



COAG
Energy Council

Trajectory for low energy buildings

December 2018

This initiative underpins National Energy Productivity Plan Measure 31



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About this document

Energy efficiency plays an important role in lowering energy bills for households and businesses; improving occupant comfort, health and productivity; saving energy (reducing wastage) for the wider economy; improving resilience to extreme weather and blackouts (peak demand); and reducing emissions.

Most new buildings in Australia are built to the minimum energy efficiency requirements in the National Construction Code (NCC). This misses cost effective opportunities for consumers, as new energy efficient technology costs have been falling considerably in recent years, while energy prices have been rising.

The National Energy Productivity Plan (NEPP), agreed by the Council of Australian Governments (COAG) Energy Council (the Council) in 2015, aims to improve Australia's energy productivity by 40 per cent between 2015 and 2030. This will reduce costs for households, while improving Australia's competitiveness and growing the economy and jobs. The NEPP also supports the Australian Government's commitment under the Paris Agreement to reducing greenhouse gas emissions to 26 to 28 per cent below 2005 levels by 2030.

Under NEPP Measure 31, Advance the NCC, the Council agreed to consider opportunities to increase minimum requirements in the NCC to achieve better energy efficiency outcomes for Australia's buildings. Energy efficiency requirements in the NCC are a key mechanism for delivering the NCC's 'Sustainability' goal, while also supporting its 'Health' and 'Amenity' goals.

Opportunities for future changes in the NCC have been developed by conducting a process that considers a broader trajectory for the building sector. This Trajectory for Low Energy Buildings (the Trajectory) was developed cooperatively between Commonwealth, State and Territory Governments, and identifies cost effective opportunities for energy efficiency improvements throughout the building system, from thermal performance to appliance energy usage and renewable energy generation.

This Trajectory acknowledges the strong calls from energy consumer groups and many in the building and building products sectors to improve the affordability of operating new and existing buildings. Extensive stakeholder consultation was conducted over a one year period with over 250 stakeholders engaged through this process, consisting of representatives from a range of sectors including: building and property, appliance and technology, energy supply and distribution, household energy consumer advocacy groups, academia and different levels of government.

In establishing this Trajectory, the Australian Sustainable Built Environment Council (ASBEC) and ClimateWorks *Built to Perform* report was also considered, which was released in July 2018 and supported by the 27¹ industry members of ASBEC. The ASBEC report outlines an industry-led trajectory and produced similar findings to this Trajectory.

This Trajectory, and its underlying reports, seek to inform the future activities of the Building Ministers' Forum and the Australian Building Codes Board (ABCB) when developing and implementing updates to the NCC, and inform further buildings policy measures considered by the Council.

1 ASBEC members include: Air Conditioning & Mechanical Contractors' Association, Australian Building Sustainability Association, Australian Institute of Architects, Australian Institute of Landscape Architects, Australian Institute of Refrigeration, Air conditioning and Heating, Australian Passive House Association, Australian Steel Stewardship Forum, Australian Window Association, Building Designers Australia, Chartered Institute of Building Australasia, Consult Australia, Energy Efficiency Council, Engineers Australia, Facility Management Association of Australia, Good Environmental Choice Australia, Green Building Council Australia, Infrastructure Sustainability Council of Australia, Insulation Australasia, Insulation Council of Australia and New Zealand, Living Future Institute Australia, Planning Institute Australia, Property Council of Australia, Royal Institute of Chartered Surveyors, Standards Australia, Vinyl Council Australia, Water Services Association of Australia, World Wide Fund.

Progress to date

Australia has made important progress in building energy performance. To date:

- Energy efficiency of buildings has improved considerably since the 1990s, with state, territory and national increases in building energy efficiency regulations and various initiatives for retrofitting existing buildings.
- Appliance efficiency has significantly improved, largely due to requirements under the Greenhouse and Energy Minimum Standards (GEMS) Act (and its state and territory predecessors).
- More than one in five Australian households now have solar panels installed on their roof – the highest rate per capita in the world.²
- Building rating systems such as Green Star and the National Australian Built Environment Rating System (NABERS), as well as mandatory disclosure under the Commercial Building Disclosure Program, have been effective in motivating owners of commercial buildings to make energy efficiency improvements.

Why a Trajectory is needed

A Trajectory and coordinated action on energy efficiency is needed because:

- Households and businesses have higher than necessary energy bills. The market does not incentivise cost effective energy efficiency improvements to buildings where the higher operating costs are borne by occupants (especially the case when building to lease).
- Modelling indicates current energy efficiency requirements in the NCC are not set at an optimal level to address the market failures and barriers.³ Potential NCC 2022 improvements could deliver bill savings to new home buyers and their renters of over \$650 each year in colder or tropical climates, such as Canberra, Townsville and Darwin, and around \$170 each year in more temperate climates, such as Sydney, Melbourne and Adelaide. While changes to commercial building would improve the bottom line of Australia's businesses and deliver a net benefit of \$25 billion to 2050.
- Changes in energy usage by buildings has a significant impact on the reliability of the energy grid. Buildings account for around 20 per cent of Australia's energy use,⁴ while the growth in household air conditioning is the major contributor to peak electricity demand, especially on hot summer afternoons. This is a key driver of investment in generation and network capacity.⁵

2 www.cleanenergyregulator.gov.au/About/Pages/News%20and%20updates/NewsItem.aspx?ListId=19b4efbb-6f5d-4637-94c4-121c1f96fcfe&ItemId=417

3 Market failures and barriers are addressed in the *Report for Achieving Low Energy Homes 2018* and *Achieving Low Energy Commercial Buildings in Australia*.

4 Department of the Environment and Energy, *Australian Energy Update 2017*, August 2017. Figures based on share of energy for residential, commercial and construction sectors.

5 Productivity Commission, *Electricity Network Regulatory Frameworks Productivity Commission Inquiry Report Volume 1*, No. 62, 9 April 2013, pages 16-17

- Buildings are long-lived and the impact of sub-optimal buildings built now will last for a long time. Two-thirds of non-residential buildings standing in 2050 will have been built or refurbished after 2019 and buildings currently account for 18 per cent of Australia's greenhouse gas emissions.⁶
- Industry is seeking certainty in order to drive innovation and remain competitive. ASBEC's *Built to Perform* report called on governments to commit to a step change in energy efficiency provisions in the NCC in 2022, while stakeholders involved in the residential and commercial Trajectory projects have requested policy certainty to enable them to plan and prepare for future changes to the NCC.

Updates of the Trajectory

The first stage of this Trajectory, which is outlined on the following page, considers opportunities for new buildings and NCC updates. Measures to transition existing buildings will be the focus for analysis work during 2019.

Future updates of the Trajectory will occur four years prior to each triennial update of the NCC. These updates will consider new opportunities and the changing cost effectiveness of measures.

⁶ Department of the Environment and Energy, *National Greenhouse Gas Inventory*. www.ageis.climatechange.gov.au. Figures based on share of greenhouse gas emissions for residential, commercial and construction sectors.

TRAJECTORY FOR LOW ENERGY BUILDINGS

(Note: Timelines for existing buildings measures are to be considered at the end of 2019)



Actions

In addition to the key steps outlined in the Trajectory on the previous page, the following actions should be undertaken. Details about these actions are provided in the *Report for Achieving Low Energy Homes* and *Achieving Low Energy Commercial Buildings in Australia*.

New buildings

Implement the Trajectory

- The trajectory towards 'zero energy (and carbon) ready buildings' should be used to provide direction and greater certainty for industry. *(This is the responsibility of the Council.)*
- Energy efficiency provisions should be substantially updated in NCC 2022 and 2025, and then revert to triennial revisions that ensure provisions keep pace with changing technologies and changing energy prices to facilitate progress towards zero energy (and carbon) ready buildings. *(The Building Ministers' Forum will determine the final policy changes to the NCC.)*
- Further work should be conducted to establish least cost approaches and practical implementation strategies and examples for achieving zero energy (and carbon) ready buildings through the NCC. *(This work will be undertaken by the Council and the Building Ministers' Forum as appropriate.)*

Every 3 years from NCC 2022

- Fuel conversion factors, which should be used to ensure the NCC is fuel neutral, should be updated based on the latest carbon intensities for different fuels. *(If agreed, updates would be made by the ABCB as required.)*
- Climate files should be reviewed and updated where required in the Nationwide House Energy Rating Scheme (NatHERS) and other modelling tools to better reflect the current, and potentially future, climate. *(This is the responsibility of the Council.)*

In NCC 2022

- The energy efficiency objective in the NCC should be updated to ensure the policy intent of including energy efficiency requirements in the NCC is communicated. The policy intent is to improve energy efficiency and reduce energy use, which has benefits of lower energy bills and improved comfort and health for occupants, saved energy and reduced wastage for the wider economy, improved resilience of buildings to extreme weather and blackouts (peak demand), and reduced carbon emissions. *(The Building Ministers' Forum will determine the final policy changes to the NCC.)*
- Changes to **residential building provisions** in the NCC should be decided following a Regulation Impact Statement (RIS) process, and ensure findings of initial modelling and other views as outlined in the *Report for Achieving Low Energy Homes* are considered. This includes: *(The Building Ministers' Forum will determine the final policy changes to the NCC and the ABCB work plan.)*
 - A fuel neutral annual energy usage budget should be quantified in the NCC and set at a level that delivers an overall Benefit Cost Ratio greater than 1:1. This budget should use a delivered energy (MJ/m²) and carbon

metric with a conversion factor for different fuel types at a jurisdictional level, to reflect the variation in carbon intensity of different fuels around Australia. This energy usage budget should consist of meeting a minimum thermal performance to deliver comfort and resilience, followed by meeting the remaining energy usage budget in a manner that reduces energy costs and peak demand.

- » The starting point for analysis should be based on thermal energy efficiency being increased to 6.5 stars equivalent (based on 2018 accredited NatHERS software) in tropical and temperate climates, such as Sydney, Perth and Darwin, and up to 7 stars equivalent in colder climates such as Melbourne, Canberra and Hobart, with a focus on well orientated and sized windows. The thermal performance requirements should also consider having a single level (i.e. 7 stars) set across a jurisdiction to support compliance.

In addition to thermal performance requirements, a flexible overall energy usage requirement should be set that allows for high efficiency appliance technologies, and be based on geographical and climatic conditions.

- » The starting point for analysis should be *equivalent* to the sum of (while allowing trade-off between): a new space conditioning appliance performance with equivalent coefficient of performance to 5 star gas heating or 4 star electric space conditioning; hot water performance equivalent to 5 star gas instant or a climate appropriate heat pump hot water system; and existing performance levels for lighting and pool pumps.
- Other appliance and fuel options with *equivalent* performance should be allowed to meet the flexible energy usage budget component, which should also be influenced by increases in thermal efficiency beyond minimum requirements, where they reduce space conditioning loads. This requirement should cover Class 1 houses, Class 2 sole-occupancy units, Class 3 residential buildings that operate like Class 1 homes (for example, retirement villages), and Class 4 parts of buildings. Rules should also be developed to ensure there are no perverse outcomes as a result of the use of the energy (and carbon) budget (such as under-sizing or post occupancy installation of appliances that will not comply with the energy budget specifications) to ensure the appliances installed are fit for purpose.
- Where appropriate, new buildings should have the capability to accommodate on-site renewable energy generation, storage and electric vehicle charging, by considering infrastructure (such as electrical conduit) and ensuring adequate roof space, pitch and orientation is available for future placement of infrastructure (such as photovoltaic panels).
- Where practical and cost effective, opportunities should be considered for setting a tighter annual energy (and carbon) usage budget for Class 1 and Class 3 residential buildings that operate like Class 1 homes (for example, retirement villages), and Class 2 common areas, with flexibility to achieve the additional performance through increased thermal or appliance efficiency beyond the minimum requirement or on-site renewable energy generation (possibly with batteries). For example, the energy usage budget could be tightened from 115MJ to 100MJ and the extra 15 MJ achieved by increased thermal efficiency beyond the minimum thermal requirement, increased efficiency of appliances, or through on-site renewable energy generation (note: this is an example only and the actual energy usage budget will be determined based on the outcomes of a RIS). Decarbonisation of the gas and LPG sectors could also assist in meeting a more stringent annual energy (and carbon) usage budget by reducing the gas conversion factors.
- Changes to building sealing, along with increases to split heating and cooling load limits, should be investigated. Any changes should give appropriate consideration to ventilation requirements to ensure there are no adverse impacts on condensation and indoor air quality, along with other requirements such as fire safety.
- NatHERS should be expanded to offer nationally accredited whole-of-home tools to enable verification of requirements in the NCC. (*This is the responsibility of the Council.*)

- Changes to **commercial building provisions** in the NCC should be decided following a RIS process, and should ensure findings of initial modelling as outlined in *Achieving Low Energy Commercial Buildings in Australia* are considered. This includes: *(The Building Ministers' Forum will determine the final policy changes to the NCC and the ABCB work plan.)*
 - Implementing energy efficiency upgrades that deliver a Benefit Cost Ratio greater than 1:1. This should include improvements to energy performance requirements for chillers and other items identified in the feasibility analysis in *Achieving Low Energy Commercial Buildings in Australia* and by ABCB experts.
 - Where appropriate, new buildings should have the capability to accommodate on-site renewable energy generation, storage and electric vehicle charging by considering infrastructure (such as electrical conduit) and ensuring adequate roof space, pitch and orientation is available for future placement of infrastructure (such as photovoltaic panels).
 - Current NCC provisions that allow for solar/renewable energy on non-residential buildings to be traded-off against other energy performance requirements, should be limited. On-site renewable energy should be encouraged where practical, but not to the unreasonable detriment of other provisions that bring comfort, health, resilience and amenity benefits to occupants. This is to take into account the declining cost of on-site renewables.
 - Consider where practical and cost effective introducing on-site renewable energy requirements for some commercial building types.
 - Changes may need transitional periods for industry to respond.

In NCC 2025

- Additional cost-effective changes to building energy efficiency provisions in the NCC should be assessed as part of a RIS process. This includes: *(The Building Ministers' Forum will determine the final policy changes to the NCC and the ABCB work plan.)*
 - Further increases in thermal and appliance energy efficiency beyond NCC 2022 that deliver a Benefit Cost Ratio greater than 1:1. The move to climate or jurisdiction-specific requirements, and changes in energy technologies and energy prices, is likely to see opportunities that offer a net benefit. For residential buildings, this should include cost effective improvements to lighting, space conditioning and renewable energy.
 - Giving consideration to whether the thermal performance requirements should set an internal comfort range for buildings, to maximise comfort and health benefit outcomes.
 - Giving consideration to facilitating and off-setting electric vehicle energy usage.
 - Introducing on-site renewable energy requirements for some residential building types where practical and cost effective.

In NCC 2028

- Changes in 2028 and beyond are likely to involve incremental triennial revisions which ensure provisions keep pace with changing technologies and movements in energy prices, and facilitate progress towards zero energy (and carbon) ready buildings. *(The Building Ministers' Forum will determine the final policy changes to the NCC and the ABCB work plan.)*

Ongoing

Measures currently underway for new buildings that support the delivery of improved energy efficiency should continue to be implemented and reviewed over time. This includes strengthening of compliance through NEPP measure 32, and developing and improving education, training and tools/calculators.

Existing buildings

Existing (pre-building standards) buildings offer the greatest potential for energy efficiency improvements. Options for improving these will be considered by the Council when considering the 2019 NEPP Work Plan review, which includes consideration of existing initiatives that align with this Trajectory, such as:

- *NEPP measure 2.1: Market mechanisms to capture societal benefits—jurisdictional schemes.* State and territory energy savings schemes reduce household and business energy bills, reduce greenhouse gas emissions, facilitate energy efficiency building improvements and put downward pressure on demand in the wholesale energy markets. Australian governments have been working together to improve and maximise the benefits to consumers from the respective energy savings of energy efficiency schemes. This includes aligning activities and reducing red tape where appropriate, while ensuring that schemes continue to deliver high quality outcomes, and further expanding opportunities for consumers to reduce their energy costs, and continuing to grow jobs and skills in each state or territory's energy efficiency sector.
- *NEPP measure 3: Making choice in energy services easier.* Australian governments recognise that the current market transition with increasing choice in energy services, tariffs and technologies can provide strong consumer benefits. However, this greater choice also increases complexity and could increase risks of bill shock for some consumers. Choice needs to be supported by the right tools and customer information to avoid adverse impacts. Therefore Australian governments have been working on a number of projects that support the improvement of tools to help simplify energy choices and continue to spur innovation in terms of energy products and services.
- *NEPP measure 4: Supporting best practice services for vulnerable consumers.* Low-income consumers are particularly vulnerable in the transitioning energy market. They are facing a combination of rising energy prices and low wage growth, and have a limited capacity to address the increased complexity of decisions in regards to energy usage. This risks further increasing the likelihood that low-income consumers will experience energy poverty unless they receive support specifically tailored to their needs. Australian governments have been working with Energy Consumers Australia and other stakeholders to reduce the barriers to vulnerable consumers effectively engaging with energy productivity measures and services.
- *NEPP measure 5: Improving residential building ratings and disclosure.* Most Australians are unaware of how their homes perform, the benefits of energy efficiency and the options for improvements. Home buyers and renters need better information about their home's energy performance when they are choosing homes or renovating, expressed in terms of their likely energy bills, comfort and liveability. It is also important for the building sector to have easy to use, clear and comparable tools. Building on the COAG Energy Council's agreement to a national collaborative approach to residential building ratings and disclosure, jurisdictions are sharing information about existing and proposed schemes in each jurisdiction to inform future policy development, including testing Victoria's Residential Efficiency Scorecard's assessment tool.

- *NEPP measure 9: Expand commercial building ratings and disclosure.* The review of the Commercial Building Disclosure scheme identified benefits of mandatory disclosure for both tenants and building owners. There are also benefits to buildings energy performance through the wider use of ratings schemes, such as the NABERS, the expansion of ratings to all classes of buildings, and expanding mandatory disclosure to high energy using classes of building.
- *NEPP measure 12: Improve energy productivity in government operations.* The minimum energy performance standards (which vary depending on the type and use of the building) apply to government owned or leased buildings in most jurisdictions.
- *NEPP measure 30: Delivering a new Equipment Energy Efficiency (E3) prioritisation plan.* Through the E3 program, governments are increasing the energy efficiency of new appliances and equipment through mandatory energy performance standards and the energy rating label. Appliance regulations save the average Australian household between \$140 and \$220 on their electricity bill each year (about 10 to 15 per cent of the average annual bill). The E3 work program has been prioritised to ensure that opportunities to save energy, lower energy costs for households and business and reduce greenhouse gas emissions, are realised as soon as possible. The E3 work program includes new and enhanced regulations for air conditioners, domestic refrigerators and freezers, hot water systems, industrial products, lighting, non-domestic fans, refrigerated storage and display cabinets, swimming pool pumps and televisions.
- *Finkel 6.6: Improving access for low-income households to distributed energy resources and energy efficiency programs.* The *Independent Review into the Future Security of the National Electricity Market* (the Finkel Review) Recommendation 6.6 identified the need to improve access for low-income households to distributed energy resources and energy efficiency programs. Recognising that many jurisdictions already have measures in place to support low-income consumers, Australian governments are working to consolidate jurisdictional learnings.
- *Other state and territory initiatives:* There are a number of state and territory initiatives that aim to improve the energy efficiency of existing buildings. These measures are at various stages of implementation, with many being used to inform other COAG Energy Council measures.

