

AUSTRALIAN CAPITAL TERRITORY

INCENTIVIZING RENEWABLES WITH NOVEL MARKET MECHANISMS TO ENSURE 100% RENEWABLE ELECTRICITY SUPPLY



Australian Capital Territory, Australia: Facts and figures

Population

431,215 (2020)

Total area

2,358 km²

GHG emissions indicator

1,684 kt CO₂e (2019-20)

*Figure 1: Map of Australian Capital Territory/ Canberra, Australia
Source: Google Maps, 2021*

The Australian Capital Territory (ACT), an autonomous territory in Australia containing the country's capital, Canberra, is recognized as the first city outside Europe to achieve 100 percent renewable electricity, and serves as an example for other states and territories within Australia to consider different market mechanisms that can foster an increase in the share of renewables in the electricity sector.

"Renewable energy encompasses all renewable resources, including bioenergy, geothermal, hydropower, ocean, solar and wind energy. One hundred percent renewable energy means that all sources of energy to meet all end-use energy needs in a certain location, region or country are derived from renewable energy resources 24 hours per day, every day of the year. Renewable energy can either be produced locally to meet all local end-use energy needs (power, heating and cooling, and transport) or can be imported from outside of the region using supportive technologies and installations such as electrical grids, hydrogen or heated water. Any storage facilities to help balance the energy supply must also use energy derived only from renewable resources"

IRENA Coalition for Action, 2020, p.7

Introduction

The Australian Capital Territory (ACT) is Australia's landlocked autonomous federal territory containing the national capital, Canberra. It is situated in the southeastern Australian mainland as an enclave within the state of New South Wales.

The journey to achieve a 100 percent renewable energy (RE) target is unique for every region according to its characteristics. The importance of such an initiative is to respond appropriately to the climate crisis by reducing greenhouse gas (GHG) emissions by replacing fossil-based energy with renewably sourced energy. The ACT is committed to tackling climate change and has set various targets and enacted legislation to achieve this, beginning with ensuring an entirely renewables-based electricity supply. The cornerstone is the ACT's Climate Change and Greenhouse Gas Reduction Act 2010, which legislates the reduction of emissions in order to achieve net zero by 2045. The ACT government also set several interim targets, including a 40 percent reduction in

GHG emissions from 1990 levels by 2020, which made renewable electricity supply a critical focus area to support these goals.

The ACT's Sustainable Energy Policy 2011–20 focused on clean energy, which aimed to increase the share of the use of renewable energy by 25 percent at the end of the last decade. The target was considered ambitious when it was set, compared to other territories that had a lower target share, longer implementation timeframes, or no renewable energy targets at all. This highlights the large contrast between regions in the same country (ACT Government, 2011), shown in Table 1 below. While not all state-based commitments are legislated, they tend to target a larger proportion of renewable electricity generation than the national Renewable Energy Target (RET) from 2001, which set a national target of a 23.5 percent share of renewable energy in total electricity generation by 2020. However, in the ACT in 2016, through a series of amendments, this

target was enhanced up to the point where 100 percent of the total electricity generation in the Territory would be supplied by RE.

In 2020, the ACT achieved its goal and target to source 100 percent of its electricity from renewable sources, primarily solar and wind, making it the first city outside Europe to do so. The achievement of this target is a critical milestone in its legislated 2045 net-zero emissions target and interim targets, and is a commitment for future governments to continue procuring the electricity consumed in the region exclusively from renewable sources.

Its renewable energy development also positions the Territory at the forefront of the sustainable knowledge economy. It has served as an example for other states and territories within Australia to consider the different market mechanisms that can foster the increase of renewable generation capacity, such as reverse auctions, as well as outsourcing RE projects to different regions of the National Energy Market (NEM) with higher wind and solar potential. Other Australian states have also implemented this reverse auction model to secure their own renewable electricity supply.

State/territory	Actual share in 2018	RE Generation commitment
New South Wales	17%	No commitment
Victoria	17%	25% by 2020
Queensland	9%	50% by 2030
Western Australia	8%	No commitment
South Australia	51%	No commitment
Tasmania	95%	100% by 2022
ACT	54%	100% by 2020
Northern Territory	4%	50% by 2030
Australia (total)	19%	23.5% by 2020

Table 1: Renewable Energy Generation commitment and share in Australian Territories Source: Reserve Bank of Australia 2020 (Accessed Oct 2020). Source: [link](#)

Reverse auctions to support ACT's renewable energy transition

Being the first region in Australia to be supplied with 100 percent renewable electricity, the ACT established a unique approach to achieving its ambitious RE targets compared to its peers. The approach simultaneously incentivized RE projects in other Australian regions as for every kWh of electricity consumed, there must be an equal amount feeding the national grid. The ACT sources its renewable electricity from interstate generators because the region does not have its own substantial RE resources, preventing local generators from being market-competitive in large-scale renewable power generation on a national level.

The ACT's Sustainable Energy Policy 2011-2020 set the foundation for a nation-leading reverse auction process, which is a competitive bidding process used to procure electricity. In this auction type, developers bid against each other to supply electricity through long term contracts, which drives the overall price to the lowest possible level. Buying electricity through this competitive mechanism enables governmental authorities to ensure that the consumers get the best value.

This also favors advancement in country- or region-specific RE development goals.

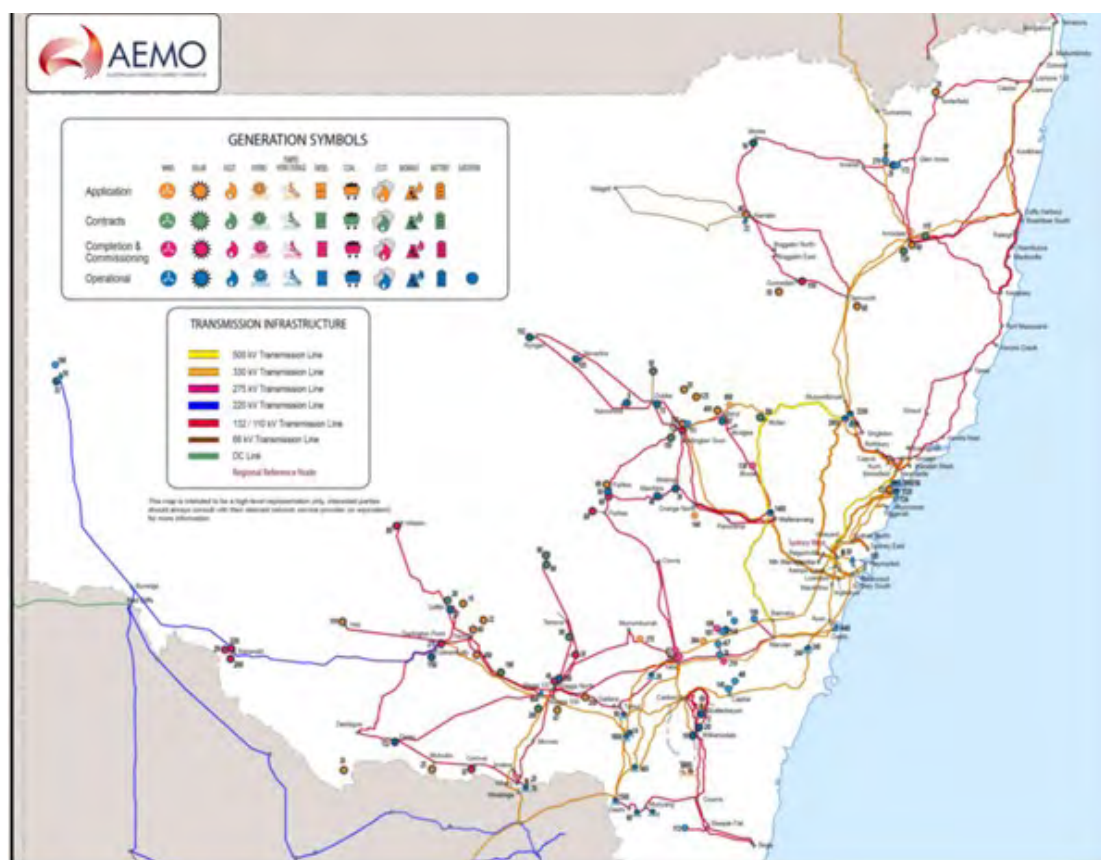


Figure 2: NEM generation map for New South Wales. Source: [AEMO, 2021](#); Accessed June 2021

The location of the renewable energy generation is not critical in achieving the policies' emission reduction (ACT Government, 2019). About five percent of the Territory's electricity is generated within its borders while the rest is sourced from NEM (Evans, 2019) which geographically goes from Queensland, through the eastern states to Tasmania and South Australia (see figure 2). Generators of renewable energy for the ACT must have registered Large-scale Generation Certificates (LGCs) for all eligible generation and transfer them to the Territory. LGCs prove that the generation is from a renewable energy source, with each LGC representing one MWh of eligible generation. LGCs are administered by the Commonwealth Government Clean Energy Regulator (CER). The Territory's LGCs are voluntarily surrendered to the CER; in this way, the government ensures that generation is above and beyond national renewable energy targets and that it results in additional carbon abatement in the electricity sector.

Generation can take place anywhere in the NEM on the condition that the projects demonstrate exceptional economic development benefits to ACT renewable energy industries. Having this flexibility of sourcing i.e. the generation of renewables from other regions increases the competitive landscape of the auctions and brings down electricity prices for consumers in the long run.

The ACT successfully secured 600 MW of wind capacity distributed across five different wind farms located outside its boundaries (ACT Government, 2019) as shown in Figure 3, and 56 MW of solar capacity from four solar farms operating within the ACT through four reverse auctions held between 2012 and 2016. This increased capacity has been the largest contributor towards the achievement of 100 percent renewable electricity by 2020. The journey of ACT towards 100 percent RE supply is summarized in Figure 4.

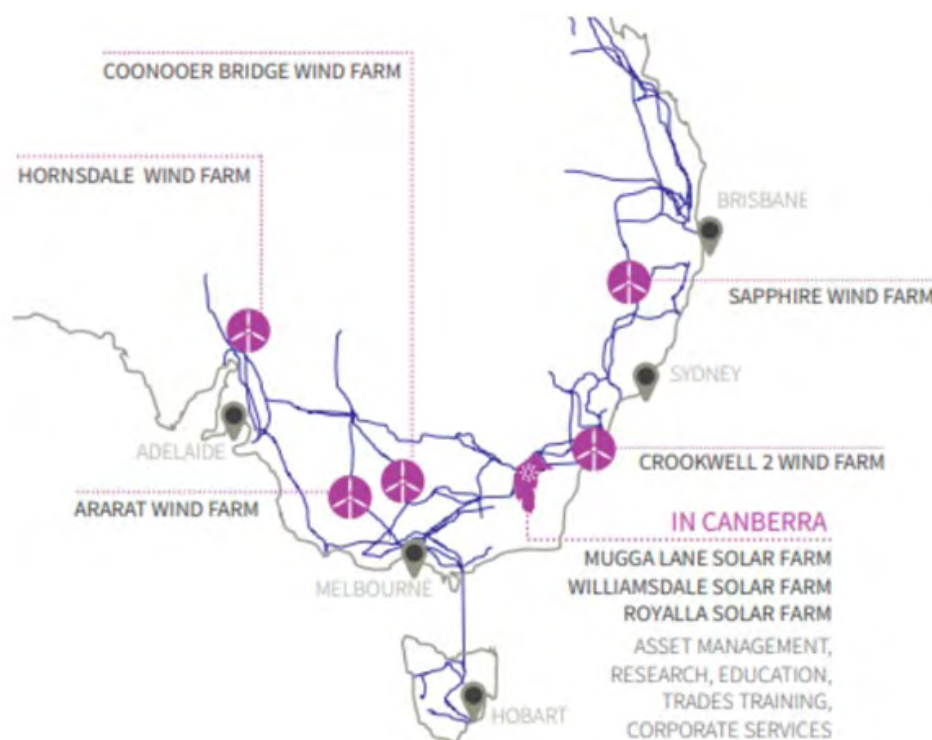


Figure 3 Location of Canberra's Wind and Solar Farms within the national electricity market.
Source: ACT Government, n.d.

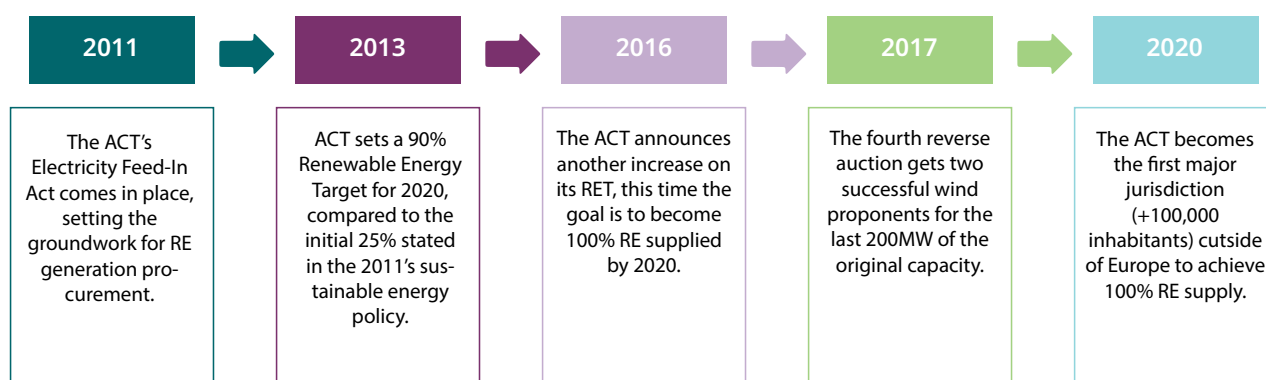


Figure 4: Summary of ACT's road to 100% RE supply. Source: Own Creation, contents from (ACT Government, 2019), (ACT Government, 2013), (ACT Government, 2016), (The Australia Institute, 2019)

In 2019, the ACT Government began its fifth renewables reverse auction to maintain its renewable electricity target. This auction sought the delivery of 200 MW of additional renewable capacity into the grid. In September 2020, the ACT Government announced that the winning bid was from the renewable energy producer Neoen which was awarded a 14-year contract for 100 MW of wind energy capacity from its Goyder Renewables Zone located in South Australia (Neoen, 2020), building on their success from the first auction organized by the ACT in 2012. The other successful bidder was Global Power Generation, with 100 MW of wind power capacity from the Berrybank Stage-2 Wind Farm in Western Victoria. A 10 MWh/20 MWh battery will also be built in the national capital.

Besides the added RE installed capacity, Neoen's bid is unique in integrating an energy storage system of at least 50 MW to support grid stability and accelerate the overall energy transition in the Territory as shown in Figure 5. ACT residents will have the opportunity to co-invest in the project, so they can also become financial stakeholders while Neoen co-owns and operates the battery storage system.

"Already, Canberra's renewable energy and cleantech industries have attracted over \$2 billion dollars of investment in large-scale wind and solar renewable infrastructure across Australia, and more than 500 million dollars of investment directly into the Canberra region."

Shane Rattenbury, ACT's Energy, Water and Emissions Reductions Minister (Matich, 2020)

"The batteries will help support the Territory's own grid, particularly providing power to help avoid blackouts during periods of high demand and when large fossil fuel generators fail in heatwave conditions. These big batteries mean that our small jurisdiction is again punching above our weight when it comes to real climate action"

Shane Rattenbury, ACT's Energy, Water and Emissions Reductions Minister (Colthorpe, 2020)

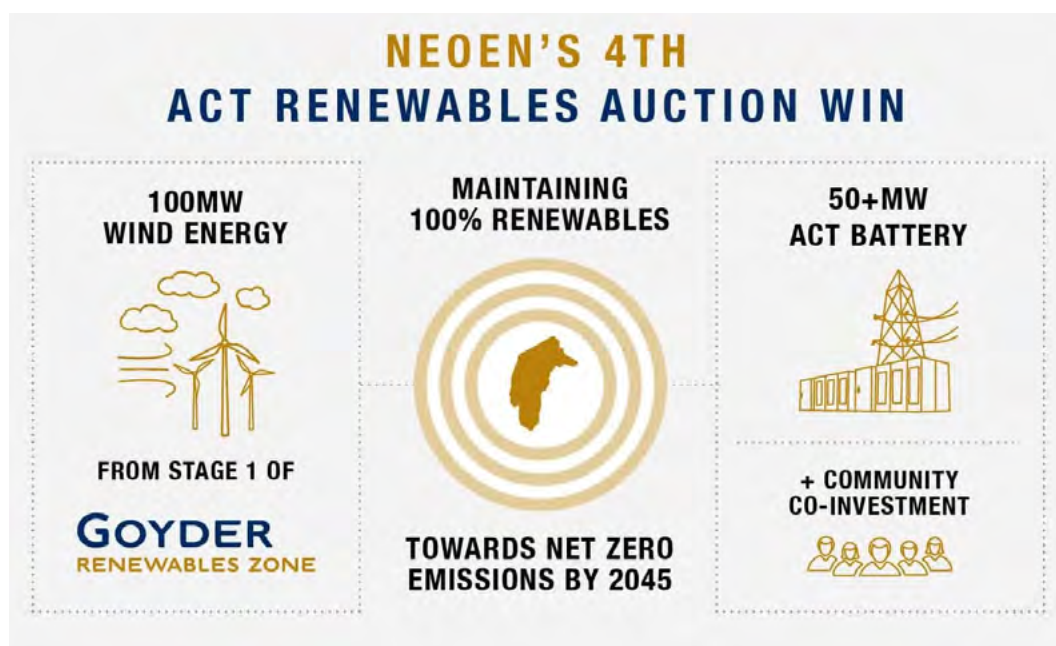


Figure 5: Neoen's 4th ACT Renewables Auction Win. Source: [link](#)

ACT's feed-in tariff schemes

Feed-in tariffs (FiTs) are one of the most common measures deployed to scale up renewable energy generation. In essence, a FiT is a fixed electricity price that has to be paid for a certain period to an RE producer for each unit of electricity it generates and feeds into the grid. The mechanism can be differentiated by technology. The legislator can push specific technologies according to their agenda and make them competitive cost-wise in the short- to medium-term while the technology matures. An advantage of FiTs is that they provide certainty for investors of RE projects, essentially guaranteeing a stable and secure return on investment with reduced risks, protecting against changes in electricity prices expected during the project's lifetime (usually between 15 to 20 years).

The ACT government provides conditional FiT entitlements to developers that meet the conditions and milestones set out in the Deed of Entitlement. The FiT has been used as the primary policy tool for attracting investment to meet ACTs renewable electricity targets. The payments are made on a 'contract for difference (CfD)' basis, meaning that RE generators are paid the FiT price set in the auction despite the fluctuation of the wholesale market price for each unit of electricity. In practice, if the wholesale price is below the FiT price, the generator has to be paid the difference by the ACT electricity distributor, ActewAGL Distribution. Conversely, if the wholesale price is higher than the FiT, the generator pays the difference to the distributor, which directly translates to savings for all of ActewAGL's consumers (ACT Government, 2019).

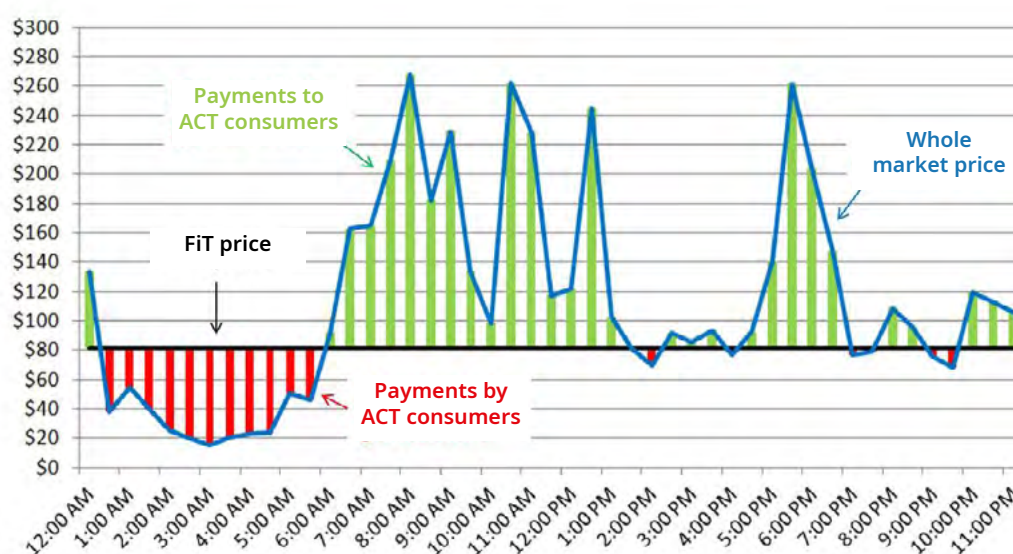


Figure 6: Wholesale market movements in Victoria on 1 July 2016.
Source: [ACT Government, 2019](#) (Accessed Oct 2020)

Figure 6 visualizes the actual wholesale market fluctuation over a single day (01 July 2016) while considering the effects of the CfD. In this example, the FiT price is set at \$81.50 per MWh for the Coonooer Bridge Wind Farm. For the periods when the wholesale market price was less than the FiT price (marked in red), ACT consumers paid the generator, whereas the payments were reversed when the wholesale market price was higher. This difference is subtracted from the wholesale market earnings by the generator. As a result, the generator received exactly \$81.50 for all the electricity produced at all times.

The “Small and Medium Feed-in Tariff Scheme” is legislation that incentivised small-scale roof-top solar generation in the ACT. Successful applicants receive FiT payments for 20 years, starting from the date they connected their system to the grid (ACT Government, 2019). Roof-top solar generation also contributes directly to the achievement of the ACT’s renewable energy target, along with the procurement of ACT’s pro-rata mandatory share of the national RET and voluntary consumer purchases of green power, which amount to 22 percent of the RE generation share. According to ACT Government (2021), the solar systems generated over 119,000 MWh of electricity in 2019–20.



The future of 100% renewable electricity

The ACT government successfully achieved its 100 percent renewable electricity target in 2020 and has secured its renewable electricity supply going forward (ACT Government, 2019). The target was achieved through the reverse auction mechanism that allowed them to procure a considerable amount of electricity via a competitive bidding process (77 percent of the renewable energy electricity generation share). Furthermore, the ACT's contracted generators receive a fixed price for their electricity production (ACT Government, 2019). As electricity demand is expected to increase in the future, and existing large-scale FiT contracts will expire in the mid-to-late 2030s, plans need to be put in place to replace the renewable electricity supply with new projects and contracts.

Increasing the installed capacity of renewable energy within the ACT is another route to provide more supply.

However, this expansion comes at a price, since the costs of the renewable energy schemes in the ACT are included in the electricity tariff as shown in Figure 7, meaning electricity consumers assume some of the burden of these schemes.

Wholesale energy costs and network charges make up 64.4 percent of the total electricity price, while the ACT renewable energy target schemes amount to 11 percent of the total price. The 'green scheme cost', in which the Australian government requires states and territories to fulfil a certain quota of renewable electricity procurement, amounts to another 10 percent. The ACT's retail prices have been increasing yearly since 2017, mainly driven by the increase of wholesale energy purchase costs on a national level. However, the electricity bills for ACT residential and small business customers are still among the lowest in Australia.

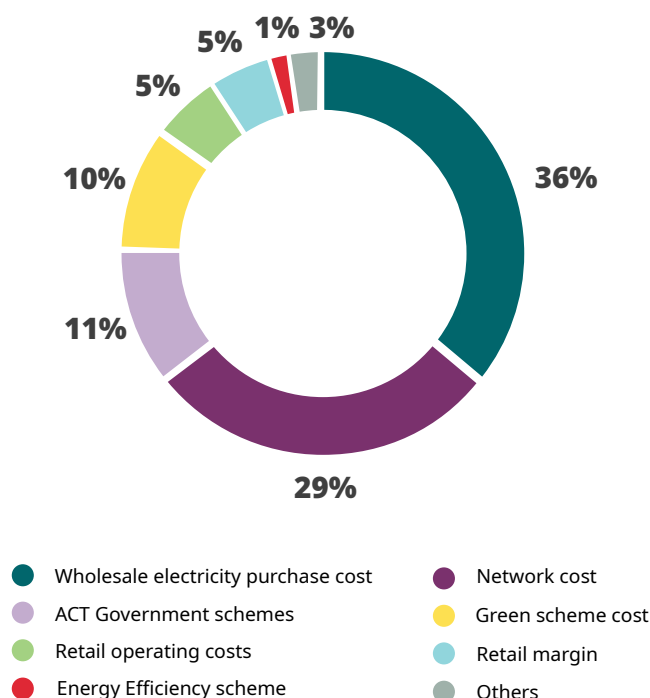


Figure 7: Cost components of the ACT Electricity Tariff 2019 – 2020. Source: [Independent Competition and Regulatory Commission](#) (Accessed Oct 2020).

The ACT Independent Competition and Regulatory Commission (ICRC) estimated the retail price to be around \$39.7 AUD per week for a typical household in Canberra estimated to consume 8000 kWh per year for 2019-2020 (Independent Competition and Regulatory Commission, 2019). Even though the retail cost is higher than the previous years, the increase is less than in previous years. The key driver is the moderation of wholesale electricity prices which have declined by 0.52 percent from the previous year (Independent Competition and Regulatory Commission, 2019).

The above could be seen as a direct result of the functioning of the ACT's policies implemented to procure renewable electricity, where FiTs with contracts for difference ensure that a stable and competitive procurement cost is maintained over the years. Nevertheless, it also shows that the ACT's electricity prices are still vulnerable to the overall national market price fluctuations, highlighting the importance of a future national policy that keeps driving the energy transition on a coordinated nationwide level.

While its connection to the NEM means the Territory does not have concerns about future supply, the ACT Government recognizes that low-cost energy storage is the missing link in the transition to a 100 percent renewable NEM (ACT Government, 2019). This represents a great challenge for future legislative efforts on a national level to keep bridging the gap between the current grid capacity and the already increasing demand for bigger transmission lines to cope with the expected renewables capacity expansion, as well as coordinated policies to continue increasing the deployment of renewables across the whole nation.

The policies being developed by the ACT Government for the next five years should envision the challenges the region will face in its energy transition, namely the need for a more flexible and robust grid and energy storage system that can cope with the intermittence of RE generation, as well as continuing to push energy efficiency measures to limit the increase of energy consumption the Territory is expected to have.

The Energy Efficiency Improvement Scheme (EEIS) in ACT requires electricity retailers to achieve energy savings in households and small-to-medium enterprises by pushing energy efficiency measures across the Territory. The EEIS has provided financial incentives for residential and commercial lighting upgrades, and has replaced old and inefficient residential space and water heaters with high-efficiency equipment. Nearly half of ACT households and 11 percent of businesses had benefited from the scheme by the end of 2018 (ACT Government, 2019).

Regarding energy storage for renewables, the ACT Next Generation Energy Storage Program supports the roll-out of 36 MW of smart solar battery storage systems in more than 5,000 homes and small businesses. The program is delivered through battery storage providers, which the ACT Government selected after a competitive selection process. The current rebate is \$825 per kilowatt (kW), limited to a maximum capacity of 30kW (ACT Government, 2020). These batteries will not only reduce the demand on the grid, but will also collect valuable data for local researchers and businesses. The goal is to use over 700 battery storage systems to create a virtual power plant, aiming to better manage peaks of electricity demand.

Key Takeaways

Exploiting the level of autonomy in the planning of its energy policy

The ACT is in a unique position within Australia. As a territory, it has full autonomy regarding the planning of its energy policy (aside from the national-mandated RE initiatives). However, at the same time its capital, Canberra, is where the majority of the population is concentrated, thus making the energy consumption profile of the Territory quite similar to a city. This can be seen in the ACT's policies to reduce GHG emissions, including energy efficiency schemes for buildings and households, the future goal of supporting Zero-Emission Vehicles uptake, and measures to increase active travel and public transport. This level of autonomy was exploited by the ACT to develop its Climate Change Strategy 2019-25, having Canberra primarily in mind. In contrast, other cities in Australia do not fit in the same setting.

Using competitive energy market mechanisms to achieve its RE targets

Being the first jurisdiction in Australia to establish the use of reverse auctions to foster renewable energy projects, the ACT has greatly benefited from the mechanism. The ACT is able to procure nowadays renewable-generated electricity from these projects at a competitive price, which remains stable in the long run thanks to the FiT scheme. This can protect ACT's electricity consumers from future increases in wholesale electricity market prices and provide stability to the long-term planning of the ACT's energy policies.

Collaborating with RE project developers in other jurisdictions

Given its size and geography, there is not enough wind energy potential in the ACT to supply the Territory's energy demand. This did not stop the ACT from sourcing renewable electricity supply from wind generation. By allowing the generation to come from elsewhere in the NEM, it has been possible to outsource RE projects to states within Australia with higher renewables potential, increasing the overall competitiveness of the tenders and stimulating investment in those regions as well as in Canberra.

The importance of creating a holistic approach towards the energy transition

The ACT is aware that there cannot be a true energy transition without considering every step in the energy supply chain. Therefore, the initiatives to transform the region's energy landscape have consisted not only of being supplied by 100 percent renewable electricity, but also working on energy efficiency initiatives that can reduce the overall energy demand in the Territory. The ACT's future energy policy also highlights the importance of strengthening the transmission and distribution networks on a national level. This includes expanding it to reach the newest RE generation additions to the grid, as well as greater flexibility. This flexibility would allow it to better balance this intermittent generation with energy storage installations and demand management systems, which would contribute to the overall stability of the supply-demand equation.

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The 100% Renewables Cities and Regions Roadmap project facilitates the energy transition by raising local awareness on renewable energy sources, showcasing how local and national governments can create coordinated enabling frameworks and policies, exploring access to public and private sector finance, and building local renewable energy projects to address electricity, heating and cooling.

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