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The economic impacts of the National Low-Income Energy Productivity Program

Prepared for the Australian Council of Social Service

April 2021

Deloitte Access Economics

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Glossary

Acronym	Full name
ACOSS	Australian Council of Social Service
AER	Australian Energy Regulator
CPRC	Consumer Policy Research Centre
FTE	Full Time Equivalent
GDP	Gross Domestic Product
GNI	Gross National Income
MPC	Marginal Propensity to Consume
NLEPP	National Low-Income Energy Productivity Plan
OECD	Organisation for Economic Co-operation and Development
WHO	World Health Organisation

Executive summary

In 2017-18 more than 3.2 million people were estimated to live below the poverty line in Australia.[1] For this financially disadvantaged population, living costs, particularly associated with energy use, impose a disproportionate burden. In 2018 for example energy costs were estimated to account for 6.4% of income for Australia's poorest households, compared with just 1.5% for high-income households (ACOSS 2018).[2]

The burden of high energy costs on Australia's financially disadvantaged has demonstrably worsened in 2020 due to the COVID pandemic. According to the Australian Energy Regulator (2020) [3], from the end of March 2020 to 19 October 2020:

- Household electricity 90-day debt grew 14% to $15 million, with average debt owed increasing 17% to more than $1,100.
- Total debt for households on hardship programs grew nearly 9% to $114 million, with average debt increasing 17% to $1,390.

Higher energy costs among Australia's financially disadvantaged in part reflects greater energy use. This stems from low energy efficient housing that requires greater energy use to maintain a comfortable standard of living.[4] In Australia the average energy efficiency rating of existing homes is only 1.7 stars compared with an average of 6.1 stars for new homes and these households with low energy efficiency are mostly occupied by low-income populations.[5]

The National Low-Income Energy Productivity Program (NLEPP) is a coordinated effort across more than 50 organisations that aims to reduce the burden of high energy costs among Australia's low-income households by implementing a range of renewable energy and energy efficiency programs. More information on NLEPP is provided at https://www.acoss.org.au/wp-content/uploads/2021/08/Brief-Proposal-and-implementaion-plan-for-National-Low-income-Energy-Productivity-Program-September-2021.pdf.

Based on estimates reported by ACOSS (2019) and Green Energy Markets (2019),[6] the NLEPP would involve a one-off investment that averages around $5,000 per residence to implement, reaching over 1.8 million homes and creating almost 22,000 Full Time Equivalent (FTE) direct jobs over the four years of the program.[7] As outlined by ACOSS, the NLEPP would deliver reverse cycle air conditioners for heating and cooling, more efficient hot water (heat pumps), draught sealing, ceiling fans, efficient thermal building envelope, lighting, shade structures, and rooftop solar photovoltaic (PV) systems.

While estimates of the direct employment that the NLEPP would generate are useful, they don't convey the broader impacts of the NLEPP being delivered. These broader impacts are important,

[1] ACOSS, Poverty In Australia (2020) <http://povertyandinequality.acoss.org.au/wp-content/uploads/2020/02/Poverty-in-Australia-2020_Part-1_Overview.pdf>
[2] ACOSS, Energy Stressed in Australia (2018) https://www.acoss.org.au/wp-content/uploads/2018/10/Energy-Stressed-in-Australia.pdf
[3] Australian Energy Regulator, AER extends COVID-19 energy customer protections, 30 October, 2020 https://www.aer.gov.au/news-release/aer-extends-covid-19-energy-customer-protections
[4] ABS Energy expenditure and consumption https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/4670.0main+features100072012
[5] See Bladen (2018) Canberra renters in worst properties in the market, according to new report https://www.allhomes.com.au/news/canberra-renters-in-worst-properties-in-the-market-according-to-new-report-20180413-h0ypdm/ and Queensland Council of Social Service (QCOSS), "Choice and Control? The experiences of renters in the energy (2017) market", https://www.qcoss.org.au/choice-and-control-experiences-renters-energy-market
[6] Green Energy Markets (2019), Energy Efficiency Employment in Australia, commissioned by Energy Efficiency Council and Energy Savings Industry Association. Labour estimates are based on industry consultations.
[7] This figure refers to the total number of jobs created in implementing the NLEPP. See Appendix A for more detail.

given energy efficiency improvements will allow for greater consumption of other goods and services, producing spill over benefits to other sectors.

This report analyses the economic impact of delivering NLEPP across a lower and upper bound scenario. In each scenario, the program would deliver higher disposable income for low-income households through reduced living costs and lower energy consumption. The scenarios are based on ACOSS estimates of eligible households, with the lower bound scenario based on the minimum average annual household saving estimate of $749 for energy-efficiency and $901 for solar, and the upper bound scenario based on the maximum of $930 for energy efficiency and $1,750 for solar.[8]

It is estimated that delivering energy efficiency specifically to low-income households via the NLEPP would deliver between $3.4 billion[9] (low) and $4.9 billion (high) in Gross Domestic Product between 2021 and 2025. Significant increases in employment are also projected with the program projected to add between 1,300 (Scenario A) and 1,800 (Scenario B) jobs over the same period.

These positive impacts are sustained throughout the modelling horizon as improved energy efficiency effectively delivers ongoing productivity improvements for the Australian economy. Importantly, the additional GDP and employment gains complement other effects of the NLEPP program. This includes benefits from reduced 'energy bill stress' and reduced costs to the public sector in managing health issues arising from poorly heated or cooled housing.

Delivering the NLEPP, with its explicit targeting of Australia's most financially disadvantaged households is projected to deliver a 17% higher economic impact than an equivalent program delivered across a broader base. This is because income improvements among Australia's most financially disadvantaged are likely to make the greatest relative gains to disposable income and reflects the fact that these households have a generally greater marginal propensity to consume.

This steady rise in growth in the periods of the modelling horizon are particularly important given the current COVID environment. While economic growth is projected to recover relatively quickly from the sharp decline in 2020 — Deloitte Access Economics (2021)[10] forecasts GDP growth to rise from a 2.4% contraction in 2020, to a 4.9% expansion in 2021 — the economic impacts of the NLEPP are likely to aid the pathway to recovery with the Australian economy more likely to return to pre-COVID levels earlier than otherwise. On top of this, those sectors projected to gain the most (service-based sectors which benefit from higher disposable income) are those which have been hardest hit from the COVID pandemic.

[8] The household savings estimates are sourced from a joint 2019 report by ACOSS and the Brotherhood of St Laurence which drew on modelling from the Australian National University https://www.acoss.org.au/wp-content/uploads/2019/02/FINAL-Report-Affordable-clean-energy-for-people-on-low-incomes_web.pdf

[9] Unless otherwise stated all dollar values are in present value terms, discounted at 7%

[10] Deloitte Access Economics, Business Outlook March (2021) <https://www2.deloitte.com/au/en/pages/media-releases/articles/business-outlook.html>

1 Overview and policy context

Household energy affordability is a major public policy and political concern. The National Low-Income Energy Productivity Program would address barriers that restrict the ability for Australia's financially disadvantaged to improve energy efficiency and adopt renewables.

1.1 Disadvantage is a persistent problem in Australia

Socio-economic disadvantage in Australia is a complex problem. While no universal definition exists, disadvantage is generally perceived as a limited access to material and social resources, and the ability to participate in society.[11]

Measuring financial disadvantage is difficult, however the poverty line — 50% of median household after (or before) housing costs income — and poverty rate — the ratio of the number of people whose income falls below the poverty line — are often used as indicator measures.

In Australia it is estimated that around 3.2 million people live below the poverty line. In relative terms this equates to one in eight Australians. But for specific groups, such as children under the age of 15, the rate is much higher (greater than one in six).[12]

Not only is the number of financially disadvantaged Australians estimated to be large, it is also relatively high compared to other countries. According to the Organisation for Economic and Social Development (OECD) for example, Australia is in the bottom half (21st of 36 countries) when ranking countries by average poverty rate between 2016 and 2019.[13]

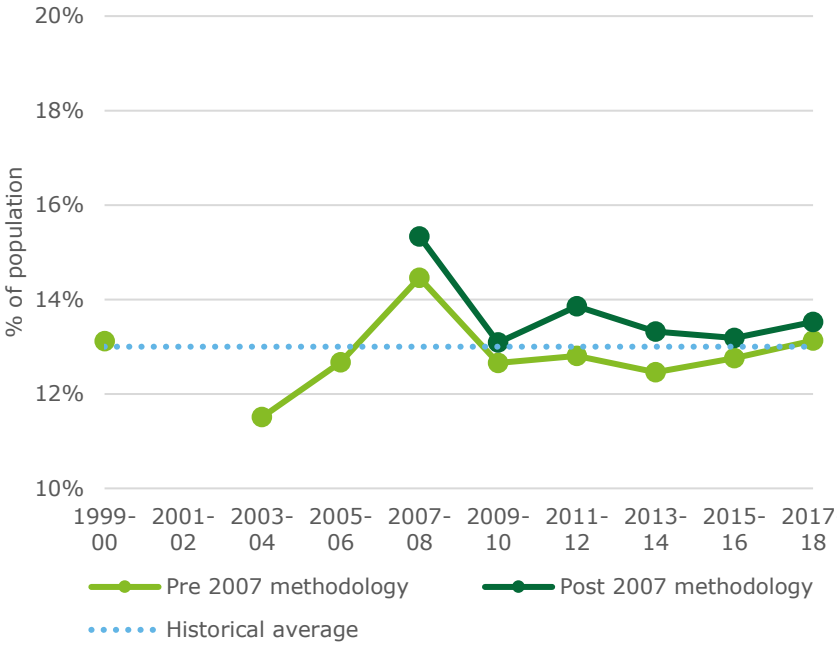
In addition, social and economic disadvantage is also recognised as a persistent problem in Australia. Despite robust economic growth and relatively low unemployment, estimated poverty rates have largely fluctuated around 13% (Chart 1.1).[12]

[11] ABS, SOCIO-ECONOMIC ADVANTAGE AND DISADVANTAGE (2016) <https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/2071.0~2016~Main%20Features~Socio-Economic%20Advantage%20and%20Disadvantage~123 >

[12] ACOSS, POVERTY IN AUSTRALIA 2020 <http://povertyandinequality.acoss.org.au/wp-content/uploads/2020/02/Poverty-in-Australia-2020_Part-1_Overview.pdf>

[13] OECD data, Poverty rate (2020) <https://data.oecd.org/inequality/poverty-rate.htm>

Chart 1.1: Estimated Australian poverty rate, pre and post 2007 methodologies



Note: The ABS has introduced a number of measurement changes to improve its poverty and income data series. The most important changes were introduced in 2007-08, and included changes in how income is recorded.[14]
Source: ACOSS[12]

1.2 High cost of living contributes to disadvantage

The financially disadvantaged are particularly exposed to high and rising costs of energy in Australia.[15] While all households use energy, the financially disadvantaged spend a larger proportion of their income on energy than other households.

It is estimated that energy costs account for 6.4% of income for the poorest households in Australia (20% of lowest income). This compares with just 1.5% for high-income households (Chart 1.2; ACOSS, 2018).[16] Importantly these issues have been exacerbated by the COVID pandemic which has resulted in greater household energy consumption (See Box 1).

[14] These changes included non-cash benefits, bonuses, termination payments and irregular overtime payments and resulted in an $85 increase in the average weekly gross household income affecting 43% of households. For more information see ACOSS, Methodology (n.d.) <http://povertyandinequality.acoss.org.au/methodology/>
[15] Chester, L, Elliot, A and Crossley P, Improving Energy Affordability for Australian Low-Income Renter Households (2018) <https://www.iaee.org/en/publications/newsletterdl.aspx?id=779 >
[16] ACOSS, Energy Stressed in Australia (2018) <https://www.acoss.org.au/wp-content/uploads/2018/10/Energy-Stressed-in-Australia.pdf >

Box 1: The effect of COVID on household energy costs

The spread of COVID and the responses to its management have had a profound effect on Australian society and our economy, as tabled by the RBA (2020).[17] The level of output in Australia fell by a record 7 per cent in the June quarter and with the downturn taking a heavy toll on the labour market.[18] Hours worked in Australia fell 10 per cent between March and May 2020, the unemployment rate rose to 6.9 per cent, and underemployment rose even higher.

These labour market impacts, combined with lockdown measures that forced households to work from home ultimately saw a greater number of Australians spending longer hours and more days within their residences. Because of this[19], household energy use increased markedly in Australia. In Victoria, for example, households consumed between 10 and 30 per cent more electricity between April and May 2020 compared with 2019.[20]

Lower retail energy prices may offset some of this increase in consumption as wholesale costs have fallen. However this effect is most likely to be evident from 2020-21 onwards, with a number of retailers announcing price changes for the 2020-21 year (Table 1.1).[21]

Table 1.1: Select retail residential price change announcements for 2020-21 (% change)

Jurisdiction	Energy Australia	Origin
South Australia	-2.7	-5.6
New South Wales	-1.0	-0.6
Queensland	-1.3	-5.1
ACT	-1.7	-0.4

Source: ACCC (2020)[22]

This higher energy use sparked research into COVID-19 energy consumer impacts by the Consumer Policy Research Centre (CPRC). In its survey the CPRC found greater concern among consumers about energy bill payments, estimating 34% of Australians were concerned about energy costs in July, which was up from 27 per cent in May. The CRPC also found the number of surveyed consumers missing bill payments increased from 2 per cent in June to 5 per cent in July.

This increase in energy use has manifested in increased energy debt for Australian households. According to the Australian Energy Regulator (2020), from the end of March 2020 to 19 October 2020:

- Household electricity 90-day debt grew by $15 million, a 14 per cent jump, with the average amount of debt owed up 17 per cent to more than $1,100.
- Total debt for households on hardship programs grew by more than $9 million to almost $114 million, with average amount of debt growing by 17 per cent to $1,390.

While energy costs have risen due to COVID, it is estimated that the number of Australians in poverty has actually reduced due to government programs, namely the coronavirus supplement. [continued over page…]

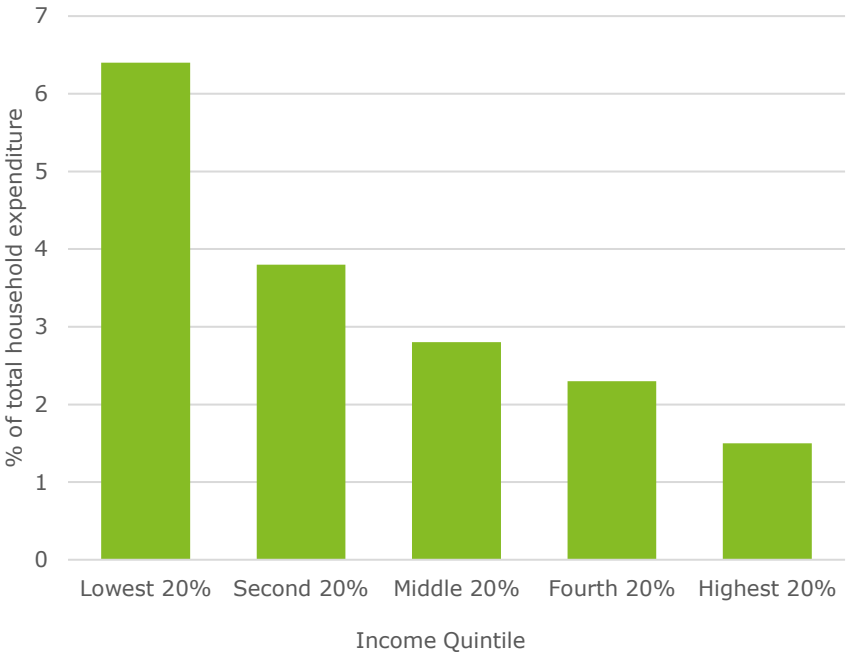
BOX 1 Continued

According to the ANU Centre for Social Research and Methods[23] while the initial impact of COVID-19 might have been expected to lift the number of people living in poverty from 1.6 million to 3.8 million, the introduction of JobKeeper and JobSeeker meant that '…the number of people in poverty has been lowered by around 32%'. In other words, during the spread of COVID, the number of people in poverty in June 2020 was actually reduced by 13% to 2.6 million.

The coronavirus supplement has now been removed, and while the effects of this are yet to become clear, the ANU Centre for Social Research and Methods[24] estimated that reducing the supplement (as initially slated in September 2020) would be expected to result in around 212,000 persons to be added to poverty compared to pre-COVID-19 economic and policy conditions.[25]

[17] RBA Covid, Our changing economy and monetary policy (2020) <https://www.rba.gov.au/speeches/2020/sp-gov-2020-11-16.html>
[18] ACCC (2020) Inquiry in the National Electricity Market <https://www.accc.gov.au/system/files/Inquiry%20into%20the%20National%20Electricity%20Market%20-%20Supplementary%20report.pdf>
[19] And relatively milder weather
[20] Victorian Small and Medium-sized enterprises (SME) consumed between 10 and 20 per cent less during the same period.
[21] ACCC (2020) Inquiry in the National Electricity Market <https://www.accc.gov.au/system/files/Inquiry%20into%20the%20National%20Electricity%20Market%20-%20Supplementary%20report.pdf>
[22] ACCC (2020) Inquiry in the National Electricity Market <https://www.accc.gov.au/system/files/Inquiry%20into%20the%20National%20Electricity%20Market%20-%20Supplementary%20report.pdf>
[23] Phillips, Gray & Biddle, ANU Centre for Social Research and Methods (2020), 'COVID-19 JobKeeper and JobSeeker impacts on poverty and housing stress under current and alternative economic and policy scenarios' https://csrm.cass.anu.edu.au/sites/default/files/docs/2020/8/Impact_of_Covid19_JobKeeper_and_Jobeeker_measures_on_Poverty_and_Financial_Stress_FINAL.pdf
[24] Phillips, Gray & Biddle, ANU Centre for Social Research and Methods (2020), 'COVID-19 JobKeeper and JobSeeker impacts on poverty and housing stress under current and alternative economic and policy scenarios' https://csrm.cass.anu.edu.au/sites/default/files/docs/2020/8/Impact_of_Covid19_JobKeeper_and_Jobeeker_measures_on_Poverty_and_Financial_Stress_FINAL.pdf
[25] Ibid

Chart 1.2: Energy share of total expenditure, household quintiles



Source: ACOSS[16]

These high costs of energy for financially disadvantaged Australians in part reflects the poor energy performance of many homes in Australia. Further, while penetration of behind-the-metre energy supply is relatively high in Australia, it has been much higher across middle- and higher-income households. In 2015-16, an ABS survey found lowest income households accounted for just 4.6% of solar panels in Australia.[26]

Roughly 95% of homes were built before adequate minimum energy efficiency standards were introduced for residential buildings in 2005. Because of this, the average energy efficiency rating of existing homes is only 1.7 stars (versus new homes, which have an average of 6.1 stars). These low energy efficient houses are costly to live in, requiring greater energy use to offset high and low temperatures and maintain a healthy standard of living.[27]

High energy costs among the financially disadvantaged also reflects their limited capacity to adapt. Of Australian households in the lowest 20% of incomes, 39% are renters, with renters accounting for a similar, but larger share (65%) of households, whose main income source is allowances (ACOSS 2020[28]).

These households have limited ability to introduce energy efficiency measures as the property is owned or managed by other parties, either private or publicly. Owners or managers of rental properties have little incentive to invest in energy efficiency (compared to owner occupiers) as owners incur the costs, while tenants incur the benefits of lower energy bills and a more comfortable living environment.[29]

[26] ABS, Australian Bureau of Statistics 2015–16, Survey of Income and Housing (2017).
[27] ABS Energy expenditure and consumption <https://www.abs.gov.au/ausstats/abs@.nsf/Lookup/4670.0main+features100072012>
[28] ACOSS, (2020) POVERTY IN AUSTRALIA 2020, Part 2: Who is affected? <http://povertyandinequality.acoss.org.au/wp-content/uploads/2020/05/Poverty-in-Australia-2020-Part-2-%E2%80%93-Who-is-affected_Final.pdf >
[29] CEFC A market report by the Clean Energy Finance Corporation (2016) <https://www.cefc.com.au/media/203027/cefc-market-report-financing-energy-efficient-community-housing.pdf>

1.3 Policy actions to address cost of energy burden among the financially disadvantaged

Two effective ways to reduce the burden of energy costs on the financially disadvantaged are to improve household energy efficiency and increase access to rooftop solar. These mechanisms respectively reduce household energy demand and lower the cost of energy use.

The International Energy Association (IEA) estimates that with global adoption of all available and viable energy efficiency options, global energy consumption could be reduced by around 20% by 2040 (relative to a case with no additional action).[30] These findings are also supported in an Australian context by Environment Victoria (2013),[31] which found improved energy efficiency — through raising an existing home from a 2-star to 5-star rating — would reduce energy use by more than 50%.

Such improvements in energy efficiency and access to renewables have been demonstrated to reduce the cost of living among the financially disadvantaged. St George Community Housing, for example,[32,33] delivered annual savings to residents of up to $570 per property through the introduction of solar instillations, as well as smart meters and improvements to insulation, lighting and appliances.

Importantly though, the benefits of improved energy efficiency and access to renewables goes beyond just expenditure savings. Improving a household's ability to manage temperature extremes is likely to positively affect a person's health and wellbeing (see for example the World Health Organisation).[34] The scope of these benefits are likely to be significant as renters account for 60% of households in persistent energy payment difficulty and more than two-thirds (67%) of households with persistent inability to heat their residences.[35]

Improved energy efficiency and access to renewables (such as solar PV) for the financially disadvantaged is also likely to support broader Australian efforts to reduce greenhouse gas emissions. This point is particularly important as it is vulnerable communities which are most heavily exposed to the costs of climate change and it is the financially disadvantaged who face greater barriers in adaptation.[36]

1.4 The National Low-Income Energy Productivity Program

There are a range of barriers to improving energy efficiency and access to solar among the financially disadvantaged in Australia. This includes for example:

- **Affordability** — limited disposable income and more limited saving restricts the capacity to invest.
- **Ownership** — with most financially disadvantaged renters, they have limited capacity to change the dwellings in which they reside.
- **Information asymmetry** — homes are sold or rented without understanding its energy requirements, and there is a lack of standard information on best ways to improve energy efficiency.

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[30] IEA (2018), World Energy Outlook 2018
[31] Environment Victoria, One Million Homes Roundtable Summary Report (2013), <http://environmentvictoria.org.au/wp-content/uploads/2016/06/OneMillionHomes_RoundableSummaryReport.pdf>
[32] with support from the Clean Energy Finance Corporation (CEFC) and the New South Wales Government
[33] CEFC, High-performing housing provides long-term benefits for Sydney families (2020) <https://www.cefc.com.au/case-studies/high-performing-housing-provides-long-term-benefits-for-sydney-families/>
[34] WHO, WHO HOUSING AND HEALTH GUIDELINES (2018) <https://apps.who.int/iris/bitstream/handle/10665/276001/9789241550376-eng.pdf>
[35] Based in HILDA data (2014-16) reported in ACOSS Affordable, clean energy for people on low incomes (2019) < https://www.acoss.org.au/wp-content/uploads/2019/02/FINAL-Report-Affordable-clean-energy-for-people-on-low-incomes_web.pdf>
[36] Sevoyan, A, Hugo, G, Feist, H, Tan, G, McDougall, K, Tan, Y & Spoehr, J, Impact of climate change on disadvantaged groups: Issues and interventions (2013), National Climate Change Adaptation Research Facility

- **Investment incentives** — incentives do not currently facilitate upgrades to rental properties.

In an effort to overcome these barriers, more than 50 organisations across Australia have united behind the National Low-Income Energy Productivity Program (NLEPP). NLEPP is a social project that aims to facilitate the adoption of renewable energy and energy efficiency among socio-economically disadvantaged people in Australia. More information on NLEPP is provided at https://www.acoss.org.au/wp-content/uploads/2021/08/Brief-Proposal-and-implementaion-plan-for-National-Low-income-Energy-Productivity-Program-September-2021.pdf.

Energy efficiency measures would include (but not be limited to) a combination of reverse cycle air conditioners for heating and cooling, more efficient hot water (heat pumps), draught sealing, ceiling fans, efficient thermal building envelope, lighting, shade structures, and solar PV.

This report analyses the economic impact of delivering the NLEPP across a lower and upper bound scenario. In each scenario, the program would deliver higher disposable income for low-income households through reduced living costs and lower energy consumption. These scenarios are informed by ACOSS estimates of eligible households and the mix of uptake of energy efficiency measures and/or rooftop solar installation.[37] The variances are driven by the assumed savings with the lower bound scenario based on the minimum average annual household saving estimate of $788, and the upper bound scenario based on the upper end figure of $1,138.[38]

[37] See Appendix A for more detail on how this split is derived.
[38] The household savings estimates are sourced from a joint 2019 report by ACOSS and the Brotherhood of St Laurence which drew on modelling from the Australian National University.
< https://www.acoss.org.au/wp-content/uploads/2019/02/FINAL-Report-Affordable-clean-energy-for-people-on-low-incomes_web.pdf>

2 Economic impacts of the National Low-Income Energy Productivity Program

We estimate that the NLEPP would deliver 22,000 direct jobs during the implementation phase (i.e. for energy auditors and installation). CGE modelling has then been used to estimate the broader economic and employment impacts of delivering the NLEPP specifically to low-income households in Australia. The program, as described by ACOSS, is estimated to deliver between $3.4 billion and $4.9 billion in additional GDP and provide between 1,300 and 1,800 additional FTE jobs. This represents a 17% larger economic impact than an equivalent program delivered across a broader base.

2.1 Introduction

In addition to the cost and jobs associated with rolling out the program, the NLEPP will also impact the cost of living for low-income households and energy demand for the rest of the economy. These impacts are estimated using Deloitte's in-house Computable General Equilibrium (CGE) model, DAE-RGEM (Deloitte Access Economic Regional General Equilibrium Model).

CGE modelling is the best practice methodology for estimating the economic impacts of change in any one part of the economy. It is the preferred method of most major Commonwealth and State government agencies in estimating the economic impacts of a project or program (for more detail on CGE models and DAE-RGEM see Appendix B).

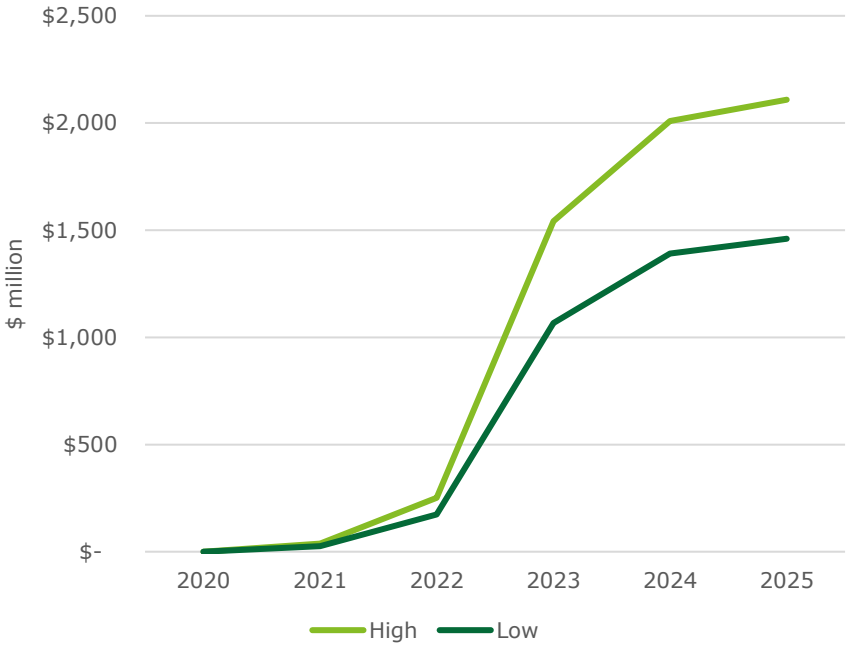
CGE models estimate economic impacts by comparing a policy scenario against a baseline. The baseline scenario is built off historical data with the economy growing as per 'business as usual'. Here the baseline refers to a world where the NLEPP is not delivered.

This report analyses the economic impact of delivering NLEPP across a lower and upper bound scenario. In each scenario, the program would deliver higher disposable income for low-income households through reduced living costs and lower energy consumption. These scenarios are informed by ACOSS estimates of eligible households and the mix of uptake of energy efficiency measures and/or rooftop solar installations described in section one above.

The rollout of the program is proposed to be incrementally introduced between 2021 and 2025 – consistent with how previous projects of large scale have been implemented. Meeting the target number of households was assumed to be achieved via a sigmoid path (see Chart 2.1). That is, the program is projected to be rolled out at the beginning of 2021 with lags before a more widespread uplift occurs. Once a critical mass is achieved in the latter stages of the program, additional growth

becomes marginally harder to achieve. In all scenarios the improvements enter the model the same way – via a cost-reducing efficiency improvement in the production of energy that is consumed by low-income households.

Chart 2.1: Household savings via sigmoid path



Source: DAE-RGEM

These shocks are summarised in Table 2.1. Data that informed each of these shocks was sourced from ACOSS estimates and is described below in more detail.

Table 2.1: Summary CGE shocks, 2021 to 2025

Shock	Baseline	Low	High
Average annual savings ($ per household)	$0	$788	$1,138
Average annual energy efficiency growth rate (% p.a.)	1.87	2.02	2.08

Source: Deloitte Access Economics analysis based on ACOSS estimates.

2.1.2 Direct fiscal and employment impact

Based on estimates reported by ACOSS (2019) and Green Energy Markets (2019)[39] NLEPP is estimated to cost around $9.1 billion to implement and require almost 22,000 Full Time Equivalent (FTE) jobs. This figure refers to the total number of audit and installation jobs created in implementing the NLEPP in its entirety. See Appendix A for more detail. This range in part reflects the various ways through which energy efficiency of Australian houses can be achieved. As outlined by ACOSS, the NLEPP would deliver a combination of reverse cycle air conditioners for heating and cooling, more efficient hot water (heat pumps), draught sealing, ceiling fans, efficient thermal building envelope, lighting, shade structures, and rooftop solar photovoltaic (PV) systems.

While estimates of the direct employment that the NLEPP would generate are useful, they don't convey the broader impacts of the NLEPP being delivered. These broader impacts are important,

[39] Green Energy Markets (2019), Energy Efficiency Employment in Australia, commissioned by Energy Efficiency Council and Energy Savings Industry Association. Labour estimates are based on industry consultations.

given energy efficiency improvements will allow for greater consumption of other goods and services, producing spill over benefits to other sectors.

2.1.3 Reduced household energy use

The NLEPP aims to reduce energy use across low-income households. This impact has been introduced into the CGE framework as a shock (improvement) to household energy efficiency.

Under the baseline growth scenario, household energy efficiency is projected to improve steadily, but at a marginally declining rate. Under the policy scenarios annual improvement in energy efficiency is assumed to be higher. For example, in the lower bound scenario average energy efficiency improvement rate is assumed to be 0.15 percentage points higher than the base case at 2.02 per cent. For the high scenario, energy efficiency improvements are assumed to be 0.21 per cent above the baseline.

The improvement in energy efficiency is estimated based on the total pool of savings that accumulates from the NLEPP, as outlined in the following section.

2.1.4 Cost of living

The policy scenario is a 'shock' to the baseline where the energy efficiency gains from the NLEPP are incrementally introduced to the economy and the subsequent energy cost savings are channelled through the economy as a higher level of consumption.

Total household savings were derived by taking average household savings values from ACOSS's 2019 report "Affordable, clean energy for people on low incomes"[40] combined with assumed household numbers provided by ACOSS (n.d.).[41] These figures are summarised below in Table 2.2.

[40] ACOSS, Brotherhood of St Laurence, Affordable clean energy for people on low incomes (2019) <https://www.acoss.org.au/wp-content/uploads/2019/02/FINAL-Report-Affordable-clean-energy-for-people-on-low-incomes_web.pdf>

[41] ACOSS, Addendum Implementing the Healthy and Affordable homes: national low-income energy productivity program (n.d.), provided by ACOSS.

Table 2.2: Summary of NLEPP household savings estimated by ACOSS

Housing group	Residences ('000)	Average savings ($/residence)		Total savings ($m)	
		Low	High	Low	High
Public Housing	320	$784	$1,118	$251	$358
Community Housing	118	$855	$1,504	$101	$177
Low-income Homeowners	1,100	$783	$1,110	$861	$1,221
Low-income Renters	315	$784	$1,118	$247	$352
Total	**1,853**	**$788**	**$1,138**	**$1,460**	**$2,109**

Source: ACOSS (2019, n.d.)

The scenarios are based on ACOSS estimates of eligible households, with the lower bound scenario based on the minimum average annual household saving estimate of $749 for energy-efficiency and $901 for solar, and the upper bound scenario based on the maximum of $930 for energy efficiency and $1,750 for solar.[42]

The exact figure of cost savings for households from implementation of the NLEPP isn't definitive as uncertainty remains regarding the amount of savings each household would receive given this is itself a function of prevailing energy prices and household consumption patterns.

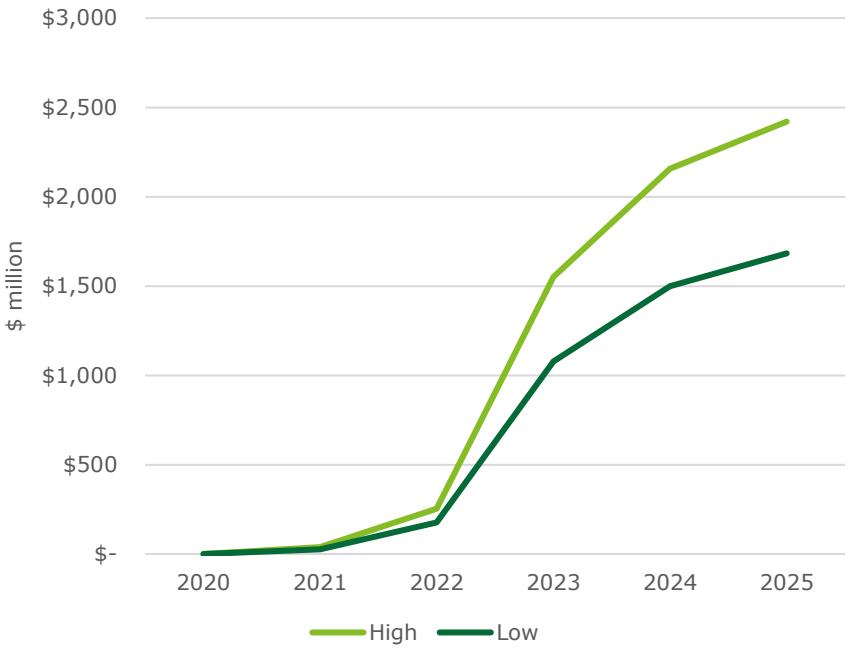
2.2 Impact to Gross Domestic Product

The NLEPP is projected to have a positive impact on the Australian economy across all scenarios. For the low and high scenarios, Australian Gross Domestic Product (GDP) is projected to increase by $3.4 billion and $4.9 billion for the low and high scenarios, respectively, relative to the baseline for the period 2021 to 2025.

As consumers spend less on energy, they direct expenditure towards other goods and services. This increases revenue to other industries, increasing broader activity in the economy and driving growth out to 2025. Because the program affects consumer spending, the main sectors that drive this growth are in the retail trade and the services industry. These sectors are those which have been hardest hit from the COVID-19 pandemic.

[42] The household savings estimates are sourced from a joint 2019 report by ACOSS and the Brotherhood of St Laurence which drew on modelling from the Australian National University.
< https://www.acoss.org.au/wp-content/uploads/2019/02/FINAL-Report-Affordable-clean-energy-for-people-on-low-incomes_web.pdf>

Chart 2.2: Impact to Gross Domestic Product, Australia



Source: DAE-RGEM

For each scenario GDP rises over the course of the modelling horizon. For example, the low scenario sees additional GDP reaching $1.7 billion (undiscounted) in 2025. This is because the program is assumed to be gradually rolled out, with the majority of households reached by 2025. The steady growth in GDP also occurs because productivity gains build throughout the modelling horizon, generating continued gains to low-income households and the broader economy over time.

This steady rise in growth in the periods of the modelling horizon are particularly important given the current COVID environment. While economic growth is projected to recover relatively quickly from the sharp decline in 2020 — Deloitte Access Economics (2021)[43] forecasts GDP growth to rise from a 2.4% contraction in 2020, to a 4.9% expansion in 2021 — the economic impacts of the NLEPP are likely to aid the pathway to recovery with the Australian economy more likely to return to pre-COVID levels earlier than otherwise.

2.3 Employment impacts

As with the impact in GDP, the NLEPP is projected to deliver employment gains across all scenarios.

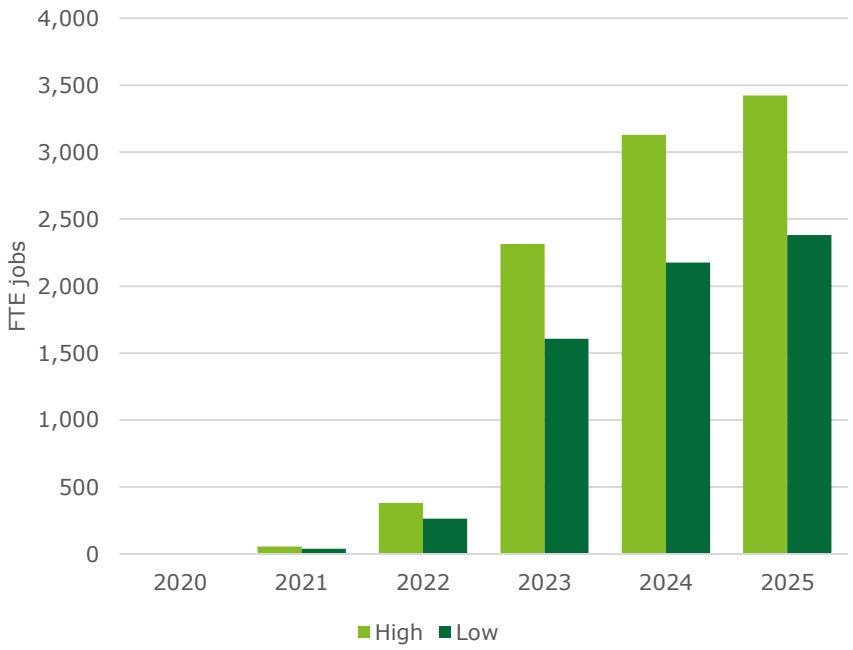
During the program (between 2021 and 2025), approximately 1,300 Full-Time Equivalent (FTE) jobs are projected to be created on average for the low scenario. This is mainly driven by an expanding services sector. As household disposable income increases from NLEPP, demand for the services industries (including retail trade) is projected to increase. These industries are labour intensive and will require expanded employment to meet demand. These impacts are supported by higher energy productivity impacts, with firms able to spend more on labour (as required) because of the reduced energy costs lowering the cost of production (all else constant).

In the high scenario 1,800 additional jobs are generated on average between 2021 and 2025. For both scenarios additional employment at 2025 is greater than the average (2,400 additional jobs

[43] Deloitte Access Economics, Business Outlook March 2021 (2021) <https://www2.deloitte.com/au/en/pages/media-releases/articles/business-outlook.html>

in the low scenario and 3,400 additional jobs in the high scenario), reflecting the cumulative impacts of the program roll out and productivity gains.

Chart 2.3: Impact on employment, Australia



Source: DAE-RGEM

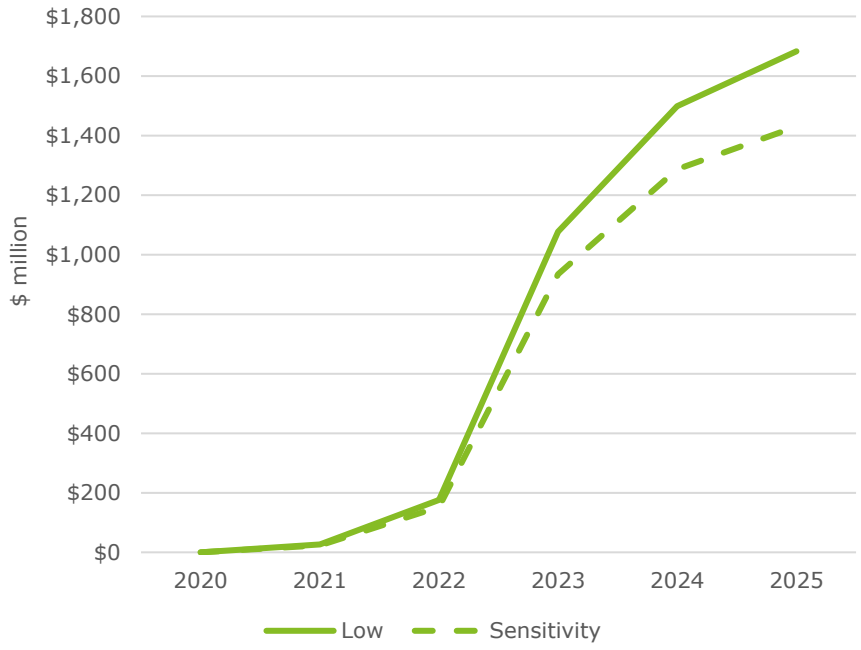
2.4 Targeting low-income households

As the explicit aim of the NLEPP is to assist low-income households, it is important to consider the benefits compared to a more broadly targeted scheme. To help answer this question, Deloitte Access Economics has run a sensitivity analysis scenario in which the same energy cost savings are assumed to become available to the average household, rather than the average low-income household.

The key difference in the sensitivity is the average marginal propensity to consume (MPC) which is higher in low-income households. Carroll et al (2017) for example found that MPC in low-income households is approximately 1.3 times higher than the median household. Deloitte Access Economics has drawn on this relative difference in calibrating the consumption response between the core and sensitivity scenario.

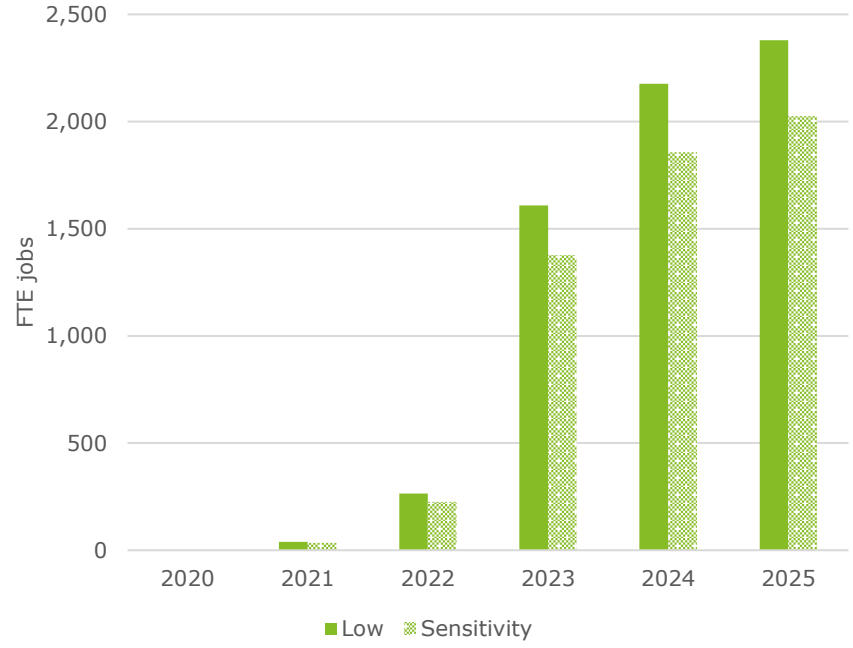
As demonstrated in Chart 2.4 and Chart 2.5 the projected economy-wide benefits from the NLEPP are expected to be in the order of 17% higher GDP and employment on average. This is because it targets low-income households, with their higher MPC leading to a much quicker transmission of the savings to aggregate demand and hence activity in key consumer sectors.

Chart 2.4: Impact to Gross Domestic Product, Low scenario and MPC sensitivity



Source: DAE-RGEM

Chart 2.5: Impact on employment, Low scenario and MPC sensitivity



Source: DAE-RGEM

3 Broader NLEPP impacts

Beyond the modelled impacts to economic growth and jobs, the NLEPP will also reduce household energy bill stress and improve quality of life among Australia's most financially disadvantaged.

The economic impact analysis demonstrates that the NLEPP program would have a significant impact on GDP and employment in the Australian economy as higher consumption results from reduced cost of living pressure for low-income households. There are however a range of other impacts of NLEPP that have not been modelled. These include benefits to low-income households and costs to government and the broader public, and the results of the economic impact analysis should be considered in this broader context.

The NLEPP is for example likely to reduce the financial stress that many low-income households face with high living costs. ACOSS (2018), in a survey of concerns around household expenditure, found electricity ranked as the most common item that respondents were concerned about.[44] The COVID crisis has likely worsened energy bill stress for Australia's financially disadvantaged meaning the NLEPP would be particularly beneficial if implemented in the current environment. A Consumer Policy Research Centre (2020)[45] survey indicated that income affected households were twice as likely to report missed payments the national average, and that 7% of households missed a bill payment in June 2020 (ABS 2020).[46]

Other benefits to low-income households from the NLEPP are anticipated to be improved quality of life. Specifically the NLEPP will improve temperature regulation of low-income residences and this is likely to reduce health impacts. A 2015 study published in The Lancet[47] reported that 6.5% of Australian deaths could be attributed to cold weather. While many of these are linked to pre-existing conditions, the difference in death rates for other countries such as Sweden (3.9% of deaths) suggests many of these health impacts can be effectively managed.

For the government, and the broader public as taxpayers, implementing a (new) program such as the NLEPP requires budgetary opportunity costs. This could include raising taxes to pay for the program, which can reduce household disposable incomes and increase the marginal cost of public funds. A new program might also redirect funds from another program or portfolio.

[44] ACOSS, EEC survey (2018) https://www.acoss.org.au/wp-content/uploads/2018/04/EEC-Survey-online-FINAL-.pdf
[45] Consumer Policy Research Centre, COVID-19 and Consumers: from crisis to recovery (2020) <https://www.parliament.vic.gov.au/images/stories/committees/paec/COVID-19_Inquiry/Submissions/66b._Consumer_Policy_Research_Centre.pdf>
[46] ABS Household Impacts of COVID-19 Survey (2020) <https://www.abs.gov.au/statistics/people/people-and-communities/household-impacts-covid-19-survey/detailed-release-june-2020>
[47] Gasparrini, A, et al. Mortality risk attributable to high and low ambient temperature: a multicountry observational study (2015) <https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(14)62114-0/fulltext>

Appendix A Direct job estimates

The NLEPP program as detailed by ACOSS, includes a variety of energy saving measures.[48] These include:

- upgrading of both lighting and heating/cooling systems
- replacement of hot water systems
- installation of rooftop solar systems.

Green energy markets (2019)[49] provides estimates of the labour hours required to deliver various energy efficiency upgrades for households. The estimates relevant to the NLEPP are reported below, split between those relevant to parts one and three in Table A.1 (as they are focussed on energy efficiency) and part two in Table A.2 (as this includes a mix of energy efficiency and rooftop solar).

Table A.1: Energy efficiency upgrade labour hour estimates

Measure	Labour hours per house
Performing efficiency audit	4
Upgrading water heater to efficient heat pump	4
Replacing old heater with single, efficient heating/cooling system	4
Replacing low voltage halogen downlights with LEDs	2
Total	**14**

Source: Green Energy markets[49]

Table A.2: Combination energy efficiency upgrade and rooftop solar install labour hour estimates

Measure	Labour hours per house
Performing efficiency audit	4
Upgrading water heater to efficient heat pump	2
Replacing old heater with single, efficient heating/cooling system	2
Replacing low voltage halogen downlights with LEDs	1
Installation of 4 kW rooftop solar system	24
Total	**33**

Source: Australian Energy Council (2020), Green Energy markets (2019). Note: a mix of labour-hour estimates are used assuming 50:50 take-up of energy efficiency and rooftop solar.

[48] ACOSS, Brotherhood of St Laurence, Affordable clean energy for people on low incomes (2018), Appendix E
[49] Green Energy Markets (2019), Energy Efficiency Employment in Australia, commissioned by Energy Efficiency Council and Energy Savings Industry Association. Labour estimates are based on industry consultations.

In deriving an estimate of direct employment, Deloitte Access Economics has made the following assumptions:

1. One FTE is equivalent to 2000 labour hours.
2. The number of households targeted in each part of the NLEPP is given by ACOSS (see table A.3 below).
3. 66% of low-income homeowners would be eligible for solar (assuming 70% of houses are eligible for solar but 7.1% already have them) and 23% would access (assuming 1/3 take up).
4. 70% of public housing would be eligible for and 23% of participants would access solar (assuming 1/3 take up).
5. 70% of rental properties would be eligible for and 23% of participants would access solar (assuming 1/3 take up).
6. 70% of community housing properties would be eligible for solar and given the upper limit of funding ($10,000) that uptake would be equal to eligibility.

Table A.3: Direct employment estimates

Measure	Dwellings	Labour hours per dwelling	FTEs
Public housing	320,000	22.7	3,638
Community housing	118,000	40.6	2,395
Low-income homeowners	1,100,000	22.4	12,298
Low-income renters	315,000	22.7	3,582
Total	**1,853,000**		**21,913**

Source: Green Energy markets[49]

Appendix B DAE-RGEM

B.1. CGE modelling

CGE modelling is the best practice methodology for estimating the economic impacts of change in any one part of the economy. It is the preferred method of most major commonwealth and state government agencies in estimating the impacts of a project or program.

This is because CGE frameworks account for a range of impacts that are otherwise omitted in alternative models. In particular Computable General Equilibrium (CGE) incorporates the following assumptions:

- Resource constraints (the use of labour or capital by one activity or industry comes at the expense of its use elsewhere);
- The possibility of changes in the mix of inputs used in production due to changes in relative prices or technology; and
- The responsiveness of prices and other variables to policy changes affecting such things as tariffs on imported goods, budgetary support to industry, industry productivity and workforce participation.

Because of these assumptions CGE models enable estimation of impacts across the entire economy and allows for second round impacts — where agents respond to changes in price signals.[50] Other economic modelling techniques (such as input output modelling) are unable to address the above assumptions and therefore can produce inflated results of economic impacts.

B.2. Estimating economic impacts

CGE models estimate economic impacts by comparing a policy scenario against a baseline. The baseline scenario is built off historical data with the economy growing as per 'business as usual' (Figure B.2 below; 1). Here the baseline refers to a world where the NLEPP is not delivered.

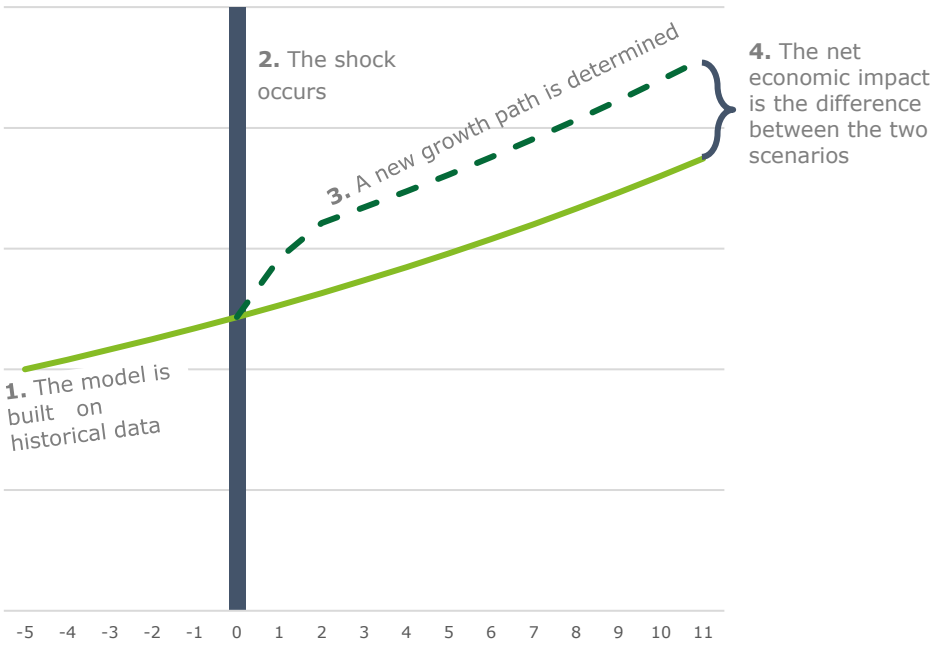
Data on an issue, project or policy in focus is then introduced into the model (2). This enters the model as a shock to the economy and represents change to the baseline. Here the shock includes the expected energy cost savings which low-income households are projected to receive as a result of the implementation of the NLEPP, as described in Chapter 1.

CGE models then solve for the market-clearing (equilibrium) levels of demand and supply across all specified goods and factor markets in the economy. This effectively creates a new path for the economy over time (3). This new path is typically referred to as the policy scenario and here it represents a world where the NLEPP program is delivered.

Comparing this new policy path to that of the baseline (where the change does not occur), shows the economic impact of the shock (4).

[50] Productivity Commission, Input Output tables <https://www.pc.gov.au/research/supporting/input-output-tables>

Chart 3.1: Estimating economic impacts via a shock to a CGE model



Source: Deloitte Access Economics

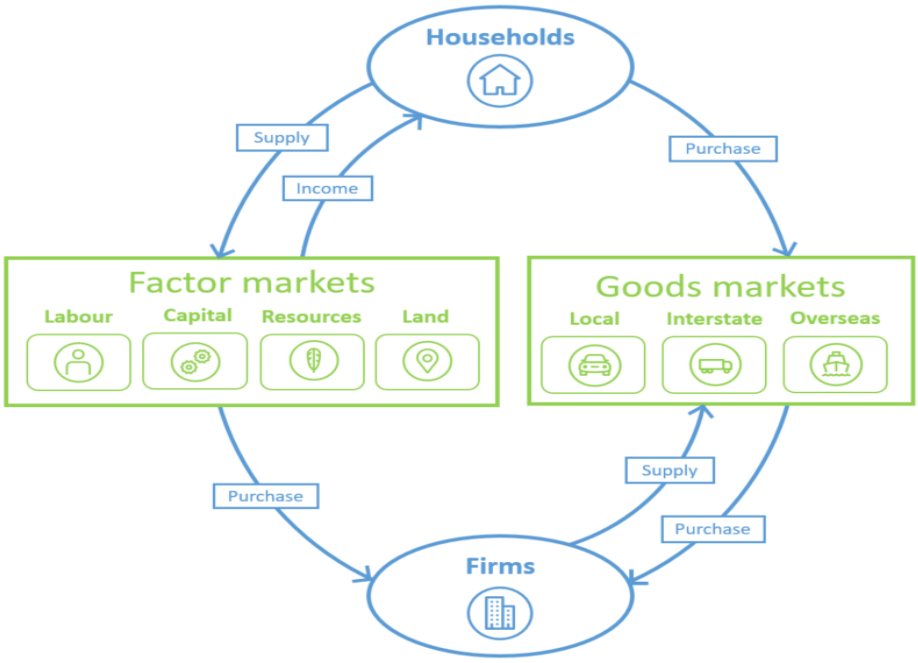
B.3. Computable general equilibrium modelling

The project utilises the Deloitte Access Economics' – Regional General Equilibrium Model (DAE-RGEM). DAE-RGEM is a large scale, dynamic, multi-region, multi-commodity CGE model of the world economy with bottom-up modelling of Australian regions. DAE-RGEM encompasses all economic activity in an economy – including production, consumption, employment, taxes and trade – and the inter-linkages between them.

For this project, the model has been customised to explicitly identify core sectors of the Australian and global economy and has split each jurisdiction into greater city and rest of jurisdiction regions.

The figure over the page is a stylised diagram showing the circular flow of income and spending that occurs in DAE-RGEM. To meet demand for products, firms purchase inputs from other producers and hire factors of production (labour and capital). Producers pay wages and rent (factor income) which accrue to households. Households spend their income on goods and services, pay taxes and put some away for savings. The government uses tax revenue to purchase goods and services, while savings are used by investors to buy capital goods to facilitate future consumption. As DAE-RGEM is an open economy model, it also includes trade flows with other regions, interstate and foreign countries.

Figure B.1: The components of DAE-RGEM and their relationships



Source: Deloitte Access Economics

DAE-RGEM is based on a substantial body of accepted microeconomic theory. Key assumptions underpinning the model are:

- The model contains a 'regional consumer' that receives all income from factor payments (labour, capital, land and natural resources), taxes and net foreign income from borrowing (lending).
- Income is allocated across household consumption, government consumption and savings so as to maximise a Cobb-Douglas (C-D) utility function.
- Household consumption for composite goods is determined by minimising expenditure via a CDE (Constant Differences of Elasticities) expenditure function. For most regions, households can source consumption goods only from domestic and imported sources. In the Australian regions, households can also source goods from interstate. In all cases, the choice of commodities by source is determined by a CRESH (Constant Ratios of Elasticities Substitution, Homothetic) utility function.
- Government consumption for composite goods, and goods from different sources (domestic, imported and interstate), is determined by maximising utility via a C-D utility function.
- All savings generated in each region are used to purchase bonds whose price movements reflect movements in the price of creating capital.
- Producers supply goods by combining aggregate intermediate inputs and primary factors in fixed proportions (the Leontief assumption). Composite intermediate inputs are also combined in fixed proportions, whereas individual primary factors are combined using a constant elasticity of substitution production function.
- Producers are cost minimisers, and in doing so, choose between domestic, imported and interstate intermediate inputs via a CRESH production function.
- The model contains a more detailed treatment of the electricity sector that is based on the 'technology bundle' approach for general equilibrium modelling developed by ABARE (1996).
- The supply of labour is positively influenced by movements in the real wage rate governed by an elasticity of supply.
- Investment takes place in a global market and allows for different regions to have different rates of return that reflect different risk profiles and policy impediments to investment. A global investor ranks countries as investment destinations based on two factors: global investment and rates of return in a given region compared with global rates of return. Once

the aggregate investment has been determined for Australia, aggregate investment in each Australian sub-region is determined by an Australian investor based on: Australian investment and rates of return in a given sub-region compared with the national rate of return.

- Once aggregate investment is determined in each region, the regional investor constructs capital goods by combining composite investment goods in fixed proportions, and minimises costs by choosing between domestic, imported and interstate sources for these goods via a CRESH production function.
- Prices are determined via market-clearing conditions that require sectoral output (supply) to equal the amount sold (demand) to final users (households and government), intermediate users (firms and investors), foreigners (international exports), and other Australian regions (interstate exports).
- For internationally traded goods (imports and exports), the Armington assumption is applied whereby the same goods produced in different countries are treated as imperfect substitutes. But, in relative terms, imported goods from different regions are treated as closer substitutes than domestically produced goods and imported composites. Goods traded interstate within the Australian regions are assumed to be closer substitutes again.
- The model accounts for greenhouse gas emissions from fossil fuel combustion. Taxes can be applied to emissions, which are converted to good-specific sales taxes that impact on demand. Emission quotas can be set by region and these can be traded, at a value equal to the carbon tax avoided, where a region's emissions fall below or exceed their quota.

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