosystem, with a goal of identifying gaps and growth areas.

Recommendation 9

The committee recommends the ACT Government continue to look at delivering R&D and start-up grant schemes and funding that promotes innovation and diversity in the renewable energy sector.

Recommendation 10

The committee recommends that the ACT Government continues to increase investment in renewable energy sector skills education and training, working in partnership with CIT and the ACT universities.

Recommendation 11

The committee recommends that the ACT Government continue to fund and support CIT Renewable Energy Skills Centre of Excellence to develop and grow to become the Australian and Asia-Pacific leader in renewable sector skill development.

Recommendation 12

The committee recommends that the ACT Government look to engage the Australian Government in discussion around opportunities through current Asia-Pacific labour and mobility schemes to up-skill workers here in the ACT.

Recommendation 13

The committee recommends that the ACT Government explore opportunities to create a regulatory environment that can facilitate innovation and experimentation in the renewable energy sector.

Recommendation 14

The committee recommends that the ACT Government investigates the development of arrangements for removing the barriers that prevent job mobility in the renewables energy sector.

Recommendation 15

The committee recommends that the ACT Government, through its plans/strategies/frameworks/grants ensure that it prioritises and promotes diversity and inclusivity.

Recommendation 16

The committee recommends that the ACT Government considers, as part of its policy and planning work in relation to renewable energy, the social and human dimensions associated with achieving renewable energy targets and objectives.

Recommendation 17

The committee recommends that the ACT Government continues to ensure that renewable energy innovation contributes to achieving social goals as part of a just energy transition to net zero emissions.

Recommendation 18

The committee recommends that the ACT Government adopts ambitious and measurable performance targets for the Energy Efficiency Improvement Scheme and considers opening the scheme to broader market participation.

Recommendation 19

The committee recommends that the ACT Government provide more detailed and clear strategies on its implementation of the big batteries program, including that a diverse range of participants take up battery storage.

Recommendation 20

The committee recommends that the ACT Government ensures its renewable energy programs and specifically, its roll-out of community-scale batteries, occurs as a just transition.

Recommendation 21

The committee recommends that the ACT Government expand the current ACT Renewables Hub initiative to support knowledge-sharing of community battery information to empower communities to design, develop and operationalise community-scale battery projects in the ACT, and provide specific training on community batteries for technicians.

Recommendation 22

The committee recommends that the ACT Government consider developing a plan covering the financial, social, business and industry transition of fully electrifying our hot water systems in the ACT.

Recommendation 23

The committee recommends that the ACT Government consider how to retrain gasfitters to support the industry transition.

Recommendation 24

The committee recommends that the ACT Government work with the Master Plumbers Association ACT and Canberra Institute of Technology to provide continuing professional development for heat pump and solar water installers.

Recommendation 25

The committee recommends that the ACT Government determine if a special licence category should be created for plumbers undertaking solar hot water heater and heat pump installations.

Recommendation 26

The committee recommends that the ACT Government continues supporting the capture of gas from landfill to convert to green energy.

Recommendation 27

The committee recommends that the ACT Government support dispatchable battery power through the co-location of renewable energy projects at suitable sites that can be connected to the ACT electricity network.

Recommendation 28

The committee recommends that the ACT Government improve staff technical expertise within the Utilities Technical Regulator team to provide the directorate with the necessary knowledge base to assess development applications for renewable energy projects.

Recommendation 29

The committee recommends that the ACT Government develops a robust transition strategy for decarbonisation of the transport sector in ACT with a clear target that is consistent with the ACT Government target of net zero by 2045 at the latest.

Recommendation 30

The committee recommends that the ACT Government explore targets to increase charging infrastructure and establish other incentives that may help EV uptake such as negative registration fees, transit lane access, and preferred parking arrangements for private EVs.

Recommendation 31

The committee recommends that the ACT Government support the development of an integrated transport network including the installation of charging hubs for personal mobility devices such as electric bikes and scooters at various locations across Canberra.

Recommendation 32

The committee recommends that the ACT government consider a procurement contract option to convert the ACT Government vehicle fleet (including buses) to EV in return for an EV manufacturer establishing a strong administrative and R&D presence in Canberra—similar to the process of reverse auctions for electricity.

Recommendation 33

The committee recommends that the ACT Government engage with industry to leverage ARENA and ARC Linkage grants. This allows \$1 of company money to obtain \$3-4 more dollars from Federal Government research funding.

Recommendation 34

The committee recommends that the ACT Government provides support to create a network of local non-distributing cooperatives and a platform cooperative, including the potential of low-interest bank loan, to fund a CORE Cooperative of interested organisations.

Recommendation 35

The committee recommends that the ACT Government look into micro-tenders for local small and medium sized businesses for grants to ensure broad participation in renewable innovation in the ACT.

Recommendation 36

The committee recommends that the ACT Government consider changing relevant planning and building codes to ensure that all apartments can provide adequate electrical infrastructure in their basements and outdoor car parks, to allow electric vehicle users to charge their cars at home.

Recommendation 37

The committee recommends that all new and refurbished Government facilities are required to include renewable energy generation capability.

1. Introduction

- 1.1. On 23 February 2021, the Standing Committee on Environment, Climate Change and Biodiversity resolved to inquire into and report on matters relating to renewable energy innovation in the ACT.

Conduct of the Inquiry

- 1.2. On 1 March 2021, the committee published a media release announcing the inquiry and inviting public submissions by 29 April 2021. The inquiry was also published through the Canberra Times, social media, and direct emails to stakeholders.
- 1.3. On 27 April 2021, upon receiving several requests for more time from submitters, the committee agreed to extend the deadline for submissions to 14 May 2021.
- 1.4. The committee received 23 submissions. They are published on the inquiry webpage³ and listed in this report as Attachment B.
- 1.5. The hearings were open to the public and livestreamed.⁴ Three public hearings were held on 8 June 2021, 17 June 2021 and 6 July 2021. A total of 27 witnesses appeared before the committee. Witnesses giving evidence before the committee are listed at Attachment A. Transcripts⁵ and video recordings⁶ of the hearings are available on the ACT Legislative Assembly website.
- 1.6. During the hearings, seven questions were taken on notice and the answers to those questions are Attachment C.⁷

Acknowledgements

- 1.7. The committee thanks everyone who assisted the inquiry, including representatives of the community; industry groups; renewable energy researchers, practitioners, and businesses; Mr Andrew Barr MLA in his capacity as Minister for Climate Action; Mr Shane Rattenbury MLA in his capacity as Minister for Water, Energy and Emissions Reduction; and accompanying directorate officials.

³ <https://www.parliament.act.gov.au/parliamentary-business/in-committees/committees/eccb/inquiry-into-renewable-energy-innovation-in-the-act#tab1710918-2id>

⁴ As the hearings were conducted during the COVID-19 pandemic, they were held under the COVID-Safe arrangements. The arrangements limited the number of people at the hearing room to a maximum of eight people sitting at the hearing table and 15 people sitting in the public gallery.

⁵ Transcripts available at: <http://www.hansard.act.gov.au/hansard/2021/comms/eccb03a.pdf> (8 June 2021); <http://www.hansard.act.gov.au/hansard/2021/comms/eccb04a.pdf> (17 June 2021); and <http://www.hansard.act.gov.au/hansard/2021/comms/eccb05a.pdf> (6 July 2021).

⁶ Video recordings available at: <http://aod.dpa.act.gov.au/C28621> (8 June 2021); <http://aod.dpa.act.gov.au/C28687> (17 June 2021); and <http://aod.dpa.act.gov.au/C28733> (7 July 2021).

⁷ <https://www.parliament.act.gov.au/parliamentary-business/in-committees/committees/eccb/inquiry-into-renewable-energy-innovation-in-the-act#tab1710918-4id>

Committee comment

- 1.8. The committee acknowledges and appreciates the views that were expressed to the committee during the course of its inquiry. The committee is cognisant of the complex nature of the renewable energy sector. It has not been the committee's approach in its report to endorse or choose one renewable energy technology and policy over another. Instead, the committee has identified the overarching issues associated with the terms of reference and has put forward high-level recommendations, drawing on evidence, for consideration by government.

2. Policy and regulatory context

- 2.1. To reduce the impact to the community, physical infrastructure and natural ecosystems by rising global temperatures a move to net zero greenhouse gas emissions is essential.⁸ Renewable energy has risen to prominence as the threat of human induced climate change, arising in large part from the burning of fossil fuels, has become more acute.
- 2.2. The widespread uptake of renewable energy and the move away from fossil fuels is one of the key means by which catastrophic climate change may be averted.
- 2.3. Renewable energy can be defined as a type of energy that is produced using natural resources that are abundant and able to be constantly replenished.⁹ Sources of renewable energy include:
 - solar power;
 - wind power;
 - hydro power;
 - geothermal energy;
 - bioenergy; and
 - ocean energy.¹⁰
- 2.4. The Australian Council of Learned Academics (ACLA) states that the Australian energy system is rapidly changing at a scale and pace that is ‘unparalleled’. ACLA identifies the following four challenges confronting Australia in its transition to a clean energy economy, the:
 - lack of a cohesive research agenda;
 - reliance on international research that is not always suitable for unique Australian conditions;
 - need to include the wellbeing of the community in decisions that can affect their lives, communities, economy and employment; and
 - urgency of the need to change in a narrowing window of time.¹¹

⁸ ACLA, *Australian Energy Research Transition Plan: A strategic research agenda to enable Australia’s sustainable, reliable, affordable, and fair energy transition*, June 2021, p 2, <https://acola.org/wp-content/uploads/2021/06/acola-2021-australian-energy-transition-plan.pdf> (accessed 5 April 2022).

⁹ Australian Government, Department of Industry, Science, Energy and Resources, *Renewable energy*, <https://www.energy.gov.au/business/equipment-and-technology-guides/renewable-energy> (accessed 26 January 2022).

¹⁰ ARENA, *What is renewable energy*, <https://arena.gov.au/what-is-renewable-energy/> (accessed 26 January 2022).

¹¹ Australian Council of Learned Academics, *Australian Energy Research Transition Plan: A strategic research agenda to enable Australia’s sustainable, reliable, affordable, and fair energy transition*, June 2021, p 3.

International greenhouse gas emission targets

- 2.5. Emissions reduction targets and obligations under international climate agreements aimed at curbing climate change—such as the Kyoto Protocol and later the Paris Agreement—have contributed to the increased global focus on renewable energy.¹²
- 2.6. The Paris Agreement, a binding agreement to which Australia is a signatory, aims to limit global warming to below 2 degrees Celsius—preferably to 1.5 degrees Celsius—compared to pre-industrial levels. To achieve this long-term climate goal, countries need to implement strategies in order that we ‘reach global peaking of greenhouse gas emissions as soon as possible to achieve a climate neutral world by mid-century’.¹³ Australia has committed to net zero emissions by 2050, with a target of 26-28 per cent reduction in emissions below 2005 levels by 2030.¹⁴
- 2.7. The International Energy Agency (IEA) states that:
- ...the energy sector is the source of around three-quarters of greenhouse gas emissions today and holds the key to averting the worst effects of climate change, perhaps the greatest challenge humankind has faced.¹⁵
- 2.8. The IEA also notes that the technologies needed to achieve deep cuts in global emissions by 2030 already exist, and the policies that drive them are already proven. To achieve net zero by 2050 further innovation must start now to enable these new technologies to be brought to market in time.¹⁶
- 2.9. ACLA notes that a ‘business as usual’ approach is no longer feasible. Australia needs to transition to the widespread adoption of low carbon energy. The trajectory to net zero emissions is challenging due to the pervasive use of fossil fuels, which provided 93 per cent¹⁷ of Australia’s energy needs in 2020.¹⁸

¹² Kate Loynes, *Climate Change – the international approach*, Parliamentary Library Briefing Book, https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/BriefingBook45p/InternationalApproach (accessed 10 March 2022).

¹³ United Nations, Climate Change, *The Paris Agreement*, <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement> (accessed 10 March 2022).

¹⁴ Australian Government, Department of Industry, Science, Energy and Resources, *Australia’s Nationally Determined Contribution Communication 2021*, p 3, <https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Australia%20First/Australia%20Nationally%20Determined%20Contribution%20Update%20October%202021%20WEB.pdf> (accessed 29 March 2022)

¹⁵ IEA, *Net Zero by 2050: a Roadmap for the Global Energy Sector*, revised version October 2021, p 13, https://iea.blob.core.windows.net/assets/deebef5d-0c34-4539-9d0c-10b13d840027/NetZeroby2050-ARoadmapfortheGlobalEnergySector_CORR.pdf (accessed 9 March 2022).

¹⁶ IEA, *Net Zero by 2050: a Roadmap for the Global Energy Sector*, revised version October 2021, pp 14–15, https://iea.blob.core.windows.net/assets/deebef5d-0c34-4539-9d0c-10b13d840027/NetZeroby2050-ARoadmapfortheGlobalEnergySector_CORR.pdf (accessed 9 March 2022).

¹⁷ This represents total energy consumption in 2019-20, which includes industrial, and transport uses. Australian Government, *Australian Energy Update 2021*, pp 7–8, <https://www.energy.gov.au/sites/default/files/Australian%20Energy%20Statistics%202021%20Energy%20Update%20Report.pdf> (accessed 9 March 2022).

¹⁸ ACLA, *Australian Energy Research Transition Plan: A strategic research agenda to enable Australia’s sustainable, reliable, affordable, and fair energy transition*, June 2021, p 2, <https://acola.org/wp-content/uploads/2021/06/acola-2021-australian-energy-transition-plan.pdf> (accessed 9 March 2022).

- 2.10. Tony Wood, Grattan Institute Energy, Program Director, notes that a mix of renewables, batteries, electric vehicles, hydrogen, and possibly fossil fuel with carbon storage should be Australia's energy future. This will require governments and the energy industry to work collaboratively to integrate energy policy with carbon policy with accompanying mechanisms to support emissions reduction targets.¹⁹

Australian Government

- 2.11. The committee notes that while Commonwealth Government policies are outside the scope of this inquiry, they do impact the regulatory environment within which the ACT Government operates.
- 2.12. Broadly speaking, the Federal Government's energy policies and regulatory settings are underpinned by three principles:
- reliable, secure and affordable energy;
 - putting consumers first; and
 - meeting international commitments.²⁰
- 2.13. Greenhouse gases are reported under the National Greenhouse and Energy Reporting (NGER) Scheme and include carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), sulphur hexafluoride (SF₆) and specified kinds of hydro fluorocarbons and perfluorocarbons. Greenhouse gas emissions. They are measured as kilotonnes of carbon dioxide equivalence (CO₂-e), meaning that:
- ...the amount of a greenhouse gas that a business emits is measured as an equivalent amount of carbon dioxide which has a global warming potential of one. For example, in 2015–16, one tonne of methane released into the atmosphere will cause the same amount of global warming as 25 tonnes of carbon dioxide. So, the one tonne of methane is expressed as 25 tonnes of carbon dioxide equivalence, or 25 t CO₂-e.²¹
- 2.14. Greenhouse gas emissions reporting can be broken down into three main types:
- scope 1—are direct emissions caused by an activity, for example, fuel use, energy use (electricity), manufacturing processes and on-site waste disposal;
 - scope 2—are indirect emissions created from the generation of electricity, produced by the burning of fuels (coal, natural gas) at a power station, that is purchased and consumed by an organisation;

¹⁹ Tony Wood, Grattan Institute, *Australia's energy transition: a blueprint for success*, September 2021, p 3, <https://grattan.edu.au/wp-content/uploads/2019/09/energy-gathering.pdf> (accessed 9 March 2022).

²⁰ Australian Government, Department of Industry, Science, Energy and Resources, *Australia's energy strategies and frameworks*, <https://www.energy.gov.au/government-priorities/australias-energy-strategies-and-frameworks> (accessed 22 March 2022).

²¹ Australian Government, Clean Energy Regulator, *Greenhouse gases and energy*, May 2021, <http://www.cleanenergyregulator.gov.au/NGER/About-the-National-Greenhouse-and-Energy-Reporting-scheme/Greenhouse-gases-and-energy> (accessed 5 April 2022).

- scope 3—are indirect emissions that are not included in scope 2 emissions, they usually occur externally to an organisation, some examples include, off-site waste disposal, product use after sale, end-of-life product disposal and employee commute to and from work²²
- 2.15. Scope 1 and 2 emissions are currently reported under NGER. However, there is no requirement to report scope 3 emissions.²³
- 2.16. In August 2020 the ACT Minister for Climate Change and Sustainability, Mr Shane Rattenbury MLA, asked the ACT Commissioner for Sustainability and the Environment to evaluate scope 3 greenhouse gas emissions for the ACT.²⁴ The *Scope 3 Greenhouse Gas Emissions in the ACT: An investigation of current scope 3 emissions and potential future reductions* report was published in September 2021.
- 2.17. The Australian Government Technology Investment Roadmap provides the framework for meeting Australia’s commitments to net zero by 2050 and identifies four low emissions technology categories:
- priority low emissions technologies—new investment will be made in these technologies which have a high potential to reduce emissions across multiple sectors and includes removing barriers to their development;
 - emerging and enabling technologies—includes investment in research and development for emerging technologies and enabling technologies, such as infrastructure, energy efficiency and innovative energy design;
 - watching brief technologies—primarily monitoring international technologies and assessing their potential use in Australia; and
 - mature technologies—existing technologies with investment being driven primarily by the private sector.²⁵
- 2.18. At the national level there are a number of organisations working in the renewable energy innovation policy area, including the; Clean Energy Regulator (CER); Australian Renewable Energy Agency (ARENA); and Clean Energy Finance Corporation (CEFC).

²² Australian Government, Department of Industry, Science, Energy and Resources, *National Greenhouse Accounts Factors: Australian National Greenhouse Accounts*, October 2020, p 7, <https://www.industry.gov.au/sites/default/files/2020-10/national-greenhouse-accounts-factors-2020.pdf> (accessed 6 April 2022).

²³ Australian Government, CER, *Greenhouse gases and energy*, May 2021, <http://www.cleanenergyregulator.gov.au/NGER/About-the-National-Greenhouse-and-Energy-Reporting-scheme/Greenhouse-gases-and-energy> (accessed 5 April 2022).

²⁴ OCSE, *Scope 3 Greenhouse Gas Emissions in the ACT: An investigation of current scope 3 emissions and potential future reductions*, September 2021, p 10, <https://envcomm.act.gov.au/wp-content/uploads/2021/11/Scope-3-Greenhouse-Gas-Emissions-in-the-ACT-FINAL-Report-A30648089.pdf> (accessed 5 May 2022).

²⁵ Australian Government, Department of Industry, Science, Energy and Resources, *Technology Investment Roadmap: First low emissions technology statement 2020*, p 15, <https://www.industry.gov.au/sites/default/files/September%202020/document/first-low-emissions-technology-statement-2020.pdf> (accessed 29 March 2022).

- 2.19. The CER was established on 2 April 2012 by the *Clean Energy Regulator Act 2011* as an independent statutory authority to administer climate change technology with a goal to ‘contribute to a reduction in Australia’s net greenhouse gas emissions, including through the administration of market-based mechanisms that incentivise reduction in emissions and the promotion of additional renewable electricity generation’.²⁶
- 2.20. The CEFC was established on 3 August 2012 by the *Clean Energy Finance Corporation Act 2012* to accelerate investment in technologies to assist Australia’s transition to net zero emissions.
- 2.21. ARENA was established by the *Australian Renewable Energy Agency Act 2011* on 1 July 2012, ARENA’s purpose is ‘to support the global transition to net zero emissions by accelerating the pace of pre-commercial innovation, to the benefit of Australian consumers, businesses and workers.’ Since 2021, ARENA has funded 612 projects with the total value of \$1.81 billion that ‘advance renewable energy technologies along the innovation chain: from early stage research in the lab, to later stage demonstration projects in the field.’ Federal research and development grants span the public sector, university sector, and private sector with cross sector collaboration being common in projects.²⁷
- 2.22. The National Electricity Market (NEM) and Renewable Energy Target (RET) are also integral to the discussion about renewable energy in Australia. The Australian Energy Market Operator (AEMO), which regulates electricity networks and covered gas pipelines in all jurisdictions except Western Australia, notes that:
- ...the NEM is an intricate system of systems, which includes regulatory, market, policy and commercial components. At its centre is the power system, which is an inherently complex machine of continental scale. This system is now experiencing the biggest and fastest transformational change in the world since its inception over 100 years ago.²⁸
- 2.23. The NEM is a wholesale market where generators and retailers trade electricity in the six eastern and southern states and territories of Australia. Reportedly one of the largest interconnected electricity systems in the world, the NEM ‘covers around 40,000 km of transmission lines and cables and provides supply to 9 million customers’ and delivers 80 per cent of the electricity consumption in Australia. NEM management includes:
- energy ministers—key decision makers with policy and governance responsibility;
 - the Australian Energy Market Commission (AEMC)—develops the rules by which the NEM, natural gas and retail markets operate, and also provide strategic and operational advice to the Energy Ministers’ meeting;²⁹

²⁶ Australian Government, CER, *Corporate Plan 2021-2025 – Our role*, <http://www.cleanenergyregulator.gov.au/About/Pages/Accountability%20and%20reporting/Corporate%20plans/Corporate%20Plan%202021-25/Our-role.aspx> (accessed 29 March 2022).

²⁷ ARENA, *About*, <https://arena.gov.au/about/> (accessed 21 March 2022).

²⁸ AEMO, *Integrated System Plan 2020*, p 10, <https://aemo.com.au/-/media/files/major-publications/isp/2020/final-2020-integrated-system-plan.pdf?la=en> (accessed 30 March 2022).

²⁹ AEMC, *About us*, <https://www.aemc.gov.au/about-us> (accessed 14 April 2022).

- the AEMO—enforces the laws for the NEM and spot gas markets in southern and eastern Australia including, setting the amount of revenue that network businesses can recover from customers using the networks, and monitoring and reporting on the conduct of market participants;³⁰ and
 - the Australian Energy Regulator (AER)—enforces the rules and makes judgements on the regulatory proposals of monopoly network operators.³¹
- 2.24. The NEM operates ‘as a pool, or spot market, where power supply and demand is matched instantaneously through a centrally coordinated dispatch process.’ The market works on a dispatch price, determined every five minutes, to provide a better price signal for investment in faster response technologies, such as batteries and gas peaking generators. It should be noted that all electricity sales are traded through the NEM and prices fluctuate depending on the supply and demand at a point in time.³²
- 2.25. ARENA advised the committee that the NEM is one of the most dynamic markets in the world, and that kind of volatility needs to be balanced with control algorithms that can balance what consumers want—for example charging their EV when they need it—with getting the electricity at the lowest price from the wholesale market. It stated that ‘this will require intermediaries, like electricity retailers or other forms of aggregators, to manage their participation in the wholesale market’.³³
- 2.26. The Renewable Energy Target (RET) was introduced in 2001 and is:
- ...designed to reduce emissions of greenhouse gases in the electricity sector and encourage the additional generation of electricity from sustainable and renewable sources. The Renewable Energy Target works by allowing both large-scale power stations and the owners of small-scale systems to create large-scale generation certificates and small-scale technology certificates for every megawatt hour of power they generate. Certificates are then purchased by electricity retailers (who supply electricity to householders and businesses) and submitted to the Clean Energy Regulator to meet the retailers' legal obligations under the Renewable Energy Target. This creates a market which provides financial incentives to both large-scale renewable energy power stations and the owners of small-scale renewable energy systems.³⁴
- 2.27. The RET initially aimed to source two per cent of the nation's electricity generation from renewable sources; however, this was increased in 2009 to 20 per cent (41 000 Gigawatt hours (GWh)). Further changes to the target were made in 2011 when it was split into two parts—the large-scale renewable energy target and the small-scale renewable energy

³⁰ AER, *About us*, <https://www.aer.gov.au/about-us> (accessed 14 April 2022)

³¹ Australian Government, Department of Industry, Science, Energy and Resources, *National Electricity Market*, <https://www.energy.gov.au/government-priorities/energy-markets/national-electricity-market-nem> (accessed 21 March 2022)

³² AEMO, *The National Electricity Market – Factsheet*, December 2021, p [3], <https://aemo.com.au/-/media/files/electricity/nem/national-electricity-market-fact-sheet.pdf> (accessed 6 April 2022).

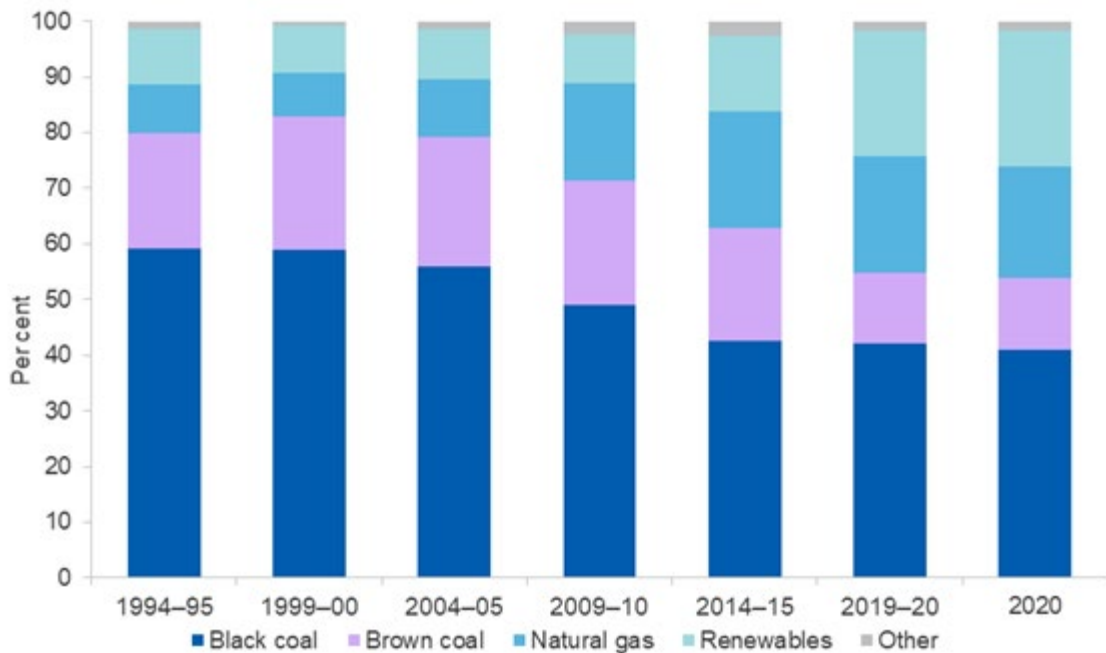
³³ Committee transcript, 6 July 2021. p 112.

³⁴ Australian Government, CER, *About the Renewable Energy Market*, <http://www.cleanenergyregulator.gov.au/About/Pages/Accountability%20and%20reporting/Corporate%20plans/Corporate%20Plan%202021-25/Our-role.aspx> (accessed 29 March 2022).

scheme. In 2015, the Commonwealth Parliament passed the *Renewable Energy (Electricity) Amendment Bill 2015* which included an amendment to reduce the large-scale renewable energy target in 2020 from 41 000 GWh to 33 000 GWh.

- 2.28. The current mix of energy resources used to generate electricity in Australia is shown in Figure 1 below.

Figure 1: Australian electricity generation fuel mix



Source: Department of Industry, Science, Energy and Resources³⁵

- 2.29. With the rise of renewable energy, and as Australia embarks on a transition to a net-zero energy system, the Federal Government has acknowledged the need to reform the NEM and has embarked on the process. It has stated that:

...the NEM needs to be modernised to accommodate and respond to changes in electricity generation, emerging technologies, such as solar batteries, and shifting consumer preferences. The government’s long-term energy policies are being informed by recommendations of the Australian Competition and Consumer Commission (ACCC). These are included in its Retail Electricity Pricing Inquiry and the Independent Review into the Future Security of the NEM reports. They provide a blueprint for ensuring Australia’s energy systems remain affordable, reliable, sustainable and secure while transitioning to low emission forms of generation.³⁶

³⁵ Australian Government, Department of Industry, Science, Energy and Resources, *Australian electricity generation – fuel mix*, [https://www.energy.gov.au/data/australian-electricity-generation-fuel-mix#:~:text=The%20figure%20shows%20Australian%20electricity,%25\)%20and%20oil%20\(2%25\)](https://www.energy.gov.au/data/australian-electricity-generation-fuel-mix#:~:text=The%20figure%20shows%20Australian%20electricity,%25)%20and%20oil%20(2%25)) (accessed 13 May 2021).

³⁶ Australian Government, Department of Industry, Science, Energy and Resources, *National Electricity Market*, <https://www.energy.gov.au/government-priorities/energy-markets/national-electricity-market-nem> (accessed 21 March 2022)

- 2.30. However, researchers have identified the need for a comprehensive energy transition plan that goes beyond the NEM reform. As the ACLA stated in its Australian Energy Transition Research Plan:

Australian governments are currently implementing a suite of reforms to address Australia's electricity infrastructure and energy market. However, much work remains to transform our industries (particularly mining, transport, manufacturing and agriculture), which are still mostly dependent on fossil fuels for their energy requirements, and also contribute substantially to emissions.

Australia also has substantial opportunities to grow our clean energy sector and to become a renewable energy superpower, buoyed by the current success of our solar and wind industries. However, realising these opportunities will require national strategic alignment, innovation and regulation... [a] successful energy transition will be one that addresses the energy trilemma: reliable, affordable and reaching net zero emissions, while also placing the wellbeing of society at its centre.³⁷

ACT Government net zero by 2045

- 2.31. The ACT legislative framework for emissions targets is set out in the *Climate Change and Greenhouse Reduction Act 2010*. The original target set in October 2010 was to achieve net zero emissions by 30 June 2060, with interim targets of 40 percent less than 1990 emissions by 30 June 2020 and 80 per cent of 1990 emissions by 30 June 2050. Since that time, the legislation has been amended to include new targets. As at March 2022, the target is to achieve zero net emissions by 30 June 2045 at the latest, with interim targets of:

- 40 percent less than 1990 emissions by 30 June 2020 (with power given to the Minister to determine additional interim targets); and
- for the ACT to have 100 percent renewable electricity by 1 January 2020.³⁸

- 2.32. The ACT Government notes that:

...the ACT's renewable energy policies benefited from a significant early mover advantage from 2012 to 2015 while the national renewables industry was at a standstill due to national policy uncertainty. Accordingly, the ACT was able to attract and sustain the attention of the national renewables industry and in-bound foreign businesses.³⁹

- 2.33. The ACT Government's current agenda for climate action in the ACT is driven, in part, by the *Parliamentary and Governing Agreement (PAGA)* for the 10th Legislative Assembly. The agreement commits the parties 'to undertaking rapid, science-based action to mitigate and adapt to climate change, and transition the ACT to net zero emissions'. The parties also

³⁷ ACLA, *Australian Energy Transition Research Plan*, June 2021, p. 2 <https://acola.org/wp-content/uploads/2021/06/acola-2021-australian-energy-transition-plan.pdf> (accessed 22 March 2022).

³⁸ *Climate Change and Greenhouse Reduction Act 2010*, s 6–9.

³⁹ ACT Government, Submission 8, p 3.

commit to ‘working closely with the community, ensuring a just transition for those impacted by the shift to net zero emissions, and growing sustainable industries and jobs.’⁴⁰ The next steps on climate change action, which will be achieved through a broad range of actions, are to:

- phase out of fossil-fuel-gas in the ACT by 2045 at the latest;
- support energy grid stability and support vulnerable households;
- significantly expand the number of zero emission vehicles (ZEV) in the ACT; and
- reform the ACT’s building and planning systems to ensure a transition to best practice climate-ready and environmentally sustainable buildings and planning.⁴¹

2.34. The ACT Government’s *ACT Climate Change Strategy 2019-2025* sets out a vision that:

...by 2045 the ACT will be a leading net zero emissions territory that demonstrates that a healthier, smarter future is possible.

The ACT will be powered by 100% renewable electricity and will continue to lead in finding innovative solutions for energy demand management and energy security. This will support a strong and diverse zero emissions economy, establishing the ACT as a zero emissions investment hub.⁴²

2.35. The *ACT Climate Change Strategy 2019-2025* builds on previous government policies and commits to the following targets for reducing emissions from 1990 levels by:

- 40 per cent by 2020;
- 50-60 per cent by 2025;
- 65-75 percent by 2030;
- 90-95 per cent by 2040 (original target of 80 per cent by 30 June 2050); and
- 100 per cent (net zero emissions) by 2045 at the latest⁴³ (a 15 year reduction from the original target to achieve net zero net emissions by 30 June 2060).

2.36. In 2020-2021, the ACT emitted a total of 1,685 kt CO₂-e consisting of:

- emissions from transport (64%);
- natural gas combustion (22%);
- waste decomposition (10%);

⁴⁰ ACT Government, Chief Ministers, Treasury and Economic Development Directorate (CMTEDD), *Parliamentary and Governing Agreement: 10th Legislative Assembly Australian Capital Territory*, Appendix 1, pp [7–8], (accessed 10 March 2022).

⁴¹ ACT Government, Chief Ministers, Treasury and Economic Development Directorate (CMTEDD), *Parliamentary and Governing Agreement: 10th Legislative Assembly Australian Capital Territory*, Appendix 1, pp [7–8], https://www.cmtedd.act.gov.au/_data/assets/pdf_file/0003/1654077/Parliamentary-Agreement-for-the-10th-Legislative-Assembly.pdf, (accessed 10 March 2022).

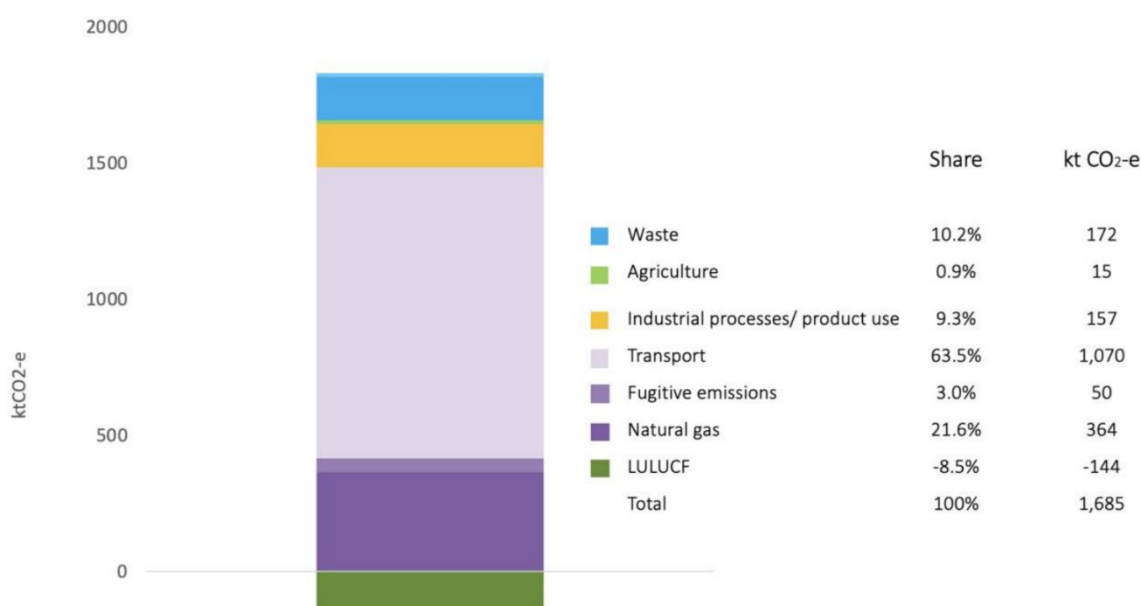
⁴² ACT Government, EPSDD, *ACT Climate Change Strategy 2019-2025*, 2019, p 15, https://www.environment.act.gov.au/_data/assets/pdf_file/0003/1414641/ACT-Climate-Change-Strategy-2019-2025.pdf/ recache (accessed 9 March 2022).

⁴³ ACT Government, EPSDD, *ACT Climate Change Strategy 2019-2025*, 2019, p 4,

- industrial processes and product use (9%);
- fugitive emissions from fuels (3%); and
- agriculture (1%).⁴⁴

2.37. The Greenhouse Gas Inventory for 2020-2021 notes that ‘total emissions are partly offset by land use, land-use change and forestry (LULUCF) that provide net sequestration (removal) of 144 kt CO₂-e (-9% of total emissions) – that is, the sector absorbed more emissions than it generated’.⁴⁵

Figure 2: ACT emissions by sector and energy sub-sector, 2020-2021



Source: ACT Greenhouse Gas Inventory for 2020-21 (Note: Numbers may not sum due to rounding).⁴⁶

2.38. The ACT Government’s *Transport Canberra Zero Emissions Transition Plan* set outs an approach to achieve a zero-emission public transport system by 2040.⁴⁷ The plan notes that ‘with the recent achievement of 100 per cent renewable sources for the ACT electricity supply, the transport sector is now the largest source of emissions in the Territory, comprising 62 per cent.’ The transition to a zero-emission transport fleet will focus on strategic priorities to:

- build the necessary infrastructure;
- procure zero-emissions buses;

⁴⁴ ACT Government, EPSDD, *ACT Greenhouse Gas Inventory for 2020-21*, p 4, https://www.environment.act.gov.au/_data/assets/pdf_file/0003/1918038/ACT-Greenhouse-Gas-Emissions-Inventory-Report-2020-21.pdf (accessed 10 March 2022).

⁴⁵ ACT Government, EPSDD, *ACT Greenhouse Gas Inventory for 2020-21*, p 4,

⁴⁶ ACT Government, EPSDD, *ACT Greenhouse Gas Inventory for 2020-21*, p 4, https://www.environment.act.gov.au/_data/assets/pdf_file/0003/1918038/ACT-Greenhouse-Gas-Emissions-Inventory-Report-2020-21.pdf (accessed 10 March 2022).

⁴⁷ ACT Government, Transport Canberra and City Services Directorate, *Transport Canberra Zero Emissions Transition Plan*, 2020, p 3, https://www.transport.act.gov.au/_data/assets/pdf_file/0010/1625095/ZERO-EMISSION-TRANSITION-FINAL-.pdf (accessed 10 March 2022).

- partner with the energy sector;
 - develop new skills, protecting jobs and growing the economy; and
 - increase public transport use through better buses and a better service.⁴⁸
- 2.39. The policy direction for private transport in Canberra is outlined in *The ACT's Transition to Zero Emissions Vehicles: Action Plan 2018-2021* which states that these vehicles offer a clean, reliable and smart option for travel which will result in no greenhouse gas emissions as a result of all electricity in the ACT being supplied from renewable sources.⁴⁹
- 2.40. The ACT Government reported that the actions being taken under this plan are to:
- support new and innovative businesses in the ZEV [zero emission vehicle] sector to maximise job creation and economic development;
 - work with local and state governments to facilitate the installation of charging stations on major transport routes to and from Canberra;
 - amending road and parking rules to promote the uptake of ZEVs;
 - ensure new leased ACT Government fleet vehicles are ZEVs in 2020-21, where fit for purpose; and
 - trial financial incentives to encourage the uptake of ZEVs and electric bikes.⁵⁰
- 2.41. The *ACT Planning Strategy 2018*, the Territory's overarching strategic framework for land use planning, 'works alongside renewed strategies for climate change, transport and housing', to build a sustainable and equitable Canberra to 2045.⁵¹ One of the five identified themes in the plan is for a 'sustainable and resilient' city, this includes, among other initiatives, transitioning to a net zero emissions city through the uptake of renewable energy, improved building design and transport initiatives.⁵²
- 2.42. The *ACT Housing Strategy 2018*, the Territory's 10 year plan to meet the Territory's housing need, notes that 'environmentally sustainable housing will help mitigate cost of living pressures for all households, reduce carbon emissions and help the city prepare for a changing climate'.⁵³

⁴⁸ ACT Government, Transport Canberra and City Services Directorate (TCCSD), *Transport Canberra Zero Emissions Transition Plan*, 2020, p 4, https://www.transport.act.gov.au/_data/assets/pdf_file/0010/1625095/ZERO-EMISSION-TRANSITION-FINAL-.pdf (accessed 10 March 2022).

⁴⁹ ACT Government, EPSDD, *The ACT's Transition to Zero Emissions Vehicles: Action Plan 2018-2021*, 2018, p 1 https://www.environment.act.gov.au/_data/assets/pdf_file/0012/1188498/2018-21-ACTs-transition-to-zero-emissions-vehicles-Action-Plan-ACCESS.pdf (accessed 10 March 2022).

⁵⁰ ACT Government, Submission 8, p 6.

⁵¹ ACT Government, EPSDD, *ACT Planning Strategy 2018*, 2018, p 1, https://www.planning.act.gov.au/_data/assets/pdf_file/0007/1285972/2018-ACT-Planning-Strategy.pdf (accessed 10 March 2022).

⁵² ACT Government, EPSDD, *ACT Planning Strategy 2018*, 2018, p 11, https://www.planning.act.gov.au/_data/assets/pdf_file/0007/1285972/2018-ACT-Planning-Strategy.pdf (accessed 10 March 2022).

⁵³ ACT Government, EPSDD, *ACT Housing Strategy 2018*, p 16, https://www.act.gov.au/_data/assets/pdf_file/0004/1265638/ACT-Housing-Strategy-2018.pdf (accessed 10 March 2022).

ACT Budget 2020-21 commitments

- 2.43. In the 2020-21 budget, the ACT Government committed \$307 million over five years to implement the next steps in the transition to net zero emissions. This includes:
- \$150 million fund for the Sustainable Household Scheme to offer zero-interest loans of up to \$15,000 to help households with the upfront costs of investing in rooftop solar panels, household battery storage, ZEVs and ZEV charging infrastructure, and efficient electric appliances;
 - \$100 million over five years to deliver a Big Canberra Battery of at least 250 Megawatt (MW) of new 'large-scale' battery storage distributed across the ACT;
 - waiving registration fees on new ZEVs for the first two years of registration from May 2021 to encourage more Canberrans to purchase electric vehicles;
 - \$5 million Building Energy Efficiency Upgrade Fund to support community clubs to undertake energy efficiency upgrades through initiative like water and ventilation audits, partial grants for certain energy and water efficiency upgrades and no-interest loans for certain upgrades such as rooftop solar;
 - \$50 million Vulnerable Household Energy Support Initiative to improve building efficiency and sustainability for social and public housing, low-income owner occupiers and low performing rental properties;
 - initial funding of \$855,000 to support phasing out fossil fuel gas through continuing work on the ACT's sustainable energy policy actions and developing legislation to prevent new gas mains network connections to future stages of greenfield residential development in the ACT; and
 - investing \$915,000 over two years to establish an Office of the Coordinator General for Climate Action to coordinate government efforts and oversee major projects to keep our Climate Action commitments on track.⁵⁴

⁵⁴ ACT Government, Submission 8, p 12.

Future policy development

- 2.44. The ANU Institute for Climate, Energy and Disaster Solutions (ICEDS) advised the committee of the need for the ACT Government to review taxation arrangements. The government should look at current regulations and legal framework which are potentially barrier to investment and companies coming into the ACT. For example, the cost incurred through the utilities network facilities tax, unique to the ACT, is calculated on the kilometres of infrastructure, and is either absorbed by the business or passed onto customers:

...I have done the numbers roughly. The electricity distribution network company has 2,394 kilometres of overhead lines and 2,694 kilometres of underground cables; they are taxed at \$1,283 per kilometre network they have. That is a tax revenue of around \$6.5 million a year just from the electricity network.⁵⁵

- 2.45. ICEDS told the committee in evidence that, while the ACT has progressive targets for delivering emissions reductions, strong interim targets need to be set for a whole range of policies, for example, the transition to EVs, as purchasing 'decisions people are making today will affect our emissions in 2035, 2040 and 2045'.⁵⁶

- 2.46. In its submission, ICEDS noted that government policy initiatives need to be sector-specific in their design, noting that measures designed to encourage urban energy-efficiency retrofitting will be different to policy measures designed to reduce emissions in the transport sector. ICEDS supported sector-specific consultations with stakeholders, including consumer representative organisations and community energy organisations. It argued that this would:

...require an honest appraisal of the effectiveness of the legislative and policy framework surrounding particular issues and sectors such as energy efficiency in buildings and sub-sectors such as commercial property or residential rental properties.⁵⁷

- 2.47. In its submission, the Weston Creek Community Council (WCCC) also highlighted the importance of engaging authentically with the ACT community to ensure thorough consultation on renewable energy projects and programs. It also stressed the importance of setting clear and measurable goals:

Whatever initiatives are eventually determined need to be underpinned by a long term, ambitious and achievable plan that includes measurable objectives and milestones and supported by solid governance arrangements.⁵⁸

- 2.48. The committee was advised by a number of submitters that a dedicated renewable energy plan was an important step towards advancing renewables in the ACT. The Smart Energy Council recommended that a coordinated renewable energy plan be created, noting that:

⁵⁵ *Committee Transcript*, 8 June 2021, p 85.

⁵⁶ *Committee Transcript*, 8 June 2021, p 82.

⁵⁷ ICEDS, Submission 16, p 5.

⁵⁸ WCCC, Submission 19, pp [2–3].

...such a plan would have to include strategies and frameworks for the effective implementation of Renewable Energy agendas across the ACT. This plan would be an incredible innovation of smart energy diplomacy.⁵⁹

- 2.49. In its submission, Canberra Solar Hot Water Repairs noted the ACT Government's intention to phase out gas in the ACT. It argued that the case for an electric-only approach is not yet clear with Environment, Planning and Sustainable Development Directorate (EPSDD) announcing they are seeking consultants to 'determine the impacts of electrification on Evoenergy's electricity networks and whether the end result will be a complete shutdown of the gas networks or a transition to green hydrogen'.⁶⁰
- 2.50. Greenlaw noted that the final plan to phase out gas under goal 4B of the *ACT Climate Strategy 2019-2025* is currently due to be finalised in 2024 and recommended that the ACT Government bring forward the plan development timetable so that gas could potentially be phased out by 2030. It also recommended that the timelines and targets for the phasing out gas be legislated and that interim targets be developed through amendments to the *Climate Change and Greenhouse Reduction Act 2010*. This, it submitted, would reduce the prospect of businesses and industry wasting their investments in gas infrastructure into the future.⁶¹
- 2.51. LGI Limited has run two carbon abatement projects in the ACT at the Mugga Lane and West Belconnen landfill sites. Mr Jarryd Doran, Chief Operating Officer, LGI Limited, told the committee that while the company had received support from the ACT Government for its projects, it also faced policy and regulatory hurdles in getting the projects off the ground. This was said to have arisen due to:
- a lack of co-ordination between government agencies; and
 - changes in legislation and approval processes leading to lengthy timelines for procurement and missed commercial opportunities.⁶²
- 2.52. In its submission, LGI Limited suggested that the ACT Government needs to develop a framework for businesses to enable them to assess their projects 'candidacy prior to lodgement to reduce the burden to Government, network providers and developers'. Useful information that the government could provide for businesses for such an assessment could include:
- clarity on the types of projects that best fit the ACT Climate Strategy;
 - the outcomes to be achieved by the energy market being addressed;
 - preferred technologies to achieve these; and
 - identified renewable energy zones for potential energy projects across the ACT.⁶³

⁵⁹ Smart Energy Council, Submission 5, p 10.

⁶⁰ Canberra Solar Hot Water Repairs, Submission 6A, p 5.

⁶¹ Greenlaw, Submission 23, p 6.

⁶² *Committee transcript*, 8 June 2021, p 53.

⁶³ LGI Limited, Submission 13, p 2.

- 2.53. LGI Limited advised that the Utilities Technical Regulator team, EPSDD did not have the in-house expertise to assess proposals of the kind that had been submitted by LGI Limited. In evidence, it stated that the:

pushback we encountered was not for the green gas project, because we are still working through the consultation phase with the various stakeholders. Where we saw pushback was with the current facility—the landfill gas to energy plan. It was pretty clear that the regulatory body did not have the in-house expertise to assess it. We already had lodged the application and achieved a development approval, we had the connection approval from the network authority and then we encountered the utilities technical regulator team within the ACT government. Given the nature of this project, it is not something they were familiar with. It required us as the project developer to bring in an external third-party auditor to act on behalf of the territory. That added about 10 per cent to the project bottom line, just through getting third-party approval on already third-party approved designs and documentation. It was an unusual process for the territory. Obviously, solar plants and wind farms are more familiar. A gas to energy plan is something new.⁶⁴

Recommendation 1

The committee recommends that the ACT Government continue to strongly pursue its target of zero net emissions by 30 June 2045 at the latest by setting strong interim targets across a broad range of policy areas and ensure adequate budget expenditure to meet these targets.

Recommendation 2

The committee recommends that the ACT Government seek to improve co-ordination and collaboration of Territory, Federal and International plans/targets/agreements to ensure that the ACT remains a leader in renewable energy innovation in Australia and internationally.

Recommendation 3

The committee recommends that the ACT Government explores enhanced mechanisms for coordination between directorates to ensure that renewable energy efforts across the ACT government are consistent and integrated.

Recommendation 4

The committee recommends that the ACT Government commission innovative social science research and methodologies to understand how to transition sectors (i.e. transport, gas for cooking) or parts of the community that may have significant infrastructure and behaviour change barriers to reducing their emissions.

⁶⁴ *Committee Transcript*, 8 June 2021, pp 55–56.

Climate reporting

- 2.54. The ACT Government established the ACT Climate Change Council in 2011 under the *Climate Change and Greenhouse Reduction Act 2010* to, among other things, advise the ‘Minister for Water, Energy and Emissions Reduction on matters relating to reducing greenhouse gas emissions and building resilience and adapting to climate change’. The Council produces an annual report of its activities, including any advice given or recommendations made to the minister.⁶⁵
- 2.55. The ACT Climate Change Council used a carbon budget to develop its latest recommendations to the Minister for Water, Energy and Emissions Reduction. A carbon budget establishes ‘the amount of greenhouse gases that can be ‘spent’ (emitted) for a given level of global warming’.⁶⁶
- 2.56. The Climate Change Council also notes that, to keep warming to a desired temperature limit (for example, the Paris 1.5°C target), total amount of greenhouse gas emissions must be kept below the ‘carbon budget’, which is set through the amount of greenhouse gases that are being emitted and absorbed in the natural environment. The Council notes that:
- So far, the relationship [between carbon dioxide and climate] has been approximately ‘linear,’ meaning that if we double the amount of carbon dioxide produced, we essentially double global warming. The budget is not an annual one, but rather a cumulative one; for all time—past, present and future. Furthermore, the carbon budget cannot be modified to suit the desires of humans; it is a fundamental feature of the way the Earth works. Once the carbon budget has been ‘spent’, then net emissions must be held to zero from that point onward in order to avoid exceeding the temperature target.⁶⁷
- 2.57. The ACT Climate Change Council estimated the total carbon budget for the ACT⁶⁸ in 2018 as being 28 million tonnes (Mt) of CO₂-e which would be expended in about seven years (if the current ‘rate of ‘spend’’ of 4 Mt CO₂-e per annum was maintained).⁶⁹
- 2.58. In his submission, Mr Larry O’Loughlin noted that, based on 2017 data, the ACT is on a path to spend its remaining carbon budget by 2030⁷⁰ and argued that the ACT Government should consider the ACT Climate Change Council’s most up to date numbers for the ACT carbon budget when considering new policies and programs.⁷¹
- 2.59. A report must be prepared each year under the *Climate Change and Greenhouse Gas Reduction Act 2010*, and include the:

⁶⁵ ACT Government, EPSDD, *ACT Climate Change Council*, <https://www.environment.act.gov.au/cc/act-climate-change-council> (accessed 3 April 2022).

⁶⁶ ACT Climate Change Council, *What is a carbon budget?*, 2018, p 2

https://www.environment.act.gov.au/_data/assets/pdf_file/0006/1297707/What-is-a-Carbon-Budget.pdf (accessed 3 April 2022).

⁶⁷ ACT Climate Change Council, *What is a carbon budget?*, 2018, p 4

https://www.environment.act.gov.au/_data/assets/pdf_file/0006/1297707/What-is-a-Carbon-Budget.pdf (accessed 3 April 2022).

⁶⁸ Assuming a projected ACT population of 500,000 between 2030 and 2040.

⁶⁹ ACT Climate Change Council, *What is a carbon budget?*, 2018, p 7,

https://www.environment.act.gov.au/_data/assets/pdf_file/0006/1297707/What-is-a-Carbon-Budget.pdf (accessed 3 April 2022).

⁷⁰ Mr Larry O’Loughlin, Submission 24, p 3.

⁷¹ Mr Larry O’Loughlin, Submission 24, p 4.

- actions taken during the year to exercise the functions required of the Minister for Water, Energy and Emissions Reduction under the Act;
- effectiveness of government actions taken to reduce greenhouse gas emissions; and
- findings of a cost-benefit analysis of any government policies or programs implemented to meet the targets.⁷²

2.60. The WCCC observed that, despite consultation being conducted in 2019, the final Sustainable Energy Policy 2020-25 has not been released. It encouraged the ACT Government to finalise this work as soon as possible.⁷³

Committee comment

2.61. The committee notes the need for timely, accurate and regular reporting on the source and amount of greenhouse gas emissions in the ACT. Without knowing the quantities and sources of our emissions it will be very difficult to eliminate them efficiently and effectively.

Recommendation 5

The committee recommends that the ACT Government consider providing an update of the ACT's carbon budget and the latest estimate of when it will be spent.

Recommendation 6

The committee recommends that the ACT Government reports to the Assembly on the status of its 2020-25 Sustainable Energy Policy and provide more detail on the progress of the ACT goal to net Zero emissions against its carbon budget in reports produced under the *Climate Change and Greenhouse Gas Reduction Act 2010*.

⁷²ACT Government, *2020-21 Ministers' Annual Report: Under the Climate Change and Greenhouse Gas Reduction Act 2010*, p 1, https://www.environment.act.gov.au/_data/assets/pdf_file/0011/1910486/2020-21-ministers-annual-report-under-the-climate-change-and-greenhouse-gas-reduction-act-2010.pdf (accessed 14 April 2022).

⁷³ Weston Creek Community Council, Submission 19, p [2].

3. ACT renewable energy innovation

3.1. The IEA states that renewable energy innovation is:

...the process of generating ideas for new products or production processes and guiding their development all the way from the lab to their mainstream diffusion into the market. At each stage of development there are funding risks, technical risks and market risks, which are influenced by various social and political factors. As a result, only a minority of products ever make it as far as mass market deployment in practice.⁷⁴

3.2. The International Renewable Energy Agency (IRENA) states that energy transformation is driven by economic opportunity and technological development. The four elements required to accelerate renewable energy innovation are:

- pursuing power system integration;
- decarbonising end-use sectors;
- nurturing innovation; and
- expanding beyond Research and Development (R&D) – governments play a key role in setting the required frameworks for innovation to become mainstream.⁷⁵

3.3. The ICEDS noted in its submission that the innovation ecosystem is governed by international parameters and national frameworks and factors and that the ‘ACT must focus on options within its power’. It also noted that while the ACT Government is not responsible for the national electricity laws and rules, it does have input through the National Cabinet’s Energy Council.⁷⁶

3.4. The ACT has steadily built investment in household and industrial-scale renewable energy in the last decade. The ACT has invested significantly in wind and solar power and, according to the ACT Government, is home to one of ‘the largest roll outs of household batteries in the world.’⁷⁷

3.5. The ACT uses 2,900,000 megawatt hours (MWh) each year, with 80 percent of this coming from non-renewable sources in 2014-15. In 2016, the ACT Government legislated a new target of sourcing 100 per cent renewable energy by 2020.⁷⁸

3.6. In its submission, the ACT Government noted that it had achieved its early renewable energy innovation goals through a number of renewable energy policies:

⁷⁴ IEA, *Energy Technology Perspectives 2020: Special Report on Clean Energy Innovation – accelerated technology progress for a sustainable future*, p 18, https://iea.blob.core.windows.net/assets/04dc5d08-4e45-447d-a0c1-d76b5ac43987/Energy_Technology_Perspectives_2020_-_Special_Report_on_Clean_Energy_Innovation.pdf (accessed 6 April 2022).

⁷⁵ IRENA, *Renewable Energy Innovation: Accelerating research for a low-carbon future*, 2017, p 2, https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2017/Nov/IRENA_Accelerating_research_2017.pdf?la=en&hash=2A53295A57DD87A0A451E68A2CE7EA020729871F (accessed 6 April 2022).

⁷⁶ ICEDS, Submission 16, p 5.

⁷⁷ ACT Government, ACTSmart, *Renewable Energy*, <https://www.actsmart.act.gov.au/what-is-the-government-doing/energy/renewal-energy-targets> (accessed 3 February 2022).

⁷⁸ ACT Government, ACTSmart, *Renewable Energy*, <https://www.actsmart.act.gov.au/what-is-the-government-doing/energy/renewal-energy-targets> (accessed 29 March 2022).

ACT's 2014 *Renewable Energy Local Investment Framework* articulated a vision of Canberra as an 'internationally recognised centre of renewable energy innovation and investment' and set out the ACT's priorities for local investment under its renewable electricity reverse auctions. This was complemented by the 2015 *Renewable Energy Industry Development Strategy* (REIDS), which set out the actions the ACT would take (and has since taken) in partnership with industry and academia to accelerate the development of its vibrant, export-oriented, renewable energy industry for the benefit of participating businesses, institutions and the ACT community.⁷⁹

- 3.7. The 'reverse auction' was pioneered in the ACT and sees energy companies competing to provide renewable energy at the lowest cost to the Territory. Four reverse auctions were held for large-scale solar and wind between 2012 and 2016.⁸⁰ These auctions leveraged \$500 million worth local investment outcomes over 20 years.⁸¹
- 3.8. The ACT is now powered by 100 per cent renewable energy through a number of solar and wind farms in the ACT, Victoria and NSW as well as domestic photovoltaic (PV) panels that feed into the grid. The major renewable energy farms are:
- Hornsdale Wind Farm – 309 MW, Neoen and Megawatt Capital;
 - Ararat Wind Farm – 80.5 MW, RES Australia;
 - Coonooer Bridge Wind Farm – 19.4MW, Windlab Limited;
 - Sapphire Wind Farm – 100MW, CWP Renewables;
 - Crookwell Wind Farm – 91MW, Union Fenosa;
 - Mugga Lane Solar Farm – 13MW, Maoneng Australia;
 - Williamsdale Solar Farm – 7MW, Impact Investment Group;
 - Royalla Solar Farm – 20MW, Fotowatio Renewable Ventures (FRV); and
 - Mount Majura Solar Farm – 2.3MW, Solar Choice, Solar Fields.⁸²

Committee comment

- 3.9. The committee notes that many of the submitters to this inquiry acknowledged the ACT Government's commitment and achievements in renewable energy, climate action and emissions reduction.

⁷⁹ ACT Government, Submission 8, p 3.

⁸⁰ ACT Government, *Canberra 100% Renewable: Leading Innovation with 100% Renewable Energy by 2020*, p. 2, https://www.environment.act.gov.au/_data/assets/pdf_file/0007/987991/100-Renewal-Energy-Tri-fold-ACCESS.pdf (accessed 26 January 2022).

⁸¹ ACT Government, Submission 8, p 3.

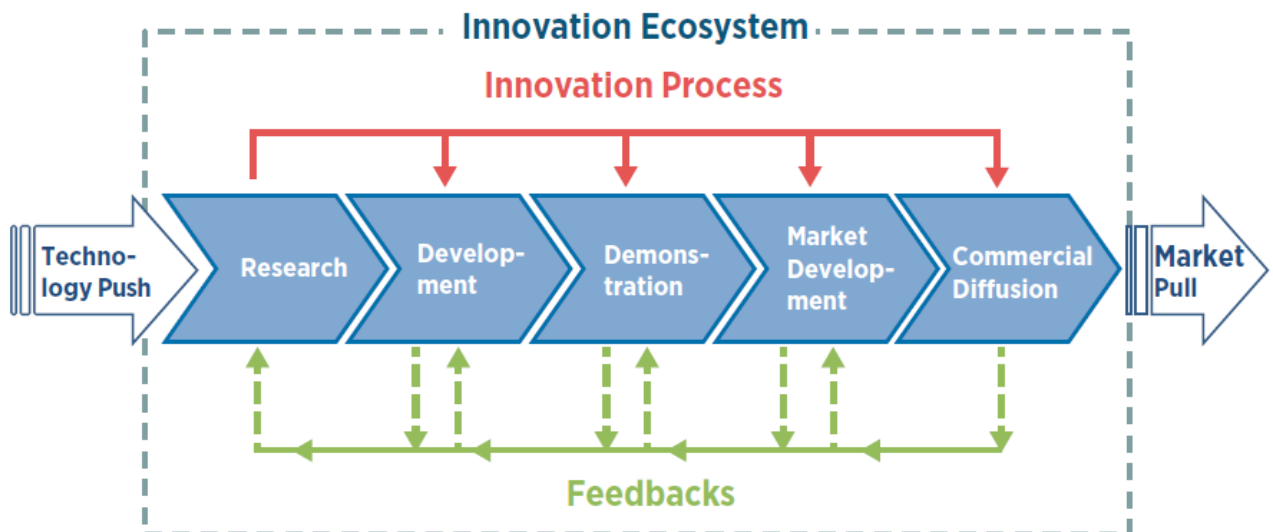
⁸² ACT Government, *Canberra 100% Renewable: Leading Innovation with 100% Renewable Energy by 2020*, pp 4–5, https://www.environment.act.gov.au/_data/assets/pdf_file/0007/987991/100-Renewal-Energy-Tri-fold-ACCESS.pdf (accessed 26 January 2022).

The ACT as a national innovation hub

Renewable energy innovation ecosystem

- 3.10. IRENA states that in the 'real world' the renewable energy innovation ecosystem is complex, often not following a linear model of 'high-technology research laboratories through early stage commercialisation and finally into the markets'. Rather, innovation emerges through networks of stakeholders, and frequently involves feedback loops that produce incremental improvements and dynamic business models (a business model that adapts to respond to consumers' wants and needs). Figure 3 illustrates this dynamic process.⁸³

Figure 3: A dynamic Renewable Energy Innovation Ecosystem



Source: IRENA, Renewable Energy Technology Innovation Policy: A Process Development Guide.⁸⁴

- 3.11. A renewable energy innovation ecosystem contains a number of elements, including researchers and innovators, the financial and physical resources to develop innovations and a market or industry for the end product.

⁸³ IRENA, *Renewable Energy Technology Innovation Policy: A Process Development Guide*, January 2015, p 4, https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2015/IRENA_RETIP_2015.pdf (accessed 7 April 2022).

⁸⁴ IRENA, *Renewable Energy Technology Innovation Policy: A Process Development Guide*, January 2015, p 4, https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2015/IRENA_RETIP_2015.pdf (accessed 7 April 2022).

- 3.12. The IER also states that ‘policy makers need to further encourage both incremental R&D and breakthroughs, nurturing all phases of the technology life cycle, from early-stage research to commercialisation’.⁸⁵ The development and deployment of low-carbon technologies requires acceleration through continuous technological improvement, and their integration within the energy system. It notes that ‘beyond generation technology, system integration entails innovation in infrastructure, new ways to operate energy systems, innovative business models to monetise services, and enabling policies and financial instruments.’⁸⁶
- 3.13. The ACT Government *Sustainable Energy Plan 2020-25: Discussion paper* advocates for an innovation ecosystem would is broad in scope, including:
- ...energy generation (both stationary and mobile), distribution, storage, asset management and demand management, market and regulatory frameworks, finance and business models innovation, social licence and behaviour change.⁸⁷
- 3.14. The ACT Government noted in its submission that innovation and collaboration across both traditional and non-traditional realms of knowledge and practice are required with academics, start-up ventures, small to mid-sized entities, and large national and international firms all having a role to play.⁸⁸
- 3.15. The ACT Government highlighted the 2 Degrees Renewables Innovation Hub, established in late 2016, as an example of an innovation ecosystem which has:
- ...supported 30 businesses employing 80 people and became the go-to premises from which to hold sustainability related events, hosting over 150 events and 3000 attendees.⁸⁹
- 3.16. The ACT Renewables Hub, also established in 2016, is managed by the Smart Energy Council⁹⁰ in partnership with the ACT Government.⁹¹ The Hub, funded by the Renewable Energy Innovation Fund (REIF), is ‘where the renewable energy industry connects to share knowledge and business opportunities through collaboration, events and innovative platforms’.⁹² Its mission is to position the ACT as a leader in renewable energy in the national and international arenas.⁹³

⁸⁵ IRENA, *Renewable Energy Innovation: Accelerating research for a low-carbon future*, 2017, p 3, https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2017/Nov/IRENA_Accelerating_research_2017.pdf?la=en&hash=2A53295A57DD87A0A451E68A2CE7EA020729871F (accessed 8 April 2022).

⁸⁶ IRENA, *Renewable Energy Innovation: Accelerating research for a low-carbon future*, 2017, p 3, https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2017/Nov/IRENA_Accelerating_research_2017.pdf?la=en&hash=2A53295A57DD87A0A451E68A2CE7EA020729871F (accessed 8 April 2022).

⁸⁷ ACT Government, Environment, Planning and Sustainable Development Directorate, *ACT Sustainable Energy Policy 2020-25 – Discussion paper*, p 74, https://www.environment.act.gov.au/_data/assets/pdf_file/0007/1411567/act-sustainable-energy-policy-discussion-paper.pdf (accessed 31 March 2022)

⁸⁸ ACT Government, Submission 8, p 11.

⁸⁹ ACT Government, Submission 8, pp 10–11.

⁹⁰ The Smart Energy Council is the largest independent peak body for solar, storage and smart energy in Australia.

⁹¹ Smart Energy Council, Submission 5, p 3.

⁹² ACT Renewables Energy Hub, *About*, <https://www.actrenewableshub.org.au/about> (accessed 30 March 2022).

⁹³ ACT Renewables Energy Hub, *About*, <https://www.actrenewableshub.org.au/about> (accessed 30 March 2022).

- 3.17. In his submission, Professor Andrew Blakers, Australian National University (ANU), acknowledged the ACT Government's commitment to reaching zero emissions; the significant presence of several renewable energy companies; and a strong renewable energy research and development community, predominantly at the ANU. He argued that, together, these factors improved the ACT's capacity to contribute to the global renewable energy industry.⁹⁴
- 3.18. Similarly, ICEDS identified advantages for the ACT as a renewable energy innovation centre, including what it labelled as 'small but growing renewable energy innovation ecosystem' due to the establishment of offices by energy companies, consulting businesses and industry bodies in the ACT. ICEDS advised the committee that in the ACT there is 'a large, diverse and international-level research and education sector; a highly educated population with strong buy-in to renewable energy and good connection to international stakeholders'.⁹⁵ In its submission, ICEDS recommended that research should be aimed at understanding stakeholder interest, perceptions and expectations around renewable energy innovation, noting that:
- ...non-government stakeholders such as research institutes, industries and communities are critical in building a national and global renewable energy innovation hub in the ACT. A supportive local policy environment may facilitate this process by orchestrating various players' efforts and assisting the innovations. A tailored policy framework for this goal requires integrating localised conditions in policymaking, such as ACT's economic and emission structure, and understanding stakeholders' diverse interests, benefits and expectations towards renewable energy innovation and adoption.⁹⁶
- 3.19. In evidence, the Smart Energy Council argued that the ACT needs to raise its profile nationally and internationally by highlighting the success stories, including around employment opportunities and the innovation that is happening from an industry perspective.⁹⁷ It also highlighted in its submission the importance of a cohesive relationship between government and industry, which is essential for the effective implementation of renewable energy innovation across the ACT, noting that 'cooperation and a united effort is more effective than independent campaigns'.⁹⁸
- 3.20. Evoenergy advised the committee that it plans, over the next five years, to establish the ACT as a national hub for renewable energy technologies and industries, including zero emissions vehicles. It would do this by:
- ensuring the efficient integration of emerging technologies into existing infrastructure by leveraging the knowledge generated through past and continuing initiatives such as the ACT Government Sustainable Household Scheme and reverse auctions;

⁹⁴ Professor Andrew Blakers, ANU, Submission 3, p. [1].

⁹⁵ ICEDS, Submission 16, p 4.

⁹⁶ ICEDS, Submission 16, p 10.

⁹⁷ *Committee Transcript*, 8 June 2021, p 36.

⁹⁸ Smart Energy Council, Submission 5, p 10, citing Mendonça, Lacey, and Hvelplund, 2009.

- community consultation processes to explore gas alternatives and the impact of changes to gas usage;
- supporting the development of a local bio-methane pilot plant to blend biomethane from existing waste sources into the local gas network
- continued support for the development of cost-effective hydrogen generation and blending pilot projects like Evoenergy’s Hydrogen Test Facility;
- developing a coordinated policy to support the uptake of ZEVs, including requirements for the standardisation of EV chargers and their integration into the network; and
- considering links and sharing insights for the national distributed energy resource registration system to inform the development of plans for the integration of ZEV infrastructure.⁹⁹

3.21. Neoen noted that it had invested \$2.5 billion in Australian renewable energy projects, \$1 billion of this was as a direct result of the ACT’s renewable energy auction program and included more than \$100 million invested into the ACT. It also stated that:

...with the Territory's support, Neoen has established a significant and enduring commitment to integration and engagement with the renewable energy industry in the ACT - leveraging our unique knowledge, expertise, available data and industry insights to collaborate with, and ultimately grow the ACT energy ecosystem.¹⁰⁰

3.22. In its submission, Bioenergy Australia recommended that the ACT Government consider the role of biomass in developing the ACT as a renewable energy hub, pointing to Cowra’s local energy hub as a successful example:

Clean Cowra’s local energy hub encourages small and medium enterprises to collaborate by providing cheaper energy via an embedded network microgrid, while enjoying a reduction in the disposal cost of their waste by-products. Their involvement in the microgrid assures energy security and stability for their enterprise with access to a combination of biomass, solar and traditionally generated energy. The output of the facility significantly exceeds microgrid customer demand providing an opportunity to store excess biogas for discretionary energy conversion to respond to immediate demand. This dispatchable energy can be fed to the grid to assist stability of local supply.¹⁰¹

3.23. The ACT Council of Social Services (ACTCOSS) advised the committee it would like to ‘see the ACT provide national leadership through renewable energy innovation – including social, technological, financial, and regulatory innovation – that contributes to community empowerment, (energy) poverty alleviation, (energy) justice, social equality, and increased wellbeing across our community while also achieving net zero emissions’.¹⁰²

⁹⁹ Evoenergy, Submission 14, p 5.

¹⁰⁰ Neoen, Submission 9, p [2].

¹⁰¹ Bioenergy Australia, Submission 21, p 2.

¹⁰² ACTCOSS, Submission 2, pp 4–5.

Recommendation 7

The Committee recommends the ACT Government support the ACT Renewables Hub to have long term objectives and projects that focus on outcomes to address social, technological, environmental, and labour market barriers and innovation to support ACT leadership in the renewable energy field.

Recommendation 8

The committee recommends that the ACT Renewables Hub be funded to conduct future mapping of the ACT renewable ecosystem, with a goal of identifying gaps and growth areas.

Recommendation 9

The committee recommends the ACT Government continue to look at delivering R&D and start-up grant schemes and funding that promotes innovation and diversity in the renewable energy sector.

Knowledge economy

3.24. In its submission, the Smart Energy Council used Powell and Snellman's 2004 definition of the knowledge economy:

...the production and services based on knowledge-intensive activities that contribute to an accelerated pace of technical and scientific advance, as well as rapid obsolescence.¹⁰³

3.25. The Smart Energy Council stated that the ACT already has status as a 'knowledge economy'. The strong linkages between industry and academia and its world-class renewable energy infrastructure were said to contribute to this status, putting the ACT in a strong position to 'become the renewable energy knowledge hub of the nation and potentially of the world'.¹⁰⁴

3.26. The Smart Energy Council argued that the ACT Government must invest in the development of specialist skills and knowledge. The ACT is well placed with the Australian National University, Canberra Institute of Technology (CIT) and the ACT Renewables Hub to promote opportunities for linking theory and practical training to a niche market in the ACT for renewable energy knowledge cultivation. The development of further partnerships with larger businesses in the renewable energy field, such as Evoenergy and ActewAGL, would increase opportunities for practical training, as well as the advance the sector's technical skills.¹⁰⁵ This could be achieved through increased:

- networking opportunities between government representatives and industry;

¹⁰³ Smart Energy Council, Submission 5, p 6, citing Powell and Snellman, 2004.

¹⁰⁴ Smart Energy Council, Submission 5, p 6.

¹⁰⁵ Smart Energy Council, Submission 5, p 6.

- frequency of forums to enhance collaboration and sharing of ideas; and
 - public consultation to assist policy development.¹⁰⁶
- 3.27. The ACT Government advised the committee that the ‘ACT is home to tertiary institutions with world-class research capabilities and experience in clean energy technology, economics and policy.’ It also noted the important role that the CIT Renewable Energy Skills Training Centre was playing in developing job skills for workers in the burgeoning ACT renewable energy sector.¹⁰⁷
- 3.28. The CIT discussed its Renewable Energy Skills Centre of Excellence that positions the ‘ACT and CIT as leaders in the renewable energy workforce development’. The centre aims to develop new training programs to support the renewable energy and sustainability industry workforces by leading the development and teaching of practical, technical skills which are required by industry across the ACT, Australia and the Asia-Pacific region.¹⁰⁸ CIT programs include:
- Global Wind Organisation (GWO) training—providing certified training in wind technology safety;
 - preparing the next generation—delivering a range of work competencies and white card accreditation, including asbestos awareness;
 - Cyber Security Skills Training—fulfilling training requirements of the Australian Energy Sector Cyber Security Framework;
 - Zero CO₂ Renewable Energy and Sustainability Hackathon—fostering innovative and collaborative solutions to support net zero by 2045;
 - Electric Vehicle (EV) skills development;
 - Grid connected PV (GCPV) and battery storage systems training—teaching GCPV design and installation skills; and
 - VET mobility excursion—providing a selected group of students with academic and cultural experience to travel to other countries for a two-week period to see global renewable energy technologies.¹⁰⁹
- 3.29. EPSDD gave evidence to the committee that CIT’s renewable skills centre of excellence has, in recent years, focused on small-scale renewables, such as solar and battery. The centre develops and delivers training courses to ‘prepare the tradespeople of the future’ to take up opportunities in small-scale renewables flowing from government programs such as the Sustainable Household Scheme.¹¹⁰

¹⁰⁶ Smart Energy Council, Submission 5, p 10.

¹⁰⁷ ACT Government, Submission 8, p 4.

¹⁰⁸ *Committee Transcript*, 8 June 2021, p 19.

¹⁰⁹ CIT, Submission 11, pp [2–5].

¹¹⁰ *Committee Transcript*, 17 June 2021, p 104.

- 3.30. EPSDD also advised of the need for the automotive and electrical schools at CIT to collaborate on developing new training modules, training packages and units of competency for servicing EVs to develop and local service industry and avoid the need for servicing to take place interstate.¹¹¹

Committee comment

- 3.31. The committee notes that improved training and partnerships within the renewable energy knowledge economy will provide an economic benefit through a reinvigorated jobs market.

Recommendation 10

The committee recommends that the ACT Government continues to increase investment in renewable energy sector skills education and training, working in partnership with CIT and the ACT universities.

Recommendation 11

The committee recommends that the ACT Government continue to fund and support CIT Renewable Energy Skills Centre of Excellence to develop and grow to become the Australian and Asia-Pacific leader in renewable sector skill development.

Recommendation 12

The committee recommends that the ACT Government look to engage the Australian Government in discussion around opportunities through current Asia-Pacific labour and mobility schemes to up-skill workers here in the ACT.

¹¹¹ *Committee Transcript*, 17 June 2021, p 104.

4. Regulatory innovation

- 4.1. The ACT Government noted that in early 2019, the Australian Energy Market Commission (AEMC), Australia’s independent energy market rule maker, recommended introducing ‘regulatory sandboxes’¹¹² into the National Electricity Market (NEM). New technology develops rapidly in the energy sector and sometimes it can be difficult for existing regulations to keep up with the pace of change. There is an opportunity for the ACT Government to set a regulatory agenda that allows innovative research, technology, business models, products and services to be trialled under relatively permissive regulatory arrangements. To manage any risks, trials can be run at a small scale and for a limited time, with safeguards in place as needed.¹¹³
- 4.2. The AER states ‘regulatory sandboxing aims to help energy innovators and start-ups navigate complex regulatory frameworks and enable the trial of new products and services that will deliver greater choice and cheaper energy options for consumers’. The AER provides services for regulatory sandboxing, including:
- an innovation enquiry service—provides innovators with guidance on how their new technologies or business models can be delivered under the current regulatory framework;
 - trial waivers—allow the AER to grant a time limited trial waiver for eligible trial projects, exempting an innovator from having to comply with specified rules for a period of time to allow a trial to proceed; and
 - a trial rule change process—allows the AEMC to temporarily change existing rules or introduce a new rule to allow a trial to proceed.¹¹⁴
- 4.3. Evoenergy also identified the need boost research and development through the use of ‘regulatory sandboxes’ to assist in the creation of effective and sustainable markets emerge.¹¹⁵ The concept of regulatory sandboxes for ACT energy laws was also supported by ICEDS.¹¹⁶
- 4.4. Evoenergy outlined additional energy-market related opportunities that, it argued, could help boost renewable energy research and development, such as:
- government support for research organisations and innovative businesses that enable customers to use existing energy infrastructure in new ways;

¹¹² ‘A regulatory sandbox is a framework within which participants can test innovative concepts in the market under relaxed regulatory requirements at a smaller scale, on a time-limited basis and with appropriate safeguards in place’, (AEMC, *Regulatory Sandboxes*, <https://www.aemc.gov.au/market-reviews-advice/regulatory-sandboxing#:~:text=A%20regulatory%20sandbox%20is%20a,with%20appropriate%20safeguards%20in%20place> (accessed 14 April 2022)).

¹¹³ ACT Government, Submission 8, p 6.

¹¹⁴ AER, Regulatory sandboxing, <https://www.aer.gov.au/networks-pipelines/regulatory-sandboxing#:~:text=Regulatory%20sandboxing%20aims%20to%20help,cheaper%20energy%20options%20for%20consumers> (accessed 18 March 2022).

¹¹⁵ Evoenergy, Submission 14, p 4.

¹¹⁶ ICEDS, Submission 16, p 6.

- government and industry collaboration to test a coordinated, highly distributed energy resource systems to explore varying models of operation, tariff optimisation, and smart meter deployment; and
- increasing support to industry, trades and academia to introduce a greater mix of targeted investments and broad programs that encourage collaboration, research and development, and knowledge sharing.¹¹⁷

4.5. The committee was informed that there were a number of the challenges that policy makers and industry confront in boosting renewable energy research and development. The list of challenges identified in the submissions to the committee included:

- the risks and costs associated with the adoption of new and rapidly changing technologies;
- the need to always update knowledge on new technologies to meet industry demand;
- competition for resources; and
- risks associated with ‘stop-start’ approaches, or discontinued initiatives or programs, which can lead to local skills loss, increase the difficulty in developing subsequent initiatives, and discouraging investment in local innovation more generally.

4.6. ICEDS noted that the key to successful innovation policy is creating conditions attracting and retaining scientific, engineering and entrepreneurial talent and suggested that a formal energy sector employee and climate professionals mobility and exchange program be established. Such a program would:

...aim to overcome the barriers for staff of any organisation moving across to spend time in another organisation to collaborate on some broadly shared objective or project. The key obstacle to a mobility programme is that high-tech businesses are keen to retain personnel and avoid sharing knowhow. One advantage of Silicon Valley is that local companies voluntarily agree to waive restraint-of-trade provisions in employment contracts. Consequentially, talent moves between companies to the benefits of the region and all local businesses.¹¹⁸

If we look at California, they have a provision in their business and professions code, at section 16600, that essentially refers to a non-competition clause in a contract that is not enforceable in California. That has been in place since 1941. This is perhaps one of the reasons why we had this growth of companies coming together and working together.¹¹⁹

4.7. ICEDS also supported the removal of mobility barriers for renewable energy sector staff, noting that when a person leaves a particular firm in the energy sector, a non-competition clause may prevent that person from moving to another part of the industry or into a

¹¹⁷ Evoenergy, Submission 14, p 4.

¹¹⁸ ICEDS, Submission 16, p 9.

¹¹⁹ *Committee Transcript*, 8 June 2021, p 84.

research institution.¹²⁰ It expanded on the theme of a mobility program, stating that the aim would be ‘to get to a position where we see innovation as something that requires collaboration rather than competition’¹²¹ and noting:

...we think we can encourage local energy companies, start-ups in energy, to accept a voluntary code of conduct for the non-restraint of trade for energy professionals within themselves. They will all be beneficiaries. It is unlikely it will happen—I do not know—but if two high-tech companies work on the same kind of hydrogen storage in the ACT, they will both benefit from moving intellectual potential and human potential between the companies.¹²²

4.8. Mobility programs within industry would provide benefits to both employees and organisations by:

- broadening knowledge and increasing employee skills;
- developing professional networks; and
- increasing engagement between organisations in the renewable energy sector.

Recommendation 13

The committee recommends that the ACT Government explore opportunities to create a regulatory environment that can facilitate innovation and experimentation in the renewable energy sector.

Recommendation 14

The committee recommends that the ACT Government investigates the development of arrangements for removing the barriers that prevent job mobility in the renewables energy sector.

Renewable energy workforce and training

4.9. The Clean Energy Council (CEC) noted research by the Diversity Council of Australia showing ‘that diverse and inclusive organisations are three times more likely to be effective, five times more likely to be innovative and three times more likely to provide excellent customer service’.¹²³ On a practical level, it was argued that businesses with inclusive practices and high levels of diversity are more successful, have higher profits and performance and usually fewer safety incidents.¹²⁴

4.10. A 2021 survey of the Australian clean energy workforce, conducted by the CEC, found of the total workforce:

¹²⁰ *Committee Transcript*, 8 June 2021, p 84.

¹²¹ *Committee Transcript*, 8 June 2021, p 84.

¹²² *Committee Transcript*, 8 June 2021, p 87.

¹²³ CEC, *Empowering Everyone: Diversity in the Australian Clean Energy Sector*, p 5, citing Diversity Council of Australia, <https://assets.cleanenergycouncil.org.au/documents/resources/reports/Empowering-Everyone-Diversity-in-the-Australian-Clean-Energy-Sector.pdf> (accessed 8 April 2022).

¹²⁴ CEC, *Empowering Everyone: Diversity in the Australian Clean Energy Sector*, p 5, <https://assets.cleanenergycouncil.org.au/documents/resources/reports/Empowering-Everyone-Diversity-in-the-Australian-Clean-Energy-Sector.pdf> (accessed 8 April 2022).

- 39 percent were females; (compared to 32% globally);
- 0.8 percent were Indigenous Australians (3.3% of Australian population);
- 13 percent were members of the LGBTIQ+ community (11% of Australian population);
- 68 percent were born in Australia (67% of Australian population) with England, India, New Zealand and China the top countries of birth after Australia; and
- 3 percent were people with a disability (18% of Australian population).¹²⁵

4.11. The survey found that the current clean energy workforce in Australia is highly skilled and diverse with good representation of women, multicultural and minority groups of people. Suggested areas for workforce improvement include:

- increasing female representation in management levels and also trades;
- increasing employment of First Australians;
- researching factors contributing to the low rate of representation of people with a disability; and
- recruitment of greater numbers of engineers and electricians (this is already difficult and requires more investment in training of young workers in these areas in universities and apprenticeships).¹²⁶

4.12. Professor Andrew Blakers argued in evidence that Australia is facing a major change in energy systems and that these changes will require substantial work to build suitable training at all levels. He noted that there is always room for improvement in the broad range of education programs, from vocational courses through to tertiary degrees—directed towards developing appropriate skills and knowledge in the renewables sector.¹²⁷

4.13. CIT told the committee that not all companies are eligible for training rebates and that training takes time. Companies will often pull their workers out of a training course because they cannot afford to have them sitting in a classroom for a week.¹²⁸

4.14. ICEDS noted that there are not enough experts and that the ACT:

...has two streams of activities in education and training for future energy professionals; the one run by CIT focuses on the training of tradies and the one run by the ANU is on a different scale. We are now trying to bring them together.

In particular, we are working through the recently established NERA hydrogen technology cluster that gives us a great opportunity to do it. The work is based at the Evoenergy testing facilities, and we implement our research outcomes at these testing facilities. We test our research outcomes jointly with CIT students who are

¹²⁵ The survey was conducted by CEC in collaboration with the Australian Power Institute (API), and the Electrical Trades Union (ETU) from 23 August to 17 September 2021, see *Empowering Everyone: Diversity in the Australian Clean Energy Sector*, p 3

¹²⁶ CEC, *Empowering Everyone: Diversity in the Australian Clean Energy Sector*, p 17
<https://assets.cleanenergycouncil.org.au/documents/resources/reports/Empowering-Everyone-Diversity-in-the-Australian-Clean-Energy-Sector.pdf> (accessed 8 April 2022).

¹²⁷ *Committee Transcript*, 8 June 2021, p 5.

¹²⁸ *Committee Transcript*, 8 June 2022, p 26.

trained for gas heaters or future hydrogen heaters. That is a very substantial component of energy transition in the ACT. One of the major components is not the creation of jobs, but the creation of experts for their jobs. We do not have a sufficient number of experts.¹²⁹

Committee comment

4.15. The committee acknowledges that:

- effective training and education will be critical to future success of the renewables sector and related technologies;
- consideration needs to be given to the mobility of the renewable energy workforce; and
- efforts to diversify the workforce would ensure a rich diversity of people participating in the industry.

Recommendation 15

The committee recommends that the ACT Government, through its plans/strategies/frameworks/grants ensure that it prioritises and promotes diversity and inclusivity.

Social innovation research

4.16. Hoppe and de Vries state that ‘the transition to low carbon energy systems cannot solely rely on technological innovation, it also requires social innovation’.¹³⁰ In contrast with commercial innovation which is driven by profit, social innovation is concerned with the wellbeing of people, communities and society at large.¹³¹

4.17. In its submission, ACTCOSS referenced the following definition of ‘social innovation’ in the context of energy transitions:

...innovation that is social in its means and which contributes to low carbon energy transition, civic empowerment, and social goals pertaining to the general wellbeing of communities ... [I]n addition to contributing to low carbon energy transition [social innovation] seeks to attain particular social goals, like community empowerment, alleviating (energy) poverty, (energy) justice, social equality, and increasing the wellbeing of local communities.¹³²

¹²⁹ *Committee Transcript*, 8 June 2021, p 83.

¹³⁰ Thomas Hoppe and Gardien de Vries, ‘Social innovation and the energy transition’, *Sustainability*, vol 11 issue 1, 2019, <https://www.mdpi.com/2071-1050/11/1/141/htm> (accessed 9 April 2022).

¹³¹ Thomas Hoppe and Gardien de Vries, ‘Social innovation and the energy transition’, *Sustainability*, vol 11 issue 1, 2019, <https://www.mdpi.com/2071-1050/11/1/141/htm> (accessed 9 April 2022).

¹³² ACTCOSS, Submission 2, p 3, citing T Hoppe & G de Vries, Editorial: Social Innovation and the Energy Transition, *Sustainability*, 11(1), 141, 2019, pp. 8–9.

- 4.18. Society faces a challenge in transitioning from a society based on fossil fuels to one built on renewable energy. As our society transitions to new forms of energy, our social and cultural stories will also change. The overwhelming weight of scientific evidence indicates that human induced climate change is rapidly occurring and that its effects will be far reaching. Notwithstanding the scientific consensus, there remain pockets of scepticism in the community.¹³³
- 4.19. The ACT Government was told social issues in the renewable energy transition have become more mainstream, and the next phase of the energy transition would require extensive community engagement.¹³⁴
- 4.20. ARENA also noted that research modelling of the energy transition to more variable renewable energy sources, like wind and solar, shows that the flexibility of the demand side—how people use energy—becomes more important. Shifting energy usage to times when it is sunny or windy means consumers can take advantage of lower-costs at those times.¹³⁵
- 4.21. ARENA noted that there has been more focus on some areas of social science—such as consumer uptake of smart energy devices, distributed energy resources, batteries and demand response.¹³⁶
- 4.22. Associate Professor Stocks noted that research to date had mainly focussed on renewable energy technology, however, more energy transition research funding has started to include provisions for social research. He suggested that the Government can play a role by providing and diversifying funding to include social issues in renewable energy research, stating:
- It is relatively difficult in this country to get funding for social science research around how people want the transition to occur. If you have a technical idea, it is relatively easy; you can go to ARENA and it is relatively easy to gain funding through an ARC linkage if you partner with industry. It is much more challenging to get money for social science research to understand how people are going to behave and how that might influence the energy and low emissions transition.
- One of the things that the ACT could look to there is actively funding work or supporting the funding of work around the social science and understanding of community expectations and how to make that transition smoother from a social science perspective rather asking, “How am I going to make a better solar cell.”¹³⁷
- 4.23. The ICEDS discussed the importance of having policy initiatives which would further develop the renewable energy innovation ecosystem in the ACT, including the social and socio-technical aspects of the energy transition. It recommends:

¹³³ Derek Gladwin, ‘We could power a new green movement by talking about energy change’, *The Conversation*, 21 April 2020, <https://theconversation.com/we-could-power-a-new-green-movement-by-talking-about-energy-change-132906> (accessed 9 April 2022).

¹³⁴ *Committee Transcript*, 17 June 2021, p 108.

¹³⁵ *Committee Transcript*, 6 July 2021, p 112.

¹³⁶ *Committee Transcript*, 6 July 2021, p.111

¹³⁷ *Committee Transcript*, 8 June 2021, pp 86-87.

- examining measures to reduce the transaction costs for all participants associated with leveraging¹³⁸ of locally-sourced research and development funding by federal funding agencies such as ARENA and the ARC;
- encouraging research into the potentially disruptive net-zero and below-zero emission technologies that draw from renewable energy;
- supporting the demonstration and local implementation of new technologies; and
- coordinating government and university renewable energy initiatives, both in research and the adoption of renewable energy technologies.¹³⁹

Recommendation 16

The committee recommends that the ACT Government considers, as part of its policy and planning work in relation to renewable energy, the social and human dimensions associated with achieving renewable energy targets and objectives.

¹³⁸ Definition (Merriam Webster Dictionary): to provide (something, such as a corporation) or supplement (something, such as money) with leverage, <https://www.merriam-webster.com/dictionary/leverage> (accessed 18 April 2022).

¹³⁹ ICEDS, Submission 16, pp 5-6.

5. Social equity

- 5.1. Social equity, as it relates to the transition to renewable energy, means ‘a world where all individuals, across all areas, have safe, affordable and sustainable energy that is, essentially, socially just’.¹⁴⁰
- 5.2. ACTCOSS noted that ‘it is critical that climate change action does not cause, entrench, or exacerbate disadvantage’. Instead, a ‘just energy transition’ ought to contribute to the ‘social goals of reducing poverty and inequality and improving individual and community wellbeing’.¹⁴¹ ACTCOSS also highlighted the important role of future renewable energy innovation in ensuring equitable access to:
- affordable, safe, and reliable renewable energy;
 - the benefits of distributed energy resources; and
 - energy efficient affordable housing.¹⁴²
- 5.3. Mr Andrew Barr MLA, Chief Minister, advised the committee that the Government had increased the utilities concession to \$800 annually, noting that this would support 31,000 Canberra householders (who are largely on statutory Commonwealth income support) in meeting the increased costs of associated with energy transition. The committee also heard that the Government will provide a range of direct supports for approximately 10,000 households through the Sustainable Household Scheme to improve the energy efficiency of individual properties.¹⁴³
- 5.4. ACTCOSS stated that public funding or community support for renewable energy innovation must integrate ‘social innovation with technological, financial, and regulatory innovation’.¹⁴⁴ This includes the need for recognition and resourcing of the work done by the community sector to support renewable energy innovation through their support of a social goal that no one is left behind during the transition to clean energy.¹⁴⁵ In its submission, ACTCOSS recommended ‘that the ACT establish a mechanism for joint governance of a just transition by community, government, technical experts, and business’.¹⁴⁶

¹⁴⁰ Kirsten Jenkins, Benjamin K. Sovacool, Darren McCauley, ‘Humanizing sociotechnical transitions through energy justice: An ethical framework for global transformative change’, *Energy Policy*, Vol 117, June 2018, pp 66–74, <https://www.sciencedirect.com/science/article/pii/S0301421518301149> (accessed 9 April 2022).

¹⁴¹ ACTCOSS, Submission 2, p 2.

¹⁴² ACTCOSS, Submission 2, pp 2–3.

¹⁴³ *Committee Transcript*, 17 June 2021, p 95.

¹⁴⁴ ACTCOSS, Submission 2, p 3.

¹⁴⁵ ACTCOSS, Submission 2, p 3.

¹⁴⁶ ACTCOSS, Submission 2, p 4.

- 5.5. ACTCOSS highlighted the ACT Energised Consumers Project as an example of a social equity program which it runs in partnership with Care Inc, that is co-funded by the ACT Government and Energy Consumers Australia (ECA).¹⁴⁷ The project aims to inform energy policies and programs by bringing together people in the community, business and government sectors. It plays an important role in ‘identifying and addressing financial and other barriers to participating in and/or benefiting from the energy transition that are experienced by low-income or other vulnerable households’.¹⁴⁸
- 5.6. Greenlaw noted that ensuring social equity also includes providing language translations and communicating these resources to community groups working with disadvantaged sectors of Canberra.¹⁴⁹
- 5.7. Greenlaw discussed the need to consider vulnerable Canberrans, particularly renters, when assessing options for the transition from gas to clean renewable energy. Vulnerable people ought to have the same opportunity to reap the many social, economic, and environmental benefits from the clean renewable energy transition. They also note that:
- ...this is especially important, as vulnerable people stand to be disproportionately impacted by the health impacts associated with gas use due to barriers to health care.¹⁵⁰
- 5.8. Greenlaw highlighted the significant health impacts of gas, with research showing gas cooking contributes up to 12 per cent of childhood asthma burden, along with other respiratory problems, impacts neuropsychological development and increases carbon monoxide poisoning risks.¹⁵¹
- 5.9. In its submission, Harvest Hot Water also noted the emergence of research that gas in our homes—that is, methane—is a health hazard for children, who are more susceptible to having asthma.¹⁵²
- 5.10. Mr David Glynn Jones also noted the improved environmental and health outcomes of eliminating transport emissions such as air particulates from fuels and brakes, noise reduction and greenhouse gas reduction.¹⁵³
- 5.11. When considering the roll out of community batteries, Greenlaw stated that it is essential that:
- community renewable energy assets have the potential to reduce energy stress by providing security, affordability, and reliability;
 - people should not be limited in their ability to invest in renewable energy based on their ability to own property;

¹⁴⁷ ACTCOSS, Submission 2, p [1].

¹⁴⁸ ACTCOSS, Submission 2, p 4.

¹⁴⁹ Greenlaw, Submission 12, p 25.

¹⁵⁰ Greenlaw, Submission 23, p 7.

¹⁵¹ Greenlaw, Submission 23, p 6.

¹⁵² *Committee Transcript*, 8 June 2021, p 68.

¹⁵³ Mr David Glynn Jones, Submission 15, p 2.

- due to the paradox that disadvantaged communities are often the most affected by climate change, they have a vested interest in supporting renewable energy; and
- due to the ACT's strong stance on human rights it would be inconsistent to ignore equity issues in reference to community batteries.¹⁵⁴

5.12. Mr Bill Gemmell's view is that:

...the move to transition away from gas towards electricity as the primary source of household heating is leading to households either reactivating or using more intensively already installed wood heaters leading to a rise in individual respiratory complaints. This is compounded by the recent increase in the use of household fire pits. I have also noted a number of older residents indicating that the purchase of heat pump equipment is beyond their financial means, or they followed previous advice to install gas heating and can see no valid reason to change because it still works.¹⁵⁵

5.13. Mr O'Loughlin noted that the ACT Climate Change Council estimated the social cost of carbon at about \$65 per tonne of CO₂-e [in 2017] and that this should be used in cost benefit analyses of public investments or policy and regulatory decisions in the ACT.¹⁵⁶

Committee comment

5.14. The committee notes that social equity is a vital component of healthy and prosperous social and economic systems in the ACT. To ensure that disadvantaged communities in the ACT share in the benefits of the transition to a clean energy economy, the ACT Government needs to incorporate social equity as a core principle in the design of policies and for investment decisions as part of the goal to reach net zero by 2045.

Recommendation 17

The committee recommends that the ACT Government continues to ensure that renewable energy innovation contributes to achieving social goals as part of a just energy transition to net zero emissions.

¹⁵⁴ Greenlaw, Submission 12, p 21.

¹⁵⁵ Mr Bill Gemmell, Submission 10, p [8].

¹⁵⁶ Mr Larry O'Loughlin, Submission 24, p 15.

6. Renewable energy sectors in the ACT

Energy efficiency improvement scheme

- 6.1. The Energy Efficiency Improvement Scheme (EEIS) commenced in 2013 and aims to encourage the efficient use of energy; reduce greenhouse gas emissions; and reduce household and business energy use and costs. It is funded through contributions from ACT electricity consumers, who provide around \$11-12 million a year.¹⁵⁷
- 6.2. The initial phase of EEIS from 2013-2017 focused on efficiencies for small activities such as lighting upgrades, draft-proofing and decommissioning old fridges which delivered a strong energy efficiency benefit-cost ratio of four to one.¹⁵⁸
- 6.3. Following an evaluation of phase one of the EEIS in 2017, and as part of the planning process leading up to the ACT Climate Change Strategy 2019-25, the EEIS was identified as 'a key mechanism for delivering on the ACT's emission reduction targets'.¹⁵⁹ Accordingly, under the second phase of the EEIS from January 2018, the scheme targeted space conditioning and water heating, by replacing gas and traditional electric appliances with RCACs (reverse cycle air conditioner) and HPWHs (heat pump water heaters).¹⁶⁰ The Climate Strategy targets that the EEIS was expected to contribute to included:
 - emission reductions of 50-60% by 2025 against 1990 levels, 65-75% by 2030, and net zero emissions by 2045 at the latest; and
 - 60,000 households disconnected from gas by 2025 and 90,000 disconnected by 2030.¹⁶¹
- 6.4. Based on the ACT currently having 150,000 household gas connections, phasing out fossil gas by 2045 would require 6,000 disconnections a year, or, if the target is 90,000 households being disconnected by 2030, then 9000 disconnections would be needed annually.¹⁶² However, Harvest Hot Water highlighted the performance of the EEIS as being less than optimal. In 2018-19, the Scheme delivered 770 replacements of gas appliances with heat pumps, increasing to around 2,560 replacements in 2019-20. Forward projections to 2025 prepared for Evoenergy, suggest that under current policy settings, gas connections are predicted to drop by just over 3,000 a year, or half the minimum rate that is needed to achieve a phase-out by 2045.¹⁶³

¹⁵⁷ Harvest Hot Water, Submission18, p 3.

¹⁵⁸ Harvest Hot Water, Submission18, p 17.

¹⁵⁹ Harvest Hot Water, Submission18, p 3.

¹⁶⁰ Harvest Hot Water, Submission18, p 17.

¹⁶¹ Harvest Hot Water, Submission18, p 3.

¹⁶² Harvest Hot Water, Submission18, p 3.

¹⁶³ Harvest Hot Water, Submission18, p 4.

- 6.5. ACT households are the second-highest energy users in Australia after Victoria. Home heating is by far the greatest energy use in the ACT, with water heating coming second. Both space heating and water heating are overwhelmingly dominated by inefficient gas appliances. Harvest Hot Water pointed out the desirability of emphasising energy efficiency as a complement to a program of gas reduction.¹⁶⁴
- 6.6. Harvest Hot Water proposed a number of reasons why the EEIS is underperforming, these include:
- no performance measures or targets have been established for the Scheme;
 - retailer obligation as opposed to a certification scheme—the operation of the scheme is left in the hands of electricity retailers to implement the scheme as they see fit;
 - market competition non-existent in the EEIS—the sole Tier 1 (large) retailer, ActewAGL, has appointed just three firms to deliver RCAC and HPWH replacements in the ACT;
 - ActewAGL uses one third of the rebates not to promote energy efficiency but to lock customers in to ActewAGL (through quarterly reductions in consumer bills stretched out over three years);
 - despite EEIS rebates, prices of energy efficient appliances remain high;
 - the EPSDD has not accredited a single abatement/energy savings provider to the EEIS in eight years; and
 - no Tier 2 (small electricity) retailer has participated in the scheme in eight years.¹⁶⁵

Recommendation 18

The committee recommends that the ACT Government adopts ambitious and measurable performance targets for the Energy Efficiency Improvement Scheme and considers opening the scheme to broader market participation.

ACT electricity sector

- 6.7. Evoenergy owns and operates the electricity network in the ACT and gas networks in the ACT and surrounding regions, distributing energy to local residential and business customers. In its submission, Evoenergy advised that it owns and operates
- 4,720 kilometres of gas mains supplying nearly 160,000 gas customers; and
 - 5,280 kilometres of electricity lines supplying over 202,000 electricity customers.¹⁶⁶

¹⁶⁴ Harvest Hot Water, Submission18, p 2.

¹⁶⁵ Harvest Hot Water, Submission18, pp 4–5.

¹⁶⁶ Evoenergy, Submission 14, p 3.

- 6.8. Evoenergy stated that it operates under the ACT Utilities Regulatory Framework and Codes, administered by the Independent Competition and Regulatory Commission (ICRC) and also the National Electricity and Gas Laws and Rules, National Energy Retail Law and Rules, and National Energy Customer Framework, administered by the AER and Australian Energy Market Commission (AEMC).¹⁶⁷
- 6.9. Evoenergy works closely with regulators, AEMO and the Utility Technical Regulator, on technical regulatory matters. It noted that ‘regulatory frameworks are evolving to remove barriers and to provide support for future growth in the levels of renewable energy generation and transportation’.¹⁶⁸ Current examples include:
- changes to the National Gas Laws and National Gas Regulations to allow hydrogen injection into the gas network;
 - changes to rules for access, pricing and incentive arrangements for Distributed Energy Resources (DER);
 - trialling new tariffs designed to incentivise efficient use of the network by residential and large-scale batteries (subject to AER approval);
 - allowing distributors to own stand-alone power systems and energy storage devices in places lacking private sector options (subject to AER approval); and
 - development of new network support services to facilitate DER.¹⁶⁹
- 6.10. Evoenergy also noted the challenges to boosting renewable energy to meet net zero emissions targets include:
- ensuring policy measures are structured in a way that limits the impact on household energy bills and avoids disproportionate impacts on low-income customers; and
 - the requirement to invest significantly in the electricity network to accommodate two-way energy flows resulting from the rapid acceleration in distributed energy resources uptake or shifts in demand on existing infrastructure.¹⁷⁰
- 6.11. Evoenergy’s stated that their future focus is outlined in their Distribution System Operator (DSO) Strategy and Roadmap that was developed to identify and realise the opportunities presented by the increasing integration of DER (such as solar and batteries) into the ACT’s electricity network. It also stated that:

...we recognise the transition will require changes to our networks, while ensuring we continue to meet customers’ changing energy needs and expectations with the impacts on affordability, reliability, security and safety front of mind.¹⁷¹

¹⁶⁷ Evoenergy, Submission 14, p 7.

¹⁶⁸ Evoenergy, Submission 14, p 7.

¹⁶⁹ Evoenergy, Submission 14, p 7.

¹⁷⁰ Evoenergy, Submission 14, p 4.

¹⁷¹ Evoenergy, Submission 14, p 4.

- 6.12. The stability and capacity of the ACT electricity networks ability to cope with increased demand was raised by many submitters to the inquiry. Demand for electricity will increase as the ACT transitions away from gas to electric appliances and private and public EVs.
- 6.13. One of the challenges for the ACT is the Government goal to decommission the gas network to achieve net zero by 2045 at the latest. ARENA noted that energy for heating in the ACT is often provided by gas, and this heating load will need to be transferred from gas to electricity, increasing the load on the electricity grid to supply this for consumers. How that is done will make all the difference as to what the cost implications are for consumers, the ACT Government can provide leadership through its policies in this area.¹⁷²
- 6.14. In its submission, Bioenergy Australia suggested that different renewable energy stakeholders need to work together to help ensure reliable gas and electricity networks as ‘the over-reliance on a single source of energy technology is not the best approach’.¹⁷³
- 6.15. In its submission, ARENA highlighted one ACT project funded—the Distributed Energy Integration Program which is a collaboration of the—AEMO, AEMC, AER and Energy Security Board, alongside industry representatives and consumer groups—which is looking at national reform agenda coordination ‘to make sure that it is streamlined for the integration of distributed energy resources’.¹⁷⁴ It also noted that there are innovative projects in this space to look at ‘software that can help grid operators understand what is happening on their grid and understand where batteries and EVs and things like that can be used to solve grid problems’.¹⁷⁵
- 6.16. The ACT Government has provided funding for innovative projects that have helped the development of online platforms to assist in managing the electricity grid, for example:
- Reposit Power—have designed a system that analyses owner electricity usage patterns to optimise wholesale electricity market opportunities allowing the company to manage a Virtual Power Plant (VPP) of aggregated smart battery storage; and
 - Solcast—have developed a very sophisticated global live and forecast solar irradiance data delivery system. They use high resolution satellite imagery to detect and characterise cloud cover, and with industry-leading models, deliver a platform that allows grid operators to balance fluctuating solar plant output with their existing assets.¹⁷⁶
- 6.17. Professor Andrew Blakers recommended that the ACT Government could go far beyond net zero emissions in electricity by going to net negative. He states that:
- in fact, the most effective way in which people can contribute to removing greenhouse emissions right at this moment is just to carry on with the offset program for electricity and go to 200 per cent electricity by contracting more solar

¹⁷² *Committee Transcript*, 6 July 2021, pp 114–115.

¹⁷³ BioEnergy Australia, Submission 21, p 4.

¹⁷⁴ *Committee Transcript*, 6 July 2021, p 113.

¹⁷⁵ *Committee Transcript*, 6 July 2021, pp 112–113.

¹⁷⁶ ACT Government, Submission 8, p 10.

and wind farms. The reason is that it undermines the intransigence at the federal level in terms of supporting renewables and, because of the low cost of wind and solar, it contributes to the continuation and expansion of the industry at very low locked in prices for electricity in the ACT.¹⁷⁷

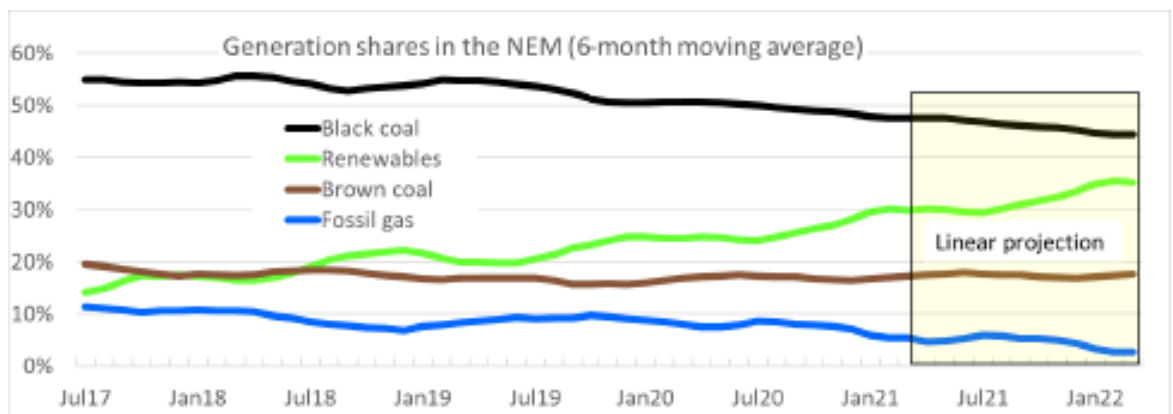
Committee comment

6.18. The committee notes that the ACT Government has met its target of sourcing 100 per cent of the ACT’s electricity through renewable energy by 2020. The challenge going forward is how to meet the anticipated increase in electricity demand, arising from the transition away from gas and the conversion of the transport fleet, both public and private, to EVs.

Solar and wind energy

6.19. Professor Andrew Blakers stated that renewable energy currently generates 30 per cent of the NEM and is tracking to reach 50 percent by 2025.¹⁷⁸ He also noted that the renewable energy industry is ‘now worth \$11 Billion per year (including both rooftop and utility solar and wind systems) and is employing 27,000 people’.¹⁷⁹

Figure 4: Renewable generation in the National Electricity Market reached 30%.¹⁸⁰



6.20. Professor Andrew Blakers noted that wind and solar are now the cheapest form of electricity generation and there is a need to upgrade rural transmission lines to bring this electricity being generated in regional renewable energy zones to the cities.¹⁸¹

6.21. The growth in renewable energy supplied through wind and solar has created challenges in the NEM due to its variable or intermittent nature—sometimes more energy is generated than is demanded, while at other times there is too little to meet the demand.

¹⁷⁷ Committee Transcript, 8 June 2021, p 1.

¹⁷⁸ Professor Andrew Blakers, ANU, Submission 3A, p [3].

¹⁷⁹ Professor Andrew Blakers, ANU, Submission 3A, p [4].

¹⁸⁰ Professor Andrew Blakers, ANU, Submission 3A, p [3], citing Open-NEM (live tracker of the Australian electricity market).

¹⁸¹ Professor Andrew Blakers, ANU, Submission 3A, p [5].

- 6.22. AEMO notes that the increased investment in solar PV by residential, industrial and commercial consumers has generated increased interest in battery storage and load management.¹⁸²
- 6.23. Greenlaw noted that solar PV penetration across the ACT is around 13 per cent; however, there has not been accompanying growth in energy storage to maximise the benefit of installing solar panels.¹⁸³

Battery storage

- 6.24. ARENA stated that battery storage systems are ‘emerging as one of the key solutions to effectively integrate high shares of solar and wind renewables in power systems worldwide’. Battery storage options can be applied at large utility scale, to micro grid and behind-the-meter applications, such as household batteries and EVs.¹⁸⁴
- 6.25. ARENA also stated that ‘batteries are an energy storage technology that uses chemicals to absorb and release energy on demand. Lithium-ion is the most common battery chemistry used to store electricity. Coupling batteries with renewable energy generation allows that energy to be stored during times of low demand and released (or dispatched) at times of peak demand’.¹⁸⁵
- 6.26. Another emerging technology is the VPP which have the power to unite many DERs, such as household batteries, under a smart, cloud-based management system, which are attracting increased interest from governments, utilities, and consumers alike.¹⁸⁶
- 6.27. Evoenergy has been exploring the integration of residential batteries into a VPP and incorporating this into our real time control system. They have introduced new technology, such as on-load tap changers (‘regulates the turns ratio and thus the voltage ratio of an electrical transformer’¹⁸⁷), for distribution substations to manage the quality of supply issues in mandated 100 percent solar photovoltaic (PV) suburbs.¹⁸⁸
- 6.28. Greenlaw outlined the many practical benefits of widespread battery use, including:
- savings on electricity bills;
 - reductions in network overloads that smooth out peaks in electricity demand;
 - additional voltage and frequency services that help stabilise the grid;
 - empowerment to communities, by enabling them to tackle climate change; and

¹⁸² AEMO, *Integrated System Plan 2020*, p 12, <https://aemo.com.au/-/media/files/major-publications/isp/2020/final-2020-integrated-system-plan.pdf?la=en> (accessed 30 March 2022)

¹⁸³ Greenlaw, Submission 12, p 7.

¹⁸⁴ ARENA, *Battery storage paves way for a renewable powered future*, 26 March 2020, <https://www.irena.org/newsroom/articles/2020/Mar/Battery-storage-paves-way-for-a-renewable-powered-future> (accessed 9 April 2022).

¹⁸⁵ ARENA, *Battery storage*, <https://arena.gov.au/renewable-energy/battery-storage/> (accessed 10 April 2022).

¹⁸⁶ Christopher Allan, ‘The Virtual Power Plant: a new frontier for distributed energy resources’, *Energy Magazine*, 14 March 2022, <https://www.energymagazine.com.au/the-virtual-power-plant-a-new-frontier-for-distributed-energy-resources/>

¹⁸⁷ saVRee, *On load tap changer*, <https://savree.com/en/encyclopedia/on-load-tap-changer-ltc> (accessed 15 April 2022).

¹⁸⁸ Evoenergy, Submission 14, p 5.

- alleviation of socio-economic inequalities by lessening the financial burden of electricity access.¹⁸⁹
- 6.29. ICEDS also highlighted the need for a diverse uptake of battery storage (residential, community, and utility scale) within the ACT in order to support the broader energy transition,¹⁹⁰ as they provide:
- storage of renewable energy generated through intermittent resources; and
 - a dispatchable energy source that will assist in stabilising network reliability.
- 6.30. Greenlaw noted that commercial viability remains an obstacle to the broad rollout of batteries, being about a decade away from presenting a commercially viable return on investment without government support. It suggests that the ACT Government implement a range of incentive schemes to facilitate the uptake of community-scale batteries stating ‘these schemes can be integrated into the existing Next Generation Battery Scheme, and through reform to the mandatory Feed-In Tariff Scheme.’¹⁹¹
- 6.31. The ACT Government’s Next Generation Battery Program (Next Gen) was created with funds contributed by successful bidders from the renewable electricity reverse auction number 4 conducted in 2016.¹⁹² Next Gen supports the development of the energy storage industry in the ACT by providing a battery rebate of \$3500, or 50 per cent of the price, whichever is lowest, to homes or businesses in the ACT who purchase a battery storage system.¹⁹³ Next Gen will see the roll-out of 36 MWh of smart solar battery storage systems in up to 5,000 homes and small businesses in the ACT.¹⁹⁴
- 6.32. The ACT Government recognises that the future energy system will be dominated by variable renewable electricity generation sources and the important role energy storage will play. They have partnered with the ANU through the REIF to establish the ANU Battery Storage and Grid Integration Program (BSGIP) in 2018.¹⁹⁵ The objectives of ANU BSGIP is to provide leadership, research, commercialisation and outreach/engagement in relation to battery storage and grid integration. Projects being undertaken include:
- the battery chemistry lab—focusing on the benchmarking of battery materials against industry standards;
 - Realising Electric Vehicle-to-grid Services (REVS)—focuses on understanding vehicle-to-grid (V2G) services from economic, technical, and social implications, to identify opportunities and challenges in the scaling of V2G services;
 - community batteries—neighbourhood and suburb scale batteries that can complement household and utility-scale batteries;

¹⁸⁹ Greenlaw, Submission 12, pp 4–5.

¹⁹⁰ ICEDS, Submission 16, p 9.

¹⁹¹ Greenlaw, Submission 12, p 5.

¹⁹² ACT Government, Submission 8, pp 12–13.

¹⁹³ ACT Government, *Next Gen Energy Storage Program*, <https://www.climatechoices.act.gov.au/policy-programs/next-gen-energy-storage> (accessed 30 March 2022).

¹⁹⁴ ACT Government, Submission 8, pp 12–13.

¹⁹⁵ ACT Government, Submission 8, p 13.

- Evolve—looks at the development smart software for 21st century electricity systems while maintaining reliability of the network; and
 - VOICES—social research into customers experiences with renewable energy technologies including, solar, batteries and EVs.¹⁹⁶
- 6.33. The ACT Government stated that identified potential sites for community or large-scale battery storage would need to comply with both the Territory Plan and current planning and environmental laws, otherwise the government may need to facilitate changes to allow these investments to occur.¹⁹⁷
- 6.34. Neoen believes that allowing battery projects to be retrofitted into existing planning legislation and frameworks is an efficient and resourceful way to regulate the planning approvals process for battery projects. Neoen is delivering the first battery project located in the Territory and, with the support of EPSDD, the Capital Battery was classified under the Territory Plan 2008 umbrella term ‘Major Utility Installation’, allowing the development to be assessed for approval under existing planning regulatory frameworks. Neoen ‘considers, however, that there are additional opportunities to further clarify and improve the efficiency of the planning and crown lease variation process more generally.’¹⁹⁸
- 6.35. The Smart Energy Council told the committee that the move to renewable energy would potentially result in an energy network that could be up to 10 times bigger than the one we have today. It said that ‘solar PV is now the cheapest way to generate electricity in the world, period’.¹⁹⁹ There are great business opportunities in harnessing the free electricity generated in the middle of the day and use it for proactive purposes, such as transportation and other things that add value to our whole economy.²⁰⁰
- 6.36. The committee was told that ARENA has been funding a lot of large-scale batteries to demonstrate innovative services like frequency control.²⁰¹ It also noted that ARENA’s focus is now moving away from funding battery deployments or battery rollouts, because the really important things that distributed battery storage can do are well demonstrated now, it is now up to the market to work out how to roll them out.²⁰²

Large-scale batteries

- 6.37. Neon noted in its submission that the ability of large scale batteries to deliver electricity grid-support through their connection to the National grid through transmission networks.²⁰³ Neon believes that big battery projects in the ACT are the most effective mechanism to ensure that all of the ACT community benefits directly from investments in large-scale battery projects,²⁰⁴ stating:

¹⁹⁶ ACT Government, Submission 8, p 14.

¹⁹⁷ *Committee Transcript*, 17 June 2021, p 93.

¹⁹⁸ Neoen, Submission 9, p [3].

¹⁹⁹ *Committee Transcript*, 8 June 2021, p 39.

²⁰⁰ *Committee Transcript*, 8 June 2021, p 39.

²⁰¹ *Committee Transcript*, 6 July 2021, p 111.

²⁰² *Committee Transcript*, 6 July 2021, p 113.

²⁰³ Neoen, Submission 9, p [3].

²⁰⁴ Neoen, Submission 9, p [4].

...the *Electricity Feed-in (Large-scale Renewable Energy Generation) Act 2011* provides an effective mechanism to stimulate investment in large-scale renewable energy in the Territory. The Objectives of the Act are well aligned with battery storage, as storage supports a higher penetration of renewables. Additionally, the reverse auction is a process that is well understood by industry and financiers and enables Government to ensure benefits are directly returned to electricity consumers via EvoEnergy.²⁰⁵

- 6.38. The ACT Government's 'Big Canberra Battery' will provide 250 MW of power to the ACT with the aim of reducing pressure on the grid and electricity prices in the ACT, while also generating new revenue opportunities for the ACT.²⁰⁶
- 6.39. Neoen advised the committee that it is delivering the first battery project classified under the Territory Plan 2008 as a 'Major Utility Installation', which allows for the development to be assessed for approval under the existing planning regulatory frameworks. Neoen 'considers, however, that there are additional opportunities to further clarify and improve the efficiency of the planning and crown lease variation process more generally'.²⁰⁷
- 6.40. Canberra Solar Hot Water Repairs noted that the proposed 250 MWh battery 'has been reported to cost around \$100 million and how it will be used most effectively is currently unknown'.²⁰⁸
- 6.41. LGI Limited saw substantial opportunities for battery storage, noting that the Big Canberra Battery does not need to be a single large battery (100MWh+), rather it should be a distributed model placing storage where the demand for electricity is.²⁰⁹ It also noted that distribution scale batteries are becoming economically viable and therefore may only require clear endorsement from the Government on a project by project basis to boost the ACT's renewable energy portfolio.²¹⁰

Recommendation 19

The committee recommends that the ACT Government provide more detailed and clear strategies on its implementation of the big batteries program, including that a diverse range of participants take up battery storage.

Neighbourhood/community-scale batteries

- 6.42. The ACT Government stated that investments in neighbourhood scale battery projects will provide:
- new opportunities for market participants such as industry investors, retailers and technology operators;

²⁰⁵ Neoen, Submission 9, p [3].

²⁰⁶ ACT Government, Submission 8, p 13

²⁰⁷ Neoen, Submission 9, p [3].

²⁰⁸ Canberra Solar Hot Water Repairs, Submission 6A, p 5.

²⁰⁹ LGI Limited, Submission 13, p [6].

²¹⁰ LGI Limited, Submission 13, p 2.

- increased community confidence in delivering innovative trials to provide communities that have limited storage options (such as tenants and multi-unit buildings) with access to ‘virtual’ storage;
 - improved grid reliability; and
 - researchers with opportunities to inform policy and regulatory reforms.²¹¹
- 6.43. In its submission, Greenlaw noted that access to general, technical, and financial knowledge is essential for the development of community batteries. This is due to the knowledge-intensive processes that underlie the development of community batteries. Specifically, complex technological and regulatory dynamics impact the performance and the financial viability of projects. So, knowledge hubs can become a valuable asset in promoting the uptake of community batteries.²¹²
- 6.44. Neon observed that revenue stream opportunities are lower for neighbourhood scale batteries due to their reduced ability to participate in wholesale electricity markets. It noted that neighbour-scale batteries are currently subject to two network charges; transmission use of service (TUOS) and distribution use of service (DUOS) which further reduces their viability in relation to their return on investment.²¹³
- 6.45. Evoenergy noted that neighbourhood-scale batteries and V2G technologies provide communities with the opportunity to store their solar energy generation in the NEM. It stated that ‘collaborative efforts like the Ginninderry Energy Pilot Project and the Jacka Community Battery project should inform future Government strategies. Evoenergy is well placed to provide technical advice on the integration of new technologies in our network’.²¹⁴
- 6.46. Greenlaw highlighted the way renewable energy options and community-scale batteries can contribute to the achievement of these rights because:
- renewable energy and storage is getting cheaper, thereby reducing energy stress and ensuring housing remains affordable;
 - batteries help provide security of energy supply, especially for renters and those in low socio-economic groups; and
 - cheaper electricity enables people to use heating and cooling to protect themselves from the impacts of weather.²¹⁵

Recommendation 20

The committee recommends that the ACT Government ensures its renewable energy programs and specifically, its roll-out of community-scale batteries, occurs as a just transition.

²¹¹ ACT Government, Submission 8, p 12.

²¹² Greenlaw, Submission 12, p 18.

²¹³ Neoen, Submission 9, p [3].

²¹⁴ Evoenergy, Submission 14, p 7.

²¹⁵ Greenlaw, Submission 12, p 23.

Behind the meter batteries

- 6.47. ARENA defined ‘behind the meter’ as electricity that is generated or managed behind the electricity meter in the home or business to provide them with power. They are also known as DER.²¹⁶
- 6.48. ICEDS stated in its submission that it is important to recognise the value of adding additional energy storage capacity through electrifying our transportation sector. There is significant potential for electric vehicles (cars, buses and trucks) to contribute to energy reliability and energy security through their participation in markets for energy, ancillary and networks services. Collectively, these capabilities are referred to V2G capabilities and should be a key focus of the ways in which ACT Government can proceed to meet their ambitious decarbonisation goals over the decades ahead.²¹⁷
- 6.49. Neon noted that behind-the-meter batteries, such as V2G and household, do have higher relative revenues due to greater tariff arbitrage²¹⁸ opportunities, however they also provide a lower return on investment due to their high costs. Neoen also noted that:
- ...such batteries are not necessarily co-ordinated with distribution peak loads without significant additional intervention from third parties. Such coordination, while potentially beneficial, is likely to continue to be extremely challenging with low overall returns due to the diverse nature of small customers—as has been shown with the Government’s Next Generation Energy Storage Program.²¹⁹
- 6.50. The ACT Government has committed in the PAGA to research and pilot V2G and Vehicle2Home projects to improve energy efficiency and grid reliability. The REVS project, hosted by the Government, is one of the largest V2G trials in the world. It involves the deployment of 51 Nissan LEAF EVs across the ACT Government fleet to test V2G services, which when plugged in, provide Frequency Control Ancillary Services (FCAS) to the National Electricity Market (NEM).²²⁰
- 6.51. Mr Gemmell expressed disappointment the Duffy Shops proposal is silent on the inclusion of localised renewable energy technologies, noting that this is a missed opportunity, and recommended that Directorates include renewable energy initiatives in future ACT infrastructure projects.²²¹
- 6.52. WCCC also highlighted the missed opportunity for renewable energy innovation at the Duffy shops and suggested that the government consider:
- installing ‘battery charging stations at high community use sites (e.g. Duffy shops, Arawang netball courts, Fisher shops and Coleman Court)’; and

²¹⁶ ARENA, *Distributed energy resources*, <https://arena.gov.au/renewable-energy/distributed-energy-resources/> (accessed 10 April 2022)

²¹⁷ ICEDS, Submission 16, p 9.

²¹⁸ Tariff arbitrage is the practice of purchasing electricity from the electricity grid when it is cheap, and storing it for later use when grid electricity is expensive (James Martin, *Tariff Arbitrage with battery storage: What it is and how can it save you money?* solar choice blog, 16 May 2016, <https://www.solarchoice.net.au/blog/battery-storage-electricity-tariff-arbitrage#:~:text=In%20short%2C%20tariff%20arbitrage%20is,than%20from%20your%20solar%20panels> (accessed 26 April 2022)).

²¹⁹ Neoen, Submission 9, p [4].

²²⁰ ACT Government, Submission 8, p 13

²²¹ Mr Bill Gemmell, Submission 10, p [8].

- giving grants to local shop owners and homeowners to be invested in energy upgrades for their businesses.²²²

6.53. Greenlaw stated it is critical for knowledge sharing hubs to help community battery projects develop by:

- connecting community groups to legal, regulatory, technical and business experts;
- supporting community groups to engage with network companies, developers and financiers;
- creating a feedback mechanism to develop a knowledge bank for future projects;
- hosting a program of workshops and events; and
- centralising general knowledge resources.²²³

6.54. Greenlaw also noted the NSW Clean Energy Knowledge Sharing Initiative as a potential model the ACT could consider for decentralised knowledge sharing. The initiative provided innovators the opportunity to test and trial clean energy solutions and increased community battery uptake by sharing experience from early adopters of renewable technologies. The Narara Ecovillage was one project that benefited from the initiative.²²⁴

Committee comment

6.55. The committee noted the importance of knowledge sharing between jurisdictions, researchers, energy stakeholders and the community to build a diverse range of effective battery storage systems across the ACT.

Recommendation 21

The committee recommends that the ACT Government expand the current ACT Renewables Hub initiative to support knowledge-sharing of community battery information to empower communities to design, develop and operationalise community-scale battery projects in the ACT, and provide specific training on community batteries for technicians.

Transitioning from gas

6.56. On 2 June 2022, the Legislative Assembly for the ACT passed a motion in the Assembly calling on the ACT Government to join with other cities, organisations, and individuals, to endorse the call for an international Treaty on Fossil Fuel Non-Proliferation.²²⁵

²²² WCCC, Submission 19, p [5].

²²³ Greenlaw, Submission 12, pp 19–20.

²²⁴ Greenlaw, Submission 12, p 19.

²²⁵ Legislative Assembly for the ACT, Minutes of Proceedings No 16, 2 June 2021, pp 184–187, https://www.parliament.act.gov.au/_data/assets/pdf_file/0006/1769595/MoP016F7.pdf (accessed 10 March 2022).

- 6.57. The initiative to create a Treaty on Fossil Fuel Non-Proliferation is aimed at ‘phasing out fossil fuel production, and fast-tracking progress towards safer and more cost-effective alternatives.’ This will require unprecedented international cooperation in three main areas:
- non-proliferation—end new oil and gas exploration and production;
 - global disarmament—phase out existing production; and
 - a peaceful, just transition—for all workers, communities and countries.²²⁶
- 6.58. The Energy Networks Australia *Gas Vision 2050: Delivering a Clean Energy Future* outlined that gas:
- is used by residential and commercial customers for cooking, space heating and hot water;
 - is used by industrial processes to provide heat and is a major feedstock to produce common goods such as plastics and fertilisers;
 - provides reliability and stability of our power system by providing peak generation to back up renewable electricity; and
 - is an important export, contributing \$47 billion to the economy in 2019-20.²²⁷
- 6.59. The ACT Government plans to phase out gas by 2045 at the latest. Commitments made in the PAGA to move towards this target for phasing out gas use include:
- developing the Molonglo Commercial Centre as an all-electric commercial centre (no new connections to gas mains network, but allowing transition gas arrangements such as tanks), in partnership with expert stakeholders, and using lessons from this project to assist the phase out of fossil-fuel gas in the ACT, and demonstrate national best practice; and
 - legislating to prevent new gas mains network connections to future stages of greenfield residential development in the ACT in 2021-22.²²⁸
- 6.60. In its submissions, Bioenergy Australia stated that good energy policy can achieve multiple outcomes:
- ...it is time for the ACT to invest in a biofuture that contributes not only to climate action, but also to support regional economies, convert waste to valued products, and increase self-sufficiency and energy security. As part of this strategy, we urge the ACT government to reconsider its plan of phasing out all gas use by 2045.²²⁹

²²⁶ The fossil fuel non-proliferation treaty, <https://fossilfueltreaty.org/home> (accessed 10 March 2022).

²²⁷ Energy Networks Australia, *Gas Vision 2050: Delivering a Clean Energy Future*, September 2020, p 1, <https://www.energynetworks.com.au/resources/reports/2020-reports-and-publications/gas-vision-2050-delivering-a-clean-energy-future/> (accessed 10 March 2020).

²²⁸ ACT Government, Submission 8, p 11.

²²⁹ Bioenergy Australia, Submission 21, p 4.

- 6.61. Greenlaw observed in its submission that gas is not a transition fuel to lower emissions, and it is critical that gas consumption, currently around 22 percent of annual emissions, be rapidly decreased in the ACT to achieve net zero by 2045.²³⁰ It also noted that ‘gas powered generation has the highest scope 3 emissions of any form of generation’.²³¹
- 6.62. The Smart Energy Council highlighted the need to explain to ordinary householders that going all electric is a viable option, noting:
- ...the gas industry has done a great job of talking about natural gas, so in some ways people think that it is somehow a natural, clean product. It is actually methane gas. Methane is a very potent greenhouse gas. We are pumping that to people’s houses.²³²
- 6.63. Evoenergy told the committee that ‘as the owner-operator of the gas network, we obviously care about that \$400 million that we have invested in the gas network. Our preference is to find a solution for the gas network into the future that meets net zero by 2045’.²³³
- 6.64. In his submission, Mr O’Loughlin quoted the Chief Minister Andrew Barr (from his appearance before the committee’s Inquiry into Annual and Financial Reports 2019-2020 and ACT Budget 2020-21), as saying that gas pipelines in the ACT are a significant government asset:
- We then come to gas, which clearly is a legacy item. We are, as a 50 per cent partner in an energy retail business, through ActewAGL, somewhat entangled in the business of selling natural gas as part of an energy product mix...[there is] I think, around \$3 billion asset that is the gas network that sits underneath this city. So it is not something that we can just turn off or divest from or privatise or do anything like that. We need to play a role in the transition, not just wash our hands of it. Fiscally, we cannot afford to wash our hands of it, so we do need to play an active role there.²³⁴
- 6.65. Mr O’Loughlin discussed the need to transition from gas to electricity noting the advantage of electricity over gas as it can be used effectively for both cooling and heating.²³⁵ He noted the transition to renewable energy will be obstructed by maintenance of gas as a fuel option through subsidies, punitive exit charges, and entering into long-term contracts for gas supply. Gas networks need to be maintained and customers’ costs will increase to compensate the lower number of consumers. This is shown by Evoenergy charging no connection fees to join the network, but charging residents \$670 and businesses \$1230 to leave the network.²³⁶

²³⁰ Greenlaw, Submission 23, p 5.

²³¹ Greenlaw, Submission 23, p 5, citing Climate Council, Submission to the New South Wales Independent Planning Commission Hearing into the Proposed Santos Narrabri Gas Project.

²³² *Committee Transcript*, 8 June 2021, p 37.

²³³ *Committee Transcript*, 8 June 2021, p 63.

²³⁴ Mr Larry O’Loughlin, Submission 24, p 10.

²³⁵ Mr Larry O’Loughlin, Submission 24, p 6.

²³⁶ Mr Larry O’Loughlin, Submission 24, p 8.

- 6.66. In its evidence, ARENA noted the challenge of the electrification process for cold climates such as the ACT, where energy for heating is often provided by gas, and this heating load will need to be transferred from gas to the electricity grid. There are also storage issues that need to be solved, noting that a household battery with a 10kWh capacity is insufficient; three times that amount is required to keep a house warm in the evening.²³⁷
- 6.67. Greenlaw noted that while gas peakers (power plants designed to balance the fluctuating power requirement in a network, operating during periods of high electricity demand²³⁸) can be used to address energy demand peaks, it considers battery storage the preferable option because it:
- outcompetes traditional gas peakers in both price and efficiency because of its faster reaction time and higher accuracy and flexibility to respond to price variability;
 - has the additional benefits of providing voltage support and solving local network problems by increasing the hosting capacity of the network in areas which have high volumes of distributed PV, unlike gas peakers; and
 - contributes to decarbonisation of the grid rather than locking-in carbon intensive energy generation.²³⁹
- 6.68. In its submission, ICEDS pointed out that ‘the transition to low emissions heating for all new and replacement heating installations must occur rapidly, or the future legacy emissions associated with gas heating will make it impossible to meet future ACT targets.’²⁴⁰ The ACT Government should accelerate the development of the plan to achieve zero emissions from gas to avoid future installations of gas systems that will need to be decommissioned to meet the 2045 target.²⁴¹
- 6.69. ICEDS also suggested the ACT government ‘conduct a study into the relative merits of sector coupling /sector integration as compared to the all-electric approach, which would involve restrictions on new or replacement gas heaters’.²⁴²
- 6.70. In its submission, the Australian Pipelines and Gas Association (APGA) highlighted research undertaken by Frontier Economics²⁴³ identifying that ‘gas use decarbonisation through 100% renewable hydrogen replacement costs less than electrifying gas demand. In addition to cost, the security and flexibility of continuing to have two energy sources, electricity and gas, means there is greater value in decarbonising gas.’²⁴⁴ APGA would like the ACT

²³⁷ *Committee Transcript*, 6 July 2021, pp 114–115.

²³⁸ Edina, *What are peaking plants*, <https://www.edina.eu/power/gas-peaking-plant#:~:text=Gas%2Dfired%20peaking%20plants%2C%20often,or%20shortfalls%20of%20electricity%20supply> (accessed 15 April 2022).

²³⁹ Greenlaw, Submission 12, p 7.

²⁴⁰ ICEDS, Submission 16, p 8.

²⁴¹ ICEDS, Submission 16, p 8.

²⁴² ICEDS, Submission 16, p 7.

²⁴³ Frontier Economics, *The benefits of Gas Infrastructure to Decarbonise Australia: A Report for the Australian Gas Industry*, September 2020, available at <https://www.energynetworks.com.au/resources/reports/2020-reports-and-publications/the-benefits-of-gas-infrastructure-to-decarbonise-australia-frontier-economics/>

²⁴⁴ APGA, Submission 20, p 1.

Government to consider trials for the injection of renewable gas into the existing infrastructure networks.²⁴⁵

- 6.71. Professor Andrew Blakers noted that many houses in the ACT do not have heat pumps installed for water, heating and cooling. With a heat pump, for every unit of electricity, you get three to five units of heat; older electric and gas technologies are less efficient because they do not leverage energy in this manner. A heat pump results in a warmer or cooler house with lower energy bills, coupling this with a solar system on the roof, which produces electricity at a third or a quarter of the price of tariff electricity. This means consumers can achieve significant energy and cost savings.²⁴⁶
- 6.72. Harvest Hot Water told the committee that current energy use goes into inefficient gas home and water heaters, noting that renewable space heat pumps—reverse cycle air conditioners and water heaters—use far less energy than gas appliances.²⁴⁷ It supported the point made by Professor Blakers in that there is an ‘efficiency multiplier with heat pumps—for every kilowatt hour of electricity that comes in, it does not just produce one kilowatt hour of heating; it produces four kilowatt hours of heating—that is the magic of heat pumps’.²⁴⁸
- 6.73. Bioenergy Australia disagreed with the assessment of the efficiency of heat pumps, stating in their answer to [Question Taken on Notice 4](#), 18 June 2021 (received 10 June 2021) that while heat pumps are a good solution for residential heat usage, their efficiency reduces as ambient temperatures get cooler, especially in cold regions, like the ACT.²⁴⁹
- 6.74. Canberra Solar Hot Water Repairs noted in its submission that ‘changing from gas hot water systems to electric hot water systems, including heat pump hot water systems, could significantly increase the peak load on the electricity network.’²⁵⁰ It stated that:
- ...at present there are no comparable alternatives to manifolded commercial gas storage and gas continuous flow hot water systems. If there was, the amount of electricity each would consume would be in the hundreds of kilowatts per hour.²⁵¹
- 6.75. Canberra Solar Hot Water Repairs also noted the ‘expected lifespan and efficiencies of all hot water systems are based on best-case scenarios of proper installation techniques, water quality, optimal location and conditions, hot water demand, new system, regular servicing, and climate. Change any of these conditions and the stated efficiencies and output can drop dramatically—no more so than with heat pump and solar hot water systems.’²⁵² It observed that the most efficient installation for electric hot water installations are on north, or north-west facing roofs, however this cannot always be

²⁴⁵ APGA, Submission 20, p 2.

²⁴⁶ *Committee Transcript*, 8 June 2021, p 4.

²⁴⁷ *Committee Transcript*, 8 June 2021, p 68.

²⁴⁸ *Committee Transcript*, 8 June 2021, p 71.

²⁴⁹ Bioenergy Australia, answer to [Question Taken on Notice 4](#), received 10 June 2021.

²⁵⁰ Canberra Solar Hot Water Repairs, Submission 6A, p 10.

²⁵¹ Canberra Solar Hot Water Repairs, Submission 6A, p 13.

²⁵² Canberra Solar Hot Water Repairs, Submission 6A, p 16.

effectively achieved, leading to installations that compromise the manufacturers stated efficiencies.²⁵³

- 6.76. Canberra Solar Hot Water Repairs noted the following potential costs implications of converting all gas hot water systems to electric systems:
- a gas continuous flow hot water systems typically use less than 0.1kW of electricity when in operation. Electric continuous flow hot water systems require 11kW of electricity and typically deliver lower temperatures and flow rates;²⁵⁴
 - the replacement of a gas continuous flow hot water system with an electric continuous flow hot water system will require the installation of a 415volt power supply. The cost to provide suitable wiring from the pole to the meter and from the meter to an electrical continuous flow hot water system would likely be many times more than the cost of the hot water system installation itself; and
 - the cost of heat pumps and solar hot water systems has increased year on year. The capital cost for heat pumps and solar hot water systems is between 200% to 400% of gas and electric systems of similar hot water output, used for residential purposes. This has the potential to negatively impact medium to low-income households.²⁵⁵
- 6.77. In its submission, the Master Plumbers Association ACT (MPA) also noted there would be a negative impact on the industry to the phasing out natural gas, including adverse financial consequences. It believes that, with more research and development, the gas-fitting industry can continue to function at its current levels while producing zero net carbon emissions.²⁵⁶ More financial guidance from the ACT Government would be welcomed, as well as a framework of support for retraining gasfitters, noting there are currently around 1700 individuals and companies holding gas-fitting and gas appliance licences in the ACT.²⁵⁷

Recommendation 22

The committee recommends that the ACT Government consider developing a plan covering the financial, social, business and industry transition of fully electrifying our hot water systems in the ACT.

Recommendation 23

The committee recommends that the ACT Government consider how to retrain gasfitters to support the industry transition.

²⁵³ Canberra Solar Hot Water Repairs, Submission 6A, pp 17–18.

²⁵⁴ Canberra Solar Hot Water Repairs, Submission 6A, p 21, citing Stiebel Eltron, 2020.

²⁵⁵ Canberra Solar Hot Water Repairs, Submission 6A, p 21.

²⁵⁶ MPA ACT, Submission 7, p 8.

²⁵⁷ MPA ACT, Submission 7, p 8.

Gas workforce

- 6.78. The committee noted that the CIT Renewable Energy Skills Training Centre provides an excellent platform from which to skill workers in the growing renewables trades sector.
- 6.79. CIT advised the committee that there are currently no extra qualifications needed to install heat pumps; any electrician and plumber can do these installations. Most training undertaken is referred to as manufacturers' training, where in-house training is provided to upskill workers on their product.²⁵⁸
- 6.80. In its submission, Canberra Solar Hot Water Repairs provided statistics showing that heating water for showers, laundry and washing makes up approximately 37 per cent of an average household's energy use with heating making up another 22 per cent. Gas continuous flow hot water systems are popular among homeowners and are also well suited to commercial, government, public, sporting, and apartment buildings.²⁵⁹ It also noted that there are few perceived options:

...a widely held view in the plumbing industry is that in the majority of commercial, government, public and apartment buildings there are no feasible alternatives to gas hot water systems.²⁶⁰

- 6.81. Canberra Solar Hot Water Repairs stated that even though solar hot water installations are taught at the CIT, there is a lack of plumbers in Canberra who are capable or willing to undertake solar hot water installations and repairs. This is because of the financial risks associated with a misdiagnosis during repairs, as solar hot water systems are very time-consuming to install, and it is easy to make mistakes during the installation process.²⁶¹ It stated that:

We visit many homes where the solar hot water systems have been improperly installed, and most if not all, heat is derived from the electric or gas booster. This is because many installers simply do not understand what mistakes they have made or what they can do to improve the efficiency and longevity of the system.²⁶²

- 6.82. Harvest Hot Water stated in its submission that heat pump hot water systems are very straightforward for any plumber to install as they mimic traditional electric hot water systems. Training needs to increase awareness amongst installers about the value of heat pump technology, particularly the benefits of heat pump water heaters as opposed to gas heaters, to encourage more plumbers to offer them as an alternative option for customers.²⁶³

²⁵⁸ *Committee Transcript*, 8 June 2022, p 24.

²⁵⁹ Canberra Solar Hot Water Repairs, Submission 6A, p 7.

²⁶⁰ Canberra Solar Hot Water Repairs, Submission 6A, p 8.

²⁶¹ Canberra Solar Hot Water Repairs, Submission 6A, p 24.

²⁶² Canberra Solar Hot Water Repairs, Submission 6A, p 24.

²⁶³ *Committee Transcript*, 8 June 2021, p 72.

- 6.83. MPA ACT is developing a Plumbing Industry Leadership Alliance (PILA) on behalf of the plumbing industry, to act as a forum to support and accelerate industry leadership and knowledge transfer across policy development, evolving technologies, and training needs.²⁶⁴

Recommendation 24

The committee recommends that the ACT Government work with the Master Plumbers Association ACT and Canberra Institute of Technology to provide continuing professional development for heat pump and solar water installers.

Recommendation 25

The committee recommends that the ACT Government determine if a special licence category should be created for plumbers undertaking solar hot water heater and heat pump installations.

Hydrogen

- 6.84. *Australia's National Hydrogen Strategy* sets a vision for a clean, innovative, safe and competitive hydrogen industry that benefits all Australians aiming to position our industry as a major global player by 2030.²⁶⁵ The strategy notes that the ACT has some competitive advantages:

the ACT offers an excellent test environment for demonstrating hydrogen technologies and is leading Australia in several hydrogen R&D trials across a wide spectrum, including hydrogen production (electrolysis), vehicle refuelling and vehicle use, blending hydrogen in gas networks, and regulatory reform.²⁶⁶

- 6.85. This Strategy also highlighted the following advantages of Hydrogen as an energy source:
- as a fuel, it produces no carbon emissions, only water and can be safely used in a broad range of applications;
 - we have the natural resources needed to produce it and are well-placed to make hydrogen our next big export;
 - a hydrogen industry could generate thousands of jobs, many of them in regional areas;
 - it has the potential to help us to reliably integrate extensive renewable generation into the electricity grid; and
 - using hydrogen, we can reduce dependence on imported fuels thereby reducing carbon emissions, in Australia and around the world.²⁶⁷

²⁶⁴ Master Plumbers Association ACT, Submission 7, p 10.

²⁶⁵ COAG Energy Council, *Australia's National Hydrogen Strategy*, 2019, p viii, <https://www.industry.gov.au/sites/default/files/2019-11/australias-national-hydrogen-strategy.pdf> (accessed 30 March 2022).

²⁶⁶ COAG Energy Council, *Australia's National Hydrogen Strategy*, 2019, p xxxii, <https://www.industry.gov.au/sites/default/files/2019-11/australias-national-hydrogen-strategy.pdf> (accessed 30 March 2022).

²⁶⁷ COAG Energy Council, *Australia's National Hydrogen Strategy*, 2019, p 1, <https://www.industry.gov.au/sites/default/files/2019-11/australias-national-hydrogen-strategy.pdf> (accessed 30 March 2022).

6.86. ARENA told the committee that it sees a significant role for government in hydrogen technologies, including:

...demonstrating the technology and commercial models that can enable hydrogen to play its potential role in the energy transition, including in terms of large-scale exports of hydrogen, but also its application for decarbonising gas networks and potential in transport, including long-haul transport, shipping and things like that.²⁶⁸

6.87. In its submission, the MPA ACT noted alternative energy sources such as hydrogen and biomethane have the potential to be a substitute for natural gas.²⁶⁹ It also noted that the NSW Government has committed to achieving 10 per cent hydrogen contribution to gas supplies by 2030. There is also Australian Government support through initiatives such as the National Hydrogen Strategy.²⁷⁰

6.88. National Energy Resources Australia (NERA) has ‘formed a network of hydrogen technology clusters across Australia, providing seed-funding in partnership with governments and industry to build the skills, capability and commercialisation opportunities in the emerging hydrogen industry’. NERA is facilitating connections and knowledge sharing to accelerate the development of the hydrogen equipment, technology and services (HETS) sector to drive market activation, establishing a global identity and recognised brand for Australian hydrogen technology and expertise.²⁷¹

6.89. NERA has provided funding to Evoenergy, the Smart Energy Council, ACT Renewables Hub, and ANU to establish the ACT Renewable Hydrogen Cluster, which has led to the development of:

- a pilot Hydrogen Refuelling Station located in Fyshwick;
- a Hydrogen testing facility, also in Fyshwick;
- the zero carbon certification scheme; and
- the ANU research association, the Energy Change Institute.²⁷²

6.90. The Smart Energy Council stated that ‘when the federal government talks about hydrogen, they are really focused on fossil fuel hydrogen’. Its focus in the ACT, because the ACT is a 100 per cent renewables jurisdiction, is in renewable hydrogen, which is sourced from renewable ammonia. Ensuring the production of zero-emissions hydrogen forms part of its job in certifying ActewAGL’s hydrogen refuelling station.²⁷³ The Smart Energy Council would like to see the ACT Government, in partnership with other organisations, explore further opportunities such as developing a ‘Renewable Hydrogen Highway’ between Canberra and

²⁶⁸ *Committee Transcript*, 6 July 2021, pp 111–112.

²⁶⁹ Master Plumbers Association ACT, Submission 7, p 8.

²⁷⁰ Master Plumbers Association ACT, Submission 7, p 9.

²⁷¹ NERA, *Hydrogen Technology Cluster Australia (H2TCA)*, <https://www.nera.org.au/regional-hydrogen-technology-clusters> (accessed 30 March 2022).

²⁷² ACT Renewables Energy Hub, *ACT Renewable Hydrogen Cluster*, <https://www.actrenewableshub.org.au/act-renewable-hydrogen-cluster> (accessed 30 March 2022).

²⁷³ *Committee Transcript*, 8 June 2021, p 30.

Sydney and also between Mildura (another NERA hydrogen hub) and Canberra, to encourage the use of renewable hydrogen heavy vehicles.²⁷⁴

- 6.91. The MPA ACT also noted the potential to run a ‘H₂ powered train (Hydrail—HFCET) on the Sydney-Canberra rail link’²⁷⁵ as the new Fyshwick Hydrogen refuelling station is less than 1km from Canberra’s current train refuelling station. Serious consideration should be given to upgrading these facilities to allow for co-location.²⁷⁶
- 6.92. Professor Andrew Blakers questioned the viability of hydrogen given ‘the round-trip efficiency to go from solar and wind electricity through an electrolyser to make hydrogen, then back to electricity through a fuel cell, is around 25 per cent or 30 per cent tops. If you put the same electricity through a pumped hydro system or a battery, the efficiency is 80 to 90 per cent’.²⁷⁷ He recommends the ACT Government focus on solar and wind electricity generation, transmission, storage, integration and use because these are directly relevant to Canberra. He also notes that Hydrogen-powered vehicles have little chance of competing with electric vehicles given the overwhelming market share of the latter.²⁷⁸
- 6.93. Professor Andrew Blakers also stated that ‘H is for hype’, and:

Hydrogen hype is a dangerous and destructive myth. You cannot put hydrogen through a natural gas network at more than—I do not know what the number is—five or 10 per cent. That means that you still have 90 per cent of the destructive capacity of methane. Methane greenhouse warming is not just the CO₂ when you burn it. Possibly up to half of it is future emissions because methane is anywhere between 28 and 70 times worse than CO₂ when you look over a 100-year or 25-year time frame.

We should be looking over a 25-year time frame, which means that methane is arguably worse than brown coal. We need to shut off our gas. The sooner we do it the better. Methane is a very nasty greenhouse gas, much worse than CO₂. I think we are better off sticking with coal. Natural gas is now five per cent of generation in the electricity market; it is a bit player. Most of the load following it is done by coal, batteries and pump hydro.²⁷⁹

- 6.94. In its submission, Canberra Solar Hot Water Repairs noted that the ACT’s existing gas network is one of the newer and more hydrogen compatible networks in Australia, with the capacity to store 32 hours of green hydrogen. It also noted that the ACT is also connected to a much larger gas distribution network—the Eastern Gas Network. Testing to determine the compatibility between hydrogen and gas networks look promising, if compatibility issues can be resolved. This larger network has the capacity to store up to 96 hours of hydrogen, saving the ACT from additional costs for installing batteries.²⁸⁰

²⁷⁴ Smart Energy Council, Submission 5, p 8.

²⁷⁵ Master Plumbers Association ACT, Submission 7, p 10.

²⁷⁶ Master Plumbers Association ACT, Submission 7, p 10.

²⁷⁷ *Committee Transcript*, 8 June 2021, p 6.

²⁷⁸ Professor Andrew Blakers, ANU, Submission 3, pp [3–4].

²⁷⁹ *Committee Transcript*, 8 June 2021, p 6.

²⁸⁰ Canberra Solar Hot Water Repairs, Submission 6A, p 5.

Bioenergy

6.95. Bioenergy usually comes in two forms:

- biomass typically comes from agriculture, food or forestry waste products that can be burned or converted, in the presence of oxygen, to make heat, electricity, or liquid fuel to create energy; and
- biogas is the end product of the anaerobic digestion process where food waste is transformed into energy in the absence of oxygen.²⁸¹

6.96. Published material from the Commonwealth Scientific and Industrial Research Organisation (CSIRO) states that:

...bioenergy currently accounts for just 0.9 per cent of Australia's electricity output – much lower than the Organisation for Economic Cooperation and Development (OECD) average of 2.4 per cent. Australia is also the only OECD country that hasn't implemented a large-scale 'waste-to-energy' (WtE) scheme to manage its wastes via sustainable and environmentally friendly methods.²⁸²

6.97. CSIRO also noted that WtE plants are common in other countries. They are clean, efficient and can significantly reduce emissions of greenhouse gases by directly reducing methane emissions from landfill (which is roughly 30 times more potent than CO₂), and offsetting emissions (which would have been produced if the power was made from coal or gas). Bioenergy offers the opportunity to increase the penetration of renewables into the transport sector allowing waste to be converted into transport fuels. They state:

There are big opportunities to further develop our bioenergy capability to help decarbonise Australia's energy sector, while offering reliable baseload supply and reducing the amount of waste ending up in landfill.²⁸³

6.98. Bioenergy Australia asked KPMG to prepare a report on bioenergy activity within Australia. Queensland was assessed as the best state because their policy objectives were better defined and more aligned to the bioenergy sector compared to other states and territories. The ACT's assessment against the five criteria used in relation to bioenergy were:

- Criteria 1—Policy development and effectiveness—notes the ACT Waste Management Strategy 2011–2025, ACT Sustainable Energy Policy and Electricity Feed-in-Tariff (Large-scale Renewable Energy Generation) Act 2011, however there are no specific objectives to drive investment in the bioenergy sector—assessed as meeting some of the requirements;

²⁸¹ Sharon Foster, 'What is the difference between biomass and biogas', *BioTech4*, 21 September 2020

<https://biotech4.co.uk/news/2020/09/21/what-is-the-difference-between-biomass-and-biogas/#:~:text=The%20main%20difference%20between%20biomass,the%20process%20of%20Anaerobic%20Digestion> (accessed 2 April 2022).

²⁸² CSIRO, *Biomass and waste to energy*, 21 June 2021 <https://www.csiro.au/en/research/technology-space/energy/biomass-to-energy> (accessed 2 April 2022).

²⁸³ CSIRO, *Biomass and waste to energy*, 21 June 2021 <https://www.csiro.au/en/research/technology-space/energy/biomass-to-energy> (accessed 2 April 2022).

- Criteria 2—Bioenergy project development—notes three projects operating in the ACT generating 4.4MWh combined, no new projects identified in the pipeline—assessed as meeting some of the requirements;
 - Criteria 3—technology and feedstock diversity—notes the three waste facilities using anaerobic digestion (biogas)—assessed as most requirements not being met;
 - Criteria 4—Sustainability guidance—found no evidence of guidance—assessed as most requirements not being met; and
 - Criteria 5—Advocacy and education—limited other than the ACT Waste Management Strategy 2011–2025—assessed as most requirements not being met.²⁸⁴
- 6.99. In its submission, Bioenergy Australia noted that a full-electrification approach would significantly increase demand on the grid and that gas plays a strong role in providing reliable energy to Canberra residents. Biogas is a renewable, reliable, and local source of energy that can be upgraded into biomethane. When derived from biomass, it can support the decarbonisation of the gas network as it has a chemical composition very similar to natural gas, and it can be injected into the gas grid.²⁸⁵
- 6.100. Bioenergy Australia highlighted in its evidence to the committee that consideration should be given to establishing a co-digesting plant which could combine the ACT’s wastewater treatment with food waste, sourced from our hospitals, event stadiums and the restaurant industry. It could extract methane through the process of the anaerobic digestion, that can be used as an energy source. It highlighted the co-digesting work being done by Yarra Valley Water as an example of what can be done in this area to create more and a higher-value gas product.²⁸⁶
- 6.101. Bioenergy Australia also noted that there is still going to be food waste and sewerage plants in 50 years’ time, the waste needs to be dealt with, and co-digesting is ‘a positive way of being able to do that and reduce emissions that would otherwise be going into the atmosphere’.²⁸⁷ The ACT Government could invest in a large-scale anaerobic digester, located close to either a landfill site or the ACT waste water treatment plant.²⁸⁸
- 6.102. In its submission, LGI Limited told the committee that it had established two carbon abatement projects in the ACT at the Mugga Lane and West Belconnen landfill sites. LGI Limited noted the flexibility of their design:

²⁸⁴ KPMG, Bioenergy state of the nation report: a report on Australia’s bioenergy performance; for Bioenergy Australia, November 2018, p 36, <https://cdn.revolutionise.com.au/news/vabsvwo5pa8jnsgrs.pdf> (accessed 2 April 2022).

²⁸⁵ BioEnergy Australia, Submission 21, p 4.

²⁸⁶ *Committee Transcript*, 8 June 2021, p 75.

²⁸⁷ *Committee Transcript*, 8 June 2021, p 76.

²⁸⁸ *Committee Transcript*, 8 June 2021, p 78.

...have developed a unique, flexible operating platform of biogas from landfill installations on sites of all scales across Australia. Our unique, flexible operating platform enables us to create hybridised energy systems which can include biogas to power generation, energy storage, synergistic solar, Green Gas (bio-methane) and innovative commercial solutions to provide dispatchable distributed renewable energy to firm intermittent renewables.²⁸⁹

6.103. LGI Limited observed that even if a landfill ceased operating or ceased receiving waste, there is more than 20 years of gas that the facilities will generate needing to be managed.²⁹⁰

6.104. LGI Limited noted that it is working to develop the existing Mugga Lane project into a renewable hybrid site with dispatchable power capability.²⁹¹ In its submission to the Big Canberra Battery Project Market Sounding process, it stated that:

Batteries at Mugga Lane will create a hybrid project allowing for storage and export of renewably generated energy when the ACT needs it due to the unique ability of the existing biogas to renewable energy facility being available 24 x 7.²⁹²

6.105. LGI told the committee that during the development process it had encountered a ‘lack of cohesive alignment of the various governing bodies in the territory’²⁹³ and that ‘the regulatory body did not have the in-house expertise’²⁹⁴ resulting in increased costs and project delays. In evidence, it stated that:

it would help the project developer if there was a more cohesive way in which parts of the territory acted together. We have seen in other states and territories that something like a champion or a project sponsor has worked quite well when that has been within the network authority or within the governing body. That means that once a project has been deemed approved, you have a facilitator that the project developer can liaise with to ensure that they coordinate with the relevant government bodies, and it all happens in a smoother, less stressful manner.²⁹⁵

Recommendation 26

The committee recommends that the ACT Government continues supporting the capture of gas from landfill to convert to green energy.

Recommendation 27

The committee recommends that the ACT Government support dispatchable battery power through the co-location of renewable energy projects at suitable sites that can be connected to the ACT electricity network.

²⁸⁹ LGI Limited, Submission 13, p 1.

²⁹⁰ *Committee Transcript*, 8 June 2021, p 53.

²⁹¹ LGI Limited, Submission 13, p 3.

²⁹² LGI Limited, Submission 13, p [5].

²⁹³ *Committee Transcript*, 8 June 2021, pp 53.

²⁹⁴ *Committee Transcript*, 8 June 2021, pp 55.

²⁹⁵ *Committee Transcript*, 8 June 2021, pp 53.

Recommendation 28

The committee recommends that the ACT Government improve staff technical expertise within the Utilities Technical Regulator team to provide the directorate with the necessary knowledge base to assess development applications for renewable energy projects.

Transport sector

- 6.106. As noted in chapter 2, the transport sector is the source of 64 per cent of emissions, therefore it provides the largest opportunity to reduce the ACT's carbon footprint.
- 6.107. Mr David Glynne Jones proposed the establishment of a Hub for Renewable Energy Transport Innovation and Adoption with the key aims of assisting the transition to renewable energy transport by:
- identifying and evaluating innovations;
 - coordinating collaboration between relevant organisations to assist in achieving the full spectrum of benefits—environmental, social & economic;
 - reducing the costs and risks;
 - informing policy development and implementation; and
 - facilitating operational adoption of technologies in key sectors.²⁹⁶
- 6.108. Mr Glynne Jones also noted the economic benefits to moving from predominantly imported fossil fuel sources to renewable energies that can be generated within Australia.²⁹⁷
- 6.109. In its submission, Bioenergy Australia told the committee that decarbonisation of the ACT transport sector could be accelerated by:
- introducing a biofuel mandate and clean fuels target;
 - reducing taxes on vehicles using bio and renewable fuels; and
 - increasing education programs on the advantages of bio fuels.²⁹⁸
- 6.110. ICEDS stated that 'to achieve 2045 targets, the transition to low emissions vehicles in the ACT must be accelerated'.²⁹⁹ It noted that:
- the average age of vehicles on the road in Australia is more than ten years, with the average life of vehicles at retirement more than 20 years, consistent with an annual attrition rate of five per cent;
 - vehicle purchases made today are affecting the emissions profiles in 2040;

²⁹⁶ Mr David Glynn Jones, Submission 15, p 2.

²⁹⁷ Mr David Glynn Jones, Submission 15, p 6.

²⁹⁸ Bioenergy Australia, Submission 21, p 2.

²⁹⁹ ICEDS, Submission 16, p 8.

- if 50 per cent of new vehicle purchases are low emission in 2030 and 100 per cent in 2040 (as per figure 7 in the ACT Climate Change Strategy 2019-2025) then approximately 45 per cent of vehicles in the ACT fleet would not be low emission vehicles in 2040; and
- the ACT consider a greater range of incentives and penalties to accelerate the uptake of low emissions vehicles to meet the interim and 2045 targets.³⁰⁰

Recommendation 29

The committee recommends that the ACT Government develops a robust transition strategy for decarbonisation of the transport sector in ACT with a clear target that is consistent with the ACT Government target of net zero by 2045 at the latest.

Electric vehicles

- 6.111. As noted in the Zero-Emission Transition Plan for Transport Canberra the largest source of emissions in the Territory now is in the transport sector comprising 62 per cent of emissions,³⁰¹ this can be broken down to emissions from private vehicles (69%), freight (20%), and public transport such as buses (3%), with other fuels (8%) making up the remainder.³⁰²
- 6.112. Method of travel to work statistics from the 2016 Australian Bureau of Statistics (ABS) for Canberra show:³⁰³

Car, as driver	Train, bus, tram or ferry	Bicycle or walked only ³⁰⁴
74.9%	7.1%	8.4%

- 6.113. In its submission, the ACT Government noted that they have one of the largest fleets of EVs in Australia, that provides a ‘testbed for industry to learn from’ as the community transitions to ZEVs.³⁰⁵
- 6.114. The Auditor-General’s Report No. 4 of 2021: *ACT Government’s vehicle emissions reduction activities* (the Audit Report) audited the 18 recommendations of the four ACT Government plans aimed at reducing transport-related greenhouse gas emissions by increasing the uptake of zero emissions vehicle technologies in the ACT (*ACT’s Transition to Zero Emissions Vehicles Action Plan 2018–21*, *ACT Climate Change Strategy 2019-25*, *ACT Transport Strategy 2020* and *Zero-Emission Transition Plan for Transport Canberra*). Broad recommendations of the audit were that EPSDD should:

³⁰⁰ ICEDS, Submission 16, p 8.

³⁰¹ ACT Government, TCCSD, *Transport Canberra Zero Emissions Transition Plan*, 2020, p 4, https://www.transport.act.gov.au/data/assets/pdf_file/0010/1625095/ZERO-EMISSION-TRANSITION-FINAL-.pdf (accessed 10 March 2022).

³⁰² ACT Government, TCCSD, *ACT Transport Strategy*, p 9, https://www.transport.act.gov.au/data/assets/pdf_file/0016/1613302/200601-ACT-Transport-Strategy_web.pdf (accessed 15 March 2022).

³⁰³ ABS, ‘More than two in three drive to work, Census reveals’, *Media Release*, 23 October 2017, <https://www.abs.gov.au/ausstats/abs@.nsf/mediareleasesbyreleasedate/7DD5DC715B608612CA2581BF001F8404> (accessed 18 March 2022).

³⁰⁴ Single method of travel only. Excludes “Worked from home”, “Not stated”, “Did not go to work” and all multi-response categories.

³⁰⁵ ACT Government, Submission 8, p 6.

- review zero emissions vehicle program design and delivery;
- improve processes when developing individual action plans or composite implementation plans that require multiple team input;
- review the effectiveness of the transition of the ACT Government fleet;
- prior to planning any successor plan to *The ACT's Transition to Zero Emissions Vehicles Action Plan 2018-21*, publicly report the Government's assessment of its progress in implementing the eleven actions in the plan; and
- improve zero emissions passenger fleet policy adherence.³⁰⁶

6.115. In evidence provided to the committee the Smart Energy Council stated that 'Australia is a laggard' in relation to EVs:

While the ACT as a jurisdiction has been quite electric vehicle friendly in having concessions for registration, for example, of electric vehicles, the uptake rate is still extremely small. It is not so much that the ACT is out of step with the rest of the country; we just need to redouble our efforts.³⁰⁷

6.116. The Smart Energy Council also noted that Australia's small market size presents obstacles for foreign manufacturers because there is no strategic advantage for them to invest in the Australian EV market. So, there's a role for government in subsidising new technologies for Australian consumers to get a product to a 'tipping point' beyond which prices can fall to a natural level at which mass consumption can take off. It supported the ACT's policy of offering free registration and interest free loans for the acquisition of electric vehicles as examples of what state governments can do to incentivise the acquisition of EVs for private use.³⁰⁸

6.117. In his submission, Mr Glynne Jones noted that many major car manufacturers are moving to increase the production of EVs and some are planning to cease the production of Internal Combustion Engine (ICE) vehicles by 2030.³⁰⁹

6.118. ARENA observed in its evidence to the committee that EVs will become dominant in the market over the next couple of decades, and that there is a need to integrate them into our electricity grids. There needs to be a focus on how smart controls can be used in the network for those vehicles to ensure that they are charging at the lowest-cost time—effectively when it is sunny and windy.³¹⁰

³⁰⁶ Auditor-General's Report No. 4 of 2021: ACT Government vehicle emissions reduction activities, April 2021, pp 8–10, https://www.audit.act.gov.au/_data/assets/pdf_file/0008/1746035/Report-No.4-of-2021-ACT-Governments-vehicle-emissions-reduction-activities.pdf (accessed 15 March 2022).

³⁰⁷ *Committee Transcript*, 8 June 2021, p 32.

³⁰⁸ *Committee Transcript*, 8 June 2021, pp 33–34.

³⁰⁹ Mr David Glynn Jones, Submission 15, p 2.

³¹⁰ *Committee Transcript*, 6 July 2021, p 112.

- 6.119. ICEDS observed in evidence to the committee that while the cars of the future will be EV, there is still a question around the long-distance travel aspects of freight and heavy vehicles, and whether we will need hydrogen for these larger vehicles or if suitable battery solutions will emerge.³¹¹
- 6.120. To encourage the purchase of ZEVs, the ACT Government has announced two years free registration for new or used ZEVs registered in the ACT between 24 May 2021 and 30 June 2024. In addition to free registration, interest free loans of up to \$15,000 are available to households to assist with the upfront cost of buying an EVs and for installing home EV charging infrastructure. Additional government commitments include:
- adopting a sales target for new ZEVs;
 - providing financial incentives for the purchase of new and used ZEVs;
 - constructing 50 publicly accessible EV charging stations; and
 - establishing a fleet advisory service to support Canberra businesses and community organisations wanting to transition their fleets to ZEVs.³¹²
- 6.121. The Smart Energy Council concluded in its submission that the existing policy settings are insufficient to reduce the primary obstacle for widespread uptake of EVs, financial inaccessibility. By way of example, Australia’s cheapest EV is the Hyundai’s Ioniq Elite PHEV. Even with registration waived, and a stamp duty exemption, this vehicle would still cost over \$46,000. Additionally, there is no appropriate market for second hand EVs in the Territory. While EVs are embraced in the ACT through the *Transition to Zero Emissions Vehicles Action Plan 2018–2021*, the Council suggest the ACT Government launch an independent and in-depth review of the policy before drafting its replacement.³¹³
- 6.122. The Smart Energy Council told the committee in evidence that incentives have not been implemented fast enough so there is still no effective second-hand EV market. Interested people, who are priced out of the new EV market, have very few options for purchasing an EV second-hand.³¹⁴
- 6.123. In its submission, the WCCC noted that a lack of charging infrastructure also acts as a disincentive to purchasing electric vehicles and more publicly available charging stations are needed to boost consumer confidence to purchase electric vehicles.³¹⁵
- 6.124. Mr O’Loughlin noted the differences in priorities and implementation of actions across ACT Directorates in relation to the use of transit lanes by EVs and public education, signage and enforcement since legislation was amended in 2019 as highlighted by the Auditor-General’s Report No. 4 of 2021.³¹⁶

³¹¹ *Committee Transcript*, 8 June 2021, p 89.

³¹² ACT Government, Submission 8, pp 6–7.

³¹³ Smart Energy Council, Submission 5, p 9.

³¹⁴ *Committee Transcript*, 8 June 2021, p 34.

³¹⁵ WCCC, Submission 19, p [3].

³¹⁶ Mr Larry O’Loughlin, Submission 24, p 14.

- 6.125. Professor Andrew Blakers highlighted the need to move very quickly in respect to the transition to EVs as there are long lag times. Someone buying an ICE vehicle today will probably still be driving it in 15 years time. To get rid of our greenhouse gas emissions in time, heavy lifting needs to be done by the mid-2030's.³¹⁷
- 6.126. Professor Andrew Blakers noted that a typical home battery is maybe 10 to 15 kWh, while EVs have between 50 to 70 kWh. He stated that 'once you have an electric car, your home battery is a very small amount extra'.³¹⁸ EVs have the capacity to be charged during the day to soak up solar power that can also be fed back into the grid. It should be noted that car manufacturers are extremely reluctant to allow this to happen regularly as it degrades the battery, however it is an option that could be used a few times a year during periods of peak demand.³¹⁹ He also noted that multi-storey car parks currently have cable tracers which could be used to run a 240-volt cable along each of those cable trays. The infrastructure is already there for the installation of a trickle charger (power cable) that would allow workers to plug in their EV, and over the course of an eight-hour day, give the EV about 100 kilometres of range. He suggested that charging infrastructure needs to keep pace with EV purchases and that a goal of 10 per cent of parking spaces have charging infrastructure installed each year.³²⁰
- 6.127. Mr Andrew Barr MLA, Minister for Climate Action, stated in his answer to Question Taken on Notice No.5, 17 June 2021 (received 1 July 2021) that:
- under the *ACT's Transition to Zero Emissions Vehicles (ZEVs) Action Plan 2018-21* amendments were made to *Road Transport (Road Rules) Regulation 2017* to allow zero emissions vehicles to access transit lanes, specifically the bus lanes on Adelaide Avenue; and
 - the Infrastructure and Transport Minister's Meeting has approved model law amendments to the Australian Road Rules (ARRs) that will insert a specific offence for parking in an electric vehicle only space and prescribes signage to support these provisions.³²¹

Recommendation 30

The committee recommends that the ACT Government explore targets to increase charging infrastructure and establish other incentives that may help EV uptake such as negative registration fees, transit lane access, and preferred parking arrangements for private EVs.

³¹⁷ *Committee Transcript*, 8 June 2021, p 1.

³¹⁸ *Committee Transcript*, 8 June 2021, p 7.

³¹⁹ *Committee Transcript*, 8 June 2021, p 7.

³²⁰ *Committee Transcript*, 8 June 2021, p 8.

³²¹ Mr Andrew Barr MLA, answer to [Question Taken on Notice no 5](#), received 1 July 2021.

Active Travel

- 6.128. The ACT Government *Planning for Active Travel in the ACT Active Travel Infrastructure - Interim Planning Guideline* states that active travel refers to ‘any form of human powered mobility such as using a wheelchair or other personal mobility device; pushing a pram; wheeling luggage; riding an e-bike/pedelec, scooter, skateboard, tricycle or rollerblades’.³²²
- 6.129. In its submission, the WCCC notes the need for greater attention being given to a successful integrated transport network with more active travel. By way of example for the Weston Creek area, they suggest improving the park and ride facilities so that public transport confidence and usage could be increased to at least pre-COVID-19 levels. In particular, it recommended that the Weston Creek/Duffy terminus at Hindmarsh Drive be designed to include a battery storage station as part of the Canberra battery plan.³²³

E-Bikes

- 6.130. In their submission, Dr Michael Thomas and Benjamin Weise noted that, with relatively mild climate and suitable geography, Canberra could ‘become a truly active transport-centric city’.³²⁴ To achieve this they advocate investment in:
- route infrastructure—segregated cycleways to improve safety and cycling freeways between town centres;
 - end of trip facilities—change rooms, showers and secure bike parking;
 - education—on the health benefits and practicality of riding an e-bike;
 - accessibility—maps of bicycle networks, improved signage and integrated transport apps;
 - financial incentives—subsidies for the purchase of e-bikes, allowing salary sacrifice and tax reductions; and
 - gender equity—improved lighting and routes for safety to encourage an increase in the number female cyclists.³²⁵
- 6.131. In his submission, Mr Gemmell expressed his disappointment at the missed opportunity to actively demonstrate localised renewable energy technologies through the design of the new Mitchell Park and Ride facility.³²⁶

³²² ACT Government, TCCSD, *Planning for Active Travel in the ACT Active Travel Infrastructure – Interim Planning Guideline*, April 2019, p 6, https://www.cityservices.act.gov.au/data/assets/pdf_file/0006/1378545/Planning-for-Active-Travel-in-the-ACT.pdf (accessed 18 March 2022)

³²³ WCCC, Submission 19, p [4].

³²⁴ Dr Michael Thomas and Benjamin Weise, Submission 17, p [4].

³²⁵ Dr Michael Thomas and Benjamin Weise, Submission 17, pp [4–6].

³²⁶ Mr Bill Gemmell, Submission 10, p [8].

- 6.132. The WCCC noted in its submission the ACT Governments' goal to be Australia's Cycling Capital and Most Walkable City, and encourages increased consultation with bicycle riders to inform the process of building well maintained and safe infrastructure. It also recommended the installation of charging hubs for personal mobility devices such as electric bikes and scooters at various locations around the city to help decrease dependence on cars.³²⁷

Recommendation 31

The committee recommends that the ACT Government support the development of an integrated transport network including the installation of charging hubs for personal mobility devices such as electric bikes and scooters at various locations across Canberra.

Public transport

- 6.133. Public transport in the ACT is provided through an electric tram and predominantly diesel buses. The ACT Government has two options in their move to zero emission buses:
- battery-driven electric buses (BEB); and
 - fuel-cell (hydrogen) electric buses.
- 6.134. The advantages of changing from diesel to electric buses include:
- a quieter, more comfortable ride;
 - reduced noise pollution, particularly in residential areas;
 - a reduction in the PM2.5 particulate matter and other noxious gases in the atmosphere, which are detrimental to human health; and
 - a reduction in carbon emissions.³²⁸
- 6.135. The Standing Committee on Planning, Transport and City Services *Inquiry into the Appropriation Bill 2021 - 2022 and Appropriation (Office of the Legislative Assembly) Bill 2021 – 2022*, noted that:

...the Government is currently procuring 90 electric buses and will lease an additional 34 buses to replace older buses, particularly those that do not currently meet Euro standards. The zero-emissions plan for Transport Canberra includes installing charging infrastructure to support electric buses, and budget initiatives for the upgrade of the Woden depot will incorporate this requirement. The delay in development of the Woden depot has not impacted the timelines for the procurement of electric buses. He also noted that work is underway to plan a

³²⁷ WCCC, Submission 19, p [4].

³²⁸ Standing Committee on Planning, Transport and City Services, *Inquiry into the Appropriation Bill 2021 - 2022 and Appropriation (Office of the Legislative Assembly) Bill 2021 – 2022*, November 2021, pp 23–24
https://www.parliament.act.gov.au/_data/assets/pdf_file/0008/1898918/PTCS-Report-6-Appropriation-Bill-2021-2022-and-Appropriation-Office-of-the-Legislative-Assembly-Bill-2021-2022.pdf (accessed 11 April 2022).

fourth fully electric depot on the north-side which will cater for the increasing number of electric buses in the future.³²⁹

- 6.136. The WCCC told the committee in its submission that it supports electrifying the ACT's bus fleet and wanted the ACT Government to think more creatively about the design of bus routes and other transport infrastructure to build an interconnected transport network for the ACT.³³⁰
- 6.137. Professor Andrew Blake noted the ancillary opportunity that the ACT's public bus fleet—and its conversion to electricity—provides for securing additional benefits to the ACT, such as encouraging potential EV and BEB conversion partners to establish a research presence in the territory.³³¹

Recommendation 32

The committee recommends that the ACT government consider a procurement contract option to convert the ACT Government vehicle fleet (including buses) to EV in return for an EV manufacturer establishing a strong administrative and R&D presence in Canberra—similar to the process of reverse auctions for electricity.

³²⁹ Standing Committee on Planning, Transport and City Services, *Inquiry into the Appropriation Bill 2021 - 2022 and Appropriation (Office of the Legislative Assembly) Bill 201 - 2022*, November 2021, p 22
https://www.parliament.act.gov.au/_data/assets/pdf_file/0008/1898918/PTCS-Report-6-Appropriation-Bill-2021-2022-and-Appropriation-Office-of-the-Legislative-Assembly-Bill-2021-2022.pdf (accessed 11 April 2022).

³³⁰ WCCC, Submission 19, p [4].

³³¹ Professor Andrew Blakers, ANU, Submission 3, p 2.

7. Innovative finance

7.1. In evidence provided to the committee, ARENA stated that the ACT ‘generally punches above its weight in terms of its contribution to renewable energy innovation in Australia. I think that is reflected in the fact that it has received about four per cent of ARENA’s total funding even though it has only 1.7 per cent of the Australian population’.³³² ARENA also told the committee that, generally speaking, it only funds up to 50 per cent of a project and will look for:

- commercial co-investment or co-investment if it is a university. For example, total funding of \$67 million in the ACT has delivered total project value of about \$185 million, this is a leveraging ratio of about 2.7—for every dollar that ARENA invests in the ACT, there has been \$1.70 additional of co-investment funding; and
- a pathway to market as ARENA wants to fund the prospective technologies that are going to have the greatest impact on the ground at the end of the day, so ARENA carefully assess that pathway to commerciality for that initiative.³³³

7.2. In its submission, Neoen noted that governments are uniquely placed to trigger and support investments as the renewable energy market continues to evolve by providing the right investment signals and creating new value streams to facilitate the entry of new technologies that complement renewables (such as batteries). It would like to see new programs backed by legislation to create long-term certainty, through either direct Government contracts and grants or through Government underwriting of commercial contracts, noting also that:

...continued grant funding to support emerging technologies linked renewables and related sectors will be critical to developing and attracting new innovative companies to the ACT. The industry funded Renewable Energy Innovation Fund and the Government’s Innovation Connect Grant Program are good examples of the potential for targeted funding which focuses on leveraging local expertise and skills.³³⁴

7.3. Evoenergy noted in its submission that small businesses and research centres face financial and regulatory challenges in pursuing research and demonstration projects in technologies that are not yet commercially viable.³³⁵

7.4. Professor Andrew Blakers told the committee in evidence that ‘roughly speaking, if a company puts up \$100, you have a 50 to 80 per cent chance of getting funding for a \$300 grant from the ARC, so you leverage your money one to four’.³³⁶

³³² *Committee Transcript*, 6 July 2021, p 110.

³³³ *Committee Transcript*, 6 July 2021, p 115.

³³⁴ Neoen, Submission 9, p [3]

³³⁵ Evoenergy, Submission 14, p 6.

³³⁶ *Committee Transcript*, 8 June 2021, p 2.

- 7.5. Professor Andrew Blakers noted that in the past, the reverse auction program has had conditions attached such as basing the company headquarters (HQ) in the ACT. An alternative option would be to ask a company to promise to spend \$1 million, for example, on R&D in the ACT. He stated that for example, ARC linkage grants ‘are primarily determined by whether or not you have strong cash contributions from a company’. Where companies agree to support activities in Canberra there are benefits to the institution receiving the grant, and also to the economy more broadly, by having that money come into the ACT.³³⁷
- 7.6. ICEDS told the committee in evidence that the ACT is a small jurisdiction, so obviously it will never have sufficient funds to do something on a large scale, but you can leverage for more substantial funding from the federal government to encourage people to do large-scale work here.³³⁸
- 7.7. In its submission, the ACT Government stated that it has a responsibility for there to be a return to territory taxpayers from a government investment as it needs to cover the cost of the capital that is borrowed in order to invest in these programs.³³⁹

Recommendation 33

The committee recommends that the ACT Government engage with industry to leverage ARENA and ARC Linkage grants. This allows \$1 of company money to obtain \$3-4 more dollars from Federal Government research funding.

Cooperatives

- 7.8. In its submission, Prepower Co-op One advocated for a low cost, clean energy cooperative for the Canberra region, noting that deploying innovation requires capital which can be funded in two ways:
- traditional investment where investors provide funds and get a return on their investment though profits often paid as a dividend on the investment; or
 - non-distributing co-operatives which provide a return on investment through the lower cost of goods, for example members in a renewable energy investment could receive cheaper electricity instead of a money dividend.³⁴⁰
- 7.9. Prepower Co-op One suggested that ACT electricity consumers could organise themselves into non-distributing cooperatives and use member’s (internal) funding to remove the cost of borrowing to ensure any profits remain within the cooperative.³⁴¹ It also suggested these non-distributing cooperatives could be established as a Cooperative of Organisations for Renewable Energy (CORE) which is a model where interested organisations work in a group as members. Prepower Co-op One recommended that the ACT Government guarantees ‘low-interest bank loans to fund a CORE Cooperative of interested organisations’.³⁴² This

³³⁷ *Committee Transcript*, 8 June 2021, p 2.

³³⁸ *Committee Transcript*, 8 June 2021, p 83.

³³⁹ *Committee Transcript*, 17 June 2021, p 99.

³⁴⁰ Prepower Coop One Ltd, Submission 4, p [1].

³⁴¹ Prepower Coop One Ltd, Submission 4, p [1].

³⁴² Prepower Coop One Ltd, Submission 4, p [3–4].

would allow each CORE, together with the appropriate government agencies, to prepare the business cases for platform cooperatives. This would assist new local cooperatives acquire low-interest bank loans to invest in shovel ready energy innovations such as rooftop solar installations for all ACT consumers and community batteries to augment grid services.³⁴³

- 7.10. In evidence provided to the committee, Prepower Co-op One stated that while cooperatives would own the batteries, it does not matter who owns them, it is who has the rights to the electricity output that is important. People express interest in having solar panels installed on their roof, and assuming there are no issues with the site, members of the cooperative will be given the option to invest in the installation. After the panels are installed and start generating electricity, the customer pays their bill which is 'actually discounted at 30 per cent off the standard price that retailers have to advertise'.³⁴⁴ If you have the right to the power that comes from the panels on your roof, it does not matter whether you own them or not.³⁴⁵

Recommendation 34

The committee recommends that the ACT Government provides support to create a network of local non-distributing cooperatives and a platform cooperative, including the potential of low-interest bank loan, to fund a CORE Cooperative of interested organisations.

Procurement

- 7.11. The ACT Government stated in its submission that it had pioneered the reverse auction, where companies compete to offer renewable energy at the lowest cost (but biggest benefit) to Canberra, rather than the usual auction process where the highest price is considered. Auction bids are evaluated on their overall value for money by considering the feed-in tariff (FiT), risk, community engagement and local investment benefits.³⁴⁶
- 7.12. In its submission, LGI Limited suggested that the ACT Government could improve procurement and shorten the timelines by endorsing specific project types through tenders and reverse auctions processes, while also creating accelerated approval pathways for successful projects.³⁴⁷
- 7.13. In its submission, Neoen was supportive of the transparent re-bidding process that was delivered through the reverse auction mechanism for the Next Generation Fifth Renewables Reverse Auction.³⁴⁸ It noted that the:

³⁴³ Prepower Coop One Ltd, Submission 4, p [3–4].

³⁴⁴ *Committee Transcript*, 8 June 2021, p 14.

³⁴⁵ *Committee Transcript*, 8 June 2021, pp 13–14.

³⁴⁶ ACT Government, Submission 8, p 10.

³⁴⁷ LGI Limited, Submission 13, p 2.

³⁴⁸ Neoen, Submission 9, p [3].

ACT's strategy of providing bankable power purchase contracts for largescale renewable energy has been critical to ensuring the Territory secures the lowest-cost renewable energy assets possible.³⁴⁹

- 7.14. Mr O'Loughlin told the committee in his submission that there is a need for economic assessment of policies and projects to include value for money evaluation relative to other projects under consideration. Technological change will also require reassessment of projects over time.³⁵⁰
- 7.15. ICEDS noted in its submission that micro tenders in the procurement processes would help ensure that small businesses are not locked out of making bids for project funding.³⁵¹
- 7.16. The ACT Government highlighted the Big Canberra Battery project in its submission, noting the commencement of market sounding in April 2021 to help deliver a flexible, value for money solution:

A market sounding commenced in April 2021 for industry to contribute ideas and innovative solutions for how the Big Canberra Battery could be built in the ACT.

The market sounding process is a pre-procurement process to inform the design and development of a preferred procurement process that delivers a value for money outcome for the Territory.

The procurement may deliver several batteries with a variety of capacities through one or many organisations. This may include a small number of large-scale batteries (50 MW+), as well as a larger number of smaller, 'precinct-scale' batteries. Batteries could be connected to the ACT's transmission or distribution network, located at government sites such as bus depots or co-located with large-scale renewable generation in the ACT.³⁵²

- 7.17. The ACT Government submission also noted that national markets and regulations are yet to catch up with battery technology—network tariffs can only be updated every five years and many of the services batteries provide cannot currently be monetised. Competition from other governments (NSW's Renewable Energy Zones, for example) is expected to compete with ACT batteries for a share of national market revenues. Large neighbourhood scale batteries have only been installed in limited numbers, leading to many challenges for the ACT: higher capital costs, revenue uncertainties (including battery focused tariff trials) and appropriate siting within grid systems requiring complex stakeholder liaison to meet community expectations.³⁵³

³⁴⁹ Neoen, Submission 9, p [3].

³⁵⁰ Mr Larry O'Loughlin, Submission 24, p 6.

³⁵¹ *Committee Transcript*, 8 June 2021, p 85.

³⁵² ACT Government, Submission 8, p 13

³⁵³ ACT Government, Submission 8, p 14.

Recommendation 35

The committee recommends that the ACT Government look into micro-tenders for local small and medium sized businesses for grants to ensure broad participation in renewable innovation in the ACT.

8. Environment

Planning Act

- 8.1. The committee noted that the ACT Government is currently undertaking the ACT Planning System Review and Reform Project to review and reform ‘our planning system in a holistic way to deliver better outcomes for communities, development, the environment and people across Canberra’.³⁵⁴
- 8.2. Renewable energy innovation is happening quickly and will result in driving big changes in our cities. Renewable energy policies and technologies are being adopted, however, there is a lag in land use planning in most jurisdictions. One example is what consideration is being given by city planning laws on the effect of overshadowing of solar panels on neighbouring buildings.³⁵⁵
- 8.3. In evidence, Greenlaw told the committee that gas infrastructure is still being put into new buildings, even with a government goal of decommissioning the network by 2045 at the latest. Planning laws need to be updated to include a stronger commitment to phase out gas by 2030 to meet the Government’s stated emissions commitments.³⁵⁶
- 8.4. The Smart Energy Council provided an example in evidence to the committee of people living in apartment blocks who are starting to discuss how their body corporate will deal with EVs coming into a complex. Power in basement garages is usually common power, not individual, so the transition to allowing EV charging needs to be carefully planned and should be a consideration for all new apartment buildings being approved in the ACT.³⁵⁷
- 8.5. In its submission, the WCCC stated that the ACT Planning Act needs a complete overhaul to be codified to protect the environment and to effectively manage renewable energy in the ACT, telling the committee that:

...the building code, assessment criteria, and appeals processes all need to be rewritten so that developers cannot put their interest and profits ahead of the environment, and win on appeal due to some minor technicality.³⁵⁸

³⁵⁴ ACT Government, EPSDD, ACT Planning System Review and reform, <https://www.planning.act.gov.au/planning-our-city/act-planning-system-review-and-reform> (accessed 27 April 2022).

³⁵⁵ Tony Matthews and Jason Byrne, ‘Pace of renewable energy shift leaves city planners struggling to keep up’, *The Conversation*, 15 August 2017, <https://theconversation.com/pace-of-renewable-energy-shift-leaves-city-planners-struggling-to-keep-up-82206> (accessed 11 April 2022).

³⁵⁶ *Committee Transcript*, 8 June 2021, p 51.

³⁵⁷ *Committee Transcript*, 8 June 2021, p 42.

³⁵⁸ WCCC, Submission 19, p [3].

- 8.6. The WCCC also noted that EV charging infrastructure is not being built as standard in modern homes and apartment buildings. It suggested that relevant planning and building codes need to be changed to ensure that medium and high density apartments are provided with adequate electrical infrastructure in their basement and outdoor car parks to allow EV users to charge their cars at home.³⁵⁹ It also suggested that the ACT Government invest in smart technologies, including demonstration projects such as smart sensors on streetlights, movement sensors on footpaths, solar energy cooperatives, neighbourhood batteries and roof top solar and gardens.³⁶⁰
- 8.7. Mr O’Loughlin noted in his submission that consideration should be given to innovative architecture when building battery facilities to assist community acceptance of the infrastructure in their local area.³⁶¹

Recommendation 36

The committee recommends that the ACT Government consider changing relevant planning and building codes to ensure that all apartments can provide adequate electrical infrastructure in their basements and outdoor car parks, to allow electric vehicle users to charge their cars at home.

Recommendation 37

The committee recommends that all new and refurbished Government facilities are required to include renewable energy generation capability.

Dr Marisa Paterson

Chair

28 June 2022

³⁵⁹ WCCC, Submission 19, p [3].

³⁶⁰ WCCC, Submission 19, p [3].

³⁶¹ Mr Larry O’Loughlin, Submission 24, p 17.

Appendix A—Witnesses

8 June 2021

- Professor Andrew Blakers, Professor of Engineering, Australian National University
- Dr Kevin Cox, Director, Prepower Co-op One Ltd
- Mr Scott Foster, Lead Organiser, Co-operatives, Commons and Communities Canberra
- Mr David Edward Keightley, Founder-Director, Ecospectral Pty Ltd
- Mr Jarryd Doran, Chief Operating Officer, LGI Limited
- Mr Erik Karl Olbrei, Director, Harvest Hot Water
- Ms Shahana McKenzie, CEO, Bioenergy Australia
- Canberra Institute of Technology:
 - Ms Karen Abel, Acting Head, Department of Building Construction, High Risk and Renewables
 - Ms Tamara Duncan, Business and Industry Engagement Officer
 - Ms Jayne Miller, Director, Strategic Growth, Industry Engagement and Strategic Relations
 - Mr Johannes van Zyl, Teacher/Trainer, Electrical Trades and Renewables
- EvoEnergy:
 - Mr Peter Billing, General Manager
 - Mr Leylann Hinch, Group Manager, Strategy and Operations
- GreenLaw:
 - Miss Isabella Boone, Researcher
 - Mx Annika Reynolds, CEO and Founder
- Institute for Climate, Energy Disaster and Solutions (ANU)
 - Dr James Prest, Senior Lecturer, ANU College of Law
 - Dr Igor Skryabin, Business Development Manager, ANU Research School of Physics
 - Associate Professor Matthew Stocks, Research Fellow, College of Engineering and Computer Science

- Smart Energy Council:
 - Miss Peta Bulling, Project and Research Assistant
 - Mr John Grimes, Chief Executive Officer
 - Mr Wayne Smith, Government Relations Manager

17 June 2021

- Mr Andrew Barr, Chief Minister, Treasurer, Minister for Climate Action Minister for Economic Development and Minister for Tourism
- Mr Sam Engele, Coordinator-General, Climate Action, Policy and Cabinet Division, Chief Minister, Treasury and Economic Development Directorate
- Mr Daniel Harding, Executive Branch Manager, Climate Change and Energy Policy, Environment, Planning and Sustainable Development Directorate
- Mr Gene McGlynn, Executive Group Manager, Climate Change and Energy, Environment, Planning and Sustainable Development Directorate
- Mr Shane Rattenbury, Attorney-General, Minister for Consumer Affairs, Minister for Gaming and Minister for Water, Energy and Emissions Reduction

6 July 2021

- Mr Jon Sibley, Principal Policy Advisor, Australian Renewable Energy Agency

Appendix B—Submissions

Submission Number	Submitter	Received
01	Mr Joss Haiblen	4 March 2021
02	ACTCOSS	23 April 2021
03	Professor Andrew Blakers	24 April 2021
04	Prepower Coop One	28 April 2021
05	Smart Energy Council	30 April 2021
06	Canberra Solar Hot Water Repairs	7 May 2021
07	Master Plumbers Association ACT	13 May 2021
08	ACT Government	13 May 2021
09	Neoen	13 May 2021
10	Mr Bill Gemmell	14 May 2021
11	CIT	14 May 2021
12	Greenlaw	14 May 2021
13	LGI Limited	14 May 2021
14	Evo Energy	14 May 2021
15	Mr David Glynne Jones	14 May 2021
16	ICEDS	14 May 2021
17	Dr Michael Thomas and Mr Benjamin Weise	14 May 2021
18	Harvest Hot Water	17 May 2021
19	Weston Creek Community Council	18 May 2021
20	APGA	19 May 2021
21	Bioenergy Australia	21 May 2021
23	Greenlaw	8 June 2021
24	Mr Larry O'Loughlin	16 June 2021

Appendix C—Questions taken on Notice

Questions taken on Notice 8 June 2021

No.	Hearing date	Asked by	Witness	Subject	Answer date
1	8/06/2021	Dr Paterson	Prepower Co-op One	Electric cooperatives in the USA	22/06/2021
2	8/06/2021	Ms Castley	CIT	Numbers of normal mechanics who join the training to upgrade their EV skills	25/06/2021
3	8/06/2021	Mr Braddock	CIT	National role to play in setting competencies	25/06/2021
4	8/06/2021	Ms Castley	Bioenergy Australia	Gas efficiency	10/06/2021

Questions taken on Notice 17 June 2021

No.	Hearing date	Asked by	Witness	Subject	Answer date
5	17/06/2021	Ms Castley	Climate Action	Amending road rules and the parking and vehicle access	1/07/2021
6	17/06/2021	Ms Castley	Climate Action	The number of businesses using the renewables innovation hub	1/07/2021
7	17/06/2021	Ms Castley	Climate Action	The role that the renewables innovation hub plays in mentoring export opportunities for business, in working with embassies including the detail of embassies interested in the ACT hydrogen refuelling station	1/07/2021