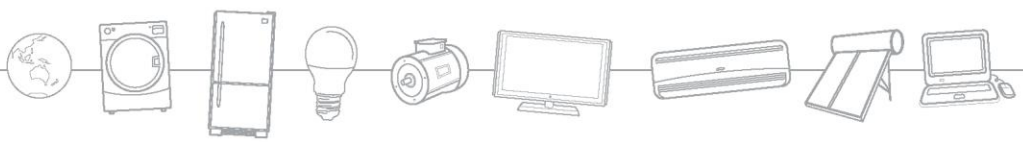
E3
Equipment Energy Efficiency

Air conditioners and chillers: Updated policy positions

Supplementary consultation document

November 2016



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

Contents

LIST OF TABLES

LIST OF FIGURES

Updated policy proposals

Introduction

The Equipment Energy Efficiency (E3) Committee published a Consultation Regulation Impact Statement (CRIS) in February 2016 that outlined policy options to reform the regulations for air conditioners and chillers to improve energy efficiency. For additional details and background on the proposals discussed in this paper, refer to the CRIS which is at available at the Energy Rating website.

Stakeholder consultation sessions on the CRIS were held in Sydney, Melbourne, Brisbane, Adelaide, Perth and Wellington between 15 and 23 February 2016. Around 100 stakeholders attended the consultation sessions, with 30 written submissions received in response.

The submissions provided policy input and technical information about the CRIS proposals. This position paper responds to the feedback received. It should be considered in conjunction with the CRIS and not as a standalone document. It provides stakeholders with the opportunity to provide further feedback, where the proposals have been modified, are not recommended to continue, and where additional input or information is sought.

Any feedback on this paper will inform preparation of the Decision RIS. The Decision RIS will be submitted to the Council of Australian Governments' Energy Council and the New Zealand Government for a decision about whether to implement any of the policy proposals and update the energy efficiency regulations for air conditioners and chillers.

Changes to the regulations are under consideration because:

- The method for rating the energy efficiency of air conditioners, including that used for the Energy Rating Label (ERL), has not kept pace with technology and market changes
- Consumers are unable to compare the energy efficiency of portable air conditioners with other types of air conditioners
- Minimum Energy Performance Standards (MEPS) for air conditioners and chillers are divided between the Greenhouse and Energy Minimum Standards (GEMS) Act and the National Construction Code (NCC) in Australia
- There appear to be opportunities to reduce regulatory costs, without affecting energy efficiency, such as by removing the regulations for water-cooled chillers and the Australian/New Zealand specific test standard
- MEPS requirements are inconsistent across portable products, the GEMS Act and NCC, and Australia and New Zealand.

E3 would appreciate any feedback you have on the policy proposals in this paper. The closing date for written submissions is **31 January 2017**. Submissions should include the subject 'Air Conditioners and Chillers' and be sent via email to energyrating@environment.gov.au for Australia or to regs@eeca.govt.nz for New Zealand. Submissions will be published unless otherwise requested.

Broad questions stakeholders may wish to consider in providing feedback include:

- Are there any implementation barriers or possible unintended consequences of any of the policy positions or proposals under consideration?
- Is the analysis of the policy proposals (including the regulatory cost estimates) based on accurate data and realistic assumptions?
- Will the proposals have any adverse effects that have not been considered?

Questions about specific or technical issues are included in the relevant section of the paper.

Consultation RIS – updated proposals

Table 1 below shows changes to the CRIS policy proposals based on stakeholder feedback (the technical details are explained in the rest of the document). New and altered policies are marked in red and eliminated options crossed out. High level reasons for the changes are outlined in this section to provide an overview of the feedback received and E3's position (whether unchanged or revised), with the attachments (by product category, as well as the development of the star rating algorithm) exploring each option and technical questions in further detail.

As in the CRIS, the individual policy proposals are bundled under two broad groupings – Option A and Option B. Note that Options B1 and B2 from the CRIS have been combined and will now be referred to as Option B. Option A mainly includes policies that are aimed at improving the energy efficiency information available about air conditioners and chillers. Option B builds on Option A by also proposing new or increased MEPS levels.

Table 1: Policy options

Policy Proposal	Option A	Option B
1. For air conditioners (A/C) adopt the Seasonal Energy Efficiency Ratio (SEER) standard AS/NZS 3823.4 (including proposed amendments) for rating products with capacity up to 30 kW.	X	X
2. Remove the existing Energy Rating Label and replace it with a Zoned Energy Rating Label that provides energy efficiency information for three distinct climate zones across Australia and New Zealand for A/C as per the current scope of mandatory energy efficiency labelling. ~~with capacity up to 30 kW~~	X	X

Policy Proposal	Option A	Option B
Mandatory disclosure of energy efficiency rating information (including star ratings) for products outside the current scope of labelling less than 30 kW capacity on the Energy Rating website. Declarations based on air enthalpy tests would be accepted for ducted, three-phase and certain 'commercial use' products up to 30 kW. Multi-split systems would continue to be excluded from physical labelling, but would be subject to the SEER standard, with rating information for the registered combination made available on the Energy Rating website.		
3. Double duct portable A/C subject to the SEER standard AS/NZS 3823.4, Zoned Energy Rating Label and a reduced MEPS level of 2.50 ~~2.60~~ based on ~~Annual~~ Energy Efficiency Ratio/~~Annual~~ Coefficient of Performance (EER/COP) ~~(AEER/ACOP)~~. Single duct portable A/C subject to Zoned Energy Rating Label (with proxy for operating time data) and tested to AS/NZS 3823.1.5.	X	X
4. Remove the unique Australian/New Zealand chiller test standard and align with the United States (US) Air conditioning, Heating and Refrigeration Institute (AHRI) test standard 551/591:~~2011~~2015. Physical test reports to AHRI 551/591:2015 would be allowed without meeting the selection, installation, operation and maintenance requirements for test instrumentation stated in Table C1 of the standard.	X	X
5. Include the energy efficiency requirements for A/C >65 kW capacity and chillers <350 kW under GEMS/New Zealand regulations and in Australia remove these from the NCC.	Further information is sought before the Decision RIS recommendations are finalised	
6. Retain current NCC MEPS levels under GEMS/New Zealand regulations.		
7. Align >65 kW A/C MEPS levels to 39 to 65 kW GEMS MEPS (i.e. AEER/ACOP 2.90). Align chiller MEPS levels to the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) energy efficiency standard 90.1:2013 where the US levels are higher.		
8. Single duct portable A/C subject to a MEPS level of ~~2.60~~ 2.50 based on EER/COP ~~AEER/ACOP.~~		X
9. Align New Zealand's residential cooling MEPS to match Australia's levels.		X
~~10. Align the MEPS levels for fixed and variable speed air conditioners, by removing the 'part load' compliance option.~~		~~X~~

Policy Proposal	Option A	Option B
11. Mandatory cooling cycle SEER rating of A/C ≥30 kW capacity. Voluntary heating cycle SEER rating (based on a physical test). Rating information made available on the Energy Rating website.	X	X
12. Remove MEPS requirements for all water-cooled chillers, and air-cooled chillers with a capacity of 700 kW or greater.	X	X
13. Resolve technical issues with air conditioner and chiller regulations.	X	X

1. Adopt SEER standard for air conditioners

For air conditioners (A/C) adopt the Seasonal Energy Efficiency Ratio (SEER) standard AS/NZS 3823.4 for rating products with capacity less than 30 kW.*

Feedback:

There was strong support for this proposal, with all submissions that specifically addressed this option in favour of adopting the SEER standard.

*The commonly used term 'SEER' is not actually mentioned in AS/NZS 3823.4. The Total Cooling Seasonal Performance Factor (TCSPF, or F_{TCSP}) of AS/NZS 3823.4.1 and the Heating Seasonal Performance Factor (HSPF, OR F_{THSP}) of AS/NZS 3823.4.2 will be the rating metrics (see Attachment A for further details), but for simplicity are referred to as SEER ratings.

Position:

Adoption of the SEER standard AS/NZS 3823.4 will be recommended in the Decision RIS. If approved, this standard would replace the requirements of AS/NZS 3823.2:2013 – the existing method for rating the energy efficiency of air conditioners.

2. Replace existing Energy Rating Label with Zoned Energy Rating Label

Remove the existing Energy Rating Label and replace it with a Zoned Energy Rating Label that provides energy efficiency information for three distinct climate zones across Australia and New Zealand to A/C with capacity up to 30 kW. Air enthalpy tests would be accepted for ducted, three-phase and certain 'commercial use' products. Multi-split systems would continue to be excluded from physical labelling but would be subject to the SEER standard, with rating information for the registered combination made available on the Energy Rating website.

Feedback:

Strong support was received for adopting the proposed Zoned Energy Rating Label (Zoned Label). Several issues were raised:

- the need for information and consultation on the development of the star rating index
- consumer education and support will be required for its introduction
- potential issues with expanding mandatory labelling scope, including:

    - labels on ducted products are less likely to be seen by consumers, prior to purchase
    - where single outdoor ducted units may be paired with multiple indoor model options, creating issues with simply supplying labels in the box
- gas industry submissions suggested emissions information should be included
- requests for clarity on the test standard to support the noise declaration.

Position:

The Decision RIS will recommend the Zoned Label replace the Energy Rating Label for air conditioners. Strong feedback was received in support of the Zoned Label. Note, if the Zoned Label is introduced, a consumer education campaign and retailer training would accompany its implementation.

E3 will amend the proposal to expand the scope of physical labelling based on the feedback received. Instead, the Decision RIS will propose mandatory energy efficiency rating information (including star ratings) only be made available on the Energy Rating website for products outside the current scope, but up to 30 kW capacity, with existing voluntary labelling policies maintained. Air enthalpy tests will be accepted for these products, even if a voluntary physical label is applied. Further technical details are in Attachment E.

Testing of a number of different air conditioner types and models was undertaken to support development of the proposed star rating index for the Zoned Label. The approach is outlined in Attachment A and feedback is welcomed.

3. SEER label for all portable a/c, reduced MEPS for double duct portables

Double duct portable A/C subject to the SEER standard AS/NZS 3823.4, Zoned Energy Rating Label and a reduced MEPS level of 2.60 based on Annual Energy Efficiency Ratio/Annual Coefficient of Performance (AEER/ACOP). Single duct portable A/C subject to Zoned Energy Rating Label (with proxy for operating time data) and tested to AS/NZS 3823.1.5.

Feedback:

There was broad support for applying the SEER to double duct portables. Some submissions, however, did not support reducing the MEPS level for these products, suggesting they should have to meet the same MEPS as other types of air conditioners.

For single duct portables, there was also broad support for introducing labelling requirements. It was recommended by several respondents to allow single duct portable products to use results from supplementary water evaporation features for label rating information, as is the case in Europe. Other responses raised issues with using an AEER/ACOP metric when portable air conditioners are not typically left connected to power. They argued that an EER/COP metric, as the EU has adopted, is more representative of real world usage.

Position:

Zoned labelling of single and double duct portables

This proposal will be recommended in the Decision RIS. There was widespread support for mandatory energy efficiency labelling of portable products. This recommendation will take account of the feedback received from stakeholders on the star rating index, proposed in Attachment A. It is also proposed that supplementary water evaporation features (for relevant products) be permitted in displaying the capacity and annual energy consumption on the Zoned Label.

Double duct portables – MEPS level

The Decision RIS will propose a revised, lower MEPS level for double duct portables of 2.50 (EER). The option, however, to meet 95 per cent of the relevant MEPS for variable speed products (referred to as part load compliance) will not be available for single or double duct products.

While E3 recognises comments related to setting comparable MEPS for double ducts as other air conditioners, it is important to note that these products serve a portion of the market who may be unable to purchase a fixed air conditioner for reasons of capital cost or landlord or other restrictions e.g. body corporate or heritage requirements.

E3 has also received further input that the proposed MEPS level of 2.60 (based on AEER/ACOP) may be insufficient to ensure double duct portables return to the market and will therefore recommend double duct portables be required to meet a MEPS level of 2.50 (based on EER/COP).

4. Replace AS/NZ chiller test standard with AHRI standard

Remove the unique Australian/New Zealand chiller test standard and align with the United States (US) Air conditioning, Heating and Refrigeration Institute (AHRI) test standard 551/591:2011.

Feedback:

There was strong, general support for maintaining a flexible approach to demonstrating MEPS compliance. While replacing the unique Australian test standard AS/NZS 4776 with AHRI Standard 551/591 was generally supported, two submissions noted they would prefer it to be maintained. Some submissions also expressed a preference for use of the European Coefficient of Performance (COP) rating conditions.

Objections to moving to AHRI Standard 551/591 were based on potential financial practicality barriers from the specific requirements outlined for selecting, installing and maintaining test instrumentation. The required accuracy of the measurement equipment varies in stringency between the AHRI and AS/NZS 4776 standards.

Position:

Note while the RIS was prepared, an updated version of AHRI Standard 551/591 was published. This version is now preferred. The Decision RIS will therefore recommend:

- The unique Australian test standard AS/NZS 4776 be removed.
- The updated regulations 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 the standard. (While, in some cases, the required accuracy of the measurement equipment in the AHRI standard is more stringent than AS/NZS 4776, feedback has suggested it is achievable.)
- Eurovent and AHRI certification be maintained as per the current arrangements.
- The differing standard rating conditions for water-cooled chillers in the EU and AHRI standards will be maintained as equivalent (as in AS/NZS 4776) in any updated regulations.
- The COP rating conditions from the Eurovent test standard EN 14825 will be accepted, as per current arrangements.

5. Remove NCC regulated chillers and a/c and replace with GEMS/New Zealand regulations

Include the energy efficiency requirements for A/C >65 kW capacity and chillers <350 kW under GEMS/New Zealand regulations and in Australia remove these from the NCC.

Feedback:

The majority of submissions supported this proposal, although some concerns were raised. One submission pointed to emerging pressures in this section of the market for air conditioners, such as a move to integrated heating, cooling and humidity control, and cautioned that including these products under the E3 program should not impede the development of these new systems. Another submission raised the issue of registration fees, being required under GEMS, but not the National Construction Code (NCC).

Position:

E3 seeks more feedback to assist in deciding whether to recommend this policy option in the Decision RIS. While there was general support for the proposal in terms of simplifying the regulations, at this stage, E3 has received only anecdotal reports that the proposed change will provide regulatory cost savings or energy efficiency benefits.

Attachment D of this paper addresses feedback received on some technical issues that relate to this policy proposal. Your input on these issues would be welcomed, noting that the fundamental question of whether this proposal will proceed is subject to further consideration.

6. Retain current NCC MEPS levels under GEMS/New Zealand regulations

Feedback:

Most submissions agreed with the proposal to retain the current MEPS levels specified in the NCC. One submission disagreed, claiming the current NCC MEPS levels should be raised.

Position:

E3 seeks further input on this proposal (and the following proposal which is to increase the NCC MEPS levels), before proceeding to a Decision RIS recommendation. Any data from stakeholders on the price, sales and efficiency of air conditioners and chillers, within the scope of this potential change, would improve the cost benefit estimates of retaining or increasing the current MEPS levels.

7. Align >65 kW A/C MEPS levels to 39-65 kW GEMS and chiller MEPS levels to the ASHRAE levels

Align >65 kW A/C MEPS levels to 39 to 65 kW GEMS MEPS (i.e. AEER/ACOP 2.90). Align chiller MEPS levels to the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) energy efficiency standard 90.1:2013 where the US levels are higher

Feedback:

Many submissions agreed with this proposal. In relation to air conditioner MEPS for >65 kW products, one submission noted the proposed MEPS level is higher than specified in ASHRAE.

On chillers, some submissions suggested products below 350 kW should have a full load compliance test only. Some submissions did not agree with alignment to the US chiller MEPS levels, with one noting the different frequency of electricity (60Hz) and rating conditions (weather, building types and usages) in the US. Another submission proposed MEPS levels for <350 kW air-cooled chillers in between NCC and ASHRAE levels and the retention of the NCC MEPS levels for water-cooled chillers.

Position:

As per proposal 6 above, E3 seeks further input and data on this change, before proceeding to a Decision RIS recommendation. In particular any data from stakeholders on the price, sales and efficiency of air conditioners greater than 65 kW capacity and air-cooled chillers would improve the cost benefit estimates of this policy option for the Decision RIS.

The suggested modifications to the proposal, such as not requiring part load compliance tests for chillers under 350 kW, are covered in Attachments B and D.

8. Single duct portable A/C subject to a MEPS level of 2.60 based on AEER/ACOP

Feedback:

Many submissions supported this proposal. Some were opposed; with one saying it should be higher, and others suggesting further information is required prior to making a decision. As with the labelling proposal, there was a request for supplementary water evaporation features to be allowed.

Position:

As per the proposal for double duct portables, E3 will recommend in one of the Decision RIS policy options a MEPS of 2.50 (based on EER/COP rather than AEER/ACOP), as well as the option to allow use of supplementary water evaporation features. However, part load compliance will not be available for single or double duct products. This proposal is discussed further in Attachment C.

9. Align New Zealand's residential cooling MEPS to match Australia's levels

Feedback:

Almost all submissions supported this proposal (with some Australian submissions noting New Zealand's views would need consideration). One submission was opposed, noting the differences between heating and cooling requirements in the two countries.

Position:

This option is preferred and E3 will recommend this proposal in one of the Decision RIS policy options, recognising the concerns raised. Aligning the cooling MEPS level will improve the average efficiency of heating products available in the New Zealand market, and simplify requirements for companies selling products into both countries.

10. Remove 'part load' compliance option

Align the MEPS levels for fixed and variable speed air conditioners, by removing the 'part load' compliance option.

Feedback:

Feedback on this proposal was mixed, with around the same number of submissions opposed as were supportive. Some submissions pointed to the likelihood of perverse outcomes, such as increased annual energy consumption, if fixed speed models displaced part load compliant variable speed products in the market.

Position:

E3 proposes to remove this policy option from the Decision RIS, due to the potential for perverse energy efficiency outcomes.

11. SEER rating of A/C ≥30 kW capacity, with rating information made available on the Energy Rating website

Feedback:

Almost all submissions supported this proposal, although one raised both policy and technical concerns. The submission suggested that the required H2 testing for SEER heating rating of these large capacity products is not possible in many laboratories. Some concerns with the accuracy and availability of H2 simulation testing were also raised.

Position:

This proposal will proceed to the Decision RIS. It is proposed that models over 30 kW could voluntarily provide heating cycle SEER rating information (based on a physical test report). SEER for the cooling cycle will be mandatory and made available on the Energy Rating website.

12. (New policy proposal) Remove MEPS requirements for all water-cooled chillers and for air-cooled chillers of 700 kW capacity or greater

Issue:

Further consideration and analysis since the release of the CRIS suggests MEPS for water-cooled chillers and air-cooled chillers of 700 kW capacity or greater are unnecessary. The requirements appear to add regulatory costs, without energy savings.

Position:

E3 seeks your feedback on a new proposal to remove the MEPS requirements for these product categories. The rationale for this proposal and some questions are provided in Attachment D.

13. (New) Resolve technical issues with air conditioner and chiller regulations

Feedback:

The CRIS sought feedback on proposals to resolve sixteen technical issues with the air conditioner and chiller requirements. Feedback was also received on other technical issues, in addition to those specifically raised in the CRIS.

Position:

E3's position on these issues and options for resolving the new issues raised are outlined in Attachments B to D.

Implementation date

Feedback:

Some submissions requested a notice period for any new requirements of up to three years. They suggested this was partly due to a lack of detail about some of the proposals, in particular, those affecting portable air conditioners. Some submissions indicated a preference for a 1 April start date.

Position:

E3 will continue to work through the policy proposals, before recommending a commencement date.

Attachment A: Star rating algorithm

Introduction

Much of the feedback on the CRIS specific to the introduction of AS/NZS 3823.4 and the Zoned Label requested additional information and consultation on the development of the new star rating index. E3 has undertaken a range of product testing to ensure performance under the new SEER standard is understood and reflected in the star ratings on the label. The star rating index has been developed using results from this testing as well as theoretical products and specific parameters (detailed below) to ensure the label will be informative, comparable and not require regrading in the near future.

Key parameters

The guiding principals for the development of the star rating algorithm on the Zoned Label were:

- All products tested to the SEER standard (AS/NZS 3823.4) shall be directly comparable to one another
- The label will have a 10 star scale, with half stars from 0.5 to 9.5 (the current scale only allows full stars from 7 to 10)
- Stars will progress on a lineal basis
- Ratings shall be provided for the three climate zones of AS/NZS 3823.4
- E3 will develop an online consumer calculator capable of re-rating products to the other 66 Australian and 18 New Zealand climate zones
- Single duct air conditioners (within the scope of AS/NZS 3823.1.5:2015) cannot be properly rated for seasonal performance because they are tested differently to other air conditioners. As was outlined in the CRIS, these products will always deliver inferior energy efficiency to other regulated air conditioners. Therefore, their ratings on the Zoned Label were designed to reflect this performance.

Test data for Zoned Label (excluding single duct portables)

Air conditioners (excluding single duct portables within the scope of AS/NZS 3823.1.5:2015) shall be labelled based on test data from AS/NZS 3823.4.1 for cooling and AS/NZS3823.4.2 for heating (if applicable). Note the proposed amendments to the AS/NZS 3823.4:2014 series are open for public comment until 20 December 2016. The draft standard is available on the Standards Australia website. The Zoned Label data will be based on the following criteria:

- Cooling capacity: rated T1 capacity.
- Heating capacity: rated H1 capacity and either 'extended' H2 capacity when possible, otherwise 'full' H2 capacity for products not capable of 'extended' mode (see Attachment E for further details).
- Cooling stars: an algorithm using the Total Cooling Seasonal Performance Factor (TCSPF, or F_{TCSP}). This incorporates standby power.
- Heating stars: an algorithm using the Heating Seasonal Performance Factor (HSPF, or F_{HSP}). This does not incorporate standby power.[1]
- Cooling Annual Energy Consumption (kWh per year): Cooling Seasonal Energy Consumption (CSEC, or C_{CSE}), plus, 60 per cent[2] of the annual Inactive Energy Consumption (IAEC, or C_{IAE} from Annex B of AS/NZS 3823.4.1).
- Heating Annual Energy Consumption (kWh per year): Heating Seasonal Energy Consumption (HSEC, or C_{HSE}), plus, 40 per cent[2] of the annual Inactive Energy Consumption (IAEC, or C_{IAE} from Annex B of AS/NZS 3823.2).

Star rating algorithm (excluding single duct portables)

A 2.5 kW Daikin US7 air conditioner has been tested at all the mandatory and voluntary test points of AS/NZS 3823.4. It is assumed this model is the most efficient on the market (it is the only product that achieves 7 stars on the current scale), and by performing all optional tests, the highest possible SEER value was calculated. It should be noted that optimisation of the optional rated test points could see a further improvement in the SEER values. The highest of its three different tested cooling SEERs has been set at 8 stars (see Table 3 for further details). This will allow room for innovation and improvement so that the algorithm remains relevant and effective into the future.

Investigative tests and theoretical modelling has revealed a unit's cooling cycle generally achieves higher SEER values than its heating cycle. This appears to be because heating conditions within the frosting zone present relatively more challenging operating conditions than any of the cooling conditions encountered in the local climate files. Furthermore, units with large capacity drops

[1] Standby power impacts on the *Total* Heating Seasonal Performance Factor heavily. The calculations assign an entire year's worth of standby to both the cooling and the heating performance factors. There is a particularly negative effect on ratings for the hot/humid zone, where approximately 8500 hours of standby are applied. Removing it from the heating factor means standby is not counted twice (i.e. for both heating and cooling) and lessens the disparity between a product's cooling and heating stars. This difference has been modelled as high as 140 per cent. It also removes the likelihood of a window/wall or ducted unit with moderate standby levels achieving lower heating stars than an otherwise less efficient double duct product.

[2] The SEER standard assesses a unit's standby power usage as a combined annual total. Analysis shows that for each zone's cooling/heating seasons, approximately 60 per cent of standby hours fall in the cooling season and 40 per cent in the heating season. The annual standby totals will therefore be allocated this way.

within these frosting conditions can incur an energy penalty for not being able to meet the calculated heating load.

A theoretical fixed speed double duct product with a rated EER/COP of 2.5 and a weighted average inactive power consumption (P_{ia} or standby) of 5 watts yields amongst the lowest possible SEER values. However, a fixed speed ducted unit or window wall unit with an AEER/ACOP value of 3.1 and a large standby can actually achieve worse cooling SEER values. These values have been used to set the benchmark for half a star (see Table 2 and Table 3 for further details).

The SEER standard effectively applies an energy penalty to fixed speed units at part load conditions due to the energy lost when they turn off and on, whereas variable speed products become most efficient in these circumstances. Therefore, it is expected that a part load compliant variable speed product will gain more stars than fixed speed products with similar or slightly better full load performance. Theoretical investigation comparing products with the same AEER/ACOP values shows inverters can easily achieve between 10 and 30 per cent higher SEER values and 11 and 28 per cent lower Annual Energy Consumption (AEC) figures, depending on the climate zone. The proposed star rating scale is shown in Table 2 below.

Table 2: Star rating scale

SEER value (TCSPF or HSPF)	Stars
SEER< 2	0
2 ≤ SEER < 2.5	½
2.5 ≤ SEER < 3	1
3 ≤ SEER < 3.5	1½
3.5 ≤ SEER < 4	2
4 ≤ SEER < 4.5	2½
4.5 ≤ SEER < 5	3
5 ≤ SEER < 5.5	3½
5.5 ≤ SEER < 6	4
6 ≤ SEER < 6.5	4½
6.5 ≤ SEER < 7	5
7 ≤ SEER < 7.5	5½

SEER value (TCSPF or HSPF)	Stars
7.5 ≤ SEER < 8	6
8 ≤ SEER < 8.5	6½
8.5 ≤ SEER < 9	7
9 ≤ SEER < 9.5	7½
9.5 ≤ SEER < 10	8
10 ≤ SEER < 10.5	8½
10.5 ≤ SEER < 11	9
11 ≤ SEER < 11.5	9½
11.5 ≤ SEER	10

Single duct portables

Single duct portable air conditioners within the scope of AS/NZS 3823.1.5:2015 will be labelled with total cooling capacity and heating capacity (if applicable). The use of supplementary water evaporation features will be allowed (subject to the requirements of Appendix B of the standard), and rated capacities both with and without use of this function (if applicable) must be declared on the label.

Single duct portables are the least efficient air conditioning product to be covered by E3 regulations. They will receive zero stars, as even a model able to achieve an EER/COP of 3.1 would not be as efficient as other air conditioners, due to the single exhaust duct leading to unconditioned air being drawn into the conditioned space. Equally, they are also less efficient than a double duct portable meeting the same EER/COP.

Despite their differences, retailers and consumers inevitably compare single duct products to other air conditioners. Therefore, the Zoned Label will demonstrate these products are less efficient (via zero stars) and are therefore more expensive to run (through the AEC figure). Consequently, it will be necessary to apply an operating schedule (hours of use) reflecting what is used in the SEER standard, to ensure they are shown to be a less efficient option. The online calculator tool could provide a cost per hour figure to help consumers understand their operating costs should they plan to only use the product in limited circumstances.

AS/NZS 3823.4 lists total heating and cooling hours for three climate zones. These hours will be multiplied by the rated power input to yield an AEC figure (in kWh) to apply to the Zoned Label.

Non-operative power will not be incorporated. The cooling/heating hours are intended to be (subject to the current standard amendment process):

- Hot zone – 2247 hours of cooling, 277 hours of heating.
- Mixed zone – 840 hours of cooling, 1291 hours of heating.
- Cold zone – 545 hours of cooling, 2660 hours of heating.

This approach is simple to apply, and while it will not take account of the outdoor air infiltration effect of single duct products, it will enable consumers to see they are less efficient than other air conditioners. Further, it will still allow the more efficient single duct products to be discerned from less efficient ones through the AEC figure and through a dollar operating total using online tools.

Table 3: Examples of products, their previous star rating and new SEER ratings

Air conditioner type	kW	Standby (P_{ia}, W)	EER/ COP	TCSPF/HSPF			Star rating			Annual Energy Consumption (kWh)			ERL stars
				Hot	Mixed	Cold	Hot	Mixed	Cold	Hot	Mixed	Cold	
Single duct, evaporative condenser, theoretical values	2.5	5	3.11	n/a	n/a	n/a	0	0	0	1804	675	438	n/a
Single duct, no evaporative assistance	2.5	5	2.5	n/a	n/a	n/a	0	0	0	2247	840	545	n/a
	2.5	5	2.5	n/a	n/a	n/a	0	0	0	277	1291	2660	n/a
Double duct, fixed speed, theoretical worst	2.5	5	2.5	2.59	2.37	2.34	1	½	½	1254	433	289	½
	2.5	5	2.5	2.07	1.94	1.89	½	0	0	114	712	1742	½
Ducted split unit, fixed speed, large crankcase heater.	15	89	3.1	3.01	2.45	2.33	1½	½	½	6302	2349	1609	1 ½
	15	89	3.1	2.53	2.26	2.16	1	½	½	719	3839	9274	1 ½
Ducted split unit, fixed speed	15	10	3.1	3.26	3.07	3.08	1½	1½	1½	6006	2034	1346	1 ½
	15	10	3.1	2.53	2.26	2.16	1	½	½	522	3629	9098	1 ½
Window/wall, fixed speed, with worst registered standby	2.5	0.8	3.1	3.27	3.12	3.14	1½	1½	1½	999	3366	222	1 ½
	2.5	0.8	3.1	2.51	2.20	2.10	1	½	½	86	619	1559	1 ½
Non-ducted split, fixed speed, theoretical worst	6.0	5	3.22	3.37	3.16	3.15	1½	1½	1½	2321	789	523	1 ½
	6.0	5	3.22	2.63	2.36	2.24	1	½	½	204	1395	3503	1 ½
Non-ducted split, fixed speed, theoretical worst	2.5	5	3.66	3.75	3.36	3.30	2	1½	1½	861	301	202	2 ½
	2.5	5	3.66	2.94	2.49	2.33	1	½	½	83	559	1411	2 ½
Non-ducted split, variable speed, part load complaint, theoretical worst	2.5	5	3.48	4.53	4.25	3.79	3	2½	2	788	277	182	2
	2.5	5	3.48	3.56	3.22	2.97	2	1½	1	71	422	1110	2
Non-ducted split, variable speed, full load complaint, theoretical worst	2.5	5	3.66	4.71	4.40	3.91	3	2½	2	759	267	177	2 ½
	2.5	5	3.66	3.68	3.44	3.06	2	1½	1½	69	408	1079	2 ½
Daikin US7, mandatory tests only (rated values shown)	2.5	1	5.95	7.89	7.74	7.09	6	6	5½	430	147	95	7
		1											7
Daikin US7, with optional test data (rated values shown)*	2.5	1	5.95	9.75	9.42	8.72	8	7½	7	347	121	77	7
		1											7

*Note the optional test points used were not necessarily all optimal. It could therefore be possible to reach larger SEER values on the same product.

Attachment B: Air conditioners

Consultation RIS – Policy options

Policy option 1: Adopt SEER standard for air conditioners

For air conditioners (A/C) adopt the Seasonal Energy Efficiency Ratio (SEER) standard AS/NZS 3823.4 for rating products with capacity less than 30 kW.*

Feedback:

There was strong support for this proposal, with all submissions specifically addressing this option in favour of adopting the SEER standard. During consultation, one international stakeholder sought clarification about the use of the term SEER. One submission requested MEPS and energy efficiency labelling requirements continue to be specified in Australian/New Zealand standards, rather than directly in legislation.

*The commonly used term 'SEER' is not actually mentioned in AS/NZS 3823.4. The Total Cooling Seasonal Performance Factor (TCSPF, or F_{TCSP}) of AS/NZS 3823.4.1 and the Heating Seasonal Performance Factor (HSPF, OR F_{HSP}) of AS/NZS 3823.4.2 will be the rating metrics (see Attachment A for further details), but for simplicity are referred to as SEER ratings.

Position:

Adoption of the SEER standard AS/NZS 3823.4 will be recommended in the Decision RIS. If approved, this standard will replace the requirements of AS/NZS 3823.2:2013 – the existing method for rating the energy efficiency of air conditioners.

E3's position remains to specify any changes to MEPS and labelling requirements directly in the GEMS Determination/New Zealand regulations. This is a change from legislating MEPS and labelling requirements through Australian/New Zealand standards. This approach was necessary when energy efficiency requirements were state-based in Australia, but is no longer necessary with the Commonwealth legislation commencing in 2012. E3 is committed to consulting with stakeholders in drafting updated regulations.

Following an approach from industry in late 2015, E3 led a working group of stakeholders to develop a number of changes to the SEER standard. The working group proposed changes to address several issues, including making the assumed operating hours of air conditioners specified in the standard more reflective of likely use. The proposed changes were submitted to Standards Australia and the relevant standards committee (EL-056) in June for finalisation, public comment and approval. The updated standard is expected to be published in the first quarter of 2017.

Policy option 5: Remove NCC regulated chillers and a/c & replace with GEMS/New Zealand regulations

Include the energy efficiency requirements for A/C >65 kW capacity and chillers <350 kW under GEMS/New Zealand regulations and in Australia remove these from the NCC.

Feedback:

The majority of submissions supported this proposal, although some concerns were raised. One submission pointed to emerging pressures in this section of the market for air conditioners, such as a move to integrated heating, cooling and humidity control, and cautioned that including these products under the E3 program should not impede the development of these new systems. Another submission raised the issue of having to pay registration fees under the GEMS Act in Australia, which is not required under the NCC.

One submission commented that AHRI and Eurovent certification is common internationally in this air conditioner size category, so if the proposal is adopted these compliance pathways should be permitted, as they are for chillers. One submission did not support allowing simulation testing.

Position:

E3 seeks further feedback to assist in deciding whether to recommend this policy option in the Decision RIS. While there was general support for the proposal in terms of simplifying the regulations, at this stage E3 does not have evidence apart from anecdotal reports to support this option.

The main problem identified in the CRIS was the potential for inefficient air conditioners and chillers to be supplied to the replacement market (as the NCC only applies to new buildings or new building works in existing buildings).

The other issue raised was a perception of a lack of compliance with the minimum Energy Efficiency Ratios (EERs) contained in the NCC. To clarify, satisfying the minimum EERs contained in the NCC is not mandatory in order to achieve compliance. There are two different options to demonstrate compliance with the NCC:

- Deemed-to-Satisfy Solution: The Deemed-to-Satisfy Provisions include prescriptive examples of materials, products and design factors which are deemed to comply. Minimum EERs are contained in these provisions.
- Performance Solution: uses a method other than a Deemed-to-Satisfy Solution to achieve compliance. For example, a Performance Solution may allow for a reduction in the energy efficiency of the building's services 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.

E3 therefore seeks your input on:

- information or data about products being supplied and used in a Deemed-to-Satisfy Solution that do not meet the Deemed-to-Satisfy minimum EERs (i.e. non-compliance with the NCC)
- information or data about air conditioners and/or chillers being supplied in the **replacement** market that do not meet the Deemed-to-Satisfy minimum EERs in the NCC (i.e. products not covered by the NCC)
- whether the proposal to remove the minimum EERs for air conditioners and chillers from the Deemed-to–Satisfy Provisions from the NCC in Australia and including them under the E3 Program will address the identified problem, or whether it will have unintended consequences
- whether other government requirements such as the Commercial Building Disclosure (CBD) program or the mandatory requirements of the NCC, already means the energy efficiency of air conditioners and chillers in these size categories is considered.

Attachment D of this paper addresses feedback received on some of the technical issues for chillers relating to this policy proposal. Your input on these issues would be welcomed, noting that the fundamental question of whether this proposal should proceed is subject to further consideration and feedback received in this process.

Policy option 6: Retain current NCC MEPS levels under GEMS/New Zealand regulations

Feedback:

Most submissions agreed with the proposal to retain the current MEPS levels specified in the NCC (note: the NCC does not use the term MEPS but refers to minimum EERs). It appears some did not look at this proposal closely as they also agreed the MEPS levels should be increased as per the next proposal. One submission disagreed and indicated the current NCC MEPS levels should be raised.

Position:

E3 seeks further input on this proposal before proceeding to a Decision RIS recommendation. Any data from stakeholders on the price, sales and efficiency of air conditioners and chillers within the scope of this potential change is welcomed. This would improve the cost benefit estimates of this policy option versus the proposal to increase MEPS levels for the Decision RIS.

Policy option 7: Align >65 kW A/C MEPS levels to 39 to 65 kW GEMS and chiller MEPS levels to the ASHRAE levels

Align >65 kW A/C MEPS levels to 39 to 65 kW GEMS MEPS (i.e. AEER/ACOP 2.90). Align chiller MEPS levels to the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) energy efficiency standard 90.1:2013 where the US levels are higher

Feedback:

Many submissions agreed with this proposal, though some suggested further investigation is required. In relation to air conditioner MEPS for >65 kW products, one submission noted the proposed MEPS level is higher than specified in ASHRAE 90.1: 2013 (which is 2.78, rather than the proposed AEER/ACOP of 2.90).

Position:

As per proposal 6 above, E3 seeks further input and data on this change before proceeding to a Decision RIS recommendation. In particular any data from stakeholders on the price, sales and efficiency of air conditioners >65 kW capacity and chillers would be welcome. This would improve the cost benefit estimates of this policy option for the Decision RIS.

The suggested modifications to the proposal, such as not requiring part load compliance tests for chillers under 350 kW, are covered in Attachment D.

Policy option 9: Align New Zealand's residential cooling MEPS to match Australia's levels

Feedback:

Almost all submissions supported this proposal, although some Australian submissions qualified this by noting New Zealand stakeholder views need to be considered. One submission was opposed, suggesting it is inappropriate to apply Australian requirements for a predominantly cooling market to New Zealand, where the market is dominated by requirements for heating.

Position:

This option is preferred and E3 will recommend this proposal in one of the Decision RIS policy options, recognising the concerns raised. New Zealand's decision in 2013 to not to align cooling MEPS with Australia was based on the following factors:

1) New Zealand is predominately a heating market, and
2) alignment of cooling MEPS would have had a large impact on the New Zealand market and place large costs on the New Zealand industry to source and test new complying products, and
3) increasing cooling MEPS may have excluded some efficient heating products designed specifically for heating performance from the New Zealand market.

While New Zealand remains a predominately heating market, preliminary findings from a recent household survey by BRANZ (for EECA) show that approximately one third of households used their air conditioners for cooling as well as heating[3].

In addition, the situation now is that aligning cooling MEPS with Australia would have a very small impact on the current models sold in New Zealand. Analysis of air conditioners sold in New Zealand in 2015-16 showed that only two models with limited sales would be affected.

The two affected models do not have exceptional heating efficiency. Therefore, aligning with Australia MEPS requirements will improve the average heating as well as cooling energy efficiency of current air conditioners available in New Zealand.

This proposal has the added benefit of simplifying regulatory requirements on companies that supply air conditioners to both countries, and removing any potential issues under the trans-Tasman Mutual Recognition Arrangement.

Policy option 10: Remove 'part load' compliance option

Align the MEPS levels for fixed and variable speed air conditioners, by removing the 'part load' compliance option.

Feedback:

Feedback on this proposal was mixed, with around the same number of submissions opposed as were supportive. Some submissions pointed to the likelihood of perverse outcomes, such as increased annual energy consumption if fixed speed models displaced part load compliant variable speed products in the market. For example, one submission provided an example of a MEPS compliant fixed speed model that would use 24 per cent more energy annually than a variable speed model that would be removed from the market by this policy change. A further example provided was a fixed speed model that would use 78 per cent more energy annually than a variable speed model optimised for part load performance that just fails the full load MEPS level.

Position:

E3 proposes to remove this policy option from the Decision RIS, due to the potential for perverse energy efficiency outcomes. Note part load compliance will not be available for single or double duct products, due to the lower full load MEPS level proposed for these products.

[3]EECA Householder Survey Supplement to the BRANZ House Condition Survey 2016. [results still in draft]

Policy option 11: SEER rating of A/C ≥30 kW capacity, with rating information made available on the Energy Rating website

Feedback:

Almost all submissions supported this proposal, although one submission raised both policy and technical concerns. The submission suggested the required H2 testing for heating cycle SEER rating of these large capacity products is not possible in many laboratories due to the size of the testing rooms required. The submission suggested models over 30 kW could voluntarily provide heating cycle SEER rating information instead. Furthermore, both Vipac and Daikin raised concerns with the accuracy and availability of H2 simulation testing.

Position:

A modified proposal for SEER testing of ≥30 kW products will be recommended in the Decision RIS due to the implementation issues identified. It is instead proposed models over 30 kW will only be required to provide mandatory cooling cycle SEER rating information (i.e. Total Cooling Seasonal Performance Factor (TCSPF, or F_{TCSP})). Heating cycle SEER rating information (i.e. Heating Seasonal Performance Factor (HSPF, OR F_{HSP}) may be voluntarily supplied, based on a physical test report. All rating information would be made available via the Energy Rating website.

Note this proposal was the only difference between policy Options B1 and B2 in the CRIS. Given the otherwise positive feedback, both options have been combined and will now be referred to as Option B.

E3 notes the amendment to the SEER standard AS/NZS 3823.4 will see the temperature bin hours orientated towards a residential operating schedule. It may therefore be desirable to add a commercial orientated operating schedule for products 30 kW capacity and above. Your views are sought on three implementation options:

- Unified implementation using domestic hours of operation – ≥30 kW products subject to cooling cycle SEER ratings from the same start date as <30 kW products, using the same climate bins.
- Unified implementation using commercial hours of operation – ≥30 kW products subject to cooling cycle SEER ratings from the same start date as <30 kW products, using different climate weightings. To unify the starting date, commercial use temperature bins would have to be developed (in conjunction with an industry working group) and be published directly in the new GEMS Determination/New Zealand regulations. These temperature bins would then be incorporated into AS/NZS 3823.4 at the next available opportunity.
- Staged implementation using commercial hours of operation – Cooling cycle SEER ratings would be implemented 12 months after the publication of an amendment to AS/NZS 3823.4 incorporating new temperature bins based on a commercial operating schedule.

Simulation testing of ≥30 kW units under a SEER scenario

If it is decided to adopt Option B2 and apply the SEER test standard to air conditioners larger than (or equal to) 30 kW, will this present an issue in terms of simulating the required extra test points (e.g. the H2 test point)? If so, can this be overcome in some way?

Feedback:

Only two submissions responded to this issue, but they both indicated it would be difficult to accurately simulate or verify product performance in the frosting region (i.e. H2).

Position:

As per above (policy option 11), E3 proposes products ≥30 kW could voluntarily provide a heating cycle SEER rating, but if provided, it would have to be based on a physical test due to the difficulty with simulating H2 performance.

Inverter over-capacity

It has been noted by several authors that some inverter air conditioners have the ability to significantly increase their capacity above rated at the expense of energy efficiency. This could be a particular problem for some units that are installed in situations where their rated capacities are insufficient to meet the cooling/heating requirements and during extreme weather events. E3 performed initial investigations on eight inverter air conditioners in 2013 and found that a number of these do perform less than optimally under certain test scenarios. Do you agree that this issue warrants further investigation by E3, to inform whether any policy action is needed to address the issue?

Feedback:

A number of submissions suggested this issue is encountered due to inappropriate application and sizing of air conditioners, rather than a general product issue. Some submissions indicated the current situation and practice could be improved by finalising the installation standard under development through Standards Australia. The benefits of sizing air conditioners appropriately could also be promoted through the Australian Refrigeration Council (ARC administers refrigerant handling licences on behalf of the Australian Government).

Actron Air however stated “this issue should be further investigated and new policy should be implemented to address this issue. A new MEPS rating should be introduced for all inverters with over-capacity to meet a certain level of efficiency at maximum capacity. All manufacturers are capable of locking in the compressor from running at over capacity so there is no reason why they can’t cap it at an acceptable MEPS level.”

Position:

E3 will recommend in the Decision RIS for the existing MEPS requirements to be analysed in the next review of the air conditioner regulations. If the Zoned Label is implemented, it would provide the necessary information for a move to a SEER based MEPS to be considered and to evaluate the ongoing need for the current MEPS settings or alternative MEPS requirements.

Supply of outdoor units only

The current requirements make it difficult to supply MEPS compliant outdoor units for the replacement market because they treat air conditioner systems as an indoor and matched outdoor unit. However, given that most of the system's working parts are contained in the outdoor unit, supplying MEPS compliant outdoor units only is a common request. It is proposed that the next air conditioner GEMS Determination/New Zealand regulations will specify the outdoor units of split systems as separate categories, matching the size classes and MEPS levels of the current requirements. Registration would still require a test report using a nominated indoor unit that is both readily available for possible check testing purposes and matches refrigeration capacities and configurations (i.e. is 'like for like', as per the requirements for multi-splits specified in clause 3.11 of AS/NZS 3823.2:2013). Do you have any comments on this proposal?

Feedback:

There was wide support for this proposal, though some submissions suggested it requires further discussion. Fujitsu supported this option to prevent companies advertising outdoor units not designed to operate with another brand's indoor unit. They state there are safety concerns if refrigerants different to what the indoor unit is originally designed for – specifically where an A3 refrigerant (flammable) is being promoted as a direct replacement for an A1 or A2 refrigerant (not flammable or slightly flammable) – are used. Another submission noted the US market has standards and processes to address this, and these should be considered for inclusion under the regulations.

Position:

E3 will recommend for this change to be implemented in the Decision RIS to improve the ability of suppliers to provide MEPS compliant outdoor units. The intent is to cover outdoor units retrofitted to air conditioners supplied by different suppliers, not suppliers keeping outdoor units to supply their own products for warranty replacement or spare parts. If adopted, this change will be implemented in consultation with industry representatives to avoid any unintended consequences.

Fully aligning to international test standards when appropriate

The ISO are likely to publish updated versions of the air conditioner test standards, ISO 5151 (non-ducted), ISO 13253 (ducted) and ISO 15042 (multi-split) sometime during 2016. These have previously been adopted as the local test standards AS/NZS 3823.1.1, 1.2 and 1.4 respectively. The drafts of these updated ISO versions appear technically equivalent to the previous versions. The main changes seem to fix known problems and provide clarifications on a range of issues. Indeed, some of these changes fix issues that the local adoption has previously addressed. It appears that creating further local adoptions of these three test standards is unnecessary and a future GEMS Determinations for air conditioners could call these three ISO test standards up directly. Would you support this change?

Feedback:

This proposal was generally supported, however the submissions noted ISO test standards should be examined and reviewed by government and other stakeholders to ensure there is no need to vary the standard for the local market or circumstances.

Position:

E3 notes the feedback received and would seek the views of stakeholders and/or the relevant Standards Committee before recommending the direct adoption of an ISO standard.

Water-source heat pumps

The ISO is considering an update of the water-source heat pump test standard, ISO 13256:1998. This standard was locally adopted as AS/NZS 3823.1.3:2005 but is only called into regulation in Australia. Do you support: New Zealand considering the costs and benefits of aligning with Australia by regulating water-source air conditioners under the scope of AS/NZS 3823.1.3 for MEPS subject to a further RIS; and updating AS/NZS 3823.1.3 if ISO 13256 is updated?

Feedback:

All submissions that responded to this question supported New Zealand aligning with Australia for water-source air conditioners subject to a RIS process. Further, the submissions indicated that if the ISO standard is updated the Australian/New Zealand standard should be updated, subject to a review by the relevant Standards Committee.

Position:

E3 notes the feedback received, however any further work on water-source air conditioners is not a priority. Any proposal to regulate the energy efficiency of water-source air conditioners in New Zealand would be subject to cost benefit analysis.

Remove H2 MEPS requirements

The current regulations stipulate MEPS requirements for products making a voluntary heating capacity declaration at H2 (2oC). If it is decided to adopt the SEER testing and rating standard AS/NZS 3823.4 and the Zoned Label, the H2 test point will become mandatory with the performance reflected in the SEER rating (and hence, the star rating). Do you agree that if a SEER rating is implemented, a separate H2 MEPS is no longer required?

Feedback:

Of the submissions that responded to this issue, all but one supported removal of the H2 MEPS requirements. However, some mentioned the need to ensure this change considers the effect on New Zealand's ENERGY STAR program (which endorses the most energy efficiency products). To be eligible for ENERGY STAR, air conditioners must meet or exceed particular requirements at the H2 test point.

Further, some submissions only supported this change if the cold climate rating on the Zoned Label provides differentiation between good and poor product performance at H2. Another did

not support removing the H2 MEPS requirements, due to a concern that a product that fails the current MEPS requirements at H2 conditions could still achieve a good energy efficiency rating.

Position:

E3 will recommend removal of the H2 MEPS requirements. The current MEPS requirements appear to be an impediment to providing information about the efficiency and capacity of air conditioners in cold climates. A draft proposal has been submitted to Standards Australia to amend the assumed running hours in AS/NZS 3823.4, which if adopted will make the running hours that underpin the Zoned Label more realistic and allow product performance (in terms of both heating capacity and efficiency) in cold climates to be discerned. The proposal does not adversely affect the ENERGY STAR program in New Zealand, as if the SEER is implemented H2 data will be available for all air conditioners up to 30 kW.

Multi-split registration

Multi-splits systems are currently registered on an outdoor unit basis, rather than as a matched 'system' of indoor and outdoor units. This interpretation is necessary due to the regulatory burden that would be created by requiring registration of the large number of possible indoor unit combinations. The regulations for air conditioners therefore need to be clarified to reflect that for registration purposes, a multi-split system is only comprised of an outdoor unit. Note that the current testing arrangements, whereby a representative combination of indoor units is nominated will be maintained. Furthermore, modular VRF multi-split systems are currently being registered as both a base outdoor unit module and in systems that rely on multiple outdoor unit modules. This can result, for example, in a 20 kW module being registered as a 20 kW system and a 40 kW system that comprises of two 20 kW modules. This is likely to create unnecessary regulatory burden. Therefore, it is proposed to clarify in the next update of air conditioner regulations that only the base modules of a VRF multi-split system require registration. Do you agree with this proposal?

Feedback:

All of the submissions that provided feedback agreed with the proposal.

Position:

E3 will propose in the Decision RIS to implement this change, so that only the base model outdoor units of a VRF multi-split system require registration.

Fixed speed air conditioners – degradation coefficient

The seasonal test standard ISO 16358 (AS/NZS 3823.1.5) recognises that fixed speed air conditioners use a certain amount of electricity turning on and off to meet part load conditions. This is reflected in the calculation of seasonal performance through a degradation coefficient (CD) with a default value of 0.25. The EU's seasonal testing and labelling standard EN 14825:2012 uses the same default value. While ISO 16358 (AS/NZS 3823.1.5) allows an applicant to change the default CD value via a test procedure in Annex C of the test standard, E3's experience of this optional test encountered reproducibility issues. This RIS is therefore proposing that the default CD value of 0.25 is used for all registrations and will not be able to be changed by the applicant. Do you have any comments on this proposal?

Feedback:

Submissions either supported this proposal or offered no comment.

Position:

E3 will recommend implementation of this proposal in the updated regulations so that the degradation coefficient cannot be changed. Stakeholders should note that while the CD is used mostly during calculations for fixed speed air conditioners, it also applies to variable speed products during hours when the calculated heating/cooling load is lower than the product's minimum capacity. During these conditions, variable speed products must also turn off and on to meet the load.

Measurement of non-operative power consumption

Australia and New Zealand were amongst the first jurisdictions in the world to incorporate a measurement of non-operative power (e.g. standby, crankcase heaters) into the energy efficiency metric in 2009. It is incorporated into the Annual Energy Efficiency Ratio to assess compliance with MEPS and calculate the star rating algorithm (see Clause 2.4 of AS/NZS 3823.2:2013 for details). The proposed SEER standard, AS/NZS 3823.4:2014 (the local adoption of ISO 16358) describes a different method for measuring non-operative power for incorporating into the seasonal metric, which in turn would be used for a new star rating algorithm. It requires a unit to be tested at two to four temperature points for a minimum of 10 to 16 hours (see Annex B of AS/NZS 3823.4:2014, noting that this Annex would need to be updated for local weighting factors and hours if it is to be used). It should be noted that exploratory tests conducted by E3 in 2013 found that the two methods yielded similar results (i.e. within a few watts for the products tested). Given that the AEER/ACOP and the new SEER metric both need a measurement of non-operative power, E3's preference is to fully align with the new ISO SEER standard (AS/NZS 3823.4:2014) and therefore use it for both AEER/ACOP and SEER. Do you agree with this proposal?

Feedback:

Some submissions supported this proposal to align with the new SEER standard AS/NZS 3823.4:2014, while others suggested that both methods should be applicable (provided the two measures yield similar results).

Position:

The amendments to AS/NZS 3823.4:2014 include a change to the measurement of standby power. The amendment would allow standby power to be calculated (rather than tested and measured), to provide a less onerous option for suppliers. The proposed calculation method is similar to the current method that is specified in clause 3 of AS/NZS 3823.2:2013 and relies on a supplier understanding a unit's inoperative power use at different ambient temperatures. If these parameters are not understood, or in the case a of a compliance check-test, the physical test from AS/NZS 3823.4:2014 can be performed.

E3 previously found that the results of average standby power calculated from AS/NZS 3823.2:2013 (the current method) and AS/NZS 3823.4:2014 (the proposed new method) yield results within 10 per cent of one another (both higher and lower). Therefore, there is a slight

possibility that a product exactly on the MEPS line using the current method of incorporating standby power no longer meet MEPS using the new method. The likelihood of this occurring is considered low.

E3 will recommend only the AS/NZS 3823.4:2014 method be used in the updated regulations for both the MEPS metric and the SEER rating. This means that the current cooling/heating inoperative power figures (P_{noc} and P_{noh}) will be replaced by the weighted average power consumption figure (P_{ia}) of AS/NZS 3823.4:2014 for the MEPS metric. The current Annual Efficiency equations (Clause 2.5 of AS/NZS 3823.2:2013), including assumed hours of operation, will otherwise be unchanged. The aim of this is to transition to a new, internationally aligned method of obtaining and incorporating inoperative power usage.

'Add-on' coolers compliance

There are a number of companies that supply cooling only ducted split system air conditioners that are designed to 'add-on' to ducted gas heater systems. Many of these products even utilise the ducted gas heater's fan rather than their own. There appears to be a misconception by some sectors of the air conditioner industry that these products are exempt from energy efficiency requirements. Other elements of industry have raised concerns over the possible lack of energy efficiency of these systems, especially given the physical restrictions on size that many of the indoor evaporator coils used in add-on units have.

After liaising with one such company, the E3 Program acknowledged the difficulties faced by this sector of the industry. In a situation akin to multi-split registrations, companies offer a limited number of outdoor units that are matched to a potentially large selection of indoor unit evaporators that are designed to be compatible with a wide range of gas heaters; even gas heaters from their competitors. There are a number of options to make compliance with the current requirements easier and more practical. Do you support either of the following options or would you suggest an alternative option?

a) Clarifying and applying the existing requirements that refer to clause 3.4 (d) of AS/NZS 3823.2:2013. This means that all possible combinations of indoor/outdoor units would require registration as a system. Systems (i.e. matched combinations) that are sold less than 10 times per annum could use simulation testing to support the registration, while systems that are sold 10 or more times per annum would require a physical test report. Compliance check-tests are based on a registered system. Annual sales declarations would need to be provided for compliance upon request.

b) Registration is required on an outdoor unit basis, with the matchable indoor units being registered as a family against the appropriate outdoor unit. A physical test report using one of the appropriate indoor units would be needed to support the MEPS registration. A compliance check-test could choose to test any combination in this registered family. If the compliance test fails, the whole family (i.e. the outdoor unit and all indoor units registered as part of the family) would have its registration cancelled.

Feedback:

Most submissions, including from the Australian Industry Group and Consumer Electronic Suppliers Association, did not agree that there is an issue with the existing MEPS requirements for

these products. A couple of submissions, however, disagreed and preferred the option to treat add-on coolers like multi-split air conditioners.

Position:

Further engagement with the particular company concerned about the cost of complying with the existing requirements indicates they were unaware of an alternate compliance pathway, which allows suppliers to provide computer simulation test reports (rather than physical test reports) for product models with less than 10 sales per annum. The company is now in the process of becoming compliant with the existing regulations, and is using the simulation method for some of their products.

E3 will not recommend any changes to the existing requirements. In recent months, work has also been undertaken to educate and inform relevant suppliers to ensure they are aware of the MEPS requirements for add-on coolers.

Inclusion of air conditioners >65 kW capacity – technical issues

Feedback:

One submission stated that for air conditioners of this size, AHRI and Eurovent certification should be accepted to verify performance data, as is acceptable for chillers. There is a lack of suitable test facilities in Australia and New Zealand for these products and *HPRATE* simulation testing is not particularly suitable. This problem extends to all products above 30 kW where simulation testing is allowed. There was also a suggestion that MEPS levels for these large air conditioners should be aligned with overseas levels, as has been proposed for chillers.

Position:

Aligning MEPS for this category with overseas levels is not considered viable. The US requirements from 2010 are similar to E3's proposed levels, however, the US has quite different and complex sub-categories that means they are not directly comparable. They range from an EER of 3.22 to 2.73 over the range covered by Australia/New Zealand's >65 kW category. This will become more difficult from 1 January 2018 when the US MEPS metric changes to the Integrated Energy Efficiency Ratio (IEER), which incorporates a weighting for part load performance.

E3 proposes to clarify and make available a range of flexible compliance pathways for products greater than 30 kW cooling capacity that are aimed at making the adoption of this policy option practical and achievable.

Fixed speed products >30 kW will have the option of using the default values for the 29 ˚C SEER test point of AS/NZS 3823.4.1. These defaults are based on the 35 ˚C capacity multiplied by 1.077 and the 35 °C power input multiplied by 0.914. These default values are conservative, so it is likely to be in a supplier's interest to obtain tested results for this point.

Variable speed products >30 kW will also have the option of registering for a cooling SEER as a fixed speed product using the default values for the 29 ˚C SEER test point. These SEER results will reflect poorly on the performance of a variable speed product, so again it is likely to be in a supplier's interest to have them tested more thoroughly.

Eurovent certification covers 'comfort air conditioners' (including multi-splits) up to 100 kW and 'rooftop' air conditioners up to 200 kW. Eurovent certificates display a range of performance criteria for each registered model based on the European test standard, EN 14511. This includes standard T1 cooling performance and H1 heating performance data. Along with declarations of inoperative power consumption and true power factor, a Eurovent certificate could be used for registering a product >30 kW.

AHRI certification covers VRF multi-splits, unitary and split systems up to approximately 222 kW. While chiller certification verifies a manufacturer's simulation and selection software, air conditioner certificates verify each model's performance to AHRI Standard 340/360. This US test standard uses slightly different rating conditions to the international test points of T1 and H1 used by E3. The US cooling test conditions are very close to T1 conditions, so E3 proposes to accept this for products >30 kW (indoor dry bulb/wet bulb (DB/WB) of 26.7 ˚C/19.4 ˚C and outdoor DB/WB of 35 ˚C/23.9 ˚C versus T1 values of 27 ˚C/19 ˚C and 35 ˚C/24 ˚C). However, heat pumps will have to be re-rated to H1 conditions as the US values differ significantly (indoor DB/WB of 21 ˚C/15.5 ˚C and outdoor DB/WB of 8.3 ˚C/6.1 ˚C versus H1 values of 20 ˚C/15 ˚C and 7 ˚C/6 ˚C). Otherwise, along with declarations of inoperative power consumption and true power factor, an AHRI certificate could be used for registering a product >30 kW.

E3 will also accept other regional test standard results alongside EN 14511 and AHRI Standard 340/360 for products greater than 30 kW. Any regional adoptions of the ISO test standards ISO 5151:2010 (non-ducted), ISO 13253:2011 (ducted) and ISO 15042:2011 (multi-split) along with declarations of inoperative power consumption and true power factor will be acceptable. Note however, all registered performance must be based on Australia and New Zealand's electrical supply voltage and frequency of 230 V single phase or 400 V three phase at 50 Hz and the T1/H1 rating conditions.

E3 recognises that the Australian simulation test standard AS/NZS 3823.3:2002, applicable to products >30 kW is now unsuitable. The software it stipulates (based on the Oak Ridge Heat Pump Model, such as *HPRATE*) is outdated in a number of areas, including the refrigerants that it can model. E3 also recognises that there is a range of sophisticated commercial and proprietary simulation software that can produce accurate simulated test results.

Therefore, E3 proposes to allow companies to demonstrate that the software that they use can yield comparably accurate results to the applicable physical test. Companies could achieve this by submitting full simulation and physical test reports on a product for comparison. Once E3 is satisfied that these tests yield similar results, the simulation software could be authorised for all

future use on products in that category (i.e. unitary or split with ducted or non-ducted, or multi-split indoor units). Note that separate evidence would be required for each different category and compliance testing would be performed using physical tests. Sub-section 6(4) of the *Greenhouse and Energy Minimum Standards (Air Conditioners and Heat Pumps) Determination 2013* already provides this option for multi-splits.

Other issues

New: remove maximum cooling test for labelled products

Background:

Products carrying an Energy Rating Label must undertake the maximum cooling performance test. The test assesses whether very hot conditions (32 ˚C inside, 43 ˚C outside) and a fluctuating voltage leads to damage of the machine. Capacity and energy efficiency is not measured. Historically, the requirement to test labelled products only was to ensure that products carrying a government endorsed Energy Rating Label would not malfunction during extreme temperatures. Non-conformance to this test has not been an issue noted during compliance testing.

Position:

Given the additional testing that SEER rating will introduce, E3 proposes that the maximum cooling test no longer be a requirement of the air conditioner regulations. The rationale for applying the maximum cooling test is no longer considered necessary and may be a disincentive to the voluntary labelling of products.

New: variable speed products with incomplete compressor locking instructions

Background:

E3 has encountered a number of inverter products that only have compressor locking instructions for the rated (full capacity) test points.

Position:

E3 will recommend that suppliers of these products have the option of testing/rating them for SEER as a fixed speed product. In that way, the rated cooling capacity locking instructions can be used for the mandatory 35 ˚C and 29 ˚C tests and the rated heating capacity instructions can be used for the 7 ˚C test and the full capacity H2 test at 2 ˚C. Suppliers should note that these ratings will not demonstrate the optimal performance of their product and it would be in a supplier's interest to obtain the full locking instructions to register their variable speed products.

Retrofitting air conditioners with refrigerants for which they are not designed

Feedback:

The Fujitsu submission raised concerns with companies that are retrofitting air conditioners with refrigerants for which they are not designed.

Position:

While E3 acknowledges the concerns raised, this issue is best dealt with under the Australian Consumer Law (ACL). Under the ACL, Commonwealth, state and territory ministers can regulate consumer goods and product-related services by issuing safety warning notices, banning products on a temporary or permanent basis, imposing mandatory safety standards or issuing a compulsory recall notice to suppliers.

Setting MEPS based on the SEER standard

Feedback:

The Japan Refrigeration and Air Conditioning Industry Association (JRAIA) and some other submissions suggested that MEPS requirements should be based on the SEER standard, rather than the current MEPS settings (based on AEER/ACOP).

Position:

E3 will recommend a move to a SEER based MEPS be considered in the next review of the regulations. Implementation of AS/NZS 3823.4 would mean SEER data is collected via the registration process, which would allow the merits of a SEER based MEPS system to be investigated.

Attachment C: Portable air conditioners

Consultation RIS policy options

Policy option 3: Double and single duct labelling, reduced double duct MEPS

Double duct portable A/C subject to the SEER standard AS/NZS 3823.4, Zoned Energy Rating Label and a reduced MEPS level of 2.60 based on Annual Energy Efficiency Ratio/Annual Coefficient of Performance (AEER/ACOP). Single duct portable A/C subject to Zoned Energy Rating Label (with proxy for operating time data) and tested to AS/NZS 3823.1.5.

Feedback:

All submissions that provided feedback on this proposal agreed with testing and labelling double duct portable air conditioners to the SEER standard. A number of submissions agreed fully to this policy option. However, some submissions raised concerns with how these products' ratings would be calculated for the new label, and were unwilling to fully support this option without that information. It was recommended by several respondents to allow single duct portable products to use results from supplementary water evaporation features for MEPS and label rating information, as they are in Europe.

There was mixed, though largely positive feedback, to the proposed reduction of MEPS in order to allow double duct products back onto the market. Other responses raised issues with using an AEER/ACOP metric when portable air conditioners are not typically left connected to power like fixed units. They argued that an EER/COP metric, as the EU has adopted, is more representative of real world usage.

Feedback against reducing MEPS included requests for further research into overseas markets and whether these products would actually return to Australia/New Zealand with this policy shift. Others raised questions on the fairness of this product category having significantly lower energy efficiency requirements than alternative products such as window/wall units or split systems. There were suggestions that the MEPS should be raised, rather than lowered, to match these comparable products.

Position:

There was unanimous agreement to mandatory energy efficiency labelling for portable products, and this proposal will be recommended in the Decision RIS. This recommendation will take account of the feedback received from stakeholders on the star rating index that is proposed in Attachment A. Supplementary water evaporation features will be permitted for meeting MEPS and for rating purposes and this information will be displayed on the label. To ensure consumers are

informed of the higher efficiency and performance levels when using the evaporation features, it is proposed that labels display the capacity for both with and without use of this feature. Similarly, a message stating the efficiency ratings are based on the use of this feature will be trialled for the label and the non-water performance available online.

While E3 recognises comments related to comparable MEPS for double ducts as other air conditioners, it is important to note that these products serve a portion of the market who may be unable to purchase a fixed air conditioner for reasons of capital cost (purchase and installation) or landlord or other restrictions. The raising of the MEPS previously appears to have removed all double duct products from the market and turned many consumers in these situations to less efficient single duct portables. As such, it is important they be allowed to return to the market to offer a more energy efficient option. Although these products will have a significantly lower MEPS than similarly sized fixed products, E3 recognises the physical size limitations in remaining portable that inhibit high levels of efficiency.

E3 has also received further input that the proposed MEPS level of 2.60 (based on AEER/ACOP) may be insufficient to ensure double duct portables return to the market. It is therefore proposed that double duct portables be required to meet a MEPS level of 2.50 (based on EER/COP), to ensure this policy change will have the desired effect. This slightly lower MEPS allows a small margin for error for the many products registered in the EU at an EER/COP of precisely 2.60. However, part load compliance will not be available for single or double duct products.

The regulations will also clarify the test set-up for double duct portables. Given that many of these products are wall mounted, the regulations will stipulate that the ducts be installed as per manufacturer's instructions with the ducts as short and straight as possible.

Policy option 8: Single duct portable MEPS

Single duct portable A/C subject to a MEPS level of 2.60 based on AEER/ACOP

Feedback:

Generally it was agreed that a MEPS should be applied to single duct portable products. Feedback on the appropriateness of the levels and the timing for introduction was mixed.

Several ideas relating to an appropriate MEPS were raised. These included a question over the validity of a MEPS that may remove many of these products from the market. However, other submissions recommended a higher MEPS be introduced, in line with small split systems, as per the comments on double duct portables.

As with the feedback on the MEPS for double duct products, there was concern raised with the lack of clarity in the CRIS on the exact method of test and how these parameters would be used to rate energy efficiency, output capacity and star ratings. Comments included that MEPS could be set either too high or too low, thus completely removing the products from the market or else

having no affect at all. A recommendation was to monitor products for a period of time and set a MEPS in the future once the market efficiency was better understood.

As per the comments for the double duct MEPS, preference for EER/COP over AEER/ACOP, as well as the use of water evaporation features to meet MEPS was also raised for this proposal. Another submission suggested a benefit be given to appliances that are hermetically sealed, providing a lower likelihood of refrigerant leaks, and for those using low GWP refrigerants, like in the EU.

Position:

As per the proposal for double duct portables, E3 will recommend in the Decision RIS setting a MEPS of 2.50 based on EER/COP rather than AEER/ACOP, as well as the option to allow use of supplementary water evaporation features. The proposed MEPS has been lowered from the original proposal of 2.60 to 2.50, as E3 has observed that many single duct products claim an EER of precisely 2.60. The proposed MEPS of 2.50 therefore provides some margin for error and is aimed at ensuring all models for sale in Europe would be able to be sold in Australia and New Zealand. Further, the AS/NZS test method was designed to follow the same methodology as the EU test to enable these products to be comparable. However, part load compliance will not be available for single or double duct products.

Technical questions

Capacity correction for single duct portable air conditioners

As outlined in the Problem and Options sections, single exhaust duct air conditioner have a unique design feature that inhibits their energy efficiency – they must draw outside air directly or indirectly into the room they are trying to condition. For every litre of air exhausted through their single exhaust duct, a litre of outside air must replace it. This means that in summer, hot outside air must enter the building and in winter, cold outside air must enter the building. While the new Australian/New Zealand test standard is an improvement on other regional test standards in that it deducts the heat that leaks out of and radiates from the unit, it still does not deduct the heat (or cold) that must be drawn into the room.

A theoretical cooling/heating capacity correction could be applied to single duct units based on the measured exhaust airflow of each unit (this data is already recorded through the test standard). Then the energy infiltration per litre per second that is being drawn into a room could be deducted. To do so, standard indoor/outdoor temperature differences would have to be established. Fixed air conditioners are tested and rated using indoor/outdoor temperatures of 27 °C/35 °C for cooling and 20 °C/7 °C for heating. These temperature points could form the logical basis on which to calculate capacity corrections. The US Department of Energy are proposing to apply such a correction factor and appear to have settle on an infiltration air temperature of 35 °C.

In addition to the Zoned Label and/or MEPS proposals outlines in the options section for single duct portables, do you support the development of a capacity correction method as outlined above for the purpose of labelling single exhaust duct products? Furthermore, do you support the use of the

proposed temperature points, or do you suggest other temperatures? Please supply data or evidence to support your proposal.

Feedback:

Feedback received on this proposal from portable air conditioner suppliers and industry groups was not supportive. Respondents from CESA and DeLonghi claimed this option would unfairly penalise portable products.

Position:

E3 has noted the feedback received and is not proposing to recommend the potential capacity correction method in the Decision RIS.

Attachment D: Chillers

Consultation RIS policy options

Policy option 4: Remove the Australian/New Zealand chiller test standard and align with the US

Remove the unique Australian/New Zealand chiller test standard and align with the United States (US) Air conditioning, Heating and Refrigeration Institute (AHRI) test standard 551/591:2011

Feedback:

There was strong general support for maintaining a flexible approach to demonstrating MEPS compliance. While replacing the unique Australian test standard AS/NZS 4776 with AHRI standard 551/591 was generally supported, two submissions noted that they would prefer the Australian option be maintained. A desire to maintain the ability to use the European COP rating conditions was also expressed.

The objection to moving to AHRI standard 551/591 seemed to be the specific requirements for selecting, installing and maintaining test instrumentation to the various standards listed in Table C1 of AHRI 551/591 that will present a financial and practical barrier to some companies. AS/NZS 4776 does not have these specific requirements.

The required accuracy of the measurement equipment in the AHRI standard is generally more stringent than AS/NZS 4776. For example, AHRI requires the ability to measure air temperature to plus or minus 0.11 ^{o}C, whereas AS/NZS 4776 stipulates plus or minus 0.2 ^{o}C. Feedback indicates these accuracy requirements are achievable.

The standard rating conditions for water-cooled chillers differs slightly between the EU test standard and AHRI with the entering water temperatures of 30 $^{\circ}$C and 29.4 $^{\circ}$C respectively. AS/NZS 4776 treats these as being equivalent. Although it was not expressly articulated in the CRIS, the intention is to maintain these dual rating conditions in any updated regulations.

Position:

The Decision RIS will recommend:

- The unique Australian/New Zealand test standard AS/NZS 4776 be removed
- The updated regulations will 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 the standard
- Eurovent and AHRI Certification will be maintained as per the current arrangements.

- The COP rating conditions from the Eurovent test standard EN 14825 will still be acceptable, as per current arrangements.

Note: during the CRIS writing process, AHRI published an updated version of Standard 551/591. This version is now preferred.

Policy option 5: Remove NCC regulated chillers and a/c and replace with GEMS/New Zealand regulations

Include the energy efficiency requirements for A/C >65 kW capacity and chillers <350 kW under GEMS/New Zealand regulations and in Australia remove these from the NCC.

Feedback:

All feedback supported expanding the scope of MEPS to less than 350 kW capacity chillers and in Australia removing the MEPS requirements from the NCC. Most respondents were concerned, however, that the proposed testing requirements for both COP (full load efficiency) and IPLV (part load efficiency) would prove difficult for some products, especially for the European companies who are prominent in this segment of the market.

Please note: E3 seeks further feedback to assist in deciding whether to recommend this policy option in the Decision RIS – this is outlined in Attachment B, along with the air conditioner specific feedback. This section deals with the chiller specific issues that were raised.

Issues:

The integrated part load value (IPLV) metric of the existing regulations is based on the US test standard AHRI 551/591. While the European test standard will produce essentially the same COP value, the IPLV methods are not compatible. The larger (>350 kW) chillers are generally able to be re-rated for the Australia/New Zealand IPLV metric, but there is concern that some European manufacturers of smaller products will not be able to re-rate them – likely because of the costs of upgrading their simulation and selection software.

There is also a technical barrier to this proposal, with many small products only being able to operate at full load (COP) because they have single, fixed speed compressors and are not capable of operating at the 25, 50 and 75 per cent load points required for IPLV.

Some feedback indicates that only COP MEPS should be applied to products <150 kW. However one company was concerned that applying IPLV MEPS to products between 150 and 350 kW may restrict entry to some smaller European companies for the reasons stated above.

Position:

Feedback is sought on the options below for this policy proposal.

Option 1 – IPLV >150 kW

- The MEPS requirements for chillers less than 350 kW will be removed from the NCC in Australia and specified under the E3 program.
- COP MEPS will apply to all products.

- IPLV MEPS requirements will apply to products larger than 150kW with voluntary disclosure for products smaller than 150kW.
- Registrations will be able to utilise all current AHRI and Eurovent pathways, both testing and certification.

Option 2 – no IPLV <350 kW

- The MEPS requirements for chillers less than 350 kW will be removed from the NCC in Australia and specified under the E3 program.
- COP MEPS will apply, with IPLV disclosure being voluntary.
- Registrations will be able to utilise all current AHRI and Eurovent pathways, both testing and certification.

Policy option 6: Retain current NCC MEPS levels under GEMS/New Zealand regulations

Feedback:

Feedback on this policy option is covered in policy options 5 and 7. Air conditioner specific feedback is included in Attachment B.

Policy option 7: Align >65 kW A/C MEPS levels to 39 to 65 kW GEMS and chiller MEPS levels to the ASHRAE levels

Align >65 kW A/C MEPS levels to 39 to 65 kW GEMS MEPS (i.e. AEER/ACOP 2.90). Align chiller MEPS levels to the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) energy efficiency standard 90.1:2013 where the US levels are higher

Air conditioner feedback is contained in Attachment B.

Proposed new MEPS levels >350 kW

Feedback:

General feedback supported the increased MEPS levels for chillers >350 kW. One company however, questioned the relevance of raising MEPS levels to those of the US and did not support the proposal. They were also disappointed that the proposal did not allow for application specific MEPS as per the US system (i.e. one that caters for high COP applications and one for high IPLV applications).

Issues:

The rationale for not mirroring the US dual compliance pathways was outlined in the CRIS. Essentially, the US standards are regulated through building codes that have the ability to regulate different applications at the point of installation. 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 GEMS Act/New Zealand regulations are not suitable for regulating MEPS based on end-use installation.

Since the CRIS was released, further analysis has been undertaken of the proposed increases to chiller MEPS levels. The aligned MEPS levels will have minimal effect on registered water-cooled products, with only 1 per cent of registrations affected. The impact in the air-cooled market will be more substantial, with 23 per cent of current registrations affected.

To update the analysis, information on the Price Efficiency (PE) ratio of chillers was requested and provided by some suppliers, as the cost benefit analysis is sensitive to this parameter. The PE ratio is used to assess the cost effects of an increase to MEPS. For example, if a 1 per cent increase in the average efficiency of the products being sold results in an average price rise of 1.5 per cent, the PE ratio is 1.5:1.

The additional price and sales data provided by suppliers indicates a better estimate of the PE ratio for air-cooled chillers is 2.6:1 (with a range of 1.1:1 to 4.1:1). The updated PE ratio increases the cost of the proposed MEPS levels, as the CRIS assumed a PE ratio of 1:1 for chillers. The CRIS estimate was developed at a workshop with stakeholders, prior to undertaking the cost benefit analyses. Note the results for increasing MEPS for water-cooled chillers have not been included, due to the updated proposal to remove MEPS requirements for these products.

Another change from the CRIS analysis is a lower estimate of the operating hours of chillers – which reduces the estimated energy savings. The operational hours are now based on two chillers operating together to share the cooling load, which we understand is likely to be a more realistic scenario (the CRIS assumed one chiller operating only). Further, the hours have been estimated using building design software, whereas the CRIS estimates were obtained through interviews and discussions with chiller suppliers. The hours of operation assumed in this analysis are shown in Table 4 below.

Table 4: Assumed operating hours

Load point	NSW	ACT	QLD	SA	WA	VIC	NT	TAS	NZ^
100%	385	385	346	312	324	227	1229	288	288
75%	947	947	1254	716	986	595	1779	789	789
50%	603	603	545	539	632	508	255	569	569
25%	213	213	131	317	196	352	9	286	286
Not operational	6613	6613	6486	6878	6624	7079	5489	6830	6830

^New Zealand operating hours are assumed to be the same as Tasmania.

The energy savings are estimated based on models below the proposed new MEPS level improving their efficiency to this level. This is also a change from the CRIS method, which assumed the MEPS increase would result in an improvement in the average efficiency of products. This

change reduced the size of the benefits and the costs. The updated cost benefit estimates for the proposed increases to air-cooled chiller MEPS are shown in Table 5 below.

Table 5: Cost benefit estimates

Measure	Australia	New Zealand
Net benefit^	$A1.6 million	$NZ-0.3 million
Benefit/cost ratio	1.1:1	0.7:1
Energy saved (cumulative to 2030)	66 GWh	5 GWh
GHG emission saved (cumulative to 2030)	54 kilotonnes	0.5 kilotonnes

^A discount rate of 7 per cent was used for Australia and 8 per cent for New Zealand. New Zealand values are shown in New Zealand dollars ($A1=$NZ1.05 as at November 2016).

Based on the updated cost benefit estimates this proposal is only marginally cost effective in Australia, with a benefit/cost ratio of 1.1:1. For New Zealand, the proposal is not cost effective with a benefit cost ratio of 0.7:1. Sensitivity analysis shows if, for example, the PE ratio is higher than 2.6:1, the proposal to increase MEPS is not cost effective for Australia.

Position:

E3 would appreciate further input on this proposal, in particular feedback on the estimates of the PE ratio and operating hours, to improve the Decision RIS.

Increased MEPS levels for chillers <350 kW

Feedback:

Three of the five chiller companies that formally responded suggested that the proposed MEPS levels for products <350 kW were too high.

- Geoclima suggested that the NCC air-cooled MEPS should be maintained, as an increase would remove too many products (particularly European) from the market.
- Daikin suggested it would be very difficult for chillers <150 kW to achieve more than the NCC MEPS due to technical issues. These smaller products often come with an integrated pump that adds to the energy use (and therefore reduces the COP). This differs from the larger end of the market where separate pumps are always added during installation and therefore are not part of the COP calculation.
- Trane suggests that the water-cooled MEPS from the NCC should be maintained so as to maintain competition from European companies in this segment of the market. They also believed that an increased MEPS COP of 2.87 for air-cooled products was unachievable and

instead suggested a level of 2.70. This was the MEPS level that AS/NZS 4776.2:2008 suggested should be the future level for chillers <350 kW.

Position:

- As per the previous proposal, E3 is seeking further information and data on this proposal. E3 is mindful of the concerns raised in some submissions about the potential for adverse competition impacts. E3 also seeks feedback on Trane's compromise proposal to adopt a COP MEPS level of 2.70, along with an IPLV MEPS of 3.70 (i.e. the COP MEPS levels that already apply to 350 to 699kW products under the E3 program – and noting that the use of IPLV for 350kW products is the subject of policy option 5).
- In terms of specific issues, E3 notes that the issue of integrated pumps could be overcome by specifying that products with integrated pumps shall discount the electricity used by the pump when calculating the COP.

Policy option 12 (new): remove MEPS requirements for all water-cooled chillers and for air-cooled chillers 700 kW capacity or greater

Issues:

The current MEPS for water-cooled chillers and for air-cooled chillers 700 kW capacity or greater appear to be unnecessary.

Water-cooled chillers

Water-cooled chillers are purchased and installed to achieve higher efficiencies and lower running costs than an air-cooled chiller can deliver. Compared to an air-cooled chiller, they are more complex and costly to install (e.g. they need to be matched to a cooling tower with its own pump and water circuit – estimated at 30 to 150 per cent above the product price, depending on the installation) and more difficult and costly to maintain (e.g. managing the risk of *legionella*).

There are no air-cooled chillers (the other main chiller type) registered under the E3 program that are able to meet the higher MEPS requirements for water-cooled chillers. Water-cooled products are often not even marketed as discrete models, as they are commonly heavily customised. For instance, one such range advertises that it comes in capacities from 420 kW to nearly 14,000 kW. Between the different compressors, heat-exchangers (e.g. physical size, water pipe passes), variable speed drives, etc., this range claims to have over 200,000 possible unique combinations. These products are therefore marketed, designed and sold as custom products and energy efficiency and lifetime running costs appear to be the focus.

In some humid tropical areas of Australia, water-cooled chillers may have less of an energy performance advantage (over air-cooled products) in terms of life-time operating costs. However, the sophisticated computer selection software used by large chiller manufacturers should allow

customers interested in high energy efficiency and low running costs to select the best chiller for their climate.

Chillers are required to meet two MEPS levels – Coefficient of Performance (COP) and Integrated Part Load Value (IPLV). COP measures cooling efficiency at full load (100 per cent), whereas IPLV measures energy efficiency across 25, 50, 75 and 100 per cent load points. Figures 1 and 2 show the COP and IPLV of air-cooled and water-cooled chillers by their cooling capacity.

Figure 1: Chillers - COP by cooling capacity

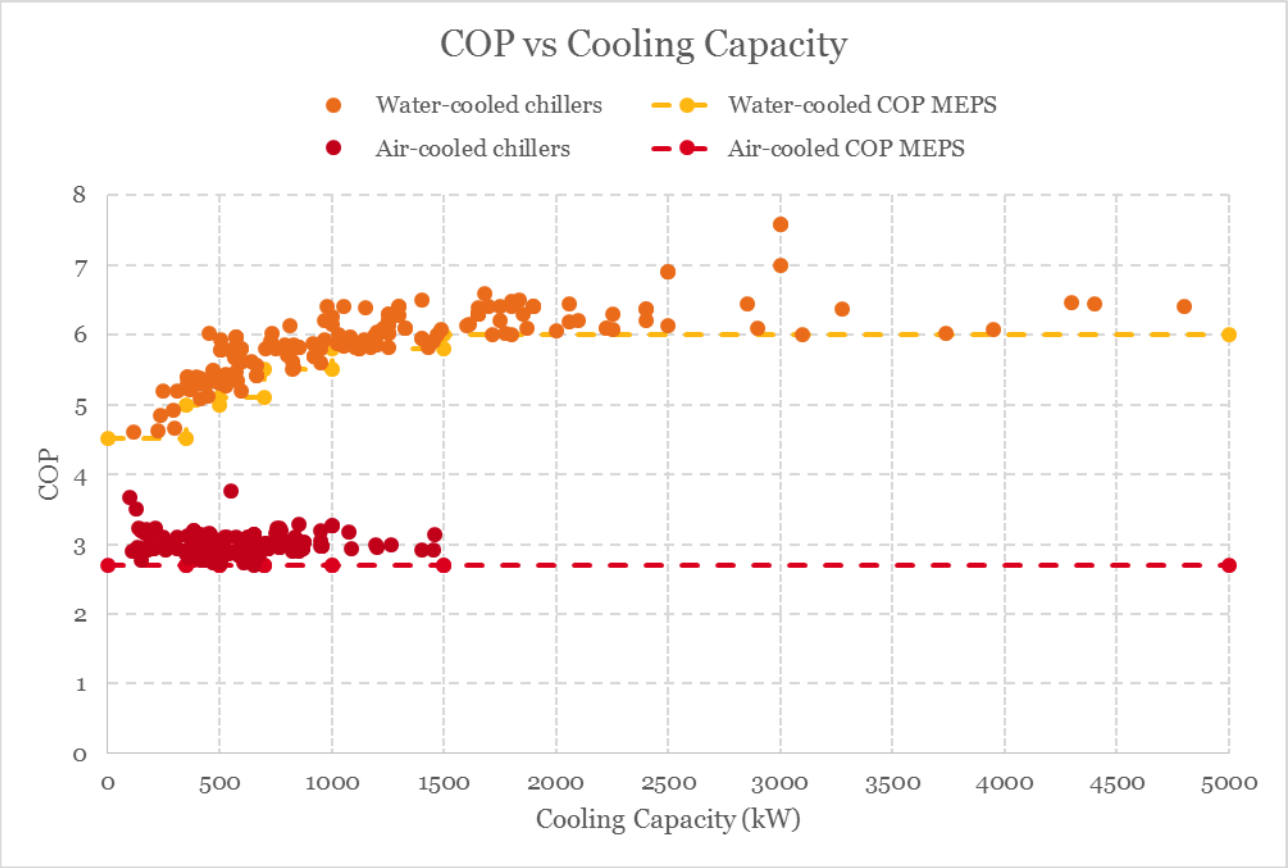
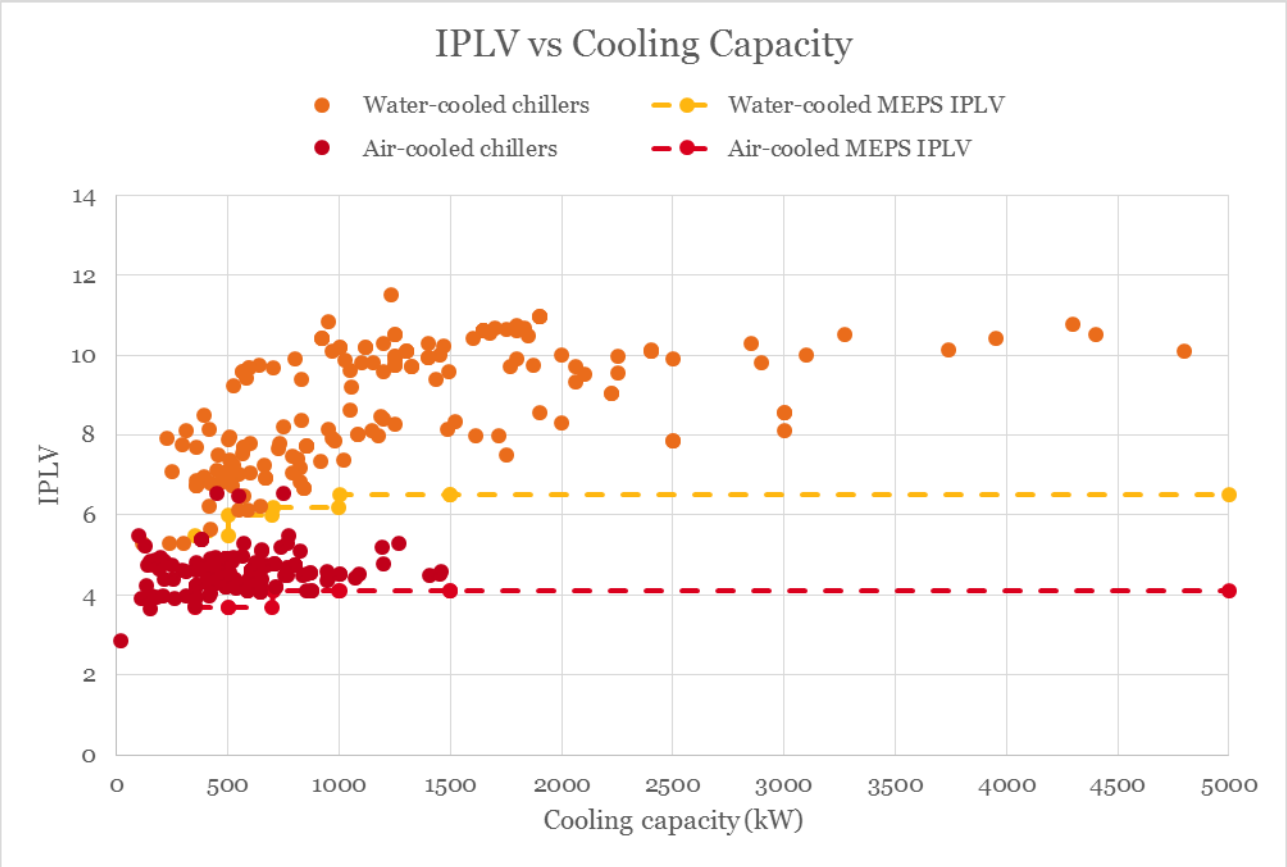


Figure 2: Chillers - IPLV by cooling capacity



The MEPS levels are indicated by the dashed lines, with the yellow dots showing the energy efficiency of air-cooled chillers and the red dots water-cooled chillers. The figures indicate that on average, water-cooled chillers are around **twice** as efficient as air-cooled chillers.

The MEPS for water-cooled chillers are intended to provide an energy efficiency floor for these high efficiency products. However, there is potential for the water-cooled chiller MEPS requirements to actually impede the purchase of more energy efficient chillers. If the MEPS requirements are making water-cooled products more expensive to purchase than they would be compared with air-cooled chillers, this may result in some chiller buyers considering a water-cooled chiller to opt for a less efficient air-cooled chiller instead.

The rationale for policy intervention through MEPS is generally to address split incentives. Split incentives can occur when those responsible for paying energy bills (e.g. a building tenant) are not the same entity as those making a capital investment (the landlord or building owner), such as selecting the type of chiller to cool a building. However, energy efficiency is the driver for installing a water-cooled chiller - they are not purchased and installed due to split incentives.

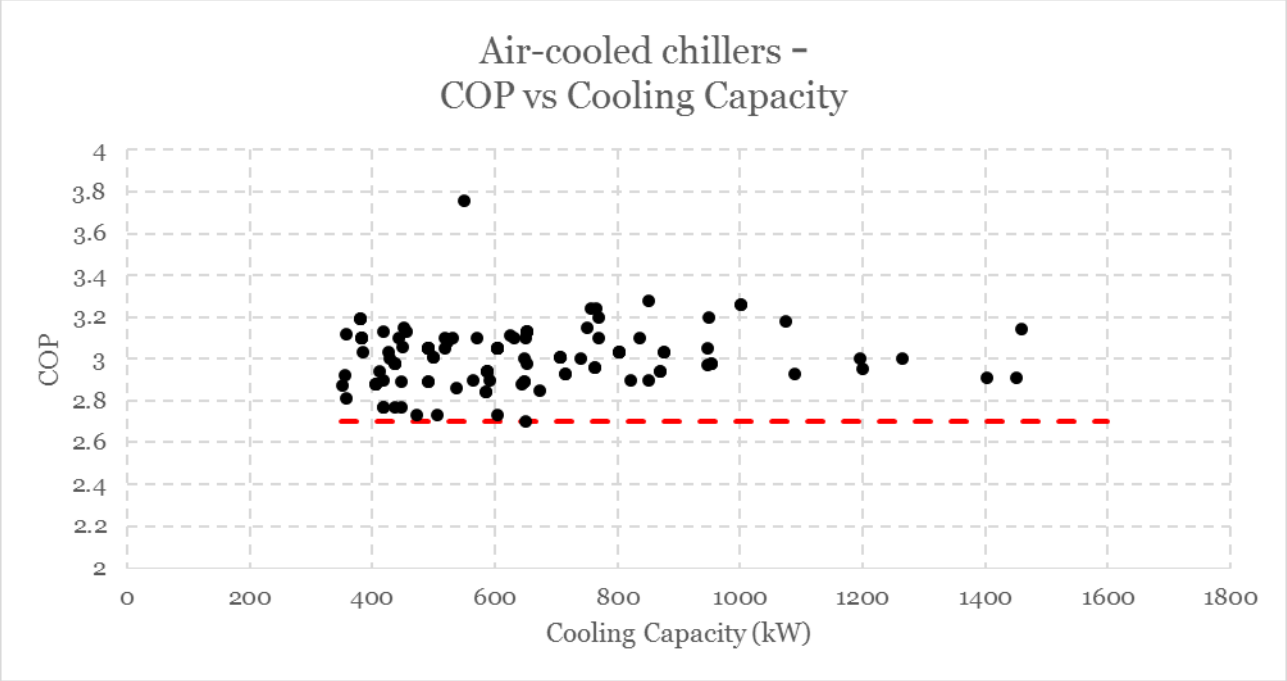
E3 therefore seeks your feedback on the need for water-cooled chiller MEPS, and whether the regulations are impeding the purchase of energy efficient chillers.

Air-cooled chillers

Compared with water-cooled chillers, air-cooled chillers appear to be the cheaper and easier alternative in terms of installation and maintenance. Although there is a level of customisation available, air-cooled chillers are more likely to be marketed as 'off the shelf' discrete models. Catalogues tend to list air-cooled model capacities and efficiencies and often include high efficiency and standard efficiency sub-ranges from which to choose. Of the 303 air-cooled chiller registrations[4], none can meet the water-cooled chillers COP MEPS level. Only five can meet the relevant water-cooled chillers IPLV MEPS level.

Figure 3 shows the COP of air-cooled chiller registrations versus their capacity and the MEPS level of 2.7.

Figure 3: Air-cooled chillers - COP by cooling capacity



The figure shows there is little difference between the most efficient and least efficient air-cooled models, with COPs ranging between the MEPS level of 2.7 and around 3.3 (apart from one high efficiency model with a COP of 3.8). It appears that for products below 700 kW, the COP MEPS requirements are binding, while products above 700 kW have a minimum COP of around 2.9; well above the 2.7 MEPS level.

[4] As at August 2016.

The situation is similar for the IPLV MEPS, with 3 per cent of registrations within 10 per cent of the MEPS level where the capacity is below 700 kW, whereas above 700 kW only two models are affected by the IPLV MEPS requirements.

The CRIS proposed increasing the air-cooled COP MEPS from 2.70 to the US level of 2.87, and the IPLV MEPS from 4.10 to 4.14. However, these MEPS increases would have limited impact in the 700 kW plus section of the market, as almost all products already have higher efficiency. Increasing the MEPS further for this market segment is difficult without adversely impacting competition, due to the limited number of products in the larger sizes. As with water-cooled chillers, air-cooled chillers of this size category are generally custom made and specified to meet the needs of the customer.

E3 is therefore seeking your feedback on the need for MEPS requirements for air-cooled chillers greater than 700 kW. There is a trend towards increased energy efficiency in large commercial buildings (where chillers are installed), driven by both the market and government intervention. Management of energy use in large buildings is increasingly sophisticated. This trend, along with government programs which disclose the energy performance of buildings such as CBD in Australia and NABERS New Zealand, is encouraging investment to improve their energy performance.

Position

E3 seeks further data and your views on removing the MEPS requirements for water-cooled chillers and air-cooled chillers greater than 700 kW capacity.

- Is energy efficiency the main reason to install a water-cooled chiller?
- Is there a need to maintain MEPS for water-cooled chillers? If yes, why?
- Are air-cooled MEPS requirements appropriate in providing an energy performance floor for the chiller market? Is a MEPS level necessary for products beyond 700 kW? Is there another threshold that is more appropriate?
- What are the most important things that buyers search for in chillers (please explain and rank)? Where does energy efficiency and running costs rank?
- Are buyers optimising their total costs (including purchase, installation, maintenance and running costs)? If not, why not?
- What proportion of buyers could benefit from considering energy use in their purchase decision?
- What unintended outcomes might arise from increasing the energy efficiency requirements for chillers? Please explain and give examples if possible.
- If the energy efficiency regulatory costs for water-cooled chillers are removed, would buyers be more likely to purchase them than an air-cooled chiller than they are now? Or are the regulatory costs relatively minor?

Issues with chiller registrations

Since the consultation RIS was released, engagement with stakeholders has identified that aspects of the current registration requirements are not suited to the often bespoke nature of chiller sales.

- 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, two physically identical chillers could be rated at 1,200 kW and 1,400 kW (or anything in between). The current regulations deem these to be separate models requiring separate registrations. Under these circumstances, many applicants appear to be grouping them into a single registration; sometimes as a 'family' registration, others as a single registration that uses 'wildcards' in the model number.
- Exact model numbers for chillers are often not finalised until a product is ordered by a customer. For instance, the rated capacity (in kilowatts) generally forms part of the model number string. However, the exact capacity is specified by the buyer.
- On further investigation, some approved applications cover physically different models under one registration (e.g. they cover different compressors).
- Industry 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. Industry submissions have suggested a solution to address this, but it further emphasises the issue that registrations are being used to cover multiple capacity units and that at least some sections of industry believe this is permissible under the regulations.

Position:

E3 seeks your views on the following proposal to fix these problems with the registration requirements:

- Base a registration around a single compressor.
- The least efficient configuration (at standard rating conditions) must be registered.
- If this is not the base model, minimum components must be stipulated as part of the registration. For example if an air-cooled chiller with standard condensers fails MEPS, but the same product fitted with more efficient condensers meet MEPS, this must be noted. Component combinations that do not pass MEPS cannot be supplied.
- A maximum MEPS compliant capacity must be stipulated.
- For modular chillers, the maximum combined number of modules that are MEPS compliant must be stipulated (note, systems comprising of multiple modules will not require registration; only the base model).
- One registration fee allows anything in this family to be sold without further registrations.
- Note that only indicative, base model data will be collected and displayed on the Energy Rating website.

Scope (type) of products covered

A question was asked in the *Technical/administrative questions* section of the RIS on the need to include reverse cycle (R/C) (or heat pump) chillers within the scope of regulations. Lots of feedback was received on this point and other types of chillers not covered.

Reverse cycle chillers

Feedback:

A range of views were received, but most submissions supported including reverse cycle chillers, or at least investigating their inclusion. Most said that MEPS for only the cooling cycle would be appropriate. Feedback was also received suggesting that some suppliers are importing R/C chillers for cooling only as a way of avoiding MEPS.

Issues:

R/C chillers are excluded from MEPS requirements. While Eurovent certification does cover them, AHRI certification is voluntary, with only a very small number of R/C water-cooled chillers listed on the AHRI website. AHRI Standard 551/591:2015 does however provide a test method. While European manufacturers may be well placed to register the performance of R/C chillers, US suppliers may not be.

There appear to be a few registrations of products that are capable of providing a heating function (according to product brochures) that have been registered as a cooling only chiller. Note that the registration system has no facility for the provision of heating performance data.

Position:

E3 are seeking further information from stakeholders on this issue.

- Do you agree there is a problem, i.e. that some suppliers of chillers with cooling efficiency below the current MEPS requirements are claiming that products are R/C to avoid compliance with the cooling MEPS? Or is this not a significant issue? Do you have information or data to support your view?
- If R/C chillers were required to meet the current cooling MEPS requirements, would this have any unintended consequences? Further, if R/C chillers cannot just be optimised for cooling cycle efficiency and were to be included in scope, would lower cooling MEPS for R/C products be required?

Adiabatic (evaporative) chillers

Feedback:

Most responses support ensuring these products meet air-cooled MEPS. Some argued that they fall under the scope of the current Determination as an air-cooled chiller, while others argued that they constitute a separate product category that should not be covered.

Issues:

The current requirements cover air-cooled and water-cooled liquid chilling packages with a cooling capacity of 350 kW or above. It lists a number of product exclusions, however it does not mention adiabatic or evaporative products.

An adiabatic chiller uses evaporative pads or netting to pre-cool the air before it reaches the condenser. This can result in greater capacity and efficiency. Some companies claim that this type of product represents an evaporatively-cooled condenser, as per the definition in the Australian/New Zealand parent standard, AHRI Standard 551/591:2015 (Clause 3.5.2). Others argued that an adiabatic chiller is instead an air-cooled condenser with pre-cooling.

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.

Position:

E3's view is that air-cooled MEPS requirements for adiabatic chillers and products using evaporatively-cooled condensers are justified. They shall be rated and registered without these water evaporating features being activated.

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 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.

It is proposed that the new requirements will allow the voluntary provision of additional performance information for adiabatic chillers or products that contain an evaporatively-cooled condenser (i.e. capacity, COP, IPLV). This performance (if provided) shall be based on the standard rating condition of air entering at 35 °C dry-bulb and 24 °C wet-bulb. The assumed evaporation efficiency of the adiabatic device shall also be disclosed, while a physical test to ARHI Standard 551/591:2015 would be required to support the voluntary performance claims for evaporatively-cooled condenser products.

Free-cooling chillers

Feedback:

Some responses suggested that these products should meet MEPS to create a level playing field.

Issues:

Free-cooling chillers are excluded from the E3 program and the AHRI test standard and certification program. They are designed to take advantage of cool ambient conditions (generally at night) to maintain cooling capacity without the need for mechanical compression. They are

highly efficient under the right circumstances, but the addition of a free cooling water loop can decrease the efficiency of the refrigeration cycle. However, these products are not being supplied because they are cheap and easy to install; they are being used in situations like data centres because they are efficient and cheaper to run than standard chillers. A free-cooling loop is unlikely to be added to avoid energy efficiency regulations.

Position:

E3's view is that MEPS for free-cooling chillers are not justified. It has the potential to cause perverse outcomes such as increased energy consumption if it inhibits the development of these highly efficient products.

Heat recovery chillers

Feedback:

Some responses suggest that these products should meet MEPS to create a level playing field.

Issues:

Heat recovery chillers are excluded from the E3 program. They can be tested by AHRI but certification is voluntary. They are designed to reuse the heat that would normally be rejected to the air. However, as with free-cooling chillers they are not being installed because they are cheap and easy to install; they are being installed in situations where this waste heat can be used to save energy in other ways (e.g. heating water). In-built heat recovery equipment is unlikely to be added to bypass energy efficiency regulations.

Position:

Mandatory MEPS are not justified. They have the potential to cause perverse outcomes such as increased energy consumption.

Clarifying rating conditions for high static propeller fans

Feedback:

Johnson Controls has recommended that the registration process clarify the requirements for air-cooled chillers with high static propeller fans. The submission suggested that as the static pressure these fans operate at is site specific (and therefore, the energy use of these fans depends on the unique installation situation), a standardised static pressure of 0 pa should be defined and used for registration purposes.

Position:

E3 proposes that any updated chiller regulations stipulate a standardised static pressure of 0 pa.

Attachment E: Zoned label

Consultation RIS policy options

Policy option 2: Remove the existing Energy Rating Label and replace it with a Zoned Energy Rating Label

Remove the existing Energy Rating Label and replace it with a Zoned Energy Rating Label that provides energy efficiency information for three distinct climate zones across Australia and New Zealand to A/C with capacity up to 30 kW. Air enthalpy tests would be accepted for ducted, three-phase and certain 'commercial use' products. Multi-split systems would continue to be excluded from physical labelling but would be subject to the SEER standard, with rating information for the registered combination made available on the Energy Rating website.

Feedback:

Feedback on this policy was generally very positive. All agreed with the adoption of the Zoned Label, with only small concerns raised. Many raised the lack of available information related to the star rating index; this is covered in Attachment A.

One submission noted that requiring a noise declaration on the label would likely provide little benefit to consumers beyond a comparative measure. They suggested that consumers may be confused by the figure and attempt to replicate it using smartphone applications. They commented that if it were to be used, it would be important that education be provided to help minimise these potential issues.

Some submissions outlined the importance of correct sizing and professional advice for air conditioner products and requested this be added to the Zoned Label. Another sought clarity on the H2 rating declaration and had views on how this figure should be tested and declared.

Two gas associations recommended the inclusion of greenhouse gas emissions information to the label. Another submission requested that efficiency information only be mandatorily declared in one zone, with the other zones voluntary, as is the case for the European Union label.

The main concerns raised with this policy proposal (in several submissions) related to the extension of mandatory labelling to ducted and three phase units. It was raised in several submissions that this could result in issues and difficulties for suppliers, as often the same outdoor unit will be used for multiple indoor unit combinations and thus each boxed unit would require multiple labels to be provided and then the correct version applied upon installation. In addition, some respondents questioned the benefit of physically labelling a product that is unlikely to be seen by a consumer prior to purchase. It was agreed that the SEER information be still made available online for these products for consumers to research and compare models. An alternative suggestion was for suppliers to include a QR code on the outdoor unit.

Position:

Given the strong positive feedback in support of the Zoned Label, the Decision RIS will recommend it replace the current Energy Rating Label for air conditioners. The Decision RIS will continue to recommend that efficiency information be provided for all three zones to ensure this information is made available to consumers in all zones. The voluntary declarations in the EU have resulted in the majority of, if not all, products only being supplied with the mandatory 'average' zone rating. Furthermore, unlike the EU system, supplying information for all three Australian/New Zealand Zones requires no further testing and therefore, negligible additional regulatory cost.

Based on the information received on the proposal to expand the scope of labelling E3 instead proposes that energy efficiency rating information (including star ratings) be made available on the Energy Rating website for products outside the current scope but up to 30 kW capacity. The existing voluntary physical labelling arrangements for ducted and commercial units would be maintained. However, if the proposal is adopted air enthalpy tests will be accepted for these products, even if a voluntary physical label is applied (under the current regulations, a physical label can only be applied if the product has been tested in a calorimeter room). See table 2 below for details.

Table 6: Rating and labelling requirements

Product category	Labelling requirements	Online Rating	Minimum test permitted
Non-ducted splits, single phase	Mandatory	SEER	Calorimeter
Non-ducted splits, three phase, <30 kW	Voluntary	SEER	Air enthalpy
Unitary, single phase	Mandatory	SEER	Calorimeter
Unitary, three phase <30 kW	Voluntary	SEER	Air enthalpy
Ducted single split, <30 kW	Voluntary	SEER	Air enthalpy
Ceiling cassettes, <30 kW	Voluntary	SEER	Air enthalpy
Water source within scope of AS/NZS 3823.1.3	Prohibited	AEER/ACOP	Air enthalpy
Multi-splits <30 kW	Prohibited	SEER on registered combination	Air enthalpy
All other products > 30 kW	Voluntary (multi-splits prohibited)	Cooling SEER, heating ACOP	Simulation or air enthalpy
Single duct portables	Mandatory	EER/COP	Calorimeter

One option that was raised in submissions was for ducted products to have a generic label (to be placed on outdoor units) to direct consumers to check the energy rating of their exact product combination online. This may encourage more consumers to compare the efficiency of these higher energy using products, but recognises the legitimate issues of mandatory labelling raised by stakeholders. Feedback is requested on this proposal and whether it should be pursued further.

The lack of understanding regarding the testing point for the H2 declaration testing information has been clarified through the EL-056 standards committee. Products that cannot increase compressor output above that used during the H1 heating test will use this same setting for the H2 test (termed H2 full capacity). Products capable of increasing their compressor speed above that used during the H1 test shall use a H2 rating point with a higher compressor speed (termed H2 extended capacity). Manufacturers will be able to decide whether to prioritise energy efficiency (at the expense of capacity) or to maintain or increase capacity (at a loss of efficiency).

While greenhouse gas emissions may be an important consideration for a number of purchasers, providing this information on the label is not considered practical. The emissions intensity of electricity varies considerably across Australia and New Zealand and providing 'averaged' figures is unlikely to give meaningful information to consumers. Instead greenhouse gas information will be made available through the website calculator tool, which will allow it to be tied to the relevant NatHERS zone in Australia or HERS zone in New Zealand (in Australia the emissions intensity of electricity is available by State).

E3 appreciates the importance of correctly sizing air conditioner products and considered multiple options in providing this information on the label. Ultimately, it was decided that this information would be best provided through education and online material, and leaving the more accurate kilowatt capacity figure on the labels. The online calculator tools, retailer focused information campaign, as well as existing and future web material will all stress the importance of a correctly sized appliance. Ensuring consumers, retailers, installers and all in contact with air conditioner products are familiar with and understand the label is enormously important and will play a large role, should this policy be implemented. This education campaign will also provide information on the noise declaration to help alleviate consumer confusion.

- Your feedback is sought on the cost of the existing Energy Rating Label, including the printing cost. Will the printing cost be the same for the Zoned Energy Rating Label? (noting the Zoned Label has been designed so that it has the same colours and dimensions).

Technical questions

Which noise test standard do you prefer?

Feedback:

Of those submissions that expressed a view, almost all preferred the European test standard, EN 12102:2013 Air conditioners, liquid chilling packages, heat pumps and dehumidifiers with

electrically driven compressors for space heating and cooling. This is the same test standard used by the EU for their air conditioner and heat pump water heater energy labelling schemes. Only one submission preferred the ISO 3741 standard. Other submissions had no preference beyond ensuring all suppliers would be required to use the same standard and thus creating a level playing field.

The NSW Environment Protection Agency was supportive of the proposal to include noise data on the Zoned Label and indicated that if the proposal was implemented, it would review and may remove its existing labelling requirements. One submission questioned the value of including noise data on the Zoned Label and, given their experience, recommended an education campaign for consumers if the proposal is adopted.

Position:

Given the strong preference for the European test standard from both suppliers and the NSW Environment Protection Agency, E3 will recommend the European test standard EN 12102:2013 be used for noise declarations on the Zoned Label in any updated regulations.

Noise rating test points

Noise test points: Air conditioner noise levels (especially those of variable capacity units) can vary greatly depending on outdoor temperature, indoor temperature and a variety of user-defined settings. For practicality and comparability, it is proposed to follow the EU's practice of testing at the standard full load T1 (35 ℃) test point or H1 (7 ℃) for heating only units. Do you agree with this proposal?

Feedback:

All submissions agreed with this proposal, though one sought to clarify the definition of "full load" – questioning whether it meant rated capacity.

Position:

E3 will recommend the noise tests be based on rated capacity at T1 or H1 as applicable.

Noise test requirements

Noise test requirements: It is proposed that indoor/outdoor testing requirements will apply to different categories of air conditioners <30 kW cooling capacity in the following way:

- Non-ducted split systems: indoor and outdoor noise levels
- Ducted units (both split and unitary units): outdoor noise levels only
- Non-ducted unitary units (e.g. window/wall units): indoor and outdoor noise levels
- Single and double duct 'portable' unitary units that sit wholly in the conditioned space: indoor noise levels only
- Multi-split systems: outdoor noise level of single outdoor units, based on the representative combination used for registration.

Do you agree with this proposal?

Feedback:

All submissions supported the proposed approach.

Position:

E3 will recommend noise declarations for the various air conditioning products are implemented as per the proposal above. Please note, noise testing and online declarations are proposed to be mandatory for all products <30 kW as per the above proposal.

Attachment F: Regulatory Burden Measure - updated cost estimates

Updated Cost Estimates

The regulatory costs associated with the updated policy options were estimated for Australia using the Australian Government's Regulatory Burden Measurement Framework (RBM). Regulatory costs counted under the RBM include the administrative costs incurred complying with the regulations, along with any increase in the purchase price of air conditioners/chillers due to design changes that are made to meet MEPS or other regulatory requirements. The Australian Government requires any new regulatory costs to be offset by a corresponding reduction in regulatory costs elsewhere.

Please provide any feedback on the assumptions and estimates of costs incurred complying with the regulations, so that the cost estimates can be improved for the Decision RIS.

Business As Usual

Under BAU, there were estimated to be 45 suppliers (registrants) of 1356 air conditioner models (based on the E3 program's registration database) that directly incur administrative costs in complying with the existing regulations. This includes the compliance costs for the 530 models for which the ERL is mandatory (incurred by 38 of the 45 suppliers).

There were estimated to be another group of 350 downstream suppliers/retailers that incur compliance costs in the supply of air conditioners. This estimate includes retail groups/chains, online suppliers and other specialist stores/store chains that have a showroom (and hence have obligations to display the ERL). A retail chain is counted once in the estimate of 350, as it is assumed regulatory compliance is dealt with by a central/head office. Installers and many other specialist stores that supply products downstream (that are advertised through brochures and online) are not included in this count, as it is assumed they source products from upstream suppliers that ensure products comply with the regulations.

The compliance costs for these businesses (both registrants and downstream suppliers) were estimated by multiplying labour costs (wage costs plus on costs) by the time spent performing a particular task. For example, for one administrative officer to complete an online registration form that takes two hours to complete, the cost is estimated as 1 x $53 x 2 = $106. The assumed labour costs (including on costs) were:

- administrative officer: $53.00
- non managerial employees: $60.00
- manager: $73.00
- legal officer: $76.50

Administrative compliance costs (per year) associated with the existing regulations were estimated as:

- reviewing/understanding legislative requirements (including purchasing standards for $300) - $3,250 per registrant/supplier
- time spent registering a product (not including the registration fee) - $250 per product
- internal compliance assurance - $350 per registrant/supplier
- data collection for reporting - $3,250 per registrant/supplier
- record keeping - $2,550 per registrant/supplier
- amending public availability status - $50 per product
- testing - $450 per product (including 2.3 hours of testing time)
- labelling - $100 per air conditioner model in scope (assumes cost of 7 cents per physical label). Note: at the Air Conditioning, Refrigeration and Building Services (ARBS) exhibition in Melbourne in May 2016 one supplier estimated the cost of the physical label as 50 cents. Your input is sought on whether the 50 cent cost is a better estimate, and whether the ongoing cost of the physical Zoned Label will be the same or more/less (noting the colours and dimensions are similar to the current label)
- downstream suppliers (i.e. retailers and specialist stores) - $1,400 per retailer

For chillers, there was estimated to be 12 suppliers of 287 models under BAU. As chillers are generally sourced directly from the 12 registered suppliers, no downstream companies were considered to incur compliance costs. The administrative compliance costs were assumed to be the same as air conditioners, except for the purchase of standards (assumed to be $200 per supplier) and computer simulation testing costs ($550 per chiller model). Chillers are not required to display the ERL.

Table 7 shows the additional regulatory costs for Option A, compared with BAU.

Table 7: Option A regulatory costs

Change in costs	Business	Community organisations	Individuals	Total change in costs
Total, by sector	$ 0.446m	$0	$ 0	$ 0.446m
Cost offset	Business	Community organisations	Individuals	Total, by source
Total, by sector	$0	$0	$0	To be confirmed
Are all new costs offset? ☒ Any costs will be offset by drawing on offsets from the Department of the Environment and Energy at the point of decision.				
Total (Change in costs – Cost offset) ($ million) = To be confirmed				

^The average annual regulatory costs were calculated by estimating the total undiscounted (nominal) cost for each policy option over the ten year period from 2017 to 2026, and dividing this by ten. The costs shown are based on the Commonwealth's portion of the GEMS funding agreement, which is 43 per cent.

The additional regulatory costs for Option A are estimated at around $450,000 per year ($0.446m). Under this option, an additional 23 registered suppliers and 103 models of portable air conditioners are assumed to be in scope and therefore incur compliance costs. An additional 50 downstream suppliers (i.e. retailers that sell portable air conditioners only) are assumed to be in scope under this option.

For chillers, there are assumed to be the same number of suppliers as under BAU. If air-cooled chillers from 0 to 700 kW only are covered by the E3 program, the number of registered products is expected to be similar to the current scope of air and water-cooled chillers >350 kW

For air conditioners, estimates of additional annual compliance costs under option A include:

- purchasing standards - $350 ($50 in net additional costs compared with BAU) on average per supplier, to purchase the Australian/New Zealand standards that will underpin the Zoned Label and the requirements for portable air conditioners. Some of this cost is assumed to be offset (hence the net $50 increase only) by removing the need to purchase a separate standard that contains the MEPS and energy efficiency labelling requirements, as these requirements would be specified directly in the updated regulations.
- testing - $600 ($150 in net additional costs compared with BAU) on average per product model, including 3.6 hours of testing time (1.4 hours of net additional time).
- purchase costs – a $200 increase in the price of air conditioners >65 kW. This reflects re-tooling costs that are assumed to result in an increase in product prices, due to MEPS applying to some air conditioners not covered by the NCC in Australia.

For chillers, a $200 reduction in costs to purchase standards is assumed, due to the removal of the Australian/New Zealand standard. A $1,100 increase in the price of air-cooled chillers <350 kW is also assumed, again due to MEPS applying to some chillers not covered by the NCC in Australia.

- Therefore, the factors that account for the increased regulatory costs under option A include:
- transitional costs associated with moving from the current ERL to a SEER rating/Zoned Label, such as costs to test products and purchase new standards (the cost increase has been limited by allowing less expensive test methods for some product types)
- expanding the scope of energy labelling requirements to cover single duct portable air conditioners
- expanding the scope of the requirements for air conditioners and chillers by removing the MEPS requirements for some products from the NCC in Australia and including these under the E3 program.

Other factors that are assumed to offset these increased regulatory costs include removing:

- the Australian/New Zealand standard for chillers and aligning with the US AHRI standard (note that not requiring physical test reports to meet the selection, installation, operation and maintenance requirements for test instrumentation in table C1 of the AHRI standard is assumed to mean that referencing it would not result in any additional costs)
- the need to purchase standards that contain the MEPS and energy labelling requirements
- the need to register VRF multi-split systems that are comprised of multiple outdoor units
- the maximum cooling test (note this proposal was not costed for the CRIS).

The revised proposal to not mandate physical labelling for ducted air conditioners has been included in the costing. The revised MEPS proposal of 2.50 (EER/COP) for double duct portables has not changed the assumption from the CRIS that 50 per cent of the portables market switches from single duct to double duct portables under Option A. However, feedback is sought on whether this assumption is reasonable.

The proposal to include the energy efficiency requirements for air conditioners greater than 65 kW capacity and chillers less than 350 kW under GEMS/New Zealand regulations (and retain the current NCC MEPS levels) is still included in the cost estimates, though feedback is sought on whether this proposal should be recommended.

Option B

Table 8 shows the additional regulatory costs for Option B, compared with BAU.

Table 8: Option B regulatory costs

Change in costs	Business	Community organisations	Individuals	Total change in costs
Total, by sector	$ 1.081m	$0	$ 2.034m	$ 3.115m
Cost offset	Business	Community organisations	Individuals	Total, by source
Total, by sector	$0	$0	$0	To be confirmed
Are all new costs offset? ☒ Any costs will be offset by drawing on offsets from the Department of the Environment and Energy at the point of decision.				
Total (Change in costs – Cost offset) ($ million) = To be confirmed				

The additional regulatory costs for Option B are estimated at around $3.1 million per year ($3.115m). Compared with Option A, Option B has higher regulatory costs, largely as a result of the additional purchase costs (i.e. the higher upfront cost) for consumers arising from the new or increased MEPS levels for some air conditioners and chillers. The increased purchase costs for

portable air conditioners have been listed against individuals, as they will mainly be borne by households (around $2 million per year). The increased purchase costs for chillers and large capacity air conditioners for the commercial market are counted against business.

The additional administrative costs assumed under this option compared with Option A are marginally higher testing costs (an increase from 3.6 to 3.7 hours of testing time). This reflects the increased testing costs for double duct portable air conditioners, which are assumed to account for 95 per cent of the portables market under Option B, compared with 50 per cent under Option A.

However at the exhibition, all single duct portable models observed stated they met the EU MEPS level of 2.60. Your input is therefore sought on whether:

- the share of single ducts in the portables market should be increased for the proposed lower MEPS of 2.50 (based on EER/COP) from 5 to 25 per cent for the Decision RIS, or a higher or lower proportion.
- the $75 increase in the price of single duct portables assumed in the CRIS due to introducing the MEPS level is reasonable.

Compared with the CRIS, the costs for Option B are estimated to be lower, mainly because under the updated proposal the part load compliance option is not removed. This proposal was assumed to increase the price of air conditioners across many product categories. Not proceeding with this proposal means most air conditioners (almost 95 per cent of sales) are not impacted by MEPS increases.

- The proposals to align >65 kW A/C MEPS levels to 39 to 65 kW GEMS MEPS (i.e. AEER/ACOP 2.90) and align chiller MEPS levels to the US levels (where they are higher) are still included in the Option B cost estimates. The assumed increase in the price of products due to the proposed MEPS increases range from $200 (ducted air conditioners >65 kW) to $1,700 (air-cooled chillers 500 to 700 kW).

Testing costs

- The testing costs assumptions for the policy changes were:
- all products already undertake standard rating condition tests for cooling and heating (i.e. T1 and H1) for marketing products in brochures/online, not because of the energy efficiency regulations
- the additional tests required would be done immediately after standard tests, so the additional testing time does not include installation and setup time
- a 25 per cent reduction was applied to the time spent testing products, to account for the time a technician spends performing other tasks while a product is in the laboratory
- for some products, part load and H2 tests are already performed for internal purposes and for SEER tests in other markets (assumptions were based on SEER testing undertaken by E3 in 2013 and estimates for some product categories). These proportions vary depending on

the product – for example, window/wall models are assumed to have undertaken none of the additional SEER tests. However, for single phase non-ducted split systems, 90 per cent of products are assumed to have already undertaken the additional cooling and heating part load tests, and 88 per cent to have already undertaken the H2 test. H2 testing costs for 30 kW and above products have been removed from the costing, due to the revised proposal to only require SEER testing for the cooling cycle

- sound test costs were estimated based on the requirements of ISO standard 3741. For most products sound tests are already performed (as they already declared in brochures/online), so additional costs due to the new proposed test method are assumed to be 2 hours (except for portables where sound is not usually declared and time costs were assumed to be 4 hours)
- removing the maximum cooling test is assumed to provide savings of 4 hours of testing time for products in scope.

Air conditioners and chillers: updated policy positions

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