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Better Renting, March 2020, Canberra, Australia
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Pushing the envelope: the climate benefits of minimum rental standards

Better Renting, March 2020

The Australian Capital Territory (ACT) has committed to net zero emissions by 2045 at the latest. To achieve this goal, the ACT's strategy includes minimum energy performance standards for rental properties. In this report, we consider the abatement potential from such standards. By analysing the energy sources in inefficient rental properties and the potential reduction in heating loads, we estimate that minimum standards for rental properties could reduce the ACT's emissions by 78,700 tonnes of carbon dioxide equivalent (tCO_2-e) per year, equivalent to the annual emissions from around 24,600 cars.

Introduction

Every state and territory in Australia has set a target or aspiration for net zero emissions by 2050 at the latest.[1] Households are responsible for around 12% of emissions, including both indirect emissions from electricity consumption and direct emissions from gas combustion.[2] Meeting these targets will thus require reducing the consumption and/or emissions intensity (emissions per unit of energy) of both electricity and gas.

Various jurisdictions have identified minimum energy efficiency standards for rental properties as one means of reducing household emissions.[3] With the rental sector growing, and rental properties disproportionately likely to have abysmal energy

[1] Cox, 'Northern Territory Banks on Solar to Meet New 2050 Zero Emissions Target'; Australian Associated Press, 'WA Finally Sets Net Zero Emissions Target'; Brailsford et al., 'Powering Progress'.
[2] Department of the Environment and Energy, 'Individuals and Households'.
[3] Office of Environment and Heritage, 'A Draft Plan to Save NSW Energy and Money'; Bladen, 'ACT Government Announces Plans for Minimum Energy Requirements for Rentals'.

performance[4], the case for action in this area is growing in strength. Besides the climate benefits, minimum standards could also improve energy affordability, and bolster public health, amongst a host of other upsides.[5]

Focusing on the Australian Capital Territory (ACT), this report aims to quantify how much minimum rental standards can contribute to reducing greenhouse gas emissions from the territory. Using existing energy rating data and data on rental households, we develop and apply a methodology to quantify the potential contribution from this policy.

Method

We first estimated the potential reduction in energy demand from an increase in the energy efficiency rating (EER) of low-rated rental properties.

An EER indicates how much energy would be used per square metre of floor area to achieve typical temperature outcomes in Canberra's climate.[6] ACT data cover both heating and cooling; our analysis covers the heating component exclusively. Using EER 5 as a baseline, we then calculate the heating load that could be avoided through improving the performance of properties with ratings below 5. For example, improving a property from EER 0 to EER 5 would reduce the annual heating requirement by 459 MJ per square metre (sqm).[7] Based upon a weighted average of the estimated floor areas of rental properties, we assume that the properties in question have an average floor area of 86.5 sqm. Thus, an improvement from EER 0 to EER 5 could reduce the annual heating requirement of a property by roughly 40,000 MJ. This is similar to the method employed by pitt&sherry in their report on EER disclosure in the ACT.[8]

Next, we estimated the frequency distribution of inefficient rental properties in the ACT. For this, we drew upon our previous analysis, *Baby it's Cold Inside: Energy Efficiency Ratings in the ACT*.[9] On this basis, we estimate that 43% of rental properties would receive an EER of 0. Using ABS data on the number of rental households in the ACT[10], we then estimate the total number of rental properties at each EER below 5. For example, we estimate that there are roughly 53,000 rental properties, and that almost 23,000 properties have an EER of 0.

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[4] Better Renting, 'Baby It's Cold Inside: Energy Efficiency Ratings in the ACT'.
[5] ACIL Allen Consulting, 'Multiple Impacts of Household Energy Efficiency'.
[6] Department of Urban Services, 'ACT HOUSE ENERGY RATING SCHEME (Guidelines for Quality ACT Residences)'.
[7] Department of Urban Services.
[8] pitt&sherry, 'Reporting the Energy Efficiency of Residential Tenancies in the ACT'.
[9] Better Renting, 'Baby It's Cold Inside: Energy Efficiency Ratings in the ACT'.
[10] Australian Bureau of Statistics, '4130.0 - Housing Occupancy and Costs, 2017-18'.

We then use avoided energy consumption to estimate emissions abatement. To do this, we estimate the fuel sources being used in rental households and the efficiency of these sources.

To estimate the fuel sources of rental households, we conduct a text analysis of 4,424 rental advertisements. A program was used to count a variety of search terms that indicated fuel sources, such as "gas heating" or "split system". We assume that if an appealing heating option exists that it will be mentioned in the advertising. Accordingly, if no heating is specified, we assume only electric resistance heating is present. In this case, the heating might be provided with the property and not mentioned, or it would be achieved by occupants' purchasing and using their own portable heaters.

Based upon this analysis, we estimate that the heating requirements of inefficient rental households are met using an even three-way split between electric resistance heating (CoP[11] 1), heat pump air conditioning (CoP 3.5), and gas combustion heating (CoP 0.8). This estimation involves less use of heat pumps than other data would suggest[12]; however, we would expect a lower frequency of heat pumps in rental properties. We then use the National Greenhouse Account Factors[13] for NSW/ACT to calculate the equivalent carbon dioxide emissions associated with electricity or gas consumption.

Finally, our method accounts for the reality that not all households are heating their homes in accordance with the assumptions of the energy efficiency rating scheme. If the converse were true, 100% of the benefits from an improvement in energy efficiency would be realised as energy savings, with no impact on indoor temperatures. However, we assume that a proportion of households is currently using less energy than the EER model would suggest, sacrificing a warmer home to reduce energy costs.

If the energy efficiency of these households was improved, they may continue to use the same amount of energy in order to achieve a healthier and more comfortable home. While this may result in health benefits, there would not be a climate benefit from emissions. From a review of various studies[14], we estimate this 'rebound effect' as being equivalent to one third of all abatement. That is, one third of the energy savings from energy efficiency improvements would be re-invested in improving thermal comfort. This reduces the abatement potential accordingly.

[11] CoP stands for "coefficient of performance". It describes the ratio of energy provided to energy consumed. CoP 1 corresponds to an efficiency of 100%.
[12] Energy Consumers Australia, 'Energy Consumer Sentiment Survey June 2019'.
[13] Department of the Environment and Energy, 'National Greenhouse Account Factors'.
[14] Clinch and Healy, 'Cost-Benefit Analysis of Domestic Energy Efficiency'.

This analysis also attributes emissions to ACT electricity consumption. This attribution may be disputed as the ACT is now purchasing 100% renewable electricity to cover its electricity demand. In any case, we include this in our method due to its relevance for other jurisdictions. Our justification for including it in relation to the ACT is discussed below.

Results and discussion

We find that increasing the minimum energy efficiency of ACT rental properties to EER 5 would achieve annual emissions abatement equivalent to 78.7 kilotonnes of carbon dioxide. This is roughly equivalent to taking 24,600 cars off the road, or 2% of the ACT's 2017-2018 emissions.[15]

EER	Abatement per dwelling (tonnes)	Number of dwellings	Total abatement after rebound (kt CO_2-e)
0	4.73	22839	72.3
1	2.68	1537	2.76
2	1.54	1590	1.65
3	0.916	1484	0.911
4	0.422	3709	1.05
TOTAL:			78.7

Table 1: Abatement potential from rental property energy efficiency improvements, ACT

Over 90% of this abatement is achieved by improving the energy efficiency of the least efficient rental properties. This is primarily due to the sheer quantity of these properties, although their low efficiency also plays a role. An implication of this is that significant abatement can be achieved (amongst other benefits) even using a minimum standard of less than EER 5. It seems that EER 0 properties perform *so poorly* and are *so common* that even marginal improvements would yield dramatic results.

This is illustrated in the table below. The second column shows the total abatement potential from bringing rental properties up to the associated EER. The right-most column shows the *additional* abatement potential for this EER, compared with the rating below.

[15] Environment, Planning and Sustainable Development Directorate Directorate, 'Measuring ACT Emissions'.

Target EER	Abatement potential (kt CO_2-e)	Additional abatement potential (kt CO_2-e)
5	78.7	8.8
4	69.9	9.1
3	60.8	10.9
2	49.9	17.4
1	32.5	-

Table 2: Abatement potential for different EER targets, ACT rental properties

Abatement by fuel source

With respect to fuel sources, the greatest abatement potential comes from those households currently using electric resistance heating. About 60% of abatement comes from these households. This is partly due to the relative emissions intensity of using electricity as a heat source compared to gas combustion, as well as the poor efficiency of resistance heating compared to heat pumps (reverse-cycle air conditioners).

Fuel source	Usage fraction	Coefficient of performance	Emissions intensity (kg.CO_2-e/GJ)	Total abatement potential (kt CO_2-e)
Gas	1/3	0.8	51.4	14.2
Electric resistance	1/3	1	228[16]	50.2
Electric heat pump	1/3	3.5	228	14.3

Table 3: Abatement potential by fuel source

Of this abatement potential, about 60% comes from reducing the need to use electric resistance heating. Roughly 20% each comes from gas heating and heat pump heating. In this case, although our heat pump is assumed to be over four times more efficient at the point of use than gas heating, this is roughly balanced by the increased emissions intensity of electricity.

Longer-term, the emissions intensity of electricity is decreasing due to increasing penetration of renewable electricity.[17] In addition, newer heat pumps will have higher coefficients of performance, using less electricity to achieve the same heating.

[16] 228 kg/GJ corresponds to 0.82 kg/kWh as specified in the National Greenhouse Account Factors.
[17] Anderson, 'Emissions Intensity of Household Electricity vs Gas'.

Alongside decarbonisation of the electricity grid, increasing the penetration of electric heat pumps is the ideal long-term solution to reduce household emissions.

Does electricity consumption in the ACT cause emissions?

The ACT is powered by "100 per cent renewable electricity".[18] As such, the ACT Government's accounting considers electricity consumption to have no climate impact. Accordingly, a "strong focus" is given to reducing emissions from transport and gas.[19]

This is valid as an accounting method, and the ACT's renewable energy policy has reduced emissions. In effect, the introduction of additional renewable generation reduces the total emissions intensity of electricity generation in the National Electricity Market (NEM), and this results in a reduction in emissions equivalent to the emissions associated with the ACT's electricity consumption. But it remains the case that electricity consumption in the ACT results in emissions.

The procurement of renewable energy generation by the ACT results in an amount of generation that is independent of the ACT's instantaneous electricity demand. As such, any reduction in ACT electricity demand would 'free up' renewable generation to supply other consumers in the NEM, displacing other forms of emissions-intensive generation. If the ACT reduces electricity consumption through minimum rental standards, renewable energy will still be generated and consumed elsewhere in the NEM. Perhaps counter-intuitively, the climate benefits of the ACT's renewable energy policy are maximised if the ACT uses energy efficiency to avoid unnecessary energy consumption.

There is an exception to this reasoning. The ACT Government plans to procure additional renewable generation if this is necessary to balance an increase in ACT electricity consumption. In this scenario, the long-term renewable generation output is *not* independent of long-term ACT electricity demand. But we are sceptical of this reasoning for two reasons.

Firstly, the ACT Government could choose to procure additional renewable generation regardless of any change in electricity consumption (for example, to go to 150% renewable electricity). Regardless of electricity consumption in the ACT, any additional renewable generation will reduce emissions and may also prove to be a sound investment. The investment decision need not be contingent upon the ACT's own usage.

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[18] Evans, 'ACT Has "100 per Cent Renewable" Electricity from Today. But What Does That Mean?'
[19] Australian Capital Territory, 'ACT Climate Change Strategy 2019-25'.

Secondly, 'negawatts' (avoided electricity consumption) from energy efficiency are cheaper than megawatts from a renewable energy reverse auction, especially if the improvement costs are borne principally by property investors. Energy efficiency is thus a financial saving relative to further renewable energy investment. These savings from not procuring additional electricity supply could be re-invested in other emissions abatement opportunities, such as reducing gas usage in owner-occupier households. In this sense, even if additional electricity consumption would eventually be offset by new generation, a missed opportunity to reduce emissions more cheaply results in less efficient abatement than would otherwise be the case.

Applying this analysis to other jurisdictions

The method we have employed can be adapted for any Australian jurisdiction in order to estimate the emissions reduction potential from minimum rental standards. The total potential would vary between jurisdictions depending upon various factors such as the size of the private rental sector, the emissions-intensity of the local NEM, fuel sources, and climate zones. As the ACT is a small jurisdiction, we would expect to see larger absolute potential in other jurisdictions, although the proportional contribution from minimum standards may be lower. Further, other jurisdictions may have proportionately more energy load linked to summer cooling, which has not been part of this analysis.

Conclusions

We sought to quantify the potential emissions abatement from minimum rental standards in the ACT. Our most ambition scenario, a minimum standard of EER 5, was estimated to achieve annual abatement of 78,700 tonnes of CO2-equivalent. This is equal to removing 24,600 cars from the roads, or a 2% reduction based upon the ACT's 2017-18 emissions. This reduction could be achieved while reducing energy bills for households and improving public health. Less overall energy demand would also reduce grid infrastructure costs, which would reduce costs even for households that were not subject to minimum standards.

Our analysis also hints at other means of reducing household emissions. Minimum rental standards would reduce emissions by reducing the amount of emissions produced by households trying to stay warm in winter. Emissions could also be reduced by reducing the emissions intensity of the National Electricity Market (through increasing the penetration of wind and solar generation) and/or increasing the relative penetration of highly-efficient heat pumps, which have the additional benefit of offering cooling in summer.

Around Australia, state and territory governments face a conundrum: how to transition to a zero-net-carbon economy while ensuring that at-risk households are

shielded from both the costs of transition and the climate effects that have become so startlingly evident. One answer is minimum rental standards. By specifying a minimum energy efficiency standard for rental properties, jurisdictions can reduce energy costs for households, improve community health, and contribute to the attainment of climate goals.

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