Decision Regulation Impact Statement on the energy efficiency of chillers

Liquid-chilling packages using the vapour compression cycle

2024

A joint initiative of Australian, State and Territory and New Zealand Governments

Acknowledgement of Country

We acknowledge the Traditional Owners of Country throughout Australia and recognise their continuing connection to land, waters and culture. We pay our respects to their Elders past and present.

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Executive summary

This Decision Regulation Impact Statement (DRIS) considers liquid-chilling packages using the vapour compression cycle, more commonly known as chillers. The Australian Government Department of Climate Change, Energy, the Environment and Water (the Department) has prepared this DRIS on behalf of the Equipment Energy Efficiency (E3) Program.

Chillers produce chilled water that is used by space cooling equipment in buildings and many industrial processes. Heat is removed from a circulating cold water loop and discharged to the outside air. This occurs through a cooling tower (in the case of water-cooled chillers) or through an air-cooled condenser (in the case of air-cooled chillers). Some chillers are also able to operate in reverse cycle, that is for heating rather than cooling.

Chillers within the scope of this DRIS are generally used for commercial air conditioning. The focus on chillers primarily designed for human comfort is given effect by specifying which inlet and outlet temperatures are within scope, in addition to certain exclusions based on particular components such as chromium heat exchangers. The E3 program sets requirements for products at the point of sale, not at the point of installation. It is difficult for suppliers to control the installation and application of their products, so the efficiency regulations in both Australia and New Zealand are not suitable for regulating flexible pieces of equipment such as chillers based on end-use installation.

There is a combination of regulatory limitations and market failures for the energy efficiency of chillers that are contributing to unnecessary electricity use in Australia and New Zealand. Reductions in electricity consumption can lower greenhouse gas (GHG) emissions and help to meet government GHG emissions commitments. Reduced electricity use can also reduce stress on electricity grids and reduce the risk of load shedding and blackouts, as well as reducing energy costs for end users. In the European Union (EU) chillers are responsible for 21% of total electricity use for space cooling for human comfort, equivalent to the share used by air conditioners. While comparable data is not available the proportion of electricity used by chillers is also likely to be a significant portion of energy use for human comfort in Australia and New Zealand.

This DRIS recommends policy options to improve Australia's and New Zealand's chiller energy efficiency requirements and harmonise with EU and United States' (US) requirements. It also proposes to broaden the scope of coverage of chillers to include smaller chillers and some types of chillers that are not covered in the current determination and regulation on chillers. The package of changes included in the policy options are set out below.

In Australia and New Zealand minimum energy performance standards (MEPS) are in place through a combination of requirements in an Australian determination, New Zealand regulations and building codes in both countries. These measures have largely achieved their objective by promoting the development and adoption of energy efficient chillers. However, there are aspects of the requirements where there is scope for significant simplification and harmonisation changes to be made which can remove some adverse consequences and improve energy efficiency.

The proposed government action would bring closer alignment between the MEPS requirements for chillers set out in a determination made under the *Greenhouse and Energy Minimum Standards Act 2012* (the GEMS Act)[1] and in the National Construction Code (NCC) in Australia, and the *Energy Efficiency (Energy Using Products) Regulations 2002* and Building Code in New Zealand.[2]

The current determination/regulations (efficiency regulations) cover chillers with a capacity of more than 350 kilowatts (kw) and apply a modest MEPS level to them. In contrast the building codes cover chillers of all capacities but only where the chillers are installed in a new building of a type that is covered by the energy efficiency requirements of the building codes. Where captured by building code requirements significantly more stringent levels of MEPS apply. Where a chiller below 350 kw capacity is installed as a replacement chiller currently no MEPS apply.

The policy proposals in this RIS complement the existing building code measures by bringing the energy regulation MEPS more closely into alignment with the building codes and extending the energy regulation's coverage to chillers in the 100 kw -350 kw capacity range regardless of which type of building they are installed in or whether they are a replacement chiller or not, providing a more consistent approach across the chillers marketplace. The MEPS proposals included in the policy options are summarised below and set out in detail in Tables 3 to 15 in Chapter 4.

The Australia/New Zealand specific test standard for chillers results in higher regulatory burden than is necessary by requiring suppliers to re-rate their chillers. This can be removed to align with international standards without jeopardising the energy efficiency of chillers supplied in Australia and New Zealand.

E3 has consulted with suppliers and manufacturers to determine which recommendations to make to resolve these issues. The discussion and recommendations in this DRIS focus

[1] GEMS Act 2012

[2] MEPS are called "minimum Energy Efficiency Ratios (EERs)" in the NCC. For simplicity references to MEPS in the NCC should be taken as referring to minimum EERs.

on the appropriate registration pathways and coverage of the measure based on considerations of feedback provided in response to a range of consultation papers.

In 2016 a Consultation RIS covering both chillers and air conditioners was released. Both appliances are used for space conditioning for human comfort and there is some overlap in terms of larger air conditioners and smaller chillers providing technical solutions to the same space conditioning needs. Over time there proved to be little common ground in terms of issues and stakeholders, and the two projects were progressed separately.

Over the following years a range of proposals, consultation papers, meetings and calls for written submissions followed. The policy positions proposed moved considerably over time in response to industry feedback and changes in international regulation of chillers before a broadly agreed path forward was developed. The details of these consultations are covered in Chapter 6.

In general industry feedback supported the retention of MEPS for chillers, broadening the range of chillers covered by MEPS in terms of both capacity and type, and aligning with international certification approaches.

Options considered in this RIS

Four options are considered in this RIS.

- Option A is Business as Usual, where no changes are made to the existing efficiency regulations governing chillers.
- Options B, C and D propose the same suite of changes to the regulatory arrangements but differ in some of the timing and level of MEPS they propose.

Option A, Business as Usual, assumes no changes to existing requirements in Australia and New Zealand.

Under Option A MEPS requirements in the efficiency regulations apply to chillers above 350 kw. They are required to meet both:

- Coefficient of Performance (COP) – the ratio of full load cooling capacity divided by power input (the same as Energy Efficiency Ratio (EER) for air conditioners which measures cooling efficiency, whereas COP for air conditioners measures heating efficiency); and
- IPLV (Integrated Part Load Value) – a 'seasonal' metric that combines energy efficiency at 25, 50, 75 and 100% load points.

The MEPS remain unchanged, and significantly below MEPS levels set in the building codes.

Replacement chillers below 350 kw and chillers below 350 kw in buildings not covered by building code chiller requirements continue to have no energy efficiency requirements.

A unique Australian/New Zealand standard (AS/NZS 4776) is used under the regulations, whereas the US standard Air Conditioning, Heating, & Refrigeration Institute [of the United States of America] (AHRI) 551/591 applies under the building codes (i.e. 2 different test standards). The Australian/New Zealand Standard no longer covers some of the recent technology changes in the chiller market. While AS/NZS 4776 provides the option of using Eurovent or AHRI certification to demonstrate compliance with MEPS, suppliers need to obtain the standard to know how they can utilise these alternate compliance pathways.

Reverse cycle and heat pump chillers, adiabatic chillers, heat recovery chillers, chillers with centrifugal fans remain unregulated for energy efficiency.

Only chillers with application outlet temperatures (leaving chilled water temperature) of between 4°C and 9°C would be covered by the regulations.

Regulatory changes proposed in each of options B, C and D

Options B, C and D all include the regulatory changes set out below but include different MEPS proposals.[3]

Removing certification through AS/NZS 4776, leaving AHRI and Eurovent certification as the pathways. This is covered in more detail at section 4.2.2.

Scope

The other regulatory changes are focused on the coverage of the measure.

The measure would be extended to include chillers in the 100 kw -350 kw size category. This is covered in more detail at section 3.4.1.

The regulatory changes and clarifications for rating conditions are covered in section 4.2.4. They are:

- Cooling capacity shall be determined under the standard rating conditions of an inlet temperature of 12°C and an outlet temperature of 7°C using water as the primary fluid
- Chillers only able to heat would be rated at an inlet temperature of 30°C and an outlet temperature of 35°C
- Reverse cycle and polyvalent chillers are rated on their cooling capacity

Section 3.3 covers in more detail the inclusions and exclusions listed below:

- Heat recovery chillers were previously excluded but would now be included, and would be tested with the heat recovery feature inactive
- Chillers with centrifugal fans were previously excluded but would now be included
- Reverse cycle chillers (chillers that can heat or cool) and polyvalent (‘4 pipe’) chillers (that can heat and cool simultaneously) were previously excluded but would now be included. They would have to meet MEPS on heating or cooling (but not both). Six pipe chillers would continue to not be covered as they are not covered by either certification scheme.

[3] With the inclusion of reverse cycle and polyvalent chillers heating MEPS levels are also imposed under Options B, C and D but these are the same levels regardless of the option. The details of these MEPS levels are set out in Chapter 4.

- Chillers that heat or cool potable water would be excluded where their full heating or cooling capacity is used for this purpose, otherwise they would be in scope. The existing efficiency regulations do not explicitly address chillers that heat or cool potable water.
- Chillers with titanium heat exchangers will be excluded. The existing efficiency regulations do not explicitly address chillers with titanium heat exchangers.
- Free cooling chillers were previously excluded but would now be included, except for air-cooled free cooling loop chillers that would continue to be excluded. This exclusion is in line with the approach of the Eurovent certification system.
- Adiabatic chillers will be excluded. In 2017 the GEMS Regulator had ruled these were in scope of the current regulations and should be treated as air-cooled chillers.
- The range of outlet water temperatures be increased from between 4°C and 9°C to between 4°C and 12°C for cooling applications, which matches the upper limit of Europe's comfort chiller regulations.
- Exclude reverse cycle pump chillers with heating application outlet temperatures of >56°C. As reverse cycle chillers were not previously included under the efficiency regulations such a limitation was not necessary.

MEPS

Chillers are often designed to be optimised for a particular usage pattern, with some favouring higher efficiency levels at full load whereas others are optimised for part load or seasonal energy efficiency. The current arrangements impose MEPS for both full load and part load performance without allowing any differentiation for specialisation.

The MEPS proposed in Options B, C and D provide registrants with a choice of MEPS pathways. They still have to meet MEPS levels for full and part load, but they are given a choice of meeting MEPS that are more stringent on full load performance or MEPS that are more stringent on part load performance. In all cases, the MEPS in Options B, C and D are higher than the existing MEPS under Option A.

The difference in the MEPS in Options B, C and D are in their treatment of positive displacement water-cooled chillers. Option B gives them an additional year before they have to match the higher MEPS that are required of centrifugal water-cooled chillers from the commencement of the new regulations. Option C only provides this year of lower MEPS to the smallest (100-350 kw) chillers, which are not currently subject to the energy efficiency regulations, while option D imposes the same tougher MEPS level on both types of water-cooled chillers from the commencement of the measure. These high level differences are set out below with the detail of the MEPS level for each type of chiller and each capacity class under each pathway and under full or part load conditions set out in Chapter 4.

All four options, including option A business as usual:

- provide a choice of AHRI or Eurovent pathway for meeting MEPS
- have different MEPS levels for air-cooled and water-cooled chillers.

Options B, C and D all have more stringent MEPS than option A and provide a choice of full load or part load focused MEPS.

In regard to whether the option has less stringent MEPS for positive displacement water-cooled chillers than centrifugal water-cooled chillers:

- Options A and D do not have different MEPS on this basis
- Option B has different MEPS for the first year of the measure and
- Option D has different MEPS for the first year of the measure for chillers of 100-350 kw capacity.

Summary of cost benefit analysis

Below are the central estimates from the cost benefit analysis for the scenarios analysed in this DRIS. Note that there is no separate calculation provided for Option C. While the figures for Option C would fall somewhere between Option B and Option D, the difference between Option C and Option B is too small to be material.

Table 1 Cost benefit analysis summary Australia

Proposal	Energy saved (cumulative GWh to 2040)	GHG emission reduction (cumulative) kt	Total benefit ($M)	Total investment ($M)	Net benefit ($M)	BCR
Option B	1,358	206	$150	$28	$121	5.3
Option D	1,383	212	$153	$29	$123	5.2

Note: This table uses discount rates of 7% for Australia

Kt = kilotonnes CO2-e

BCR = benefit-cost ratio

Table 2 Cost benefit analysis summary New Zealand

Proposal	Energy saved (cumulative GWh to 2040)	GHG emission reduction (cumulative) kt	Total benefit ($M)	Total investment ($M)	Net benefit ($M)	BCR
Option B	37	2.0	$4	$1	$2	3.2
Option D	38	2.0	$4	$1	$2	3.2

Note: This table uses discount rates of 5% for New Zealand

These results show that there is an overall net benefit for introducing more stringent MEPS compared with keeping the current efficiency regulations in both Australia and New Zealand. Note the benefits calculated to flow from the measure are influenced by how the effect on the overall chillers market of the building codes increasing their chiller MEPS levels in advance of the energy efficiency regulations is treated. In the cost benefit analysis a conservative approach was taken in estimating the size of the sector of the market currently not subject to MEPS. Given the limitations in the availability of market data and registration data for this sector, it is possible that the benefits from the proposed options may be significantly larger than the levels used in the cost benefit analysis.

Recommendations

This DRIS recommends the regulatory changes below to overcome the market failures and regulatory limitations as follows.

- Adopt the MEPS proposed in Option D. This option does not provide any period of lower MEPS for water-cooled positive displacement chillers of any capacity. All water-cooled chillers would be required to meet the same MEPS levels from the commencement of the measure.
- Compliance pathways: Remove the option of compliance under the Australian/New Zealand chiller test standards.
- Compliance pathways: Require AHRI or Eurovent certification or testing under AHRI or Eurovent conditions.
- MEPS: Levels and pathways: Replace the current arrangements that impose MEPS levels for full and part load based purely on capacity and whether a chiller is air or water-cooled. Introduce new MEPS that provide different requirements for chillers optimised for full load versus those optimised part load and seasonal performance, while retaining MEPS levels for full load performance in all cases.
- MEPS: Levels and pathways: Retain the current arrangements of applying MEPS to water-cooled chillers based on their capacity, rather than set separate MEPS for water-cooled chillers based on whether they are positive-displacement or centrifugal technology.
- MEPS: Ratings conditions: Focus the measure on chillers for space heating for human comfort by applying coverage to a specified range of inlet and outlet temperatures that cover those types of chillers.
- Scope: Capacity: Cover smaller (less than 350 kw, but not less than 100 kw) chillers in addition to the existing scope (350 kw and above).
- Scope: Treatment, inclusions and exclusions of different types of chillers: Resolve the coverage of different types of chillers to expand coverage where those types of chillers are covered by both AHRI and Eurovent certification or reasonable translations between them can be made, as well as to close loopholes and cover expanding sectors of the market, such as reverse cycle chillers, that are not covered by the current measures.
- GEMS Determination (Australia only). Delegate approval of any new GEMS determination for chillers to the Energy Efficiency Working Group.

1 Background and context

This chapter explains the type of document this is and the program that the document was created for.

1.1 Decision Regulation Impact Statement

This DRIS makes recommendations to update Australia's and New Zealand's chiller energy efficiency requirements and harmonise the testing arrangements with the EU and US certification systems. It also makes recommendations on the coverage of the measure, proposing including chillers between 100 kilowatts (kw) and 350 kw capacity as well clarifying which types of chillers are covered by the measure. Input and submissions from stakeholders have been considered in the development of these recommendations.

This document has been developed by the Australian Government Department of Climate Change, Energy, the Environment and Water (the Department) – on behalf of the Equipment Energy Efficiency (E3) Program[4] - in accordance with the *Regulatory Impact Analysis Guide for Ministers' Meetings and National Standard Setting Bodies*[5] and in consultation with the Office of Impact Assessment (OIA)[6]. The cost benefit analysis was provided by EnergyConsult.

This document covers the 7 standard RIS questions[7]:

1. What is the policy problem to be solved?
2. Why is government action needed?
3. What policy options are being considered?
4. What is the likely net benefit of each option?
5. Who was consulted and was their feedback incorporated?
6. What is the best option from those considered?
7. How will the chosen option be implemented and evaluated?

The following principles are considered in this DRIS:

- Harmonisation with certification arrangements by both the main EU and US certification agencies

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[4] Energy Rating website
[5] Regulatory Impact Analysis Guide for Ministers' Meetings and National Standard Setting Bodies, June 2023
[6] Home | The Office of Impact Analysis (OIA) was formerly known as the Office of Best Practice Regulation (OBPR).
[7] The 7 Impact Analysis questions | The Office of Impact Analysis

- Reducing greenhouse gas emissions
- Reducing the regulatory burden on industry and government
- Enabling improved compliance measures.

1.2 E3 Program

The E3 Program is an initiative of the Australian Government, states and territories and the New Zealand Government. It provides for an integrated program of energy efficiency standards and energy labelling for appliances and equipment in Australia and New Zealand. The E3 Program operates under the GEMS Act in Australia and the *Energy Efficiency (Energy Using Products) Regulations 2002* under the *Energy Efficiency and Conservation Act* (EEC Act)[8] in New Zealand.

The E3 Program is overseen by Energy and Climate Change Ministerial Council (ECMC)[9], who are advised on energy efficiency matters by the Energy Efficiency Working Group (EEWG), which is made up of officials from participating jurisdictions and New Zealand. The Australian Government Department of Climate Change, Energy, the Environment and Water (the Department) prepared this DRIS on behalf of EEWG and the E3 Program (E3).

In Australia, chillers are regulated under the provisions of the *Greenhouse and Energy Minimum Standards (Liquid-chilling Packages Using the Vapour Compression Cycle) Determination 2012*.

In New Zealand, chillers are regulated under the *Energy Efficiency (Energy Using Products) Regulations 2002* (‘the NZ Regulations’). In this paper, determinations and the regulations are collectively referred to as ‘efficiency regulations’.

[8] EEC Act

[9] Energy and Climate Change Ministerial Council | energy.gov.au

2 What is the problem?

This chapter sets out the issues that the policy proposals in this document are addressing and why the current arrangements are no longer sufficiently addressing these issues.

2.1 Overview

There are a combination of regulatory limitations and market failures in the energy efficiency of chillers that are contributing to excessive electricity use in Australia and New Zealand. These problems are described in the sections below.

The operation of inefficient electrical appliances and equipment increases electricity demand above what it otherwise would be. This increased demand requires increased investment in electricity generation, transmission and distribution, which increases the cost of electricity supplied to all households and businesses. Increased electricity use also contributes to increased GHG emissions, which contributes to climate change. At a consumer level, increased electricity use increases utility bills.

Reductions in electricity consumption can lower GHG emissions and help to meet government GHG emission commitments. Reduced electricity use can also reduce stress on electricity grids and reduce the risk of load shedding and blackouts. Energy efficiency can help reduce the need to add expensive new power generation or transmission capacity and reduce pressure on energy resources.

Energy efficient appliances use less electricity to achieve the same level of performance as similar models with the same size or capacity. The more energy efficient a model, the less energy it will use and the less it will cost consumers to run. While in Australia the emissions intensity of electricity has been steadily decreasing with the gradual decarbonisation of the electricity grid, significant emissions reductions can still be made from energy efficiency improvements, particularly where regulatory limitations and market failures exist.

In Australia, the GEMS Act objectives include promoting the development and adoption of products that use less energy or produce fewer greenhouse gases. In New Zealand, the purpose of the EEC Act includes the promotion of energy efficiency and energy conservation.

The current regulatory arrangements also impose higher costs than necessary, have led to difficulties in compliance and administration, and through some uneven coverage may have created market distortions that favoured less efficient or less cost-effective chillers.

This DRIS assesses and makes recommendations regarding the revision and updating energy efficiency requirements for chillers in order to better meet the policy objectives of the Australian GEMS and New Zealand EEC Acts, and to harmonise with major international markets. International harmonisation reduces costs and trade barriers for manufacturers and suppliers.

While Australia's National Construction Code (NCC) and New Zealand's Building Code (NZBC) already incorporate energy efficiency requirements that in many cases match the proposed stringency in this RIS there remain gaps in coverage under the current arrangements. For example the recommendations would expand the coverage of the measure to include replacement chillers between 100-350 kw in capacity that are not currently covered by energy efficiency requirements in building codes in Australia or New Zealand. There are also other significant gaps in the building codes coverage of this sector of the market, for example the chiller MEPS requirements in New Zealand Building Code (NZBC) only apply to commercial and industrial buildings, excluding buildings such as hotels, cinemas, schools and swimming pool complexes. The MEPS included in the policy proposals in this document are targeted at those chillers used for human comfort regardless of which type of building they are installed in or whether they are a replacement chiller or not. In addition growing sectors of the market such as reverse cycle chillers are also not currently covered by either the efficiency regulations or the building codes but would be covered by the policy proposals.

2.2 Energy use and greenhouse gas emissions

Chillers consume significant quantities of electricity. For example, in the EU chillers are responsible for 21% of total electricity use for space cooling for human comfort, equivalent to the share used by air conditioners[10]. Electricity usage costs are unnecessarily high because people continue to buy chillers that are not the most energy efficient on the market. The reasons for this are discussed below.

MEPS for chillers were introduced in Australia's NCC in 2005[11]. In 2008 an Australian/New Zealand standard[12] was introduced that included MEPS but these MEPS did not become a legal requirement until 2012 in Australia and 2011 in New Zealand. While the legal requirements removed the worst performing chillers from the market, there have only been relatively modest improvements in the general energy efficiency of chillers supplied in Australia and New Zealand beyond the levels set in the 2008 standard, compared to what is technically achievable. It is likely that in the absence of more stringent MEPS, further efficiency gains in these markets will be relatively slow to materialise.

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[10] European Commission Ecodesign Impact Accounting Overview Report 2023, p.32.

[11] Building Code of Australia 2005 Volume 1 Class 2 to Class 9 buildings, J5.4(d), p.376

[12] Australian/New Zealand Standard 4776.2:2008 Liquid-chilling packages using the vapour compression cycle: Part 2: Minimum energy performance standards (MEPS) and compliance requirements (AS/NZS 4776.2:2008)

While proposed future MEPS were included in Australian/New Zealand Standard 4776.2:2008 Liquid-chilling packages using the vapour compression cycle: Part 2: Minimum energy performance standards (MEPS) and compliance requirements (AS/NZS 4776.2:2008)[13] these were not implemented. Since 2008, the US and EU have tightened their MEPS, stimulating product energy efficiency improvements, reducing emissions and reducing energy costs. While some very efficient models are already sold in Australia and New Zealand, other less-efficient models continue to have a significant market share. Moving the market towards the already available more efficient models would deliver considerable emissions abatements and energy cost savings.

The energy efficiency of chillers is important because although the absolute numbers of chillers sold in Australia and New Zealand are modest, compared to many other products regulated for energy efficiency the total energy use per chiller is high. Chillers also tend to be long lived appliances so decisions made today about which chiller to install have consequences for a decade or more into the future. Feedback from industry suggests that with the move away from gas boilers to electrification of buildings the market for chillers is expected to expand over the coming decade.

It is proposed to expand and clarify the coverage of different types of chillers in order to avoid unintended consequences of some of the current inclusions and exclusions. For example reverse cycle chillers, that is chillers that are capable of heating and cooling, are currently excluded from MEPS. Industry sources have indicated that this is a potential loophole allowing inefficient chillers to enter the Australia and New Zealand markets. With reverse cycle chillers forming a growing portion of the market the potential to exploit this loophole is increasing. The changes to scope will improve the integrity and consistency of the scheme.

2.3 Barriers – split incentives

Unlike consumer products where the purchaser of the product will in most instances be the person paying the electricity costs associated with use of the product, there is often a split incentive issue with regard to chillers. Chillers are most commonly used in large commercial premises which are often leased to tenants. While the builder or building owner will bear the cost of purchase and installation of the chiller, the operational cost of the chiller is passed on to tenants. While the building owner has an incentive to purchase the cheapest chiller it is the tenants that bear the costs of this decision if efficiency is sacrificed for a reduction in upfront costs. This situation constrains the uptake of energy efficient products and contributes to unnecessarily high energy bills, high externality costs from GHG emissions and peak loads on electricity distribution networks. Without up to date energy efficiency requirements, the guarantee that the products will be cost-effective

[13] AS/NZS 4776.2:2008, Section 5 Table 2, p.5.

over their life-time is lost. This is especially important for certain groups of consumers, in particular those in a landlord-tenant situations, where the landlord buys the appliance and the tenant pays the energy bills.

2.4 Regulatory issues

This section sets out some of the shortcomings of the current regulatory arrangements.

2.4.1 Superseded test methods

Australia and New Zealand have a long-standing policy of harmonising with international energy efficiency standards, wherever it is possible and reasonable to do so. This reduces trade barriers as well as costs to industry and consumers.

The current regulatory arrangements allow registrants to demonstrate compliance with MEPS through either:

- a physical test report to the local test standard AS/NZS 4776.1.1:2008 Liquid-chilling packages using the vapour compression cycle: Part 1.1: Method of rating and testing for performance – Rating (AS/NZS 4776.1.1:2008); or
- a certificate from the US's AHRI; or
- a certificate from the EU's equivalent scheme, Eurovent.

Even where suppliers use the AHRI or Eurovent certification pathways, they still need to obtain AS/NZS 4776 to know how to utilise the AHRI and Eurovent compliance pathways as the requirements for use of these pathways (including the MEPS) are currently set out in the local test standard. AS/NZS 4776 gives a set of standard rating conditions that means products using the different overseas ratings need to be re-rated to these specific parameters to normalise the results.

There are also problems with allowing the use of the Australia/New Zealand test standard as a pathway to registration. AS/NZS 4776 was based on a draft International Organisation for Standardisation (ISO) standard which was abandoned in 2013. It does not cover all relevant chiller technology types and features and is causing difficulties for regulators and for the small proportion of applicants that utilise this compliance pathway. Further, the local standard has so little support that it has been withdrawn by Standards Australia.[14]

There is one manufacturer of chillers in Australia and none in New Zealand. Most of the product in both markets is imported. The chiller manufacturer in Australia also has manufacturing facilities overseas and operates as part of the global market.

For globally traded products, such as chillers, having a unique test method standard in Australia and New Zealand adds to testing costs for suppliers, because they cannot re-use

[14] The withdrawn status indicates that the standard is no longer relevant. Standards Australia will not undertake further work to maintain or update a withdrawn standard. It is still possible for a withdrawn standard to be used within an industry or reference by a government if they choose to do so.

test results that are required in other markets. Use of these out of date standards, rather than an updated, internationally recognised and employed test methodology, imposes an unnecessary regulatory burden and cost on manufacturers and suppliers.

2.4.2 Coverage and consistency issues

Government action is needed to address regulatory limitations with the current energy efficiency requirements for chillers. In some circumstances, the requirements are distorting the market for these products.

2.4.2.1 Overlapping coverage and differences between the energy efficiency regulations and building codes

The MEPS requirements for chillers:

- are divided between the GEMS Act and the NCC in Australia;
- are divided between the Building Code and Energy Efficiency (Energy Using Products) Regulations 2002 in New Zealand;
- are inconsistent between the energy efficiency regulations and the building codes; and
- have different spans of coverage (types of chillers) between the energy efficiency regulations and the building codes.

The specification of MEPS requirements for chillers in separate regulations is the result of a piecemeal approach to energy efficiency policy development. The initial government requirements in Australia for the energy efficiency of chillers pre-dated the GEMS Act and were implemented through the NCC. It was subsequently decided to apply energy efficiency requirements to chillers under the E3 program. The 2008 decision to apply MEPS to chillers larger than 350 kw under the E3 Program was made following consultation with industry and took into account the lack of local testing capacity for the smaller products (i.e. less than 350 kw). Subsequently chillers up to 350 kw were regulated under the NCC and those over 350 kw were regulated under E3 program through the GEMS Act. This approach is not ideal and does not utilise the respective strengths of the 2 regulations.

The building codes have now expanded their coverage include the full capacity range for chillers. The MEPS levels were tightened under the building codes in both countries in anticipation of the introduction of the MEPS levels proposed in earlier consultation documents following on from the Consultation RIS released in 2016. Implementation of the changes proposed in this document would bring the requirements in terms of both MEPS and coverage closer together. Further details on the differences between the regulations and the building codes are discussed in Chapter 3.

2.4.2.2 Gaps in coverage

Chillers come in a wide variety of types and capacities. In regulating this product it is necessary to be very clear as to which of these products are and are not covered by the regulations. Feedback from industry has indicated that some of the distinctions and categorisations made in the 2012 Determination and 2011 New Zealand regulations are no longer appropriate or defensible. Issues around the treatment of:

- reverse cycle and heat pump chillers;
- adiabatic chillers;
- heat recovery chillers; and
- chillers with centrifugal fans are discussed in Chapter 3.

Currently only chillers with application outlet temperatures (leaving chilled water temperature) of between 4°C and 9°C are covered by the energy efficiency regulations. This excludes a number of chillers with slightly higher outlet temperatures that are covered by the EU's 'comfort chillers' regulations. The adjustment of the outlet temperature range is considered in Chapter 3.

2.4.3 Administrative and compliance issues

Product registration is required for products in Australia subject to MEPS, labelling, and other GEMS requirements under the GEMS Act, where products are "supplied, offered for supply, or used commercially". New Zealand registrations are required by the NZ regulations before a product is sold.

The current approach to registration is not suited to the bespoke nature of chiller sales. Differing interpretations of how to apply the requirement to register products when offered for supply, and of how to apply family of model requirements[15] have led to inconsistent approaches from companies applying to register chillers and in the treatment of those applications. The capacity (cooling power output) of a single large chiller can be varied according to the application for which it is being sold. For instance, 2 physically identical chillers could be rated at 1200 kw and 1400 kw, or anything in between. These are treated under the efficiency regulations as separate models requiring separate registrations, because they have different energy performance characteristics, despite being identical equipment. This is because the efficiency regulations set out the circumstances in which 2 or more products are considered the same model. These circumstances are when the products have the same:

- technical specifications, as they relate to compliance with the efficiency regulations;
- brand or trademark used in supplying or offering to supply the products; and
- unique model identifier.

Some suppliers are getting around this problem by grouping multiple products into a single registration; sometimes as a family registration, even though they technically do not

[15] The efficiency regulations allow, under certain circumstances, for multiple models to be registered under a single registration as a 'family' of models. The specific requirements for appliances are set out in the relevant determination or schedule of the efficiency regulations. For chillers the current requirements for models to qualify as part of the same family are that they must: be of a single brand; rely on the same test report; have the same physical characteristics that are relevant to complying with MEPS requirements; and have the same energy performance characteristics including rated energy consumption, rated capacity and energy efficiency.

fall within the family definition set out in the determination. Others are using a single registration with 'wildcards' in the model number.

The current efficiency regulations do not make it clear whether registrations should be based on nominal performance or the performance of each chiller as supplied. Furthermore, there has been confusion as to whether a catalogue of nominal models constitutes an offer to supply (in Australia), which would trigger the requirement to register all products in a catalogue.

In addition, the exact model numbers and capacities of large chillers are often not fixed until a customised product is ordered. For instance, the rated capacity (in kilowatts) may form part of the model number string. The exact capacity, however, is specified by the buyer, based on their building's requirements.

A review of chillers registered under the current determination has shown some approved applications cover physically different models under one registration (for example they cover different compressors), which shows that even the assessors are not sure of the registration requirements for chillers.

Some stakeholders have raised concerns that some chillers are being registered with a rated capacity that meets MEPS to achieve compliance, but sold later at a higher rated capacity, at which point the chiller does not meet MEPS. Submissions have suggested that disclosing a maximum MEPS compliant capacity would solve this issue, although some have suggested that there should be a tolerance on this maximum capacity.

The recent clarification to the meaning of "offer to supply" through the changes to the GEMS Act have addressed some of the difficulties chiller suppliers faced in meeting the requirements of the energy efficiency regulations. This has created an opportunity to clarify the registration requirements and enhance industry compliance.

At the same time, the proposals under Options B, C and D in Chapter 4 entrench challenges in applying the Australian and New Zealand legislative requirements to chillers. This difficulty arises as a result of the certification schemes not being focused at the certification level on a specific model of chiller.

Eurovent Certificates are issued per model on a 'Basic Model Group' (BMG) basis. While Eurovent's definition of a BMG isn't precise, it does define units that include capacities with no more than 10% difference that are otherwise 'essentially the same' or 'comparable'.

AHRI Certificates certify a company's selection software as being accurate. They are also based on a BMG that is defined as: "a family of chillers using the same compressor model family or combination of same compressors from the same compressor model family. A participant may choose to further subdivide its products into additional BMGs."

In practice, a single AHRI Certificate can cover a family of chillers ranging from 300 kw to 3000 kw of capacity. A single E3 registration based on one AHRI BMG would not provide enough information on the energy efficiency performance of the chillers sold in Australia and New Zealand. Nor would it offer assurance that all products within such a large and diverse range actually met the requirements, because certification doesn't automatically mean conformance to MEPS.

Specifying what outputs from the certifications schemes is required and how these outputs will be interpreted as part of the registration process will be issues that will need to be carefully considered and addressed to avoid replacing one set of compliance issues with another.

Performing compliance check testing to a unique Australia/New Zealand chiller test standard is not practical. Independent, third party, large chiller testing is not available in Australia or New Zealand. One of the benefits of aligning testing requirements with overseas certification programs is that such programs have their own compliance regimes, so linking to them offers the potential for a level of compliance that cannot be achieved by using a local test standard.

3 Rationale for government action

This chapter considers how government action may be used to address some of the issues flagged in Chapter 2, and in particular provides some detail on the coverage of various types of chillers.

3.1 Overview

Government action may be needed when the market fails to provide the most efficient and effective solution to a problem. A range of regulatory limitations and market failures exist for chillers in Australia and New Zealand. These were described in Chapter 2 and include:

- The MEPS levels for chillers in Australia and New Zealand are less stringent than those in major international markets. This costs the Australian and New Zealand. communities every year in additional energy costs and causes higher GHG emissions than would be the case were our standards of equivalent stringency to those in major international markets.
- There are no requirements for the energy use of chillers between 100 kw and 350 kw where they are sold for use in the replacement market or which otherwise fall outside the coverage of the building codes. While data on the market size of 100-350 kw segment in Australia and New Zealand is not available, data from Europe suggests that chillers in this size bracket form a significant part of the market.[16]
- Chillers are globally traded. Requiring suppliers to obtain a copy of the Australia/New Zealand standard and re-rate the performance of their products add to the regulatory burden and cost to suppliers.

In Australia, the GEMS Act objectives include promoting the development and adoption of products that use less energy and produce fewer GHG emissions. The GEMS Act allows for mandatory minimum energy efficiency requirements to be set for appliances and equipment (called GEMS level requirements), which helps drive greater energy efficiency by excluding the poorest performing products from the market.

In New Zealand, the purpose of the EEC Act includes the promotion of energy efficiency and energy conservation. Improved energy efficiency reduces energy consumption, energy costs and GHG emissions for consumers, businesses, and society.

[16] In 2020 there were 2.3 million chillers installed in EU27 of which 1.7 million were air-cooled chillers under 400 W capacity, European Commission Ecodesign Impact Accounting Overview Report 2023, p.50. (Circabc)

Without government action, the regulatory limitations and market failures identified in Chapter 2 will persist and worsen over time and the objectives of the GEMS and EEC Acts will not be met. Regulatory limitations and market failures such as those described in Chapter 2 can be resolved or reduced by expanding the coverage of chiller energy efficiency requirements and more stringent MEPS to improve energy efficiency. Energy efficiency provides some of the most cost-effective GHG mitigation options, while reducing energy bills and strengthening energy security[17]. Energy efficiency improvements reduce the amount of energy use required to provide a service. These energy savings create economic, social and environmental benefits.

3.2 Tackling market failures by tightening MEPS

MEPS for chillers under national legislative instruments were introduced in Australia and New Zealand in 2012 and 2011 respectively through the relevant Australia/New Zealand 2008 standard. While a future increase in the MEPS was foreshadowed in the standard, these higher levels were not implemented, and the requirements for chillers under E3 have not been amended since that time.

The range of efficiencies of registered products is an indicator of the effectiveness of the regulations. A broad range of efficiencies indicates that the regulations are likely to be preventing some inefficient products from entering the market. It also indicates that there may be scope to make the MEPS requirement more stringent to increase the average efficiency of new products sold.

Since 2008 both the EU and US have increased the stringency of their MEPS for chillers. Australia's and New Zealand's MEPS levels are lagging behind prevailing international standards and there is the potential for less efficient products to dominate in the market. While some efficient models are already sold in Australia and New Zealand, other less-efficient models continue to have a significant market share. Moving the market towards more efficient models available overseas would deliver considerable electricity savings, emissions abatement and energy cost savings for consumers.

A regulatory issue exists because current MEPS are set too low for Australia's and New Zealand's markets. In an environment where we now have access to a wider variety of cheaper and more efficient appliances, increased electricity costs mean that it is cost effective to mandate tighter MEPS levels. This will reduce net costs of chiller operation and also reduce the negative externality of GHG emissions.

MEPS are an effective way to increase the energy efficiency of appliances and equipment. By specifying a minimum energy performance level, inefficient products are prevented from entering the marketplace, and manufacturers are given a signal to increase energy efficiency of the products they supply. For consumers, MEPS mean that products available

[17] Energy Efficiency - Energy System - IEA

in the market use less energy and have lower running costs over their lifetime. MEPS act as a consumer protection measure by ensuring that all models of a given product type available for sale meet minimum acceptable levels for energy performance and do not result in unnecessarily high running costs.

Government intervention to update the MEPS for chillers would reduce the regulatory limitations and market failures identified in Chapter 2, which would reduce unnecessarily high electricity consumption for these products. Government intervention provides a level playing field for businesses and consumers and helps to ensure the integrity of the system.

3.3 Reducing regulatory burden through harmonisation

The Australia/New Zealand Standard is outdated. Rather than attempt to update a unique standard for Australia and New Zealand, it is proposed to allow chiller manufacturers and suppliers to utilise either of the main international chiller certification regimes as the pathway for compliance with the local requirements and basis for registration. This would reduce the regulatory burden on industry and facilitate more consistent treatment of chillers under the energy efficiency regulations.

The coverage of MEPS across the Australian and New Zealand chiller markets is inconsistent and inefficient. Consider the case of a 400 kw chiller. Current modest efficiency regulation MEPS apply in Australia or New Zealand but the more stringent building code MEPS apply if it is installed in a new building, but not if it is a replacement chiller, in which case only the more modest efficiency regulation MEPS apply, or if is in a building not covered by the building codes requirements for chillers, such as theatres in New Zealand. The situation is even more stark for chillers under 350 kw which face either no MEPS applying if they are replacement chillers or in a building not covered by the building codes, or they have to meet the relatively stringent building code MEPS.

The changes proposed in this RIS will complement the energy efficiency measures in the building codes by bringing the MEPS requirements more closely into alignment and by expanding the application of MEPS to cover chillers above 100 kw used for human comfort regardless of what type of building they are installed in or whether they are replacement chillers or not. The current loopholes that permit the supply of inefficient chillers to a section of the 100-350 kw market will be closed.

Notwithstanding this there will still be points of difference between the regulatory arrangements. For example the building codes use an older version of the AHRI testing and rating standards whereas it is proposed to allow use of the Eurovent methodology in the efficiency regulation and, where the AHRI methodology is used, to adopt the more recent version of the AHRI standards. These issues will be further discussed with the relevant bodies with a view to adopting an approach that will avoid any requirement for double testing to meet the building code and efficiency regulation requirements.

For reasons set out below in 3.4.1, MEPS will not apply to chillers under 100 kw capacity in the efficiency regulations. This restriction does not apply to the building codes with their greater ability to set requirements determined based on the end use of a product.

Both regulatory arrangements will have compliance paths not available under the other. For the energy efficiency regulations compliance will be permitted via the European Eurovent certified pathway whereas under the building codes performance must be measured in accordance with the American AHRI pathway. For the building codes the MEPS are binding if the Deemed to Satisfy (NCC) and verification method (NZBC) approach is taken but both codes also have an alternative (and less frequently used) pathway to compliance called the Performance Solution option (NCC) or H1/VM3 under the NZBC under which it is not mandatory to satisfy the MEPS to achieve compliance. For example, a Performance Solution may allow for a reduction in the energy efficiency of the building's services, including the energy efficiency of chillers, below the minimum specified in the Deemed-to-Satisfy Provisions by increasing the performance of the building fabric. This provides flexibility in achieving the overarching mandatory requirements for building energy performance. A combination of these solutions may also achieve compliance. Updating the MEPS as proposed in this RIS will therefore set a firmer baseline under the minimum energy performance of chillers covered by the building codes.

The requirements in the building codes only apply to chillers installed in new buildings or in association with new construction work. This means that the building code requirements do not apply to replacement chillers. As a result an estimated 50% of the market for chillers below 350 kw capacity are not covered by the efficiency regulations. The revised efficiency regulation requirements would apply to chillers regardless of whether they were replacement chillers or associated with new building activity.

In their consultations for the 2025 revision of the NCC the Australian Building Codes Board has proposed taking a systems approach to assessing energy efficiency for chillers. This approach recognises that multiple chillers are often installed as part of a system and that it is the energy efficiency of the system that drives the energy consumption. If such an approach were adopted it could stand in addition to energy efficiency requirements for individual chillers and would not be inconsistent with them. While the likelihood that chillers are often installed as part of a multi-chiller system is recognised in the work behind this RIS, for example the assumed hours of operation are based on a two chiller system, the efficiency regulations are designed for the regulation of individual appliances. If the NCC moves to a system based approach then this element of differing but not necessarily inconsistent approaches to regulating chillers will persist.[18]

[18] The proposed 2025 changes have not yet been agreed (October 2024) and were not included in the cost benefit analysis modelling for this RIS.

3.4 Scope of regulation coverage

Consultation with industry uncovered areas where there were gaps in coverage of the energy efficiency regulations without appropriate justifications, for example in the exclusion of reverse cycle chillers and adiabatic chillers.

This RIS proposes several changes to the scope of the efficiency regulations based on technical characteristics of the chiller. The policy intention of this RIS is to have the energy efficiency standards apply to chillers that are or could be used for human comfort space conditioning, where certification for such types of chillers is available under both the Eurovent and AHRI schemes. Some of the scope definitions, such as inlet and outlet water temperature, are to narrow the scope to avoid including chillers designed, for example, for industrial purposes. Other changes are included to avoid the creation of loopholes in the coverage by providing broader or easily abused exemptions from coverage. In some cases rating and testing standards have developed over the past decade to cover types of chillers that could not adequately be tested for regulatory purposes before. Consistency of approach across the Australian and New Zealand chiller market is also a consideration. For example chillers with remote condensers are included under Eurovent certification but excluded under AHRI's program. It would not be appropriate to apply requirements differently to the same chiller depending on which certification path it chose.

3.4.1 Capacity, potable water and heat recovery

In the Consultation RIS it was proposed to extend the coverage of the energy efficiency regulations to cover all chillers for space conditioning for human comfort with a capacity below 350 kw, that is, no chiller would be excluded on the basis of being too small for the measure. This proposed approach had some benefits, such as AHRI and Eurovent certification being available for this size range, and applying MEPS to chillers that were competing with air conditioners for the small commercial market where such air conditioners are already subject to MEPS.

Several concerns were raised by industry during the consultation processes regarding this proposal. Industry advised that in this sector of the market there was a prevalence of chillers that were <u>not</u> intended for human comfort space conditioning. For example many chillers in this capacity range are used to heat and cool potable water. There would be a higher risk, were this sector of the market to be covered, of inadvertently capturing chillers not intended for human comfort space conditioning.

In addition to chillers designed to heat and cool potable water, industry advised that there were an increasing range of models that simultaneously provided hot domestic potable water and hydronic heating water. The potable hot water and hydronic heating test standards that have been developed by the International Standards Organisation impose significantly different requirements to those other test standards suggested by this proposal.

The use of the AHRI and Eurovent certification schemes is a central feature of the policy options in this RIS. Chillers under 100 kw capacity are of a size that they can be subjected to a physical test. The exclusive use of an AHRI or Eurovent certification approach may not have been warranted were these smaller chillers included under the efficiency regulations.

Notwithstanding these concerns, it is noted that there is no lower capacity limit to the chillers covered by the energy efficiency requirements in the building codes in Australia and New Zealand. The building codes are able to apply their requirements to chillers restricted on the basis of use, for example specifying that the requirements only apply to heating, ventilation and air conditioning (HVAC) chillers.

The different regulatory arrangements of the building codes make it straightforward to restrict the application of these energy efficiency requirements to ones intended for space conditioning. The focus of the efficiency regulation requirements at offer to supply and point of sale do not suit these regulatory instruments to specifying exclusions based on intended end use. It would not be reasonable to require that a supplier of a chiller be under an obligation to report on and held responsible for the end use for which that chiller will be put, particularly given the flexibility of the operating parameters of many chillers. While a policy intent to focus the measure on chillers for space conditioning for human comfort can be simply stated, this RIS includes a range of measures such as specifying particular inlet and outlet temperatures or excluding chillers with titanium heat exchangers that will have to be deployed to try and give legal effect to this policy intent. These measures may prove effective in achieving the policy intent but given the breadth of changes in scope to the coverage of the energy efficiency regulations, the dominance of non-HVAC chillers in the under 100 kw market and the risk of perverse outcomes it is proposed, on balance, that chillers below 100 kw capacity remain out of scope for this round of changes to the efficiency regulations. E3 acknowledges that this is an area appropriate for further investigation both in terms of how the new energy efficiency requirements are operating in regard to the 100-350 kw class of chillers but also whether it would be appropriate to extend coverage to chillers below 100 kw capacity in future. E3 will continue to work with building code board colleagues and industry to determine whether further action is warranted to avoid market distortions or unintended consequences in the marketplace of products directed to small commercial space heating and cooling and/or potable water heating and cooling.

Chillers that heat or cool potable water would be excluded from the proposed regulations. This exclusion would be limited to those chillers whose design is dedicated to this purpose, and not allow chillers that recover part of the heat rejected during a cooling process, through a 'heat reclaim' device such as a desuperheater, to avoid regulation by this means. This limitation is to avoid providing a loophole for inefficient chillers to enter the market via a broader exclusion from the energy efficiency requirements.

Currently heat recovery chillers are excluded from GEMS chiller regulations. While heat recovery feature can be either integrated with the chiller or fitted later, both the US and

European requirements stipulate that heat recovery chillers must meet the relevant MEPS levels, for heating or cooling, with the heat recovery feature inactive. AHRI and Eurovent certificates reflect this. It is considered that the exclusion from MEPS of such chillers is not warranted and that heat recovery chillers should be included in the scope of regulation and would need to meet the applicable MEPS level for heating or cooling with the heat recovery device inactive.

3.4.2 Chillers with centrifugal fans

Under the current determination, chillers with centrifugal fans are excluded from MEPS.

Centrifugal fans are generally used with air-cooled chillers, where the fans are working against high static pressure, generally because the chiller has been installed within a building, as opposed to outside of it. These types of fans use more electricity than an axial (or propeller) fan, making it harder for chillers incorporating them to meet MEPS.

Neither the US nor European regulations set different MEPS for chillers with centrifugal fans, nor do they appear to exclude them from MEPS.[19]

E3 recognises that there may be situations where a chiller is required to be installed with a large, centrifugal fan, which would detract from the energy efficiency of the chiller. While in such cases in Australia the supplier would be able to apply to the GEMS Regulator for an exemption from meeting MEPS, the New Zealand Regulator cannot grant exemptions for MEPS under the current NZ regulations. The NZ Government is looking at potential reforms to enable exemptions on a case-by-case basis.

On balance the current exclusion of chillers with centrifugal fans does not appear warranted but any adverse effects of including such chillers should be monitored.

3.4.3 Reverse cycle and polyvalent chillers

The consultation RIS asked whether the regulations should cover reverse cycle chillers, which provide both heating and cooling. Such chillers are currently not covered. This issue was followed up in subsequent consultation papers.

Some suppliers claimed that the exclusion of reverse cycle chillers was being used as a way to avoid complying with MEPS. Industry feedback on the prevalence of this type of chiller in the below 350 kw chiller market supports a position where if the capacity cap of chillers covered by the measure is lowered below 350 kw then reverse cycle chillers should be brought within scope.

A related issue was coverage of polyvalent or '4-pipe' chillers that can cool, heat, or cool and heat simultaneously. This latter function might be used in a situation where the central part of a building required cooling while the parts near the building shell require heating.

[19] Eurovent certification, however, acknowledges that 'ducted' chiller efficiency is harder than non-ducted chiller efficiency and this is reflected in a different set of efficiency classes (an A to G rating system).

Some of these products are optimised for their cooling cycle with the ability to provide heat as more of a bonus, and vice-versa. The 4-pipe units may sometimes have overall high efficiency but be considered to perform more poorly when either cycle is considered in isolation.

Eurovent certification covers the heating cycle of reverse cycle units and dedicated heat pumps can also be certified, up to 400 kw capacity. AHRI certification is not offered for heating cycles of chillers.

This is a growing sector of the market. Care is needed to avoid unintended consequences of stymying this sector while also bringing them into coverage of the energy efficiency measures. A similar approach as for MEPS (outlined in Chapter 4) appears to be a reasonable way forward. Such an approach would allow such chillers to meet MEPS for either the cooling or the heating cycle, though such chillers would have the option of demonstrating that they meet both cooling and heating MEPS, if the supplier considers this advantageous and has the certification to support it.

Industry advice is that in practice chillers that can both cool and heat are optimised for one or other of these functions, and may struggle to meet MEPS against the other function. Europe only applies MEPS to the part load (SEER [cooling] or SCOP [heating]) performance of such chillers and not to the full load performance. The proposal is that for reverse cycle chillers over 400 kw capacity they will not have to meet full load cooling MEPS (EER or COP) but will only have to the meet the SEER or IPLV MEPS of their chosen path. Not requiring greater than 400 kw capacity reverse cycle chillers to meet any MEPS would provide too large a potential loophole for inefficient products to enter the market.

By bringing reverse cycle chillers into scope, a maximum outlet temperature in heating mode needs to be specified that avoids unintentionally including industrial chillers. Advice from industry suggested a maximum level of 56°C outlet temperature as appropriate.

Some chillers that are used to heat swimming pools would also potentially be brought into scope by the inclusion of reverse cycle chillers. To avoid inclusion of products designed to heat swimming pools, chillers using titanium heat exchangers (to withstand the salt and chlorine) should be excluded.

Industry feedback indicated that the area of reverse cycle heat pumps is one of the most rapidly developing areas of chiller technology. In these circumstances it would be appropriate to have treatment of reverse cycle and 4-pipe chillers as a high priority when the regulations for chillers are re-visited.

3.4.4 Focusing on chillers for comfort space conditioning

Chillers can operate at a range of temperatures and for a variety of different end uses. The policy intent of the energy efficiency requirements is to cover those chillers used for space conditioning for human comfort, broadly the same scope as covered by the air conditioner determinations and regulations.

There is no single unambiguous dividing line between chillers for space conditioning for human comfort and those intended for other end uses. It is necessary therefore when seeking to give effect to the policy intent to apply requirements such that those chillers used for human comfort space conditioning are largely covered and other chillers largely are excluded. One such requirement, exclusion of chillers with titanium heat exchangers, is covered in section 3.4.3. More widely applicable requirements include specifying the primary fluid used in the chiller and the permissible range of leaving temperatures from the condenser of that fluid.

The current requirements exclude chillers for fluids other than water and specify a leaving temperature of between 4°C and 9°C. It is proposed that it be clarified that the scope be amended such that the use of, for example, a small proportion of glycol in solution would not allow exclusion from the requirements of the regulation. This clarification is intended to close off a potential loophole whereby an inefficient chiller that would otherwise be subject to MEPS avoids regulation through the inclusion of a small amount of additive in its circulating water supply.[20]

Increasing the upper limit of application outlet cooling temperatures from 9°C to 12°C would bring the measures in line with the upper bound of the EU's comfort chiller regulations without capturing significant numbers of coolers not intended for human comfort.

It is acknowledged that many chillers can operate at a range of temperatures such that a single chiller could be either in or out of scope depending on the end use of the product. While this is an unusual situation for products covered by the efficiency regulations it appears unavoidable in the case of chillers. As the operating specifications of most chillers, including inlet and outlet temperatures, are settled at the point of sale this approach nonetheless provides a clear basis for determining whether a particular chiller is in or out of scope of the regulations.

3.4.5 Other exclusions

Under Options B, C and D only certified chillers would be able to be registered. Certain types of chillers, which are not covered by AHRI and Eurovent certification would therefore be excluded from the requirement to be registered and to comply with MEPS. These types of chillers include air-cooled, free-cooling chillers[21], which are excluded under Eurovent, and chillers with remote condensers, that are excluded under AHRI.

[20] In comparison chillers using brine have tests conducted where the brine composition is 30-50% of the weight by volume; see A.1.4.1 General requirements Technical Certification Rules of the Eurovent Certified Performance Mark: Liquid chilling packages and hydronic heat pumps: 03/2023. (LCP-HP | Eurovent Certita Certification)

[21] A free-cooling chiller would be defined as an air-cooled chiller that has an integrated, additional water loop in the condenser that cannot be isolated without interfering with the airflow of the refrigeration system's condenser.

Adiabatic chillers use evaporative pads or netting to evaporate water and pre-cool air before that air reaches the chiller's air-cooled condenser. No water is evaporated on the condenser itself. Adiabatic chillers are covered by the existing regulations, but it is not clear whether this was intentional or inadvertent.

E3 sought expert advice on the status of adiabatic chillers, establishing that a chiller that uses evaporative pads or netting to pre-cool the air before that air reaches the condenser does not constitute an evaporatively-cooled condenser. Pads, netting or other adiabatic devices are relatively cheap and easy to add either in the factory or at other points of the supply chain. Equally easily added are components that convert an air-cooled condenser into an evaporatively-cooled condenser (e.g. misters or sprayers). While these modifications do improve the energy efficiency of an air-cooled chiller, there is a risk they could be used to mask the poor performance of otherwise non-MEPS compliant models and therefore, be used to avoid the regulations.

The GEMS Regulator published a guidance note in August 2017 that clarified that adiabatic chillers are in the scope of the regulations. Feedback on drafts of this guidance note showed that some companies considered that adiabatic chillers should be treated like an air-cooled chiller. However, other companies were equally firm that, due to some of the inherent design features of an adiabatic chiller, such as corrosion inhibitor on the condenser surface and the larger fans required to draw air through the pads, they should not be considered an air-cooled chiller.

There is no test standard or certification system that covers adiabatic chillers. Under Options B, C and D, dedicated purpose-built adiabatic chillers will be excluded from the updated regulations. This will require that a definition of purpose built adiabatic chillers be included in order for this type of chiller to be excluded. Air-cooled chillers with aftermarket evaporative pads or spray kits would continue to be treated as an air-cooled chiller.

While industry concerns were raised on both sides regarding the treatment of adiabatic chillers, E3 has received no evidence that purpose-built adiabatic chillers are being used to circumvent MEPS or that their deployment is leading to poor energy or financial outcomes.

Should a test standard be created and adiabatic chillers are covered by a certification scheme it would be appropriate to review the treatment of this type of chiller.

4 Policy options

In early 2016 the Consultation RIS – Air Conditioners and Chillers was released outlining a range of issues and policy options for consultation. Through the rounds of consultation papers and processes that followed the policy options were significantly modified and refined. The options around the timing of the introduction of the measures are set out in this section below.

Four options are considered in this RIS.

- Option A is Business as Usual, where no changes are made to the existing efficiency regulations governing chillers.
- Options B, C and D propose the same suite of changes to the regulatory arrangements but differ in some of the timing and level of MEPS they propose.

Regulatory changes proposed in each of options B, C and D

Options B, C and D all include the regulatory changes set out below but include different MEPS proposals.[22]

Removing certification through AS/NZS 4776, leaving AHRI and Eurovent certification as the pathways. This is covered in more detail at section 4.2.2.

Scope

The other regulatory changes are focused on the coverage of the measure.

The measure would be extended to include chillers in the 100 kw -350 kw size category. This is covered in more detail at section 3.4.1.

The regulatory changes and clarifications for rating conditions are covered in section 4.2.4. They are:

- Cooling capacity shall be determined under the standard rating conditions of an inlet temperature of 12°C and an outlet temperature of 7°C using water as the primary fluid
- Chillers only able to heat would be rated at an inlet temperature of 30°C and an outlet temperature of 35°C
- Reverse cycle and polyvalent chillers are rated on their cooling capacity

Section 3.3 covers in more detail the inclusions and exclusions listed below:

[22] With the inclusion of reverse cycle and polyvalent chillers heating MEPS levels are also imposed under Options B, C and D but these are the same levels regardless of the option. The details of these MEPS levels are set out in Chapter 4.

- Heat recovery chillers were previously excluded but would now be included, and would be tested with the heat recovery feature inactive
- Chillers with centrifugal fans were previously excluded but would now be included
- Reverse cycle chillers (chillers that can heat or cool) and polyvalent ('4 pipe') chillers (that can heat and cool simultaneously) were previously excluded but would now be included. They would have to meet MEPS on heating or cooling (but not both). Six pipe chillers would continue to not be covered as they are not covered by either certification scheme.
- Chillers that heat or cool potable water would be excluded where their full heating or cooling capacity is used for this purpose, otherwise they would be in scope. The existing efficiency regulations do not explicitly address chillers that heat or cool potable water.
- Chillers with titanium heat exchangers will be excluded. The existing efficiency regulations do not explicitly address chillers with titanium heat exchangers.
- Free cooling chillers were previously excluded but would now be included, except for air-cooled free cooling loop chillers that would continue to be excluded. This exclusion is in line with the approach of the Eurovent certification system.
- Adiabatic chillers will be excluded. In 2017 the GEMS Regulator had ruled these were in scope of the current regulations and should be treated as air-cooled chillers.
- The range of outlet water temperatures be increased from between 4°C and 9°C to between 4°C and 12°C for cooling applications, which matches the upper limit Europe's comfort chiller regulations.
- Exclude reverse cycle pump chillers with heating application outlet temperatures of >56°C. As reverse cycle chillers were not previously included under the efficiency regulations such a limitation was not necessary.

The MEPS proposals in each of the options are also different.[23] Chillers are often designed to be optimised for a particular usage pattern, with some favouring higher efficiency levels at full load whereas others are optimised for part load or seasonal energy efficiency. The current arrangements impose MEPS for both full load and part load performance without allowing any differentiation for specialisation.

The MEPS proposed in Options B, C and D provide regulated parties with a choice of MEPS pathways. They still have to meet MEPS for full and part load but they are given a choice of meeting MEPS that are relatively more stringent on full load performance or MEPS that more stringent on part load performance. In all cases the MEPS in Options B, C and D are higher than the existing MEPS. The difference in the MEPS in Options B, C and D are in their treatment of positive displacement water-cooled chillers. Option B gives them a year before they have to match the higher MEPS that are required of centrifugal

[23] With the inclusion of reverse cycle and polyvalent chillers, heating MEPS levels are also imposed under Options B, C and D but these are the same levels regardless of the option. The details of these MEPS levels are set out in Chapter 4.

water-cooled chillers from the commencement of the new regulations. Option C only provides this year of lower MEPS to the smallest (100 to 350 kw) chillers, which are newly subject to the energy efficiency regulations, whereas Option D imposes the same tougher MEPS on all water-cooled chillers from the commencement of the measure. These high level differences are set out below, followed by the detail of the MEPS level for each type of chiller and each capacity class under each pathway and under full or part load conditions.

All four options, including option A business as usual:

- provide a choice of AHRI or Eurovent pathway for meeting MEPS
- have different MEPS levels for air-cooled and water-cooled chillers.

Options B, C and D all have more stringent MEPS than option A and provide a choice of full load or part load focused MEPS.

In regard to whether the option has less stringent MEPS for positive displacement water-cooled chillers than centrifugal water-cooled chillers:

- Options A and D do not have different MEPS on this basis
- Option B has different MEPS for the first year of the measure and
- Option D has different MEPS for the first year of the measure for chillers of 100-350 kw capacity.

Table 3 Option A Current MEPS levels for chillers

Chiller type	Size (kw)	COP	IPLV
Air-cooled	<350	N/A	N/A
Air-cooled	350 to <500	2.70	3.70
Air-cooled	500 to <700	2.70	3.70
Air-cooled	700 to <1000	2.70	4.10
Air-cooled	1000 to <1499	2.70	4.10
Air-cooled	≥1500	2.70	4.10
Water-cooled	<350	N/A	N/A
Water-cooled	350 to <500	5.00	5.50
Water-cooled	500 to <700	5.10	6.00
Water-cooled	700 to <1000	5.50	6.20
Water-cooled	1000 to <1499	5.80	6.50
Water-cooled	≥1500	6.00	6.50

MEPS specified in Table 1 of AS/NZS 4776.2:2008.

Table 4 Option B cooling MEPS levels 2026 Eurovent pathways

Chiller type	Size (kw)	Option 1 EER	Option 1 SEER	Option 2 EER	Option 2 SEER
Air-cooled	100 to <350	2.785	3.218	2.674	3.712
Air-cooled	350 to <528	2.931	3.387	2.814	3.982
Air-cooled	≥528	2.931	3.462	2.814	3.982
Water-cooled, positive displacement	100 to <264	4.591	4.411	4.414	5.294
Water-cooled, positive displacement	≥264 to <350	4.781	4.726	4.591	5.402
Water-cooled, positive displacement	≥350 to <528	4.890	4.726	4.591	5.402
Water-cooled, positive displacement	≥528 to <700	5.217	5.034	5.063	6.178
Water-cooled, positive displacement	≥700 to <1000	5.379	5.034	5.063	6.178
Water-cooled, positive displacement	≥1000 to <1055	5.644	5.034	5.063	6.178
Water-cooled, positive displacement	≥1055 to <1500	5.672	5.228	5.509	6.630
Water-cooled, positive displacement	≥1500 to <2110	5.868	5.228	5.509	6.630
Water-cooled, positive displacement	≥2110	6.148	5.437	5.886	7.154
Water-cooled, centrifugal	100 to <528	5.644	4.813	4.954	6.016
Water-cooled, centrifugal	≥528 to <1055	5.644	5.034	5.422	6.178
Water-cooled, centrifugal	≥1055 to <1407	6.148	5.228	5.787	6.971
Water-cooled, centrifugal	≥1407	6.148	5.437	5.886	7.154

Table 5 Option B cooling MEPS levels 2026 AHRI pathways

Chiller type	Size (kw)	Option 1 COP	Option 1 IPLV	Option 2 COP	Option 2 IPLV
Air-cooled	100 to <350	2.836	3.846	2.723	4.436
Air-cooled	350 to <528	2.985	4.048	2.866	4.669
Air-cooled	≥528	2.985	4.137	2.866	4.758
Water-cooled, positive displacement	100 to <264	4.694	5.867	4.513	7.041
Water-cooled, positive displacement	≥264 to <350	4.889	6.286	4.694	7.184
Water-cooled, positive displacement	≥350 to <528	5.000	6.286	4.694	7.184
Water-cooled, positive displacement	≥528 to <700	5.334	6.519	5.177	8.001
Water-cooled, positive displacement	≥700 to <1000	5.500	6.519	5.177	8.001
Water-cooled, positive displacement	≥1000 to <1055	5.771	6.519	5.177	8.001
Water-cooled, positive displacement	≥1055 to <1500	5.800	6.770	5.633	8.586
Water-cooled, positive displacement	≥1500 to <2110	6.000	6.770	5.633	8.586
Water-cooled, positive displacement	≥2110	6.286	7.041	6.018	9.264
Water-cooled, centrifugal	100 to <528	5.771	6.401	5.065	8.001
Water-cooled, centrifugal	≥528 to <1055	5.771	6.519	5.544	8.001
Water-cooled, centrifugal	≥1055 to <1407	6.286	6.770	5.917	9.027
Water-cooled, centrifugal	≥1407	6.286	7.041	6.018	9.264

Table 6 Option B cooling MEPS levels 2027 onwards Eurovent pathways

Chiller type	Size (kw)	Option 1 EER	Option 1 SEER	Option 2 EER	Option 2 SEER
Air-cooled	100 to <350	2.785	3.218	2.674	3.712
Air-cooled	350 to <528	2.931	3.387	2.814	3.982
Air-cooled	≥528	2.931	3.462	2.814	3.982
Water-cooled	100 to <528	5.644	4.813	4.954	6.016
Water-cooled	≥528 to <1055	5.644	5.034	5.422	6.178
Water-cooled	≥1055 to <1407	6.148	5.228	5.787	6.971
Water-cooled	≥1407	6.148	5.437	5.886	7.154

Table 7 Option B cooling MEPS levels 2027 onwards AHRI pathways

Chiller type	Size (kw)	Option 1 COP	Option 1 IPLV	Option 2 COP	Option 2 IPLV
Air-cooled	100 to <350	2.836	3.846	2.723	4.436
Air-cooled	350 to <528	2.985	4.048	2.866	4.669
Air-cooled	≥528	2.985	4.137	2.866	4.758
Water-cooled	100 to <528	5.771	6.401	5.065	8.001
Water-cooled	≥528 to <1055	5.771	6.519	5.544	8.001
Water-cooled	≥1055 to <1407	6.286	6.770	5.917	9.027
Water-cooled	≥1407	6.286	7.041	6.018	9.264

Option C MEPS are the same as Option B MEPS except for the shaded area. Under Option C small water-cooled positive displacement chillers, which were not previously covered by the efficiency regulations, have one year of lower MEPS than they would under Option B.

Table 8 Option C cooling MEPS levels 2026 Eurovent pathways

Chiller type	Size (kw)	Option 1 EER	Option 1 SEER	Option 2 EER	Option 2 SEER
Air-cooled	100 to <350	2.785	3.218	2.674	3.712
Air-cooled	350 to <528	2.931	3.387	2.814	3.982
Air-cooled	≥528	2.931	3.462	2.814	3.982
Water-cooled, positive displacement	100 to <264	4.591	4.411	4.414	5.294
Water-cooled, positive displacement	≥264 to <350	4.781	4.726	4.591	5.402
Water-cooled, positive displacement[a]	≥350 to <528	5.644	4.813	4.954	6.016
Water-cooled, positive displacement[a]	≥528 to <700	5.644	5.034	5.422	6.178
Water-cooled, positive displacement[a]	≥700 to <1000	5.644	5.034	5.422	6.178
Water-cooled, positive displacement[a]	≥1000 to <1055	5.644	5.034	5.422	6.178
Water-cooled, positive displacement[a]	≥1055 to <1407	6.148	5.228	5.787	6.971
Water-cooled, positive displacement[a]	≥1407	6.148	5.437	5.886	7.154
Water-cooled, centrifugal	100 to <528	5.644	4.813	4.954	6.016
Water-cooled, centrifugal	≥528 to <1055	5.644	5.034	5.422	6.178
Water-cooled, centrifugal	≥1055 to <1407	6.148	5.228	5.787	6.971
Water-cooled, centrifugal	≥1407	6.148	5.437	5.886	7.154

[a] *The rows in the table for water-cooled, positive displacement chillers above 350 kw capacity are highlighted to indicate that these values for these chillers are different to those set out in Table 6 for such chillers.*

Table 9 Option C cooling MEPS levels 2026 AHRI pathways

Chiller type	Size (kw)	Option 1 COP	Option 1 IPLV	Option 2 COP	Option 2 IPLV
Air-cooled	100 to <350	2.836	3.846	2.723	4.436
Air-cooled	350 to <528	2.985	4.048	2.866	4.669
Air-cooled	≥528	2.985	4.137	2.866	4.758
Water-cooled, positive displacement	100 to <264	4.694	5.867	4.513	7.041
Water-cooled, positive displacement	≥264 to <350	4.889	6.286	4.694	7.184
Water-cooled, positive displacement[a]	≥350 to <528	5.771	6.519	5.544	8.001
Water-cooled, positive displacement[a]	≥528 to <700	5.771	6.519	5.544	8.001
Water-cooled, positive displacement[a]	≥700 to <1000	5.771	6.519	5.544	8.001
Water-cooled, positive displacement[a]	≥1000 to <1055	5.771	6.519	5.544	8.001
Water-cooled, positive displacement[a]	≥1055 to <1407	6.286	6.770	5.917	9.027
Water-cooled, positive displacement[a]	≥1407	6.286	7.041	6.018	9.264
Water-cooled, centrifugal	100 to <528	5.771	6.401	5.065	8.001
Water-cooled, centrifugal	≥528 to <1055	5.771	6.519	5.544	8.001
Water-cooled, centrifugal	≥1055 to <1407	6.286	6.770	5.917	9.027
Water-cooled, centrifugal	≥1407	6.286	7.041	6.018	9.264

[a] *The rows in the table for water-cooled, positive displacement chillers above 350 kw capacity are highlighted to indicate that these values for these chillers are different to those set out in Table 7 for such chillers.*

Table 10 Option C cooling MEPS levels 2027 onwards Eurovent pathways

Chiller type	Size (kw)	Option 1 EER	Option 1 SEER	Option 2 EER	Option 2 SEER
Air-cooled	100 to <350	2.785	3.218	2.674	3.712
Air-cooled	350 to <528	2.931	3.387	2.814	3.982
Air-cooled	≥528	2.931	3.462	2.814	3.982
Water-cooled	100 to <528	5.644	4.813	4.954	6.016
Water-cooled	≥528 to <1055	5.644	5.034	5.422	6.178
Water-cooled	≥1055 to <1407	6.148	5.228	5.787	6.971
Water-cooled	≥1407	6.148	5.437	5.886	7.154

Note: No difference in MEPS from Option B from 2027 onwards.

Table 11 Option C cooling MEPS levels 2027 onwards AHRI pathways

Chiller type	Size (kw)	Option 1 COP	Option 1 IPLV	Option 2 COP	Option 2 IPLV
Air-cooled	100 to <350	2.836	3.846	2.723	4.436
Air-cooled	350 to <528	2.985	4.048	2.866	4.669
Air-cooled	≥528	2.985	4.137	2.866	4.758
Water-cooled	100 to <528	5.771	6.401	5.065	8.001
Water-cooled	≥528 to <1055	5.771	6.519	5.544	8.001
Water-cooled	≥1055 to <1407	6.286	6.770	5.917	9.027
Water-cooled	≥1407	6.286	7.041	6.018	9.264

Note: No difference in MEPS from Option B from 2027 onwards.

Option D MEPS are the same as Option B MEPS except for the shaded area.

This is the same as Option B except that the more stringent MEPS start straight away. The 2027 table MEPS are the same as the 2026 MEPS.

Table 12 Option D cooling MEPS levels 2026 Eurovent pathways

Chiller type	Size (kw)	Option 1 EER	Option 1 SEER	Option 2 EER	Option 2 SEER
Air-cooled	100 to <350	2.785	3.218	2.674	3.712
Air-cooled	350 to <528	2.931	3.387	2.814	3.982
Air-cooled	≥528	2.931	3.462	2.814	3.982
Water-cooled, positive displacement [a]	100 to <264	5.644	4.813	4.954	6.016
Water-cooled, positive displacement [a]	≥264 to <350	5.644	4.813	4.954	6.016
Water-cooled, positive displacement [a]	≥350 to <528	5.644	4.813	4.954	6.016
Water-cooled, positive displacement [a]	≥528 to <700	5.644	5.034	5.422	6.178
Water-cooled, positive displacement [a]	≥700 to <1000	5.644	5.034	5.422	6.178
Water-cooled, positive displacement [a]	≥1000 to <1055	5.644	5.034	5.422	6.178
Water-cooled, positive displacement [a]	≥1055 to <1407	6.148	5.228	5.787	6.971
Water-cooled, positive displacement [a]	≥1407	5.868	5.228	5.509	6.630
Water-cooled, centrifugal	100 to <528	5.644	4.813	4.954	6.016
Water-cooled, centrifugal	≥528 to <1055	5.644	5.034	5.422	6.178
Water-cooled, centrifugal	≥1055 to <1407	6.148	5.228	5.787	6.971
Water-cooled, centrifugal	≥1407	6.148	5.437	5.886	7.154

[a] *The rows in the table for water-cooled, positive displacement chillers above 350 kw capacity are highlighted to indicate that these values for these chillers are different to those set out in Table 6 for such chillers.*

Table 13 Option D cooling MEPS levels 2026 AHRI pathways

Chiller type	Size (kw)	Option 1 COP	Option 1 IPLV	Option 2 COP	Option 2 IPLV
Air-cooled	100 to <350	2.836	3.846	2.723	4.436
Air-cooled	350 to <528	2.985	4.048	2.866	4.669
Air-cooled	≥528	2.985	4.137	2.866	4.758
Water-cooled, positive displacement [a]	100 to <264	5.771	6.401	5.065	8.001
Water-cooled, positive displacement [a]	≥264 to <350	5.771	6.401	5.065	8.001
Water-cooled, positive displacement [a]	≥350 to <528	5.771	6.401	5.065	8.001
Water-cooled, positive displacement [a]	≥528 to <700	5.771	6.519	5.544	8.001
Water-cooled, positive displacement [a]	≥700 to <1000	5.771	6.519	5.544	8.001
Water-cooled, positive displacement [a]	≥1000 to <1055	5.771	6.519	5.544	8.001
Water-cooled, positive displacement [a]	≥1055 to <1407	6.286	6.770	5.917	9.027
Water-cooled, positive displacement [a]	≥1407	6.286	7.041	6.018	9.264
Water-cooled, centrifugal	100 to <528	5.771	6.401	5.065	8.001
Water-cooled, centrifugal	≥528 to <1055	5.771	6.519	5.544	8.001
Water-cooled, centrifugal	≥1055 to <1407	6.286	6.770	5.917	9.027
Water-cooled, centrifugal	≥1407	6.286	7.041	6.018	9.264

[a] *The rows in the table for water-cooled, positive displacement chillers above 350 kw capacity are highlighted to indicate that these values for these chillers are different to those set out in Table 7 for such chillers.*

Table 14 Option D cooling MEPS levels 2027 onwards Eurovent pathways

Chiller type	Size (kw)	Option 1 EER	Option 1 SEER	Option 2 EER	Option 2 SEER
Air-cooled	100 to <350	2.785	3.218	2.674	3.712
Air-cooled	350 to <528	2.931	3.387	2.814	3.982
Air-cooled	≥528	2.931	3.462	2.814	3.982
Water-cooled	100 to <528	5.644	4.813	4.954	6.016
Water-cooled	≥528 to <1055	5.644	5.034	5.422	6.178
Water-cooled	≥1055 to <1407	6.148	5.228	5.787	6.971
Water-cooled	≥1407	6.148	5.437	5.886	7.154

Table 15 Option D cooling MEPS 2027 onwards AHRI pathways

Chiller type	Size (kw)	Option 1 COP	Option 1 IPLV	Option 2 COP	Option 2 IPLV
Air-cooled	100 to <350	2.836	3.846	2.723	4.436
Air-cooled	350 to <528	2.985	4.048	2.866	4.669
Air-cooled	≥528	2.985	4.137	2.866	4.758
Water-cooled	100 to <528	5.771	6.401	5.065	8.001
Water-cooled	≥528 to <1055	5.771	6.519	5.544	8.001
Water-cooled	≥1055 to <1407	6.286	6.770	5.917	9.027
Water-cooled	≥1407	6.286	7.041	6.018	9.264

Note: No difference in MEPS from Option B from 2027 onwards. No difference in MEPS levels in 2026 and 2027 under Option D, the 2026 and 2027 tables were separated for ease of comparison with other options.

4.1 Option A: Business as usual

Under Option A BAU, the energy efficiency benefits of the existing requirements continue to accrue as the existing stock of chillers is turned over and replaced by more energy efficient products that meet the current MEPS. Further, the slow improvement in the average energy efficiency of chillers is projected to continue. Another factor that contributes to improvements in energy efficiency are increases in energy efficiency regulations overseas that flow through to chillers imported to Australia and New Zealand.

The BAU option assumes no changes to existing requirements in Australia and New Zealand. Details of the existing requirements are set out below, so that they can be compared with the proposed changes in the policy reform options.

MEPS requirements apply to units above 350 kw. They are required to meet both:

- Coefficient of Performance (COP) – the ratio of full load cooling capacity divided by power input (the same as Energy Efficiency Ratio (EER) for air conditioners which measures cooling efficiency, whereas COP for air conditioners measures heating efficiency); and
- IPLV (Integrated Part Load Value) – a 'seasonal' metric that combines energy efficiency at 25, 50, 75 and 100% load points.
- The MEPS are as set out in Table 3 and would remain unchanged.

In Australia and New Zealand MEPS for both COP and IPLV are specified in the building codes. These requirements apply to installations in new buildings or new building works in existing buildings only, not to replacement chillers. Not all new building are covered by the building codes chiller requirements.

A unique Australian/New Zealand standard (AS/NZS 4776) is used under the regulations, whereas the US standard AHRI 551/591 applies under the NCC (i.e. 2 different test standards). The Australian/New Zealand Standard no longer covers some of the recent technology changes in the chiller market. While AS/NZS 4776 provides the option of using Eurovent or AHRI certification to demonstrate compliance with MEPS, suppliers need to obtain the standard to know how they can utilise these alternate compliance pathways.

Reverse cycle and heat pump chillers, adiabatic chillers, heat recovery chillers, chillers with centrifugal fans remain unregulated for energy efficiency.

Only chillers with application outlet temperatures (leaving chilled water temperature) of between 4°C and 9°C would be covered by the regulations.

4.2 Option B: Staged introduction of higher MEPS

Under Option B tightened MEPS with a range of compliance pathways and a staged approach to tightening MEPS for water-cooled chillers would be available, registration would be dependent on Eurovent or AHRI certification (or testing to their requirements) and a range of modifications to the coverage of the measure as set out below would be applied, in particular inclusion of reverse-cycle chillers.

4.2.1 MEPS

The MEPS for cooling are set out in Tables 4 to 7. This approach focuses on the strength of each technology in a way the current hybrid MEPS approach cannot.

This approach uses the US standard as the framework for the cooling MEPS, while using the EU framework for heating MEPS. The US levels are converted to an EU equivalent value, so that Eurovent Certification could be accepted, without the need to re-rate product. This approach includes both full load metrics (COP and EER), to ensure a specified minimum energy efficiency during peak load conditions; something that a part load metric does not guarantee.

The conversion of the IPLV to Seasonal Energy Efficiency Ratio (SEER) values and COP to EER values[24] is based on data from an International Energy Agency (IEA) Energy Efficient End-use Equipment (4E) study[25] and other information supplied by companies during

[24] The US (ASHRAE 90.1) levels are based on AHRI 551/591's IPLV and COP as the full load metric. The EU levels are based on EN 14825's SEER and EN 14511's EER as the full load metric.
[25] *Policy benchmarking for Packaged Liquid Chillers and evaluating the lack of comparability between economies*, IEA 4E, 4 August 2015. (iea_4e_benchmarking_report_packaged_liquid_chillers.pdf)

2017. As the IEA report makes clear, this cannot be an exact conversion factor and there are a range of observed conversions for different models, size categories and chiller types. The proposed MEPS levels are an attempt to give all suppliers, regardless of what test standard they use, a number that they can compare against their overseas catalogues to easily determine which products pass MEPS.

As set out in Tables 8 to 15, Options B, C and D all follow the same outline in their approach to setting MEPS. The only difference between Options B, C and D is in their MEPS for water-cooled positive displacement chillers in the first year after the measure comes into operation, with Option D being more stringent than Option C which is more stringent than Option B.

The following elements are the same across options B, C and D:

- Choice of four pairs of full load and part load MEPS for each chiller with the registrant choosing which pair of MEPS values they will comply with
- The MEPS for air-cooled chillers
- The MEPS for water-cooled centrifugal chillers
- The MEPS for all water-cooled chillers after the first year

The proposed alignment of MEPS for water-cooled chillers regardless of whether they are of the positive displacement or centrifugal type has been a consistent aspect of the options and discussion papers put forward for the efficiency regulations since 2018. Since that time revised MEPS for chillers have been included in the building codes of both countries that are close to, but not exactly aligned with, the initial AHRI pathway MEPS proposed under Option B.[26] That is, the building code requirements set differing levels of MEPS for positive displacement and centrifugal water-cooled chillers with no pathway to bring the positive displacement water-cooled chiller MEPS into line with centrifugal water-cooled chiller MEPS. Given industry support for imposing the more stringent level of MEPS[27] it is not proposed to weaken the MEPS levels proposed in the Chillers: Updated Policy Positions, June 2018 paper.

The building codes impose a higher level of MEPS for small (<350 kw) air-cooled chillers than is proposed under any of the options in this DRIS. This class of chiller has not previously been covered by the efficiency regulations. Those chillers in this class covered

[26] A consequence of this is that much of the benefit that would have flowed from the introduction of Option B, C or D has already occurred through the introduction of similar MEPS levels for chillers through the building codes.
[27] They were to have been introduced from 1 January 2024 according to the timetable of the *Update: Proposed changes to the regulation of liquid chilling packages paper*. (Update: Proposed changes to regulation of liquid chilling packages | Energy Rating)

by the building codes must follow the AHRI certification path.[28] Input from industry has indicated that there are European chillers, including reverse cycle chillers, that may not have been captured by building code requirements but would be subject to MEPS under the efficiency regulations that would struggle to meet a higher level of MEPS. Registration data following any amendment to the efficiency regulations will be assessed to determine whether these lower MEPS for this class of chillers are sufficiently stringent to have any effect on the market or whether they are set at a level that is easily cleared by all the registered chillers.

Important points to note:

- A supplier only needs to demonstrate compliance with MEPS under just one of the 4 options and pathways.
- A supplier can choose to demonstrate compliance under either the Eurovent or AHRI pathways and can choose either the MEPS specified in Option 1 or the MEPS specified in Option 2.
- Reverse cycle chillers will not be required to meet a specified EER under the Eurovent pathway or a COP under the AHRI pathway. Industry feedback had indicated that such chillers would have difficulty meeting both full load and part load MEPS.
- The SEER values under the Eurovent pathways are the exact EU requirements, with the IPLV derived by using the same conversion ratios as were used to create the SEER values from the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) building energy performance standard 90.1 IPLVs.
- Note that the EER values indicated under the Eurovent pathway are inclusive of the pump energy factor.

4.2.2 Certification

All the policy options provide a choice of using AHRI or Eurovent certification pathways.

4.2.2.1 AHRI and US based test standards and certification

AHRI 550/590 was one of the early major test standards to test chiller performance and has been adopted by many countries around the world. The 2003 version of AHRI 550/590 used to help establish AS/NZS 4776:2008 has since undergone several major updates.

AHRI certification certifies that a chiller's selection software can produce results equivalent to a physical test. However, the actual certificates contain no specific model performance. One certificate typically covers tens of nominal models. Performance is demonstrated by a printout of the selection software or other catalogued data. The

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[28] As also applies to chillers in different size classes, there is provision under the building codes for chillers certified under a different scheme to show how the chiller compares to Deemed-to-Satisfy requirements of J5.10 under the NCC, and the H1/VM3 of the New Zealand building code, which may be used with the approval of the local building control authority.

performance is certified equivalent to the test standard. Since 2018 AHRI can also certify cooling performance to the European test standards. Fifty-five per cent of chillers registered under the E3 program rely on AHRI certification.

Unlike the European regulatory standards, AHRI has no part load metric for heating and only rates the full load performance at an air temperature of 8˚C, for air-cooled products, or a water temperature of 12˚C, for water-cooled products. All AHRI based ratings include a 'fouling' factor to simulate the loss of performance from an installed unit, because water impurities inhibit the heat transfer process and therefore the efficiency of the chiller over time. Because AHRI treats a chiller as a standalone product, AHRI certification excludes the power used by internal water pumps to pump the chilled water through the building.

4.2.2.2 Eurovent and European chiller requirements

European regulations have also changed markedly since the E3 program decided to accept Eurovent certification. The changes include an increased focus on seasonal performance and tightening of MEPS. In contrast to the AHRI standard, EN 14511 includes the power used by water pumps and fans, lowering the apparent efficiency rating of products. EN 14511 also applies a pump power penalty for chillers that do not come with an integrated pump. The standard, however, does not include a fouling factor correction, unlike AHRI. The part load efficiency metrics of EN 14825 also include standby power measurements, while AHRI's IPLV does not.

The EU introduced a cooling cycle MEPS based on a new seasonal cooling metric, the SEER. The SEER is fundamentally different to AHRI's IPLV. The SEER tests are performed at different temperatures and the weightings bear no resemblance to those used by AHRI.

The EU MEPS metrics are not exclusively based on SEER/Seasonal Coefficient of Performance (SCOP) values, but incorporate a constant conversion coefficient to represent the EU's average electricity generation efficiency, and a correction factor for the electricity used by temperature controls and cooling tower water pumps. This is to allow the use of a primary energy metric that can be compared across all fuels and technology types. However, the SEER and SCOP values can be isolated from these metrics.

Following these changes the Eurovent arrangements have little in common with the Australian/New Zealand standard or AHRI requirements. The Eurovent scheme issues individual certificates for each nominal model from the certified range. As the whole range becomes certified, this is effectively certifying the selection software as well, because the certification process only requires a percentage of the range to be physically tested, while the remaining products rely on selection software values.

4.2.2.3 Dual compliance pathways

E3 considers that compelling all applicants to re-rate chillers to a unique Australian/New Zealand standard places an onerous regulatory burden on all suppliers. E3 also considers that adopting only one of the world's 2 major certification schemes would force an unreasonable regulatory burden on those companies that do not currently use whichever scheme is chosen. The proposed approach, therefore, is to provide a dual compliance pathway that allows the use of both AHRI and Eurovent certification.

This approach requires that chillers be certified by AHRI or by Eurovent. The testing (simulation) and test report used for AHRI compliance or Eurovent compliance can also be used to demonstrate compliance with Australian/New Zealand requirements, with this information required to be provided at point of registration. This would mean replacing the Australian/New Zealand standard AS/NZS 4776:2008 with AHRI 551/591:2023 and the European test standards, EN 14511:2022 and EN 14825:2022.

Alternatively, a supplier may provide a report of a physical test to AHRI or Eurovent test conditions, as evidence that the chiller meets the appropriate MEPS. Each model registered using this alternative approach would need a separate test report.

4.2.3 Definition of a model of a chiller

All chiller models within the scope of the determination or regulations are required to be registered, before being offered for supply in Australia or sold in New Zealand. This would mean that there would be no grouping of registrations and no families of models for chillers. A registration fee would have to be paid in Australia for every registered chiller within scope, even where the difference in cooling or heating capacity between 2 chillers is as little as 1 kw.

4.2.4 Rating conditions

A chiller's cooling capacity, under the standard rating conditions of an inlet temperature of 12°C and an outlet temperature of 7°C[29] using water[30] as the primary fluid, would determine the chiller's cooling capacity and therefore, whether it would be within the scope of the regulation.

Australia and New Zealand would retain the temperature based adjustment formulae for all water-cooled chillers for non-standard rating conditions set out in clause 6.4.1.2 of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) 90.1:2016 (also known as "K_{adj}"), for the purposes of demonstrating compliance with MEPS. The rating points for these chillers would be those defined in their rating conditions.

For chillers that are only able to heat a circulating fluid and not cool it, a chiller's performance in raising the temperature of water from an inlet temperature of 30°C to an outlet temperature of 35°C (as per the standard rating conditions in EN 14511:202) would determine its heating capacity.

[29] As per AHRI 551/591:2015, EN 14825 and EN 14511.

[30] The use of, for example, a small proportion of glycol in solution would not allow exclusion from the requirement to be registered and to comply with MEPS

Chillers that are capable of heating or cooling and 4-pipe (polyvalent) chillers would be rated on their cooling capacity, not their heating capacity.

4.2.5 Scope: Inclusions

This section clarifies which types of chillers are included under the measure and which types are proposed to be included.

4.2.5.1 Capacity and refrigerants

All chillers with a rated cooling or heating capacity of at least 100 kw be required to be registered and to comply with the applicable MEPS, before being sold in Australia or New Zealand. Chillers under 100 kw in capacity would be out of scope and would not be regulated for energy efficiency or performance.[31]

Implicit in this position is that the use of specialised or alternative refrigerants would not be a basis for exclusion of a chiller from the applicable MEPS.

4.2.5.2 Chillers that heat or cool potable water

Chillers that heat or cool potable water be excluded from the requirement to be registered and to comply with MEPS. Chillers that heat potable water would be excluded where the full rated capacity of the vapour compression system can be absorbed by the hydronic heat exchanger. Chillers that recover part of the heat rejected during a cooling process, through a 'heat reclaim' device, such as a desuperheater, would not be excluded and would be required to be registered and to comply with MEPS.

Chillers that cool potable water would also be excluded, but only where this cooling is due to the unit's full refrigeration capacity. Chillers that cool potable water, where the cooling is the by-product of a heating process, would not be excluded and would be required to be registered and to comply with the applicable MEPS.

4.2.5.3 Heat recovery chillers

Chillers with a heat recovery unit would be required to meet the applicable cooling or heating MEPS and to be registered before being sold in Australia or New Zealand. The testing and rating of such chillers would be with the heat recovery feature inactive.

4.2.5.4 Chillers with centrifugal fans

Chillers with centrifugal fans would be required to meet the applicable MEPS and to be registered before being sold in Australia or New Zealand. The testing and rating of such chillers would be at a static external pressure of 0 Pascals (Pa).

E3 recognises that there may be situations where a chiller is required to be installed with a large, centrifugal fan, which would detract from the energy efficiency of the chiller. In such cases, in Australia the supplier would be able to apply for an exemption from meeting MEPS. Suppliers should note that the GEMS Regulator assesses exemptions on the merits

[31] They may still be subject to energy efficiency or performance requirements under the building codes.

of each individual case and not all applications for an exemption may be granted. The New Zealand Regulator cannot grant exemptions for MEPS under current regulations. The NZ Government is looking at potential reforms to enable exemptions on a case-by-case basis.

4.2.5.5 Reverse cycle and polyvalent chillers

Reverse cycle, heat pump and 4-pipe (polyvalent) chillers from 100-400 kw capacity be required to demonstrate compliance with either the applicable cooling MEPS or the applicable heating MEPS, but not both.[32] (Note that this is different to the determination of their capacity, which will be based on their cooling capacity.)

Suppliers would be required to provide performance data against both cooling and heating as part of their registration documentation but would nominate which one they wished to be assessed against for MEPS compliance. The performance data against both heating and cooling would be made publicly available.

The proposed heating MEPS for chillers match the SCOP used in the EU for chillers up to 400 kw in heating capacity, noting that suppliers of reverse cycle chillers can choose to demonstrate compliance with the cooling MEPS instead, if they prefer. These SCOPs are:

- Medium temperature applications (55°C outlet temperature):
    - Air-to-water – SCOP of 2.825
    - Water-to-water – SCOP of 2.95
- Low temperature applications (35°C outlet temperature):
    - Air-to-water – SCOP of 3.2
    - Water-to-water – SCOP of 3.325

There would be no heating MEPS above 400 kw and chillers with a heating capacity above 400 kw that are not capable of cooling a circulating fluid would be out of scope and would continue not be regulated for energy efficiency or performance.

Reverse cycle chillers above 400 kw capacity would be required to comply with the SEER or IPLV MEPS of their chosen path but would not be required to meet the full load (EER or COP) MEPS.

In addition, suppliers of chillers with AHRI heat pump (water heating) certification would be allowed to re-rate their chillers to EN 14825 SCOP conditions.

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[32] The industry uses reverse cycle to refer to chillers that both heat or cool but which are optimised for heating. It uses heat pump to refer to chillers that can heat or cool but which are optimised for cooling. Four-pipe or polyvalent chillers are capable of heating and cooling simultaneously. Reverse cycle chillers is used in this document to refer to all chillers that are capable of both heating and cooling.

4.2.6 Scope: Exclusions

Certain types of chillers, which are not covered by AHRI and Eurovent certification, will be excluded from the regulations.

Certain types of chillers that are not used for heating or cooling of buildings would also be excluded.

The chillers to be excluded under this option are:

- Chillers that do not use mains electricity
- Chillers not driven by an electric motor
- Chillers with remote condensers
- Air-cooled, free-cooling chillers
- Chillers with titanium heat exchangers
- Chillers with 6-pipe units
- Adiabatic chillers
- Chillers for cooling applications with an outlet temperature of greater than 12°C
- Chillers for cooling applications with an outlet temperature of less than 4°C
- Chillers with heating outlet temperatures of 56°C or more.

4.3 Option C: Staged introduction of higher MEPS for small chillers

Option C includes the same package of reforms as Option B, as set out in section 4.2 above.

The difference between Option C and B relates to their MEPS levels, with the difference being highlighted in blue in Tables 8 and 9. The difference is that Option C allows small (<350 kw) positive displacement chillers to have a year of lower MEPS. This option acknowledges the greater burden on industry in registering products not previously in scope.

4.4 Option D: Single step introduction of higher MEPS

Option D includes the same package of reforms as Options B and C, as set out in section 4.2 above.

The difference between Option D and B relates to their MEPS levels, with the difference being highlighted in blue in Tables 12 and 13. Option D does not provide any period of lower MEPS for water-cooled positive displacement chillers of any capacity. They must meet the same MEPS levels as centrifugal water-cooled chillers from the commencement of the measure.

5 Cost benefit analysis of MEPS options

This chapter discusses assumptions, scope and technical and modelling outputs from the CBA for the MEPS proposed in this Decision RIS.

5.1 Summary of key assumptions and model parameters

This section sets out the key parameters, features and assumptions of the cost benefit analysis modelling undertaken for this RIS.

5.1.1 Scenarios

The following policy options (described in Chapter 4) were modelled:

- Option A: Business as usual
- Option B: Tables 4 to 7 MEPS
- Option D: Table 12 to 15 MEPS

Note Option C was not modelled separately as the input of providing lower MEPS to 100-350 kw positive displacement water-cooled chillers for one years is expected to be small. The results would lie between Options B and D, and would be expected to be closer to Option D.

5.1.2 Sales

Historical sales for Australia from previous CRIS and work conducted for Cold Hard Facts 4[33].

Forecast sales based on projected trends and industry feedback on these trends.

5.1.3 Projection period

15 years (2026-2040, cohort ending in 2050).

Cohort modelling refers to tracking the effect of the products installed up to 2040 for their remaining another 10 years.

This approach has been used to capture the ongoing savings of the policy induced technology changes installed in the period up to 2040.

[33] Expert Group, Cold Hard Facts 4, Prepared for the DCCEEW, 2024 (Cold Hard Facts 4 report)

5.1.4 Efficiency

The efficiency changes induced by the various policy proposals are shown below:

- **Option A**: Historical COP values are model weighted from 2009 to 2022, based on the registration database, categorised by product type. BAU efficiency projections from 2023 are based on historical trends and found to increase by 0.25% per annum at full load.
- **Option B**: Assumes all chiller products will meet the new requirements from Tables 4 to 7. The average efficiency increase is calculated from the average of the COP of registered products in 2024 after removing the products that do not meet the MEPS.
- **Option D**: Assumes all chiller products will meet the new requirements from 2026 (Tables 12 to 15). The average efficiency increase is calculated from the average of the COP of registered products in 2024 after removing the products that do not meet the MEPS.

5.1.5 Capital costs

All incremental capital/development costs are assumed to be passed on to the consumer.

Options B and D: A price efficiency (PE) ratio was assumed of 1.0 and supported by stakeholder feedback from the CRIS and subsequent consultation.

5.1.6 Registration administration costs and costs of compliance

Government administration costs are made up of salary, program administration, check testing, consumer information/education and miscellaneous (market research, etc.). As most of the product categories are already regulated for MEPS, there is only a small increase in government costs.

The incremental administration cost for Australia and New Zealand are assumed to be $20,000 per annum for additional check testing. In addition, an establishment cost of $100,000 is counted in the year of implementation.

5.1.7 Energy consumption

Energy consumption of the stock is calculated for each product group by calculating the power consumption for each of the 4 modes (25%, 50%, 75% and 100% capacity), then multiplying this by the annual operating hours and cohort stock quantity. Products are retired from the stock according to a survival function, which varies from average replacement after 18 years for air-cooled and 25 years for water-cooled chillers. The energy consumption of each category is undertaken at the State level and summed for national results for Australia, and separately for New Zealand.

BAU is based on registration data from the registration database.

Energy Prices are:

- Australia: Large business from the ACCC and forecast based on the wholesale electricity price index, from AEMO.
- New Zealand: long run marginal price from EECA (2024).

5.1.8 GHG emissions

Australia: Projected Factors from 2024 to 2035 -Australian Government[34] by state and assumed to decline to close to zero from 2035 to 2050.

New Zealand: Sourced from EECA in 2024, and based on the scenarios produced by the Climate Change Commission's 2021 Final Advice.

5.1.9 Industry costs

Registration costs for new products within the scope of the proposals are $780/model for the registration fee, which is treated as an income to the government for modelling purposes as partial cost recovery for government of administering the regulations in Australia. There are no registration fees in New Zealand.

Other costs of compliance (for example testing, staff education, record keeping) are accounted for using the Regulatory Burden Measurement tool (for Australia) and are included as a component of the CBA.

5.1.10 Sensitivity analysis

Net Present Value (NPV):

- Australia - 7% discount rate, with sensitivity tests at 0%, 3% and 10%
- New Zealand – 5% discount rate, with sensitivity tests at 0%, 2% and 7%

Costs:

- Average incremental costs due to efficiency increase are increased and decreased by 50%.

Carbon price:

- Carbon price is increased and decreased by 50% in Australia.
- Carbon price Low and High is used according to the New Zealand Treasury figures[35].

5.1.11 Key assumptions

Reduction in energy use is due to new policy options described in Chapter 4 in 2026 and 2027 or 2026.

Rebound (take back) treated as zero in relation to energy use. Rebound occurs where the increased energy efficiency of a product results in a consumer making greater use of the product.

[34] DCCEEW 2023, *Australia's emissions projections 2023*, Department of Climate Change, Energy, the Environment and Water, November 2023 (Australia's emissions projections 2023)

[35] New Zealand Treasury 2023, *Assessing climate change and environmental impacts in the CBAx tool*, The Treasury, New Zealand Government, December 2023 (The Treasury's CBAx Tool | The Treasury New Zealand)

For Australia the additional benefits of lower levels of GHG emissions have been included in the benefits with a value of \$105 per t CO_2-e in 2030, increasing to \$221 per t CO_2-e in 2040[36].

For New Zealand the additional benefits of lower levels of GHG emissions have been included in the benefits with a value of NZ\$171 per t CO_2-e in 2030, increasing to NZ\$230 per t CO_2-e in 2040.

Benefits due to reduced peak demand due to lower power consumption are intrinsically included in the electricity prices used for the Australian calculations for the CBA. New Zealand uses a separate value for peak demand reduction.

5.1.12 Assumptions around the effect of the building codes

Obtaining accurate sales data to undertake the CBA proved to be challenging. While model registrations demonstrated that several chillers comply with MEPS levels set out in the building codes, a share of registered models did not. In addition, no model registration data was available for the proposed to be newly covered market segment of chillers under 350 kw capacity. While the building codes do cover chillers of this size their coverage of the market is far from universal. The building codes do not cover the replacement market for chillers which in the Consultation RIS was estimated to constitute 50% of the market. There are also other HVAC chiller applications that are not covered by the building codes. For example, the NZBC only covers commercial and industrial buildings. Buildings such as hotels, whole apartment buildings, theatres, museums, schools, cinemas and swimming pool complexes are not covered.[37]

In the CBA a conservative approach was taken in estimating the size of the sector of the market currently not subject to MEPS. Given the limitations in the availability of market data and registration data for this sector, it is possible that the benefits from the proposed options may be significantly larger than the levels used in the CBA.

Note that the CBA modelling for Australia in this RIS is based on the current requirement for the NCC, not the proposed NCC 2025 commercial building requirements which, at the time the CBA was undertaken, were yet to be finalised and agreed by relevant Australian Ministers.

5.2 Methods

This section sets out the approach to calculating energy consumption and the inclusions and exclusions for the calculation of cost benefit.

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[36] AEMC 2024, *How the national energy objectives shape our decisions*, Australian Energy Market Commission, 28 March 2024

[37] Point 5-6-7 of the New Zealand Code Building Regulations 1992 (SR 1992/150) (Building Regulations 1992 (SR 1992/150) (as at 23 December 2023) – New Zealand Legislation)

5.2.1 Method for calculating energy and greenhouse gas impacts

This section sets out how the energy consumption and greenhouse gas emissions are calculated in the cost benefit analysis.

5.2.1.1 Energy consumption

The energy used by chillers is a function of average electrical input power, number of operating units and average number of hours of operation. In turn GHG emissions are a function of energy consumption and the emission factors determined by the electricity generation mix.

To calculate the energy consumption under the BAU and policy scenarios, a detailed and elaborate stock model of units installed and operating was developed. The number of operating units in a particular year is a function of existing stock, replacements and new sales. Estimates of stock and sales were made for Australia and New Zealand, as detailed in 5.4. Units were also retired from operation according to a "survival function" that reflected the life span of typical equipment. Hence, a complete stock model of the chiller market was developed by state/region and year, with additional details such as category, capacity range, average efficiency (at multiple load points) and year of purchase or installation. These units were multiplied by BAU and policy average power input figures at various load points and corresponding average number of hours of operation for each category/load point to obtain the total energy consumption by state, category and capacity range.

It is worth noting that operating hours vary according to the state/region (see Table 18). In addition, the proportion of time operating at various load points is based on the AHRI 551/591 standard.

To determine the average BAU input power to the chillers, data on the rated efficiency of the units was used. The input power to chillers is a function of the COP. For chillers, the COP and the IPLV (the weighted efficiency when running at part load – e.g. 25, 50, 75% and 100%) is used as the measure of efficiency, with values calculated as equivalent to AHRI 551/591 if measured under Eurovent pathway. The input power in kw for each load point can be calculated as:

$$\text{Input Power (kw)} = \frac{\text{Cooling Capacity (kw)}}{COP}$$

The BAU average efficiency was determined from sales weighted average or model weighted average COP/IPLV from 2009 and projected to 2040 with an autonomous annual efficiency improvement of 0.25%. Efficiency increases due to the current Australian/New Zealand MEPS were included in the BAU average efficiency. The average efficiency of the units as a result of the policy options being assessed was determined on the basis of the increase in sales weighted average COP at each load point, due to the scenario removing products not meeting the MEPS for each particular category and capacity range.

Energy consumption was determined for the BAU and policy scenarios. The difference in the projections of energy consumption provided the net energy savings used to calculate the impacts reported later in this section.

5.2.1.2 Greenhouse gas emissions

GHG emissions can be determined by multiplying the energy used by the chillers by the relevant emission factor for New Zealand or the State/Territory in which they operate. The emission factor refers to the amount of GHG emissions produced through the supply of a given unit of electricity. In the model, the GHG emissions were estimated by using the State/region energy calculations combined with the GHG Emissions Factors in Table 21.

5.2.2 Cost benefit methodology

A financial analysis has been conducted on the societal cost benefits of the proposals being reviewed, with the analysis conducted at the State and national level. In the analysis the following costs and benefits are included:

5.2.2.1 Costs

- To the consumer, due to increases in the upfront price of products reflecting costs passed on by suppliers
- To government for implementing and administering the requirements
- To the product supply businesses for complying with the new or modified regulatory requirements of the program (i.e. testing, administration and training for modified or new product categories).

5.2.2.2 Benefits

- To the consumer, due to improved energy efficiency of available products resulting in avoided electricity purchase costs
- To government from simplification of the regulatory framework
- To suppliers from simplifications to the regulatory framework
- To society from reduced GHG emissions.

In terms of an approach for the CBA, it is necessary to do this from either a consumer or societal perspective. The consumer or private approach is chosen as the basis for the CBA and aligns with the approach used in recent RISs for assessing the benefits and costs of energy efficiency policy measures, including the commercial building energy efficiency provisions in the 2025 National Construction Code (NCC)[38], the RIS for MEPS and other

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[38] CIE 2024, *Increasing the stringency of the commercial building energy efficiency provisions in the 2025 National Construction Code, Consultation Regulation Impact Statement,* Prepared for the Australian Building Codes Board April 2024, by the Centre for International Economics. (Report)

measures for Commercial Ice Makers[39] and RIS: Televisions, computer monitors and digital signage displays[40].

The New Zealand Government requires that electricity savings are based on long run marginal cost (LRMC), rather than marginal retail energy prices, with financial benefits associated with greenhouse gas abatement and avoided or delayed infrastructure investment also included in the benefits. Resource (or manufacturing) costs should be used for the product costs. As these are not available, the wholesale price has been used in this CBA. These prices are higher than manufacturing cost, and therefore the CBA presents a conservative assessment of the impact of the policy options.

All Net Present Value (NPV) figures are real 2024 dollars. NPV is a calculation that allows decision makers to compare the costs and benefits of various alternatives on a similar time scale by converting all options to current dollar figures. New Zealand values are shown in New Zealand dollars, calculated with an exchange rate of 1.075 New Zealand dollars to Australian dollars where necessary.

5.3 Key inputs

The various inputs are detailed below and are derived from available data, industry interviews or where necessary, realistic assumptions.

The data research used for this attachment was obtained from multiple sources (past RIS analysis, industry data/interviews, published sources, and unpublished industry data) and aligned with the research conducted for the Cold Hard Facts 4[41], a comprehensive data update and analysis to identify key developments and emerging trends in the refrigeration and air conditioning industry. Interviews were conducted for the CRIS with over 25 suppliers from Australia and New Zealand during late 2013 and 2014. They followed a structured interview guide to obtain information on the market trends, lifetimes of products, shares of sales to business vs residential sectors, efficiency trends, price trends, size trends and technology barriers to greater energy efficiency.

In the case of New Zealand the model parameters were adjusted utilising EECA sales data of products regulated under the *Regulations*.

[39] E3 2023, *Regulation Impact Statement for Consultation: MEPS and other measures for Commercial Ice Makers*, May 2023. (GEMS commercial ice makers: consultation paper - Department of Climate Change, Energy, Environment and Water)

[40] DCCEEW 2023, *Consultation Regulatory Impact Statement: Televisions, computer monitors and digital signage displays*, May 2023 (Consultation Regulation Impact Statement – Televisions, Computer Monitors and Digital Signage Displays - Department of Climate Change, Energy, Environment and Water)

[41] Expert Group, Cold Hard Facts 4, Prepared for DCCEEW 2024

5.3.1 Product categories assessed

For each of the classes of equipment, multiple product categories were utilised to ensure the impacts of potential policy changes are assessed. The following product categories were utilised, along with the key inputs of average rated output.

Table 16 Chiller product categories and average rated capacity

Product category	Cooling capacity (kw)
Air 100 < 350 kw	225
Air ≥350 - < 528 kw	431
Air ≥528 to <1055 kw	693
Air ≥1055 to <1407 kw	1,210
Air ≥1407 kw	1,618
Water 100 < 350 kw	300
Water ≥350 - < 528 kw	454
Water ≥528 to <1055 kw	806
Water ≥1055 to <1407 kw	1,257
Water ≥1407 kw	2,383

The average rated capacity is based on the average of all registered products from 2009 within each size category. For 100-350 kw, the average capacity is estimated.

5.3.2 BAU efficiency in 2023

The BAU operational COP at full load and IPLV is shown in Table 17 below for Australia and New Zealand (with the assumption that New Zealand values are the same as Australia). All product categories were derived from model weighted average data using the registration database, except for <350 kw, where it was assumed that this category is below the minimum COP required by the NCC in 2019 (as products are only required to meet the NCC in new buildings). BAU values were calculated from the registration database from 2009 to 2022, with earlier values derived from the 2008 Chiller RIS.

The model separates the calculations of energy consumption into 4 loads for cooling modes, as per the IPLV load points of 100%, 75%, 50% and 25%. The COP at each load point is calculated using a ratio of 100% load COP to each of the 75%, 50% and 25% load point COP. The ratio of COP at various load points was calculated from data used to develop the 2008 Chiller RIS and validated against the model weighted average IPLV from the registration database.

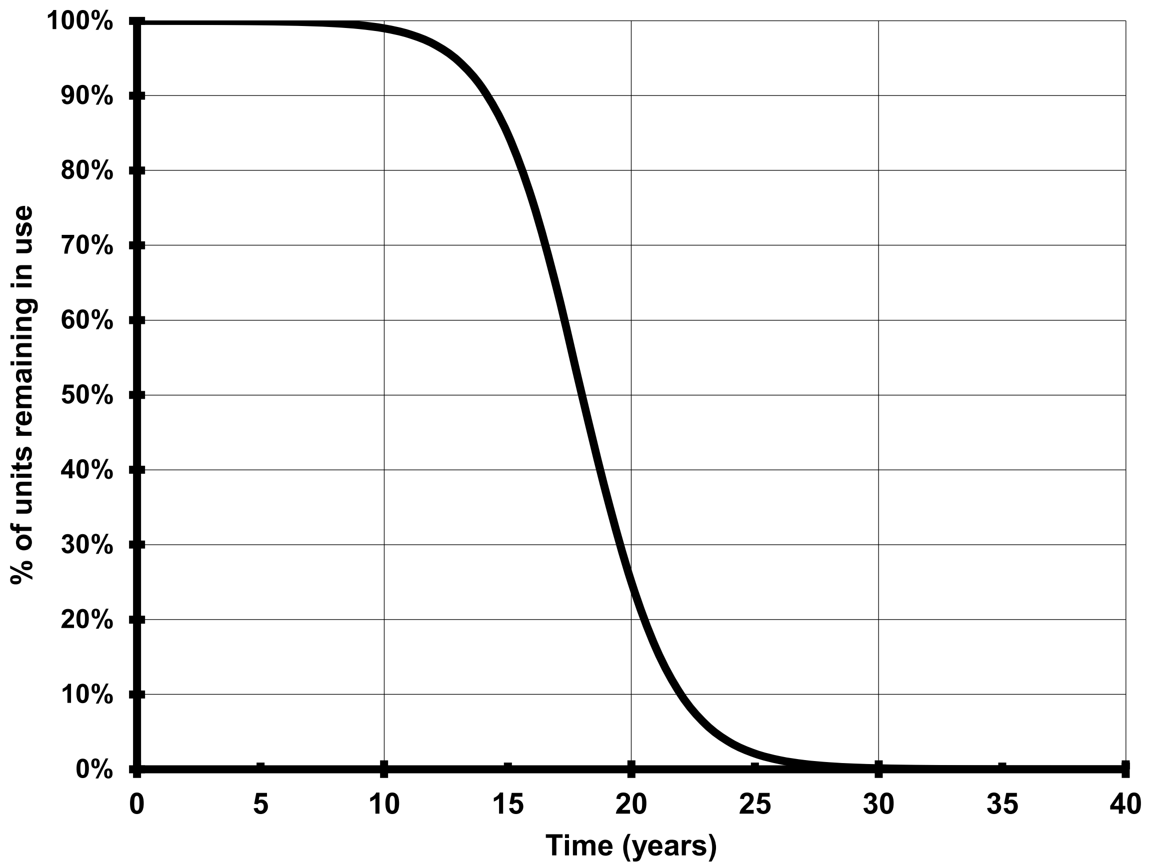
Table 17 Chiller product categories and average efficiency in 2023 - Australia and New Zealand

Product category	Cooling COP (W/W)	Cooling IPLV (W/W)
Air 100 < 350 kw	2.58	4.32
Air ≥350 < 528 kw	3.28	5.49
Air ≥528 to <1055 kw	3.31	5.54
Air ≥1055 to <1407 kw	3.60	6.03
Air ≥1407 kw	2.92	6.23
Water 100 < 350 kw	4.34	6.46
Water ≥350 < 528 kw	5.50	8.19
Water ≥528 to <1055 kw	5.57	8.78
Water ≥1055 to <1407 kw	5.83	9.20
Water ≥1407 kw	6.23	9.83

5.3.3 Life of equipment (Survival)

The forecasts of stock were subjected to appropriate "survival functions" for each category and size. Examples of the different survival functions are shown in Figure 1, where a graphical view is presented of the percentage of chillers (Rt) in useful service over the life in years from purchase (t).

Figure 1 Survival function of air-cooled chiller



The 50% life assumed was 18 years for air-cooled chillers and 25 years for water-cooled chillers.

These life assumptions were developed in consultation with the Australia and New Zealand suppliers in workshops and interviews.

5.3.4 Operating hours

The operating hours for all products were the estimated operating hours of the equipment at various load points.

The chiller operating hours were based on estimates of operating hours by type of building and the share of energy consumption for each building type from the Baseline Energy

Consumption and Greenhouse Gas Emissions in Commercial Buildings in Australia study[42] and information from the previous RIS[43]; and are shown in Table 18.

Table 18 Chiller state/zone average annual operating hours

State/Zone operating hours factor	Cool
New South Wales (NSW)	3,506
Australian Capital Territory (ACT)	3,068
Northern Territory (NT)	3,945
Queensland (QLD)	3,945
South Australia (SA)	3,506
Tasmania (TAS)	1,753
Victoria (VIC)	3,243
Western Australia (WA)	3,506
New Zealand (NZ)	1,753

These operating hours were adjusted to account for the installation of redundant chillers. The adjustments are shown in Table 19 and are based on stakeholder interviews. These figures are conservative given they don't account for heating hours of use for reverse cycle/polyvalent chillers.

Table 19 Chiller equipment adjustment to average annual operating hours

Product category	Factor
Air 100 < 350 kw	0.90
Air 350 - < 528 kw	0.90
Air ≥528 to <1055 kw	0.90
Air ≥1055 to <1407 kw	0.80
Air ≥1407 kw	0.80
Water 100 < 350 kw	0.90
Water 350 - < 528 kw	0.90
Water ≥528 to <1055 kw	0.90
Water ≥1055 to <1407 kw	0.80
Water ≥1407 kw	0.80

The cooling operating hours were then allocated to each of the 4 load points for each State/Zone. Feedback from the industry stakeholders requested that the allocation be the same as the IPLV calculations in the ASHRAE standards. The IPLV calculations allocate the amount of time a chiller would be operating in various IPLV load points for cooling mode. The proportion of time in each temperature range was allocated to the load points as follows for all regions:

[42] DCCEE 2012, *Baseline Energy Consumption and Greenhouse Gas Emissions in Commercial Buildings in Australia*, Department of Climate Change and Energy Efficiency, Prepared by Pitt and Sherry, November 2012 (baseline-energy-consumption-part_1-report-2012.pdf; cbbs-part-2.pdf)

[43] Ministerial Council on Energy 2008, *Decision Regulatory Impact Statement: Minimum Energy Performance Standards and Alternative Strategies for Chillers*, prepared by EnergyConsult for the Equipment Energy Efficiency Committee under the auspices of the Ministerial Council on Energy, Canberra, Australia, July 2008 (Decision Regulatory Impact Statement: Minimum Energy Performance Standards and Alternative Strategies for Close Control Air Conditioners)

100% load	*1% of the time*
75% load	*42% of the time*
50% load	*45% of the time*
25% load	*12% of the time*

5.3.5 Price efficiency ratio

A key input for the modelling of the costs of the policy option is the impact on the price of the product to the consumer. The assumption used in the modelling is that more efficient equipment is more expensive than a similar performing product with lower efficiency.[44] This approach has been used for past RISs in determining the relative costs of efficiency improvements due to the policy intervention.

A range of options exist for determining the potential price changes as a result of the policy, such as engineering/cost deconstruction, surveys of the suppliers to obtain price increments vs efficiency performance, analysis of the price versus efficiency relationship from matched model sales and technical data. The latter 2 approaches were used in this modelling exercise.

The aim of this price versus efficiency research is to obtain a value for the Price Efficiency (PE) ratio that can be used to assess the cost impacts of the policy options. For example, if a 1% increase in the average efficiency of the products being sold/installed is achieved with an average price increase of 1.5%, this results in a PE ratio of 1.5.

The PE ratio used for the assessment of costs in the CBA for chillers was 1.0, based on stakeholder workshops, interviews, and feedback on the CRIS.

5.3.6 Discount rates

All the outputs of the CBA were assessed in Australia at a 7% discount rate, with sensitivity tests at 0, 3 and 10%. For New Zealand a 5% discount rate is used, with sensitivity tests at 0, 2 and 7%.

5.3.7 Electricity prices

The electricity prices and forecasts used in the CBA are taken from documented research:

[44] Although this assumption is used – it is not necessary supported by evidence from evaluations of efficiency programs, see 'Evaluation of Energy Efficiency Policy Measures for Household Air Conditioners in Australia', EnergyConsult 2010.

- In Australia they are based on Large Business Customers electricity price from the ACCC[45] and the forecast is made using the wholesale price index, from AEMO 2024 Draft ISP (Step change scenario)[46].
- In New Zealand electricity prices are the long range marginal cost provided by the Energy Efficiency and Conservation Authority.

5.3.8 GHG emission factors

The GHG emission factors and forecasts used in the modelling are taken from published sources[47], with the Australian factors assumed to decline to close to zero from 2035 to 2050. The New Zealand factors are sourced from EECA in 2024, and based on the scenarios produced by the Climate Change Commission's 2021 Final Advice.

[45] ACCC 2023, *Inquiry into the National Electricity Market report - December 2023*, Australian Competition and Consumer Commission, December 2023 (Inquiry into the National Electricity Market report - December 2023 | ACCC)

[46] AEMO 2023, *Draft 2024 ISP forecast*, Australian Energy Market Operator, August 2023, retrieved from NATIONAL ELECTRICITY FORECASTING on 18 April 2024 (AEMO | Draft 2024 ISP Consultation)

[47] DCCEEW 2023, *Australia's emissions projections 2023*, Department of Climate Change, Energy, the Environment and Water, November 2023 (Australia's emissions projections 2023 - DCCEEW)

Table 20 Commercial/business electricity prices (real 2023 cents/ kwh) for Australia and long run marginal price for New Zealand

Region/ year	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
NSW	26.4	26.7	23.5	21.5	17.6	16.5	15.5	14.8	14.7	14.4	14.0	13.9	14.0	14.0	13.5	13.1	12.5	12.6
ACT	26.4	26.7	23.5	21.5	17.6	16.5	15.5	14.8	14.7	14.4	14.0	13.9	14.0	14.0	13.5	13.1	12.5	12.6
NT	25.0	28.7	23.9	19.7	17.2	16.0	15.1	14.5	14.5	14.2	13.9	13.7	13.7	13.6	13.3	13.1	12.6	12.5
QLD	24.6	22.9	20.8	18.4	14.8	14.5	14.4	14.4	14.3	14.1	13.7	13.5	13.3	13.4	13.0	12.7	12.1	12.0
SA	25.0	28.7	23.9	19.7	17.2	16.0	15.1	14.5	14.5	14.2	13.9	13.7	13.7	13.6	13.3	13.1	12.6	12.5
TAS	22.6	23.6	20.8	17.6	12.7	11.6	11.4	11.6	11.9	12.0	11.9	11.8	11.9	11.9	11.7	11.5	11.2	11.3
VIC	22.6	23.7	21.6	20.6	17.2	16.4	15.7	15.4	15.6	15.3	15.0	14.6	14.7	14.7	14.3	14.0	13.5	13.5
WA	24.7	24.9	22.2	20.0	16.3	15.5	14.9	14.6	14.6	14.4	14.0	13.8	13.8	13.8	13.4	13.1	12.6	12.6
NZ (NZ cents)	N/A	10.11	9.58	9.18	9.18	9.18	9.18	9.18	9.02	9.01	9.03	9.07	9.11	9.21	9.25	9.37	9.37	9.42

Sources: AEMO/ACCC (2023) and EECA (2024). Note: New Zealand long run marginal electricity price is used for the CBA impact modelling. The commercial price is 19.63 c/ kwh (real 2023 New Zealand dollars).

Table 21 GHG emissions factors for electricity (kg CO2-e/ kwh) for Australia and New Zealand

Region/ year	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
NSW	0.730	0.630	0.560	0.420	0.320	0.300	0.300	0.200	0.110	0.060	0.020	0.030	0.030	0.029	0.029	0.028	0.027	0.027
ACT	0.730	0.630	0.560	0.420	0.320	0.300	0.300	0.200	0.110	0.060	0.020	0.030	0.030	0.029	0.029	0.028	0.027	0.027
NT	0.610	0.590	0.440	0.420	0.400	0.390	0.380	0.350	0.310	0.300	0.300	0.300	0.290	0.275	0.261	0.246	0.231	0.217
QLD	0.880	0.850	0.800	0.780	0.670	0.560	0.510	0.480	0.440	0.320	0.230	0.220	0.220	0.210	0.200	0.190	0.180	0.170
SA	0.320	0.220	0.180	0.170	0.080	0.100	0.100	0.080	0.110	0.120	0.140	0.190	0.210	0.198	0.186	0.174	0.162	0.150
TAS	0.130	0.050	0.020	0.040	0.040	0.030	0.030	0.020	0.010	0.010	0.010	0.010	0.020	0.020	0.020	0.020	0.020	0.020
VIC	0.850	0.810	0.750	0.740	0.690	0.640	0.430	0.420	0.410	0.340	0.260	0.130	0.010	0.015	0.021	0.026	0.031	0.037
WA	0.570	0.540	0.510	0.470	0.370	0.310	0.290	0.200	0.190	0.170	0.160	0.160	0.150	0.144	0.138	0.132	0.126	0.120
NZ	0.105	0.079	0.040	0.043	0.046	0.049	0.051	0.054	0.056	0.056	0.055	0.055	0.055	0.054	0.054	0.054	0.053	0.052

Sources: DCCEEW (2023) and EECA (2024). The data from DCCEEW (2023) is taken from Table 46, Indirect scope 2 and 3 combined emissions factors in the baseline scenario.

5.3.9 Carbon price

The benefits include a value for the reduction of carbon emissions in accordance with CBA methodologies. The emissions reduction value is calculated by multiplying the carbon reduction multiplied by the carbon price in each year. For Australia, the carbon price ranges from $70/tonne in 2024 to $420/tonne in 2050 (AU$ real, AEMC 2024), and in New Zealand, the carbon price ranges from $105/tonne in 2024 to $309/tonne in 2050 (New Zealand Treasury 2023, New Zealand dollars real, central scenario).

Sensitivity tests are undertaken as follows:

- Australia: 50% lower and 50% higher then the central carbon price[48].
- New Zealand: Low and high recommended emission values[49].

5.4 Sales and stock

This section sets out the sales data and projections and the stock of chillers in both Australia and New Zealand using that data and those projections.

5.4.1 Sales trends

The sales of chillers are a function of economic growth and business product preferences. The sales data from published and unpublished sources has been utilised to determine the most probable forecast that matches the historic data and trends. These sales forecasts have been developed in consultation with industry stakeholder interviews in Australia for the development of Cold Hard Facts 4[50] and trends are assumed to also apply to New Zealand.

Figures 2 to 5 show the resulting historical and forecast sales of chillers to 2040 in Australia and New Zealand by category.

[48] AEMC 2024, [How the national energy objectives shape our decisions](), Australian Energy Market Commission, 28 March 2024

[49] New Zealand Treasury 2023, *Assessing climate change and environmental impacts in the CBAx tool*, The Treasury, New Zealand Government, December 2023

[50] Expert Group, Cold Hard Facts 4, Prepared for DCCEEW, 2024

Figure 2 Historical and forecast annual sales of air-cooled chillers: Australia

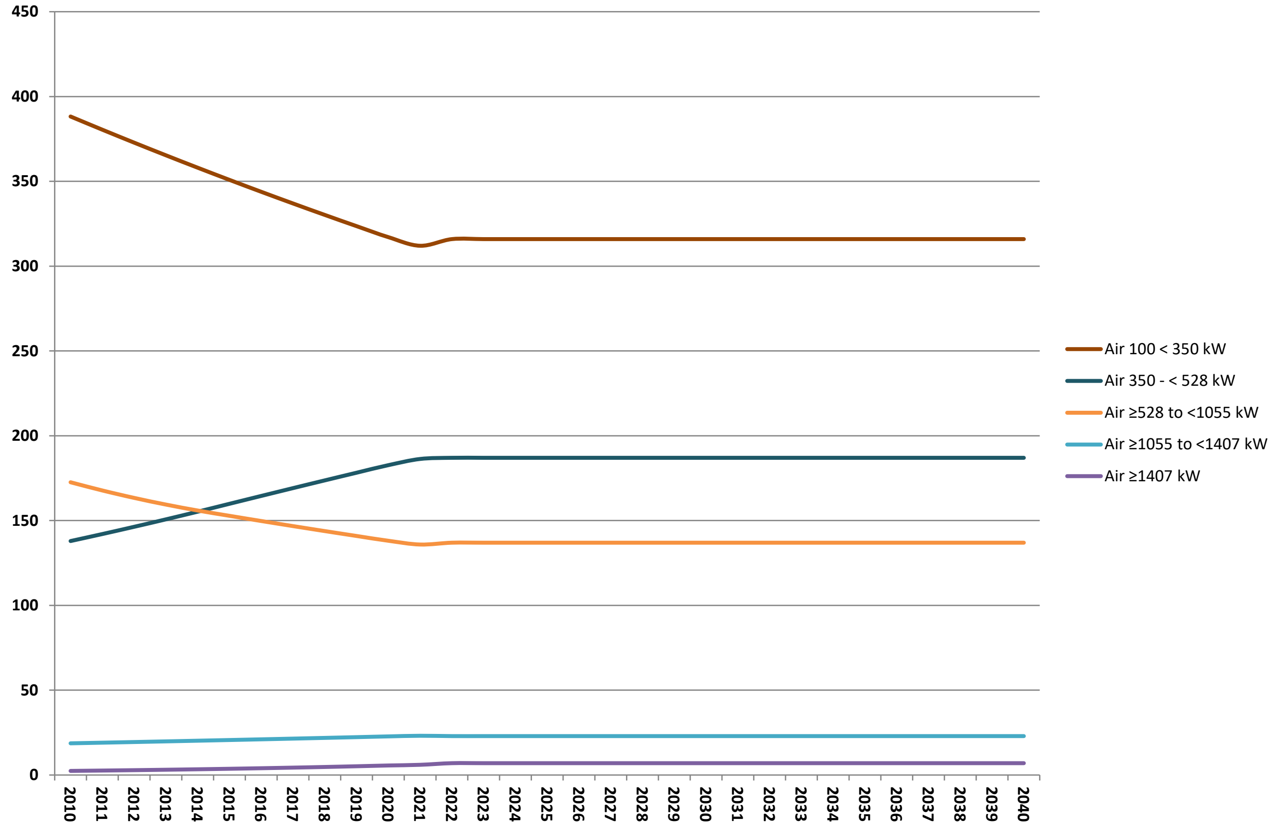


Figure 3 Historical and forecast annual sales of water-cooled chillers: Australia

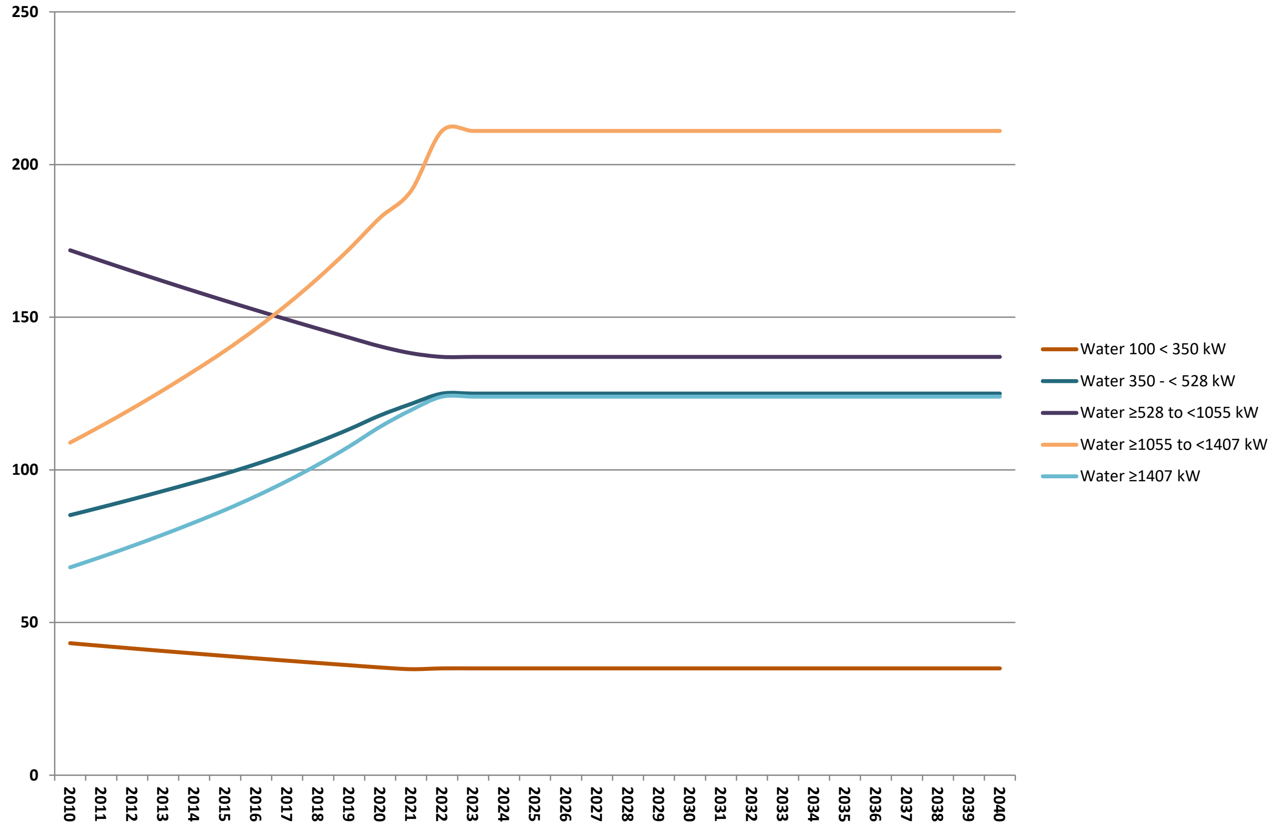


Figure 4 Historical and forecast annual sales of air-cooled chillers: New Zealand

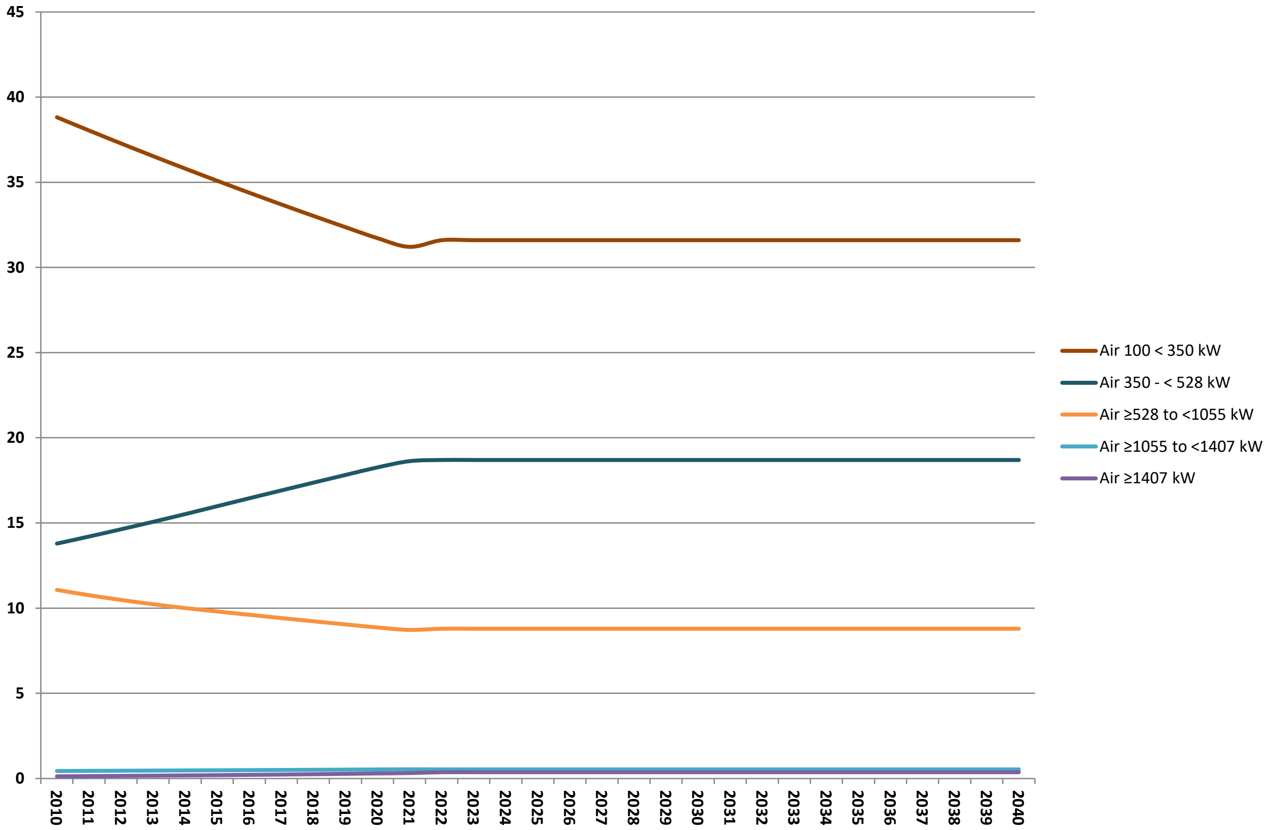


Figure 5 Historical and forecast annual sales of water-cooled chillers: New Zealand

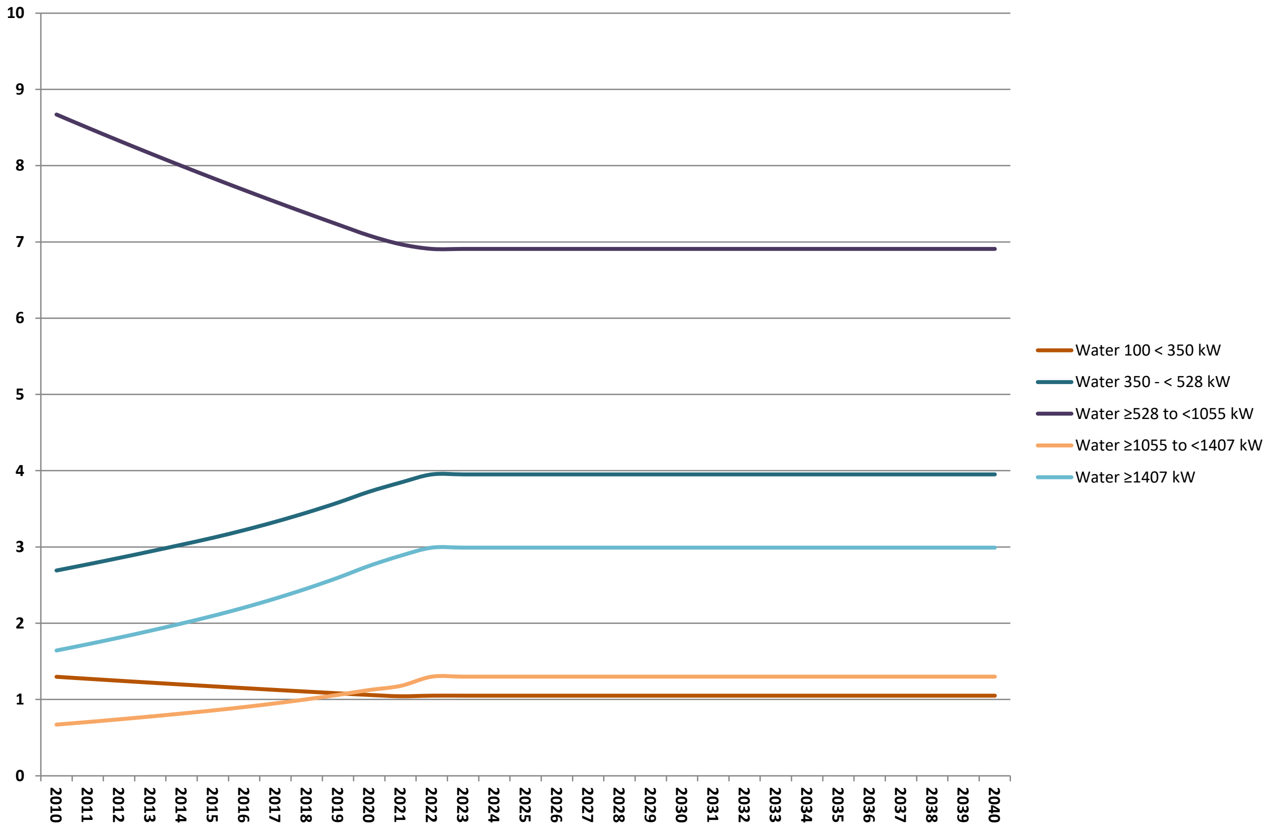


Figure 6 Forecast stock of chillers by category – Australia

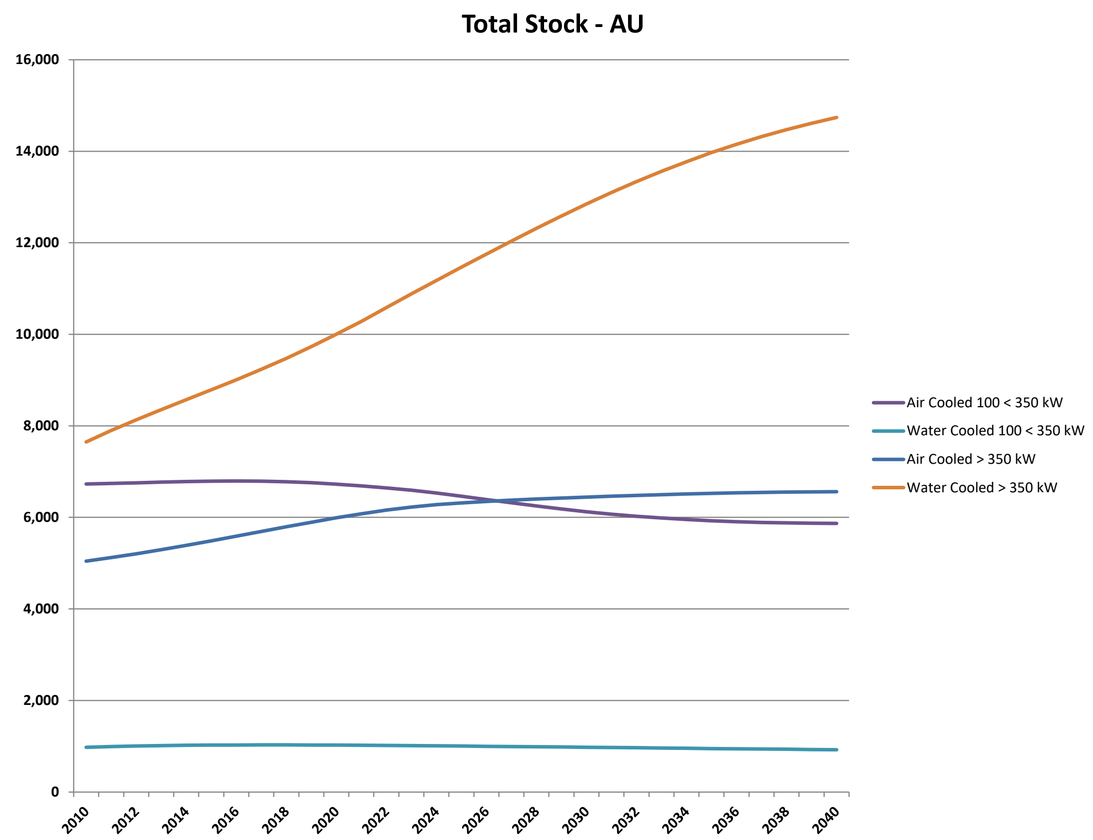
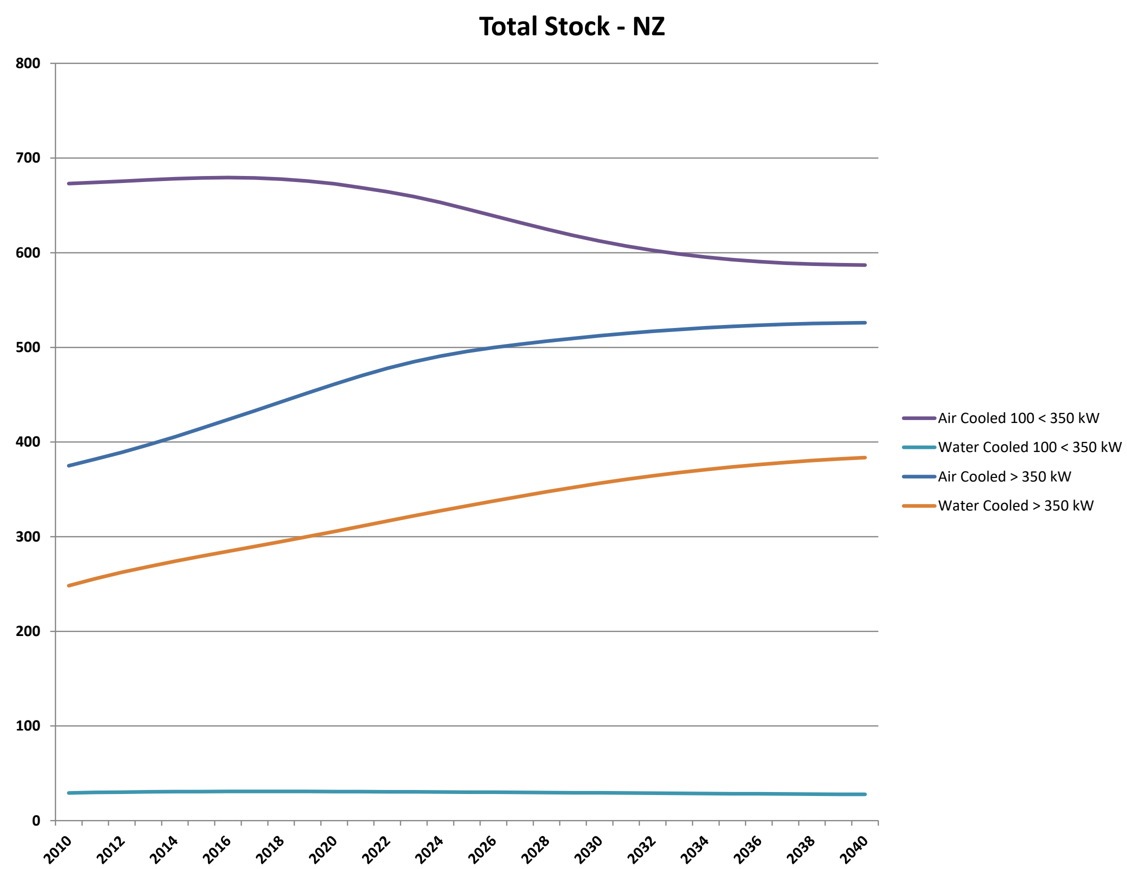


Figure 7 Forecast stock of chillers by category – New Zealand



5.4.2 Stock trends

The estimated stock of chiller by category for Australia and New Zealand over the period 2010 to 2040 is shown in Figures 6 and 7.

5.4.2.1 Stock by region

The estimates of chiller stock for the period between 2020 and 2040 by State/region are provided in Table 22.

Table 22 Stock of chillers 2020-2040, by state/region

Year/ Region	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	AU total	NZ
2020	651	7,071	408	5,236	1,119	528	6,567	2,162	23,743	1,470
2021	660	7,169	414	5,308	1,135	536	6,658	2,191	24,071	1,480
2022	670	7,269	420	5,382	1,151	543	6,751	2,222	24,407	1,490
2023	678	7,361	425	5,450	1,165	550	6,836	2,250	24,714	1,497
2024	686	7,444	430	5,512	1,178	556	6,913	2,275	24,994	1,501
2025	693	7,520	434	5,568	1,190	562	6,983	2,299	25,249	1,504
2026	699	7,592	438	5,621	1,202	567	7,050	2,321	25,491	1,506
2027	706	7,661	442	5,673	1,213	572	7,115	2,342	25,723	1,507
2028	712	7,729	446	5,723	1,223	577	7,178	2,363	25,951	1,508
2029	718	7,796	450	5,772	1,234	582	7,239	2,383	26,174	1,509
2030	724	7,861	454	5,820	1,244	587	7,300	2,403	26,392	1,510
2031	730	7,924	457	5,867	1,254	592	7,358	2,422	26,605	1,512
2032	736	7,985	461	5,912	1,264	597	7,415	2,441	26,810	1,513
2033	741	8,043	464	5,955	1,273	601	7,469	2,459	27,006	1,514
2024	746	8,099	467	5,997	1,282	605	7,521	2,476	27,194	1,516
2035	751	8,152	471	6,036	1,290	609	7,571	2,492	27,372	1,517
2036	756	8,203	473	6,073	1,298	613	7,617	2,507	27,540	1,519
2037	760	8,249	476	6,108	1,306	616	7,660	2,522	27,697	1,520
2038	764	8,292	479	6,140	1,312	619	7,700	2,535	27,841	1,522
2039	767	8,331	481	6,169	1,319	622	7,737	2,547	27,973	1,523
2040	771	8,368	483	6,195	1,324	625	7,770	2,558	28,094	1,524

5.5 Policy option impacts – energy and cost/benefit

This section sets out the headline results for options B and D when considered in relation to option A business as usual.

5.5.1 Options considered

The options proposed are as follows:

Option B: Tables 4 to 7

This option follows closely the proposal considered in the *UPDATE: Proposed changes to regulation of liquid chilling packages*[51], with Table 1 from that document implemented on 1 January 2026 and Table 2 on 1 January 2027.

Option D: Tables 12 to 15

This option implements Tables 12 and 13 on 1 January 2026.

The summary impacts of the options are shown in Tables 23 to 26 and Figures 8 to 11 below in terms of the energy savings and greenhouse gas emission reductions.

5.5.2 Summary of impacts and benefits

Table 23 Key energy/emission impacts and cost benefits by proposal: Australia

Proposal	Energy saved (cumulative GWh to 2040)	GHG emission reduction (cumulative) kt	Total benefit ($M)	Total investment ($M)	Net benefit ($M)	BCR
Option B	1,358	206	$150	$28	$121	5.3
Option D	1,383	212	$153	$29	$123	5.2

Note: This table uses discount rates of 7% for Australia

Table 24 Key energy/emission impacts and cost benefits by proposal: New Zealand

Proposal	Energy saved (cumulative GWh to 2040)	GHG emission reduction (cumulative) kt	Total benefit ($M)	Total investment ($M)	Net benefit ($M)	BCR
Option B	37	2.0	$4	$1	$2	3.2
Option D	38	2.0	$4	$1	$2	3.2

Note: This table uses discount rates of 5% for New Zealand

Table 25 Summary energy savings and emissions reductions by proposal: Australia

Proposal	Energy savings (GWh pa) in 2030	Energy savings (GWh pa) in 2040	Energy savings cumulative 2040 (GWh)	GHG reduction cumulative (kt CO2-e)
Option B	57	169	1,358	206
Option D	58	171	1,383	212

Table 26 Summary energy savings and emissions reductions by proposal: New Zealand

Proposal	Energy savings (GWh pa) in 2030	Energy savings (GWh pa) in 2040	Energy savings cumulative 2040 (GWh)	GHG reduction cumulative (kt CO2-e)
Option B	2	5	37	2
Option D	2	5	38	2

[51] E3 2018, *UPDATE: Proposed changes to regulation of liquid chilling packages*, Department of Industry, Innovation and Science on behalf of the Equipment Energy Efficiency Program December 2018

Option B – Detail by state/region and category

Table 27 Option B State/region summary energy greenhouse and cost benefit analysis

Impact	ACT	NSW	NT	Qld	SA	TAS	Vic	WA	Australia (total)	New Zealand
Total benefit ($m)	3.3	41.0	3.2	39.7	7.1	1.3	40.1	13.9	**149.7**	**3.6**
Total cost ($m)	0.8	8.4	0.5	6.2	1.3	0.6	7.8	2.6	**28.2**	**1.1**
Benefit cost ratio (BCR)	4.3	4.9	6.7	6.4	5.3	2.0	5.1	5.4	**5.3**	**3.2**
Energy saved (GWh cumulative)	32.8	406.7	26.4	338.8	64.4	15.2	349.4	124.3	**1,358**	**37**
Greenhouse gas emission reduction (kt CO_2-e cumulative)	2.1	26.1	7.4	88.3	10.2	0.3	51.4	20.0	**206**	**2**

Note: This table uses discount rates of 7% for Australia and 5% for New Zealand

Figure 8 Option B energy savings by year

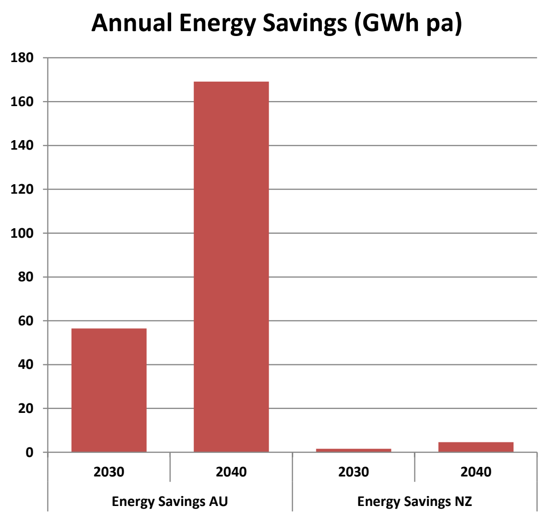
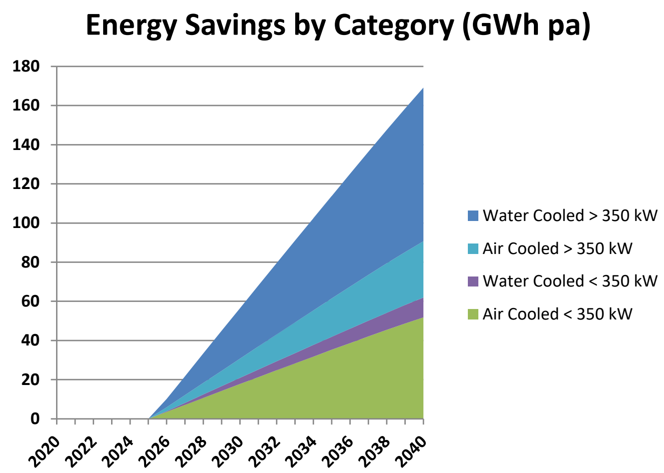


Figure 9 Option B energy savings by category



Option D – Detail by state/region and category

Table 28 Option D State/region summary energy greenhouse and cost benefit analysis

Impact	ACT	NSW	NT	Qld	SA	TAS	Vic	WA	Australia (total)	New Zealand
Total benefit ($m)	3.4	41.9	3.3	40.4	7.3	1.3	40.9	14.1	**152.6**	**3.6**
Total cost ($m)	0.8	8.7	0.5	6.4	1.4	0.6	8.0	2.6	**29.1**	**1.1**
Benefit cost ratio (BCR)	4.2	4.8	6.6	6.3	5.3	2.0	5.1	5.3	**5.2**	**3.2**
Energy saved (GWh cumulative)	33.4	414.3	26.9	345.1	65.6	15.5	355.9	126.6	**1,383**	**38**
Greenhouse gas emission reduction (kt CO_2-e cumulative)	2.2	27.0	7.5	90.5	10.4	0.3	53.2	20.5	**212**	**2**

Note: This table uses discount rates of 7% for Australia and 5% for New Zealand

Figure 10 Option D energy savings by year

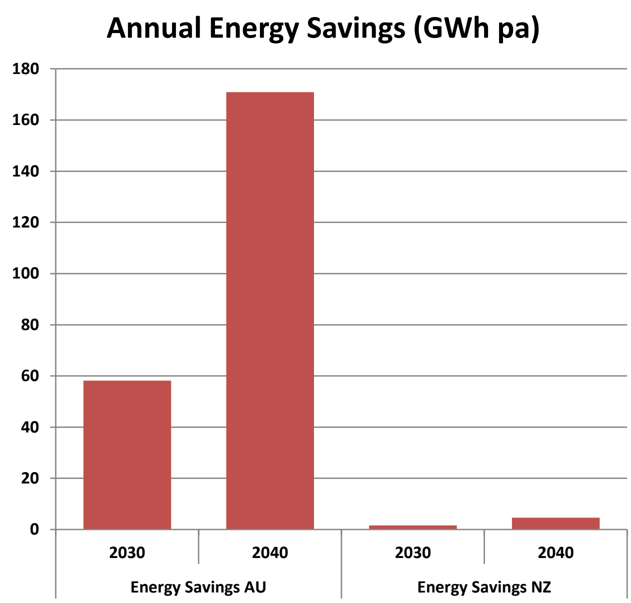
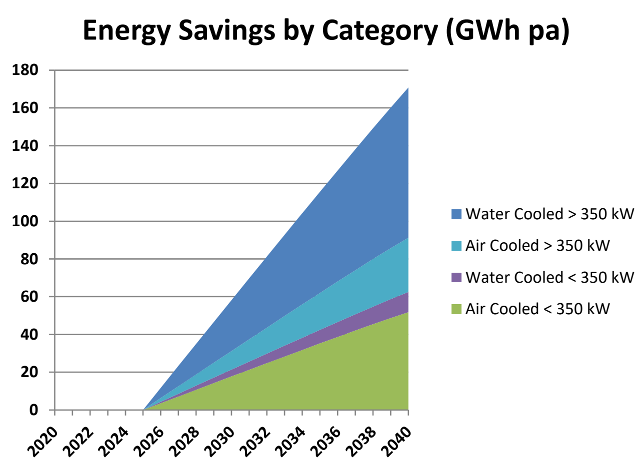


Figure 11 Option D energy savings by category



5.5.2.1 Sensitivity tests: discount rates

Table 29 Results from NPV sensitivity tests on discount rates: Australia Option B

Australia Option B	NPV Nil (0%)	NPV Low (3%)	NPV Med (7%)	NPV High (10%)
Total costs	$47,426,562	$37,456,805	$28,176,795	$23,206,333
Total benefits	$438,891,875	$268,410,303	$149,652,680	$101,416,322
Net benefits	$391,465,313	$230,953,498	$121,475,885	$78,209,988
Benefit cost ratio	9.3	7.2	5.3	4.4

Note: This table uses discount rates of 7% for Australia

Table 30 Results from NPV sensitivity tests on discount rates: Australia Option D

Australia Option D	NPV Nil (0%)	NPV Low (3%)	NPV Med (7%)	NPV High (10%)
Total costs	$48,538,664	$38,461,844	$29,062,103	$24,015,339
Total benefits	$445,443,086	$272,877,213	$152,551,136	$103,616,176
Net benefits	$396,904,422	$234,415,368	$123,489,033	$79,600,837
Benefit cost ratio	9.2	7.1	5.2	4.3

Note: This table uses discount rates of 7% for Australia

Table 31 Results from NPV sensitivity tests on discount rates: New Zealand Option B

New Zealand Option B	NPV Nil (0%)	NPV Low (3%)	NPV Med (7%)	NPV High (10%)
Total costs	$1,622,859	$1,385,112	$1,110,830	$968,695
Total benefits	$8,093,247	$5,762,028	$3,592,142	$2,683,859
Net benefits	$6,470,387	$4,376,916	$2,481,312	$1,715,163
Benefit cost ratio	5.0	4.2	3.2	2.8

Note: This table uses discount rates of 5% for New Zealand

Table 32 Results from NPV sensitivity tests on discount rates: New Zealand Option B

New Zealand Option D	NPV Nil (0%)	NPV Low (3%)	NPV Med (7%)	NPV High (10%)
Total costs	$1,639,197	$1,400,361	$1,124,647	$981,669
Total benefits	$8,146,438	$5,802,049	$3,619,434	$2,705,575
Net benefits	$6,507,240	$4,401,688	$2,494,787	$1,723,906
Benefit cost ratio	5.0	4.1	3.2	2.8

Note: This table uses discount rates of 5% for New Zealand

5.5.2.2 Sensitivity tests: higher and lower incremental costs

Table 33 Results from 50% increase of incremental costs sensitivity test: Australia

Proposal	Energy saved (cumulative GWh to 2040)	GHG emission reduction (cumulative) kt	Total benefit ($M)	Total investment ($M)	Net benefit ($M)	BCR
Option B	1,358	206	$150	$42	$107	3.5
Option D	1,383	212	$153	$43	$109	3.5

Note: This table uses discount rates of 7% for Australia

Table 34 Results from 50% increase of incremental costs sensitivity test: New Zealand

Proposal	Energy saved (cumulative GWh to 2040)	GHG emission reduction (cumulative) kt	Total benefit ($M)	Total investment ($M)	Net benefit ($M)	BCR
Option B	37	2.0	$4	$2	$2	2.2
Option D	38	2.0	$4	$2	$2	2.2

Note: This table uses discount rates of 5% for New Zealand

Table 35 Results from 50% decrease of incremental costs sensitivity test: Australia

Proposal	Energy saved (cumulative GWh to 2040)	GHG emission reduction (cumulative) kt	Total benefit ($M)	Total investment ($M)	Net benefit ($M)	BCR
Option B	1,358	206	$150	$14	$135	10.5
Option D	1,383	212	$153	$15	$138	10.4

Note: This table uses discount rates of 7% for Australia

Table 36 Results from 50% increase of incremental costs sensitivity test: New Zealand

Proposal	Energy saved (cumulative GWh to 2040)	GHG emission reduction (cumulative) kt	Total benefit ($M)	Total investment ($M)	Net benefit ($M)	BCR
Option B	37	2.0	$4	$1	$3	6.2
Option D	38	2.0	$4	$1	$3	6.2

Note: This table uses discount rates of 5% for New Zealand

5.5.2.3 Sensitivity tests: higher and lower carbon price

Table 37 Results from 50% increase of carbon price: Australia

Proposal	Energy saved (cumulative GWh to 2040)	GHG emission reduction (cumulative) kt	Total benefit ($M)	Total investment ($M)	Net benefit ($M)	BCR
Option B	1,358	206	$160	$28	$132	5.7
Option D	1,383	212	$163	$29	$134	5.6

Note: This table uses discount rates of 7% for Australia

Table 38 Results from 50% increase of carbon price: New Zealand

Proposal	Energy saved (cumulative GWh to 2040)	GHG emission reduction (cumulative) kt	Total benefit ($M)	Total investment ($M)	Net benefit ($M)	BCR
Option B	37	2.0	$4	$1	$3	3.3
Option D	38	2.0	$4	$1	$3	3.3

Note: This table uses discount rates of 5% for New Zealand

Table 39 Results from 50% decrease of carbon price: Australia

Proposal	Energy saved (cumulative GWh to 2040)	GHG emission reduction (cumulative) kt	Total benefit ($M)	Total investment ($M)	Net benefit ($M)	BCR
Option B	1,358	206	$139	$28	$111	4.9
Option D	1,383	212	$142	$29	$113	4.9

Note: This table uses discount rates of 7% for Australia

Table 40 Results from low carbon price: New Zealand

Proposal	Energy saved (cumulative GWh to 2040)	GHG emission reduction (cumulative) kt	Total benefit ($M)	Total investment ($M)	Net benefit ($M)	BCR
Option B	37	2.0	$3	$1	$2	3.1
Option D	38	2.0	$3	$1	$2	3.1

Note: This table uses discount rates of 5% for New Zealand

5.5.3 Option A: BAU energy consumption

The modelled BAU energy consumption for Australia and New Zealand is shown Figure 12.

Figure 12 Australia by year

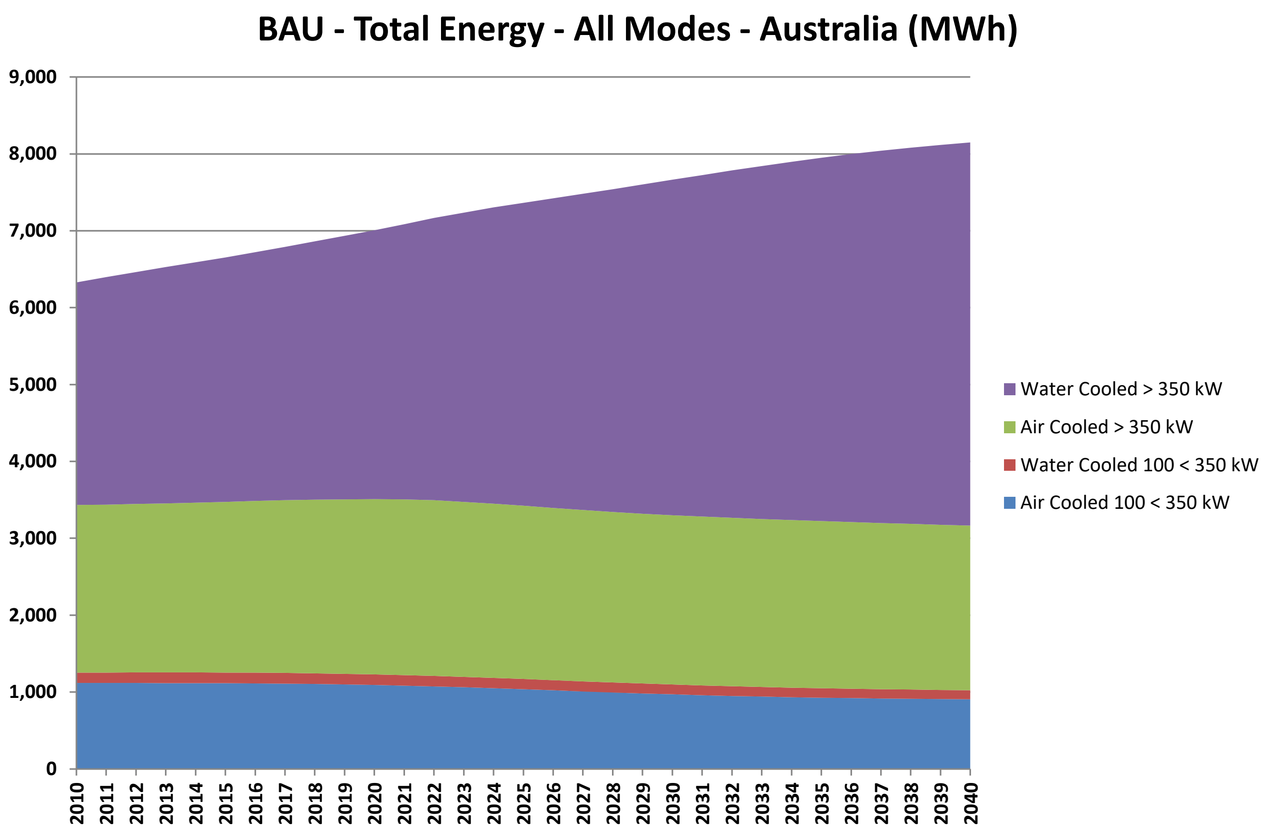
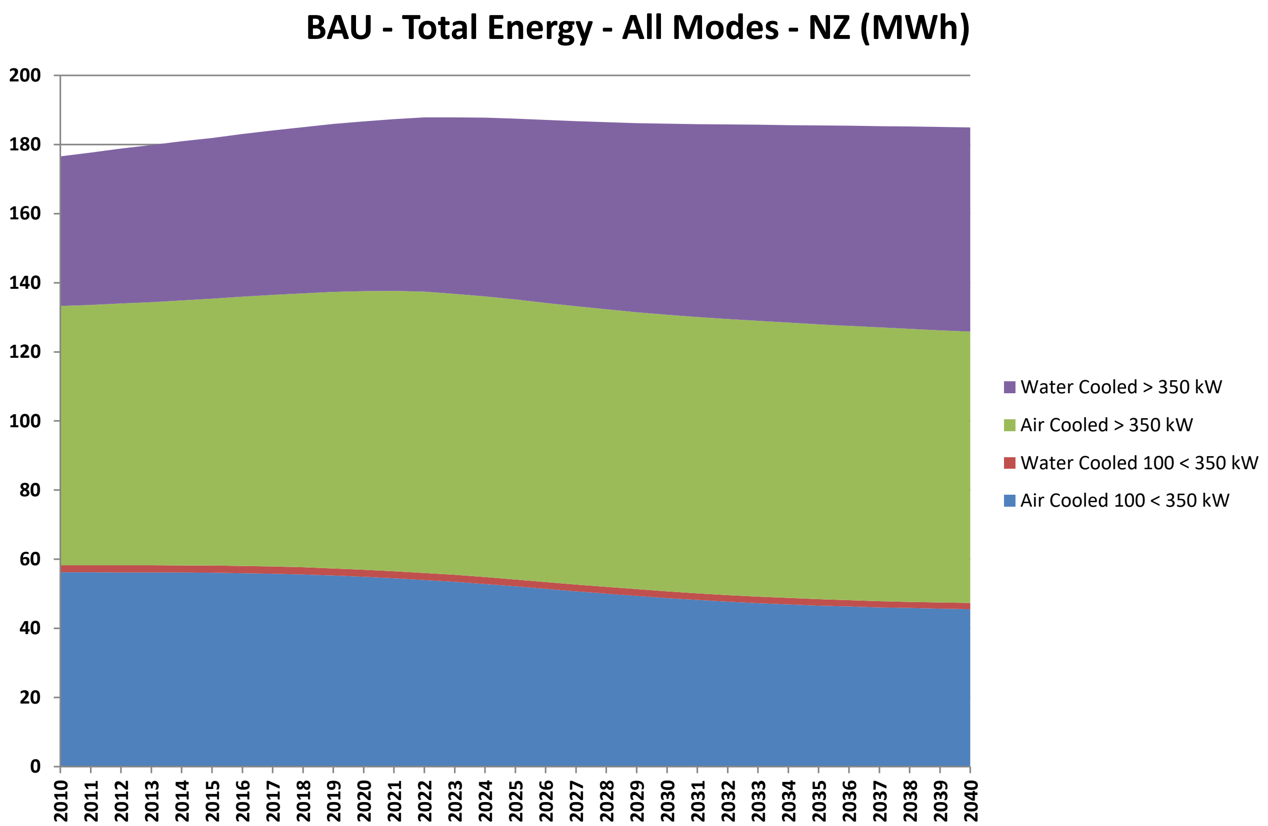


Figure 13 New Zealand by year



6 Consultation and feedback

The position set out in this Decision RIS is the outcome of a consultation process extending over some years and several consultation documents. The main documents that formed part of the consultation process and the date of release were:

• Consultation RIS – Air Conditioners and Chillers	Feb 2016
• Air conditioners and chillers: Updated policy positions	Nov 2016
• Chillers: Updated Policy Positions	Jun 2018
• Chillers: Final policy positions	Aug 2018
• Update: Proposed changes to regulation of liquid chilling packages	Dec 2018

6.1 Consultation RIS – Air Conditioners and Chillers

EnergyConsult interviewed 25 suppliers from Australia and New Zealand in 2013 and 2014 to identify the data inputs and develop assumptions for the cost benefit analysis. E3 also held a workshop with 50 industry participants in April 2014, where the preliminary results of the modelling were presented and feedback sought. This was followed by further consultation at the Air Conditioning, Refrigeration and Building Services (ARBS) conference in May 2014. In New Zealand, EnergyConsult interviewed stakeholders to obtain feedback on the preliminary modelling results for New Zealand.

On 4 December 2015, the Council of Australian Governments (COAG) Energy Council committed to an E3 prioritisation plan. The 2015-16 plan identified 6 priority areas: lighting, non-domestic fans, swimming pool pumps, refrigerated storage and display cabinets, air conditioners and domestic refrigerators.

The Consultation RIS was published in February 2016 on the Energy Rating, COAG Energy Council and EECA websites.[52] Comments and discussion were invited from consumers, industry and other interested stakeholders on proposals to address regulatory issues and increase the uptake of more energy efficient chillers.

The Consultation RIS included the following options for change in regard to chillers:

- remove the Australia/New Zealand specific test standard for chillers and align with the US test standard;

[52] Proposal to increase energy efficiency of air conditioners and chillers | The Office of Impact Analysis (pmc.gov.au)

- remove the energy efficiency requirements for air conditioners and chillers from the NCC and include them under the E3 Program. This would have the effect of capturing replacement chillers below 350 kw in Australia and including New Zealand chillers below that capacity for the first time;
- align MEPS levels for chillers to the updated MEPS levels specified in the US standard ASHRAE 90.1:2013 where the US levels are higher.

Consultation sessions on the RIS were held in Sydney, Melbourne, Brisbane, Adelaide, Perth and Wellington between 15 and 23 February 2016. Around 100 people attended the consultation sessions, with 30 written submissions received in response from a range of manufacturers, industry groups and individuals. The submissions provided policy input and technical information about the proposals. Little feedback was received on the data or assumptions that underpin the cost benefit estimates.

6.2 Air conditioners and chillers: Updated policy positions supplementary consultation document

E3 published a supplementary consultation paper on the Energy Rating website in November 2016, in response to feedback on the Consultation RIS. The paper was released to provide the opportunity for further feedback where the Consultation RIS proposals had been modified or were not recommended to continue and to seek additional information on specific issues. It was also distributed to approximately 1000 stakeholders by email.

Some of the policy options proposed in this document, including a proposal to abolish MEPS for water-cooled chillers and for air-cooled chillers over 700 kw capacity, varied significantly from those put forward in the Consultation RIS. This document also canvassed administrative regulatory issues regarding chiller registration requirements.

Consultation sessions were held on 6 December 2016 in Sydney and 9 December 2016 in Wellington (with a teleconference link to Auckland). Around 50 people attended the 2 sessions. Separate meetings were held with 3 stakeholders in Sydney, Melbourne and Canberra in January 2017, while a further teleconference was held with an overseas based supplier in March. Thirty written submissions were received in response.

Stakeholders provided feedback on whether a policy proposal was supported or whether it was feasible. Again, little feedback was received on the data or assumptions that underpin the cost benefit estimates.

Note that both the Consultation RIS and supplementary consultation paper covered both chillers and air conditioners. Separate consultation papers and processes were followed for chillers and air conditioners from then on.

6.3 Chillers: Updated policy positions supplementary consultation document

In addition to feedback on the chillers sections of the Consultation RIS and the updated policy positions supplementary consultation document further consultation was held through one on one discussions with companies in Sydney, Melbourne, Canberra and New Zealand in 2017 and 2018, discussions at the 2018 ARBS exhibition, and discussions with officers from the Australian Buildings Code Board and international developments since the review of the regulations started, including discussions with AHRI in the United States and Eurovent in Europe.

This document canvassed a range of issues including a proposal to remove the unique Australian/New Zealand standard and accepting both AHRI and Eurovent certification, a modified registration arrangement and several proposals regarding the scope of the measure and MEPS levels to be applied.

This document included the position following feedback from industry that the updated determination/regulation would allow physical test reports to AHRI 551/591:2015 without meeting the selection, installation, operation and maintenance requirements for test instrumentation stated in Table C1 of that standard.

Seventeen written submissions from companies, the industry association Airconditioning and Refrigerant Equipment Manufacturers Association of Australia (AREMA), companies and AHRI were received. The issues raised in these submissions are summarised in the next section.

6.4 Chillers: Final policy positions supplementary consultation document

This document summarised the points made in submissions in relation to each of the issues canvassed in the Updated policy positions supplementary consultation document (see previous section 6.3 Chillers: Updated policy positions supplementary consultation document). Feedback was sought on a range of broader questions mainly around the timing and effects of the proposals and barriers to implementation. Specific feedback was sought on:

- whether physical test reports in AHRI or Eurovent certified labs should be accepted in place of certification;
- the proposal to remove grouping of registrations as a family registration;
- the proposed MEPS levels;
- cost of upgrading equipment to meet the proposed efficiency levels; and
- sales data for chillers in Australia.

Following industry feedback on the November 2016 updated policy positions consultation document (see section 6.2), this document included various revised policy positions some of the more significant of which were:

- MEPS would only need to met on full load or part load and on heating or cooling
- exclusion of chillers below 100 kw rated capacity from the measure
- inclusion of reverse cycle chillers

Eleven submissions were received in response to this paper with much of the feedback focused on MEPS levels and registrations issues.

6.5 Update: Proposed changes to the regulation of liquid chilling packages

This document set out the finalised policy positions which are reflected in this Decision RIS.

The document also made proposals regarding the consultation process to be followed in developing the determination, including an expectation that there would be:

- A minimum of 2 exposure drafts to be released for public comment and submissions;
- A final exposure draft published for public comment and submissions;
- A minimum of 4 weeks to comment on the exposure drafts of the determination; and
- A minimum of 2 weeks to comment on the final exposure draft of the determination.

6.6 Further consultation meeting

In October 2022 a further consultation meeting was held with chiller industry representatives in Sydney. Around 20 representatives attended.

Stakeholders were consulted on whether the market had moved on since the publication of the previous consultation paper and, if so, whether such changes warranted re-visiting any of the proposed policy recommendations. Feedback from industry noted that while there had been some movement in the chiller market towards chillers that were capable of heating and cooling and some increase in 4-pipe chillers (that are capable of heating and cooling simultaneously) there was general support for implementing the policy positions outlined in the Update: Proposed changes to the regulation of liquid chilling packages paper while flagging that the settings may need to be re-visited in the medium term if the position set out on reverse cycle and 4-pipe chillers was creating issues for the industry or regulation of the chiller market. Again, little feedback was received on the request for data or the assumptions that would underpin the cost benefit estimates.

7 Recommended option

While Options B, C and D all provide the same suite of changes as set out below, Option D is the recommended policy option. The tighter MEPS levels from an earlier date lead to a result that is estimated to provide the largest net benefit to both Australia and New Zealand at A$123 million and NZ$2 million respectively. Option D would also provide the largest energy and GHG savings.

Options B, C and D all include the regulatory changes set out below but include different MEPS proposals.[53]

Removing certification through AS/NZS 4776, leaving AHRI and Eurovent certification as the pathways.

Scope

The other regulatory changes are focused on the coverage of the measure.

The measure would be extended to include chillers in the 100 kw -350 kw size category.

The regulatory changes and clarifications for rating conditions are:

- Cooling capacity shall be determined under the standard rating conditions of an inlet temperature of 12°C and an outlet temperature of 7°C using water as the primary fluid
- Chillers only able to heat would be rated at an inlet temperature of 30°C and an outlet temperature of 35°C
- Reverse cycle and polyvalent chillers are rated on their cooling capacity

Inclusions and exclusions are listed below:

- Heat recovery chillers were previously excluded but would now be included, and would be tested with the heat recovery feature inactive
- Chillers with centrifugal fans were previously excluded but would now be included
- Reverse cycle chillers (chillers that can heat or cool) and polyvalent ('4 pipe') chillers (that can heat and cool simultaneously) were previously excluded but would now be included. They would have to meet MEPS on heating or cooling (but not both). Six pipe chillers would continue to not be covered as they are not covered by either certification scheme.

[53] With the inclusion of reverse cycle and polyvalent chillers heating MEPS levels are also imposed under Options B, C and D but these are the same levels regardless of the option. The details of these MEPS levels are set out in Chapter 4.

- Chillers that heat or cool potable water would be excluded where their full heating or cooling capacity is used for this purpose, otherwise they would be in scope. The existing efficiency regulations do not explicitly address chillers that heat or cool potable water.
- Chillers with titanium heat exchangers will be excluded. The existing efficiency regulations do not explicitly address chillers with titanium heat exchangers.
- Free cooling chillers were previously excluded but would now be included, except for air-cooled free cooling loop chillers that would continue to be excluded. This exclusion is in line with the approach of the Eurovent certification system.
- Adiabatic chillers will be excluded. In 2017 the GEMS Regulator had ruled these were in scope of the current regulations and should be treated as air-cooled chillers.
- The range of outlet water temperatures be increased from between 4°C and 9°C to between 4°C and 12°C for cooling applications, which matches the upper limit Europe's comfort chiller regulations.
- Exclude reverse cycle pump chillers with heating application outlet temperatures of >56°C. As reverse cycle chillers were not previously included under the efficiency regulations such a limitation was not necessary.

Table 41 Option D MEPS from 2026 onwards Eurovent pathways

Chiller type	Size (kw)	Option 1 EER	Option 1 SEER	Option 2 EER	Option 2
Air-cooled	100 to <350	2.785	3.218	2.674	3.712
Air-cooled	350 to <528	2.931	3.387	2.814	3.982
Air-cooled	≥528	2.931	3.462	2.814	3.982
Water-cooled	100 to <528	5.644	4.813	4.954	6.016
Water-cooled	≥528 to <1055	5.644	5.034	5.422	6.178
Water-cooled	≥1055 to <1407	6.148	5.228	5.787	6.971
Water-cooled	≥1407	6.148	5.437	5.886	7.154

Table 42 Option D MEPS from 2026 onwards AHRI pathways

Chiller type	Size (kw)	Option 1 COP	Option 1 IPLV	Option 2 COP	Option 2 IPLV
Air-cooled	100 to <350	2.836	3.846	2.723	4.436
Air-cooled	350 to <528	2.985	4.048	2.866	4.669
Air-cooled	≥528	2.985	4.137	2.866	4.758
Water-	100 to <528	5.771	6.401	5.065	8.001
Water-	≥528 to <1055	5.771	6.519	5.544	8.001
Water-	≥1055 to <1407	6.286	6.770	5.917	9.027
Water-	≥1407	6.286	7.041	6.018	9.264

8 Implementation and review

8.1 Implementation

If the Australian Energy and Climate Change Ministers (Cabinet in New Zealand) agree to updating MEPS, certification requirements and the scope of energy efficiency measures for chillers, then the decision will be implemented as below.

New regulations

In Australia E3 will prepare a draft determination and stakeholders would have the opportunity to review and provide comments on at least one exposure draft of the determination.

The proposed requirements for chillers would be implemented in Australia by a GEMS Determination under the *Greenhouse and Energy Minimum Standards (GEMS) Act 2012*. In New Zealand, the Energy Efficiency (Energy Using Products) Regulations 2002 would be used.

If Ministers agree to proceed with measures for chillers, a draft GEMS Determination could be published by mid-2025 for public comments and submissions and a final Determination later that year. It is expected that industry would be given a lead time of approximately 12 months in the Determination. This would mean that the new MEPS as proposed in Option D would come into effect in late 2026 or early 2027.

If Ministers agree to proceed with measures for chillers, any new determination would require the approval of the Energy Efficiency Working Group before it could be submitted to the Commonwealth Minister for signature.

Products imported into or manufactured in Australia from the commencement date would be required to comply with the new determination, before they could be offered for sale. Products that are manufactured or imported into Australia prior to the commencement date would be allowed to be offered for sale until sold out. In addition, suppliers would be able to voluntarily register products before the commencement date.

A similar situation would apply in New Zealand with the date the amended regulation comes in being the date from which products imported into or manufactured would be required to comply with the new determination, before they could be offered for sale. Products that are manufactured or imported into New Zealand prior to the commencement date would be allowed to be offered for sale until sold out, but must comply with the existing regulations.

Product registration - Australia

In accordance with the Australian Government Charging Framework[54], the GEMS Regulator charges fees for the registration of products. These fees recover the costs incurred in processing registration applications and monitoring compliance with the GEMS Act.

When developing new GEMS determinations, the GEMS Regulator will determine the appropriate registration fees[55]. This will be based on analysis of expected registration volumes and likely compliance activities and may include consultation with industry to ensure the analysis and proposed fees are a reasonable estimate of the cost of administering the program.

Currently, products required to be registered under the GEMS Act are grouped into one of 4 fee bands[56], ranging from $440 to $780, depending on the product type. Registrations in Australia are for a period of 5 years and the applicable fee is payable on lodgement of the application to register a product. GST does not apply to these fees.

The current fee for chillers is $780 per registration. This figure has been used as an indicative value for modelling purposes to support this DRIS. It does not indicate that the applicable fees would continue to be $780 per registration. In setting the fee for registration of products under any new determinations, the GEMS Regulator will take into account the expected costs of registration and testing products and the number of models that would need to be registered.

Registration of models in New Zealand is free, but models registered only in New Zealand cannot be supplied in Australia, unless they are manufactured in or exported from New Zealand (TTMRA).

New Zealand requirements

Products imported into New Zealand before the enforcement date can legally be sold after the enforcement date without meeting the requirements of the amended regulations but must meet the requirements of the Regulations on the day they were imported.

Products imported into New Zealand from the enforcement date must meet the requirements of the amended regulations, which includes meeting the appropriate MEPS levels and any labelling requirements.

Under the New Zealand Regulations, if a product is registered with the Australian (GEMS) regulator, it does not have to be registered with the New Zealand regulator. This does not affect the requirement of meeting the new MEPS levels and the new labelling requirements.

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54 Australian Government Charging Framework, Department of Finance (What is the Australian Government Charging Framework? | Department of Finance)
55 GEMS Registration Fees instrument as amended from time to time (Legislative framework | Energy Rating)
56 Registration fees and payment | Energy Rating

The TTMRA allows products that comply with the GEMS determination to be sold in New Zealand, without meeting the New Zealand Regulation requirements (and vice versa). For the TTMRA to apply, the product (each individual item to be sold in New Zealand) must be manufactured in or imported through an Australian jurisdiction.

Family of models

The GEMS Act specifies that a registered product may cover more than one model in a family of models. In practice the proposed requirement to register chillers as separate models where there is even 1 kw different in capacity as offered for supply means that it is unlikely that chiller models will be eligible to be grouped together in a family and registered as a single product.

Public information

As part of the registration process, some information about registered chillers would become public and some information would be kept confidential. Applicant details and test information will remain confidential. However, energy performance and product information would be available to the public. Information about proposed changes resulting from new regulations would be prepared for suppliers, industry groups and consumers to explain the new regulations.

Implementation risks

There are some risks with introducing the proposed new arrangements for chillers. The first risk, which is considered low, is with not allowing enough time for industry to adjust before the new regulations would take effect. This decision RIS has been prepared following an extended consultation period with the main policy parameters largely agreed some years ago. Also the more stringent MEPS have been applied to part of the chiller market in Australia through the NCC and the Building Code in New Zealand, so most suppliers have access to a full range of products that would meet the proposed requirements.

E3 does not expect the introduction of the tightened MEPS to significantly reduce competition in the chillers markets. There are many companies supplying the market and a range of products sold. There may be some reduction in contestability, if small or medium sized firms, who stock a small number of products that won't meet the new MEPS levels, withdraw products from market. A reduction in companies supplying the market is unlikely to occur, because the many of the main suppliers already supply compliant products in the EU and US marketplaces where MEPS of similar or greater stringency than those proposed in this DRIS already apply, or already meet the MEPS requirements for chillers in new buildings under the NCC in Australia and NZBC in New Zealand.

Very limited sales data has been made available to E3 from industry even from those sectors covered by the current energy efficiency regulations. Even less information is available regarding the 100 kw to 350 kw sector of the market, where sales volumes are likely to be higher as well as having a greater share of 'off the shelf' as opposed to bespoke or semi-bespoke product. While most of the suppliers already covered by the existing energy efficiency requirements also offer chillers in this lower size range there may be some suppliers who will be brought within the scope of the requirements who have not previously needed to be operate within the GEMS Act or the New Zealand regulations. The limitations of a twelve month period before the regulations would take effect would be lessened by allowing product imported or manufactured in Australia, prior to the regulation start date, being allowed to be sold until the stock is exhausted. In addition, industry would have notice of the impending regulation from the time that the Ministers announce their decision to introduce new requirements for chillers.

Registration data will provide some insight into what effect the new definitions around coverage of the efficiency regulations are having. If, for example, no reverse cycle chillers are registered within the 12 months following the measures coming into force, this reasons for this absence would be followed up during the agencies' regular contact with industry.

Another risk is the potential for administrative issues as assessors will need to interpret whether the information provided from certification under foreign certification schemes provides them with the information necessary to determine whether a particular product meets the Australian and New Zealand requirements, for example whether a certificate that covers a range of products demonstrates that the particular model being registered meets the requirements. Training and education material would also be made available to the suppliers, industry associations and assessors in how to interpret the material provided through AHRI and Eurovent certification processes. Experience with using these certification paths under the existing requirements should diminish any difficulties encountered.

Compliance monitoring

Once the determination and regulations are published, products can be registered. All products that fall within the scope of the determination will need to be registered by the date of commencement. The GEMS Regulator (in Australia) and EECA (in New Zealand) is responsible for monitoring and enforcing compliance of GEMS products in Australia. The Regulator works with industry groups and informs manufacturers, suppliers and retailers of their obligations under the GEMS Act. The GEMS Regulator undertakes compliance and monitoring activities such as:

- assist industry with understanding the requirements of the GEMS Act
- monitor compliance
- check test products to verify MEPS energy efficiency claims and other performance measures are met
- respond to any allegations of non-compliance
- pursue those who contravene the Act.

Independent, third party, large chiller testing is not available in Australia or New Zealand. Overseas certification programs have their own compliance arrangements, so linking the Australian and New Zealand requirements to them offers the potential to 'piggyback' off these arrangements. Details of such arrangements would be further explored once the new Determination was made.

8.2 Evaluation and review

For Australia Section 176 of the GEMS Act states that the Act itself must be independently reviewed at least every 10 years. New requirements for chillers would be included in these evaluation and review processes as needed.

There is not a similar statutory review period for New Zealand regulations. Nevertheless, E3 uses various sources of information to evaluate the effectiveness of the program and product requirements. Given the inclusion of chiller requirements in the building codes in both countries it would be appropriate for any review of the chiller determination and regulations to be mindful of developments in the building codes.

Glossary

Term	Definition
$m	Million dollars
ACCC	Australian Competition & Consumer Commission
AEMO	Australian Energy Market Operator
AHRI	Air-Conditioning, Heating, & Refrigeration Institute [of the United States of America]
ASHRAE	The American Society of Heating, Refrigerating and Air-Conditioning Engineers
BAU	Business as usual
BCR	Benefit cost ratio
BMG	Basic Model Group
CBA	Cost benefit analysis
CO2-e	Carbon dioxide equivalent
COP	Coefficient of Performance
CRIS	Consultation Regulation Impact Statement
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Australia)
DRIS	Decision Regulation Impact Statement
E3 Program	Equipment Energy Efficiency Program (Australia and New Zealand)
EC	European Commission
EEC Act	Energy Efficiency and Conservation Act (New Zealand)
EECA	Energy Efficiency and Conservation Authority (New Zealand)
EER	Energy Efficiency Ratio
EU	European Union
Eurovent	European Committee of Air Handling and Refrigeration Equipment Manufacturers
GEMS	Greenhouse and Energy Minimum Standards
GHG	Greenhouse gas emissions
GST	Goods and Services Tax (Australia)
GWh	gigawatt hour – unit of electrical energy
IPLV	Integrated Part load Value

ISO	International Organization for Standardization
kt	kilo tonnes (thousand tonnes)
kw	kilowatt
kwh	kilowatt hour – unit of electrical energy
MEPS	minimum energy performance standards
MWh	megawatt hour – unit of electrical energy
Mt	mega tonnes (million tonnes)
NCC	National Construction Code (Australia)
NPV	Net present value
NZ	New Zealand
pa	Per annum
PE	Price efficiency
RIS	Regulation Impact Statement
SEER	Seasonal Energy Efficiency Ratio
SCOP	Seasonal Coefficient of Performance
t CO_2-e	Tonnes carbon dioxide equivalent
TTMRA	Trans-Tasman Mutual Recognition Agreement
US	United States of America

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E3
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A joint initiative of Australian, State and Territory and New Zealand Governments