



Australian Government

New Zealand Government

UPDATE: Proposed changes to regulation of liquid chilling packages

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Proposed changes to the regulation of liquid chilling packages

Overview

The Commonwealth Department of the Environment and Energy and New Zealand's Energy Efficiency and Conservation Authority (EECA) have consulted with industry on the regulation of liquid chilling packages ("chillers") on behalf of the Equipment Energy Efficiency Committee (E3) under the Council of Australian Governments' (COAG) Energy Council. As discussed in [Chillers: Updated Policy Positions](#) and previous papers, chillers are not being registered correctly under the *Greenhouse and Energy Minimum Standards Act 2012* ("the GEMS Act") and it is difficult for Regulators to ensure compliance with the existing determination. This situation is complicated by the nature of chillers as bespoke equipment and by the way chillers are supplied to the market. The standard approach applied under the E3 Program to registration and compliance has proven to have limited effectiveness with chillers and the setting of minimum energy performance standards (MEPS) is based on an obsolete test standard, which is unique to Australia and New Zealand.

E3 considers that many of the problems with regulating chillers are due to the challenges in regulating bespoke commercial and industrial equipment. E3's proposed solution is to harmonise Australian and New Zealand requirements with the major international certification programs and standards for chillers to make it easier for manufacturers and importers of chillers to comply with Australian and New Zealand requirements. This paper outlines how E3 proposes this approach would work, the MEPS that E3 will recommend to the COAG Energy Council, the process for the development of a new determination covering chillers and the scope of such a determination.

Certification

E3 will propose to the COAG Energy Council that chillers be required to be certified by the Air Conditioning, Heating, and Refrigeration Institute (AHRI) or by Eurovent as meeting the applicable MEPS, before they may be sold in Australia or New Zealand. This would mean replacing the Australian/New Zealand standard AS/NZS 4776:2008 with AHRI 551/591:2015 and the European test standards, EN 14511:2018 and EN 14825.

E3 recognises that some suppliers of smaller chillers may not have AHRI or Eurovent certification and obtaining such certification may be an unreasonable burden. For this reason, E3 will propose that a supplier may provide a report of a physical test in an AHRI or Eurovent certified laboratory, as evidence that the chiller meets the appropriate MEPS. Each model registered using this alternative approach would need a separate test report. E3 is aware of only one laboratory certified by AHRI in Australia, but most suppliers of chillers within the scope of regulation would be connected to international supply chains, including laboratories overseas.

Definition of a model of a chiller

E3 will propose to the COAG Energy Council that all chiller models within the scope of the determination or regulations be required to be registered, before being sold in Australia or New Zealand. This would mean that there would be no grouping of registrations and no ‘families’ of models for chillers. A registration fee would have to be paid in Australia¹ for every registered chiller within scope, even where the difference in cooling or heating capacity between two chillers is as little as one kilowatt (kW). This approach is expected to dramatically increase the number of chillers registered. The GEMS Regulator will consider the number of likely registrations and the cost of registration, compliance and any check testing, in setting the fee to be applied to chillers. E3 understands that industry acceptance of this approach to registrations is predicated on a significant reduction in fees and E3 will work through these issues cooperatively with industry.

Scope

E3 will propose to the COAG Energy Council that all chillers with a rated cooling or heating capacity of at least 100 kW be required to be registered and to comply with the applicable MEPS, before being sold in Australia or New Zealand. Chillers under 100 kW in capacity would be out of scope and would not be regulated for energy efficiency or performance. Implicit in this position is that the use of specialised or alternative refrigerants would not be a basis for exclusion of a chiller from the applicable MEPS. That is, all refrigerants would be included.

Rating conditions

E3 will propose to the COAG Energy Council that a chiller’s cooling capacity, under the standard rating conditions of an inlet temperature of 12 °C and an outlet temperature of 7 °C² using water³ as the primary fluid, would determine the chiller’s cooling capacity and therefore, whether it would be within the scope of the regulation. E3 will also recommend to the COAG Energy Council that Australia and New Zealand would retain the temperature based adjustment formulae for all water-cooled chillers for non-standard rating conditions set out in clause 6.4.1.2 of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) 90.1:2016 (also known as “K_{adj}”), for the purposes of demonstrating compliance with MEPS. The rating points for these chillers would be those defined in their rating conditions.

For chillers that are only able to heat a circulating fluid and not cool it, E3 will propose to the COAG Energy Council that a chiller’s performance in raising the temperature of water from an inlet temperature of 30 °C to an outlet temperature of 35 °C (as per the standard rating conditions in EN 14511) would determine its heating capacity. Chillers that are capable of heating or cooling and 4 pipe (polyvalent) chillers would be rated on their cooling capacity, not their heating capacity.

¹ There is no fee for registrations in New Zealand.

² As per AHRI 551/591:2015, EN 14825 and EN 14511.

³ The use of, for example, a small proportion of glycol in solution would not allow exclusion from the requirement to be registered and to comply with MEPS.

Chillers that heat or cool potable water

E3 will propose to the COAG Energy Council that chillers that heat or cool potable water be excluded from the requirement to be registered and to comply with MEPS. Chillers that heat potable water would be excluded, where the full rated capacity of the vapour compression system can be absorbed by the hydronic heat exchanger. Chillers that recover part of the heat rejected during a cooling process, through a 'heat reclaim' device, such as a desuperheater, would not be excluded and would be required to be registered and to comply with MEPS. Chillers that cool potable water would also be excluded, but only where this cooling is due to the unit's full refrigeration capacity. Chillers that cool potable water, where the cooling is the by-product of a heating process, would not be excluded and would be required to be registered and to comply with the applicable MEPS.

Heat recovery chillers

E3 will propose to the COAG Energy Council that chillers with a heat recovery unit be required to meet the applicable cooling or heating MEPS and to be registered before being sold in Australia or New Zealand. The testing and rating of such chillers would be with the heat recovery feature inactive.

Chillers with centrifugal fans

E3 will propose to the COAG Energy Council that chillers with centrifugal fans be required to meet the applicable MEPS and to be registered before being sold in Australia or New Zealand. The testing and rating of such chillers would be at a static external pressure of 0 Pascals (Pa). E3 recognises that there may be situations where a chiller is required to be installed with a large, centrifugal fan, which would detract from the energy efficiency of the chiller. In such cases, in Australia the supplier would be able to apply for an exemption from meeting MEPS. Suppliers should note that the GEMS Regulator assesses exemptions on the merits of each individual case and not all applications for an exemption may be granted.⁴

Further exclusions

E3 will propose to the COAG Energy Council that certain types of chillers, which are not covered by AHRI and Eurovent certification, be excluded from the requirement to be registered and to comply with MEPS. In addition, E3 proposes to exclude certain types of chillers that are not used for heating or cooling of buildings. The chillers E3 proposes to exclude are:

- Chillers that do not use mains electricity
- Chillers not driven by an electric motor
- Chillers with remote condensers
- Air-cooled, free-cooling chillers⁵
- Chillers with titanium heat exchangers

⁴ The New Zealand Regulator cannot grant exemptions under the Energy Efficiency (Energy Using Products) Regulations 2002.

⁵ A free-cooling chiller would be defined as an air-cooled chiller that has an integrated, additional water loop in the condenser that cannot be isolated without interfering with the airflow of the refrigeration system's condenser.

- Chillers with 6-pipe units
- Adiabatic chillers⁶
- Chillers for cooling applications with an outlet temperature of greater than 12 °C
- Chillers for cooling applications with an outlet temperature of less than 4 °C
- Chillers with heating outlet temperatures of 56 °C or more

Reverse cycle and polyvalent chillers

E3 will propose to the COAG Energy Council that reverse cycle and 4 pipe (polyvalent) chillers be required to demonstrate compliance with either the applicable cooling MEPS or the applicable heating MEPS, but not both. Suppliers would be allowed, at their option, to demonstrate their chiller's compliance with both the applicable cooling and heating MEPS, if a company considers this advantageous and has the certification to support it.

E3 will propose to the COAG Energy Council that the heating MEPS for chillers match the Seasonal Coefficient of Performance (SCOP) used in the European Union (EU) for chillers up to 400 kW in heating capacity, noting that suppliers of reverse cycle chillers can choose to demonstrate compliance with the cooling MEPS instead, if they prefer. These SCOPs are:

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

There would be no heating MEPS above 400 kW and chillers with a heating capacity above 400 kW that are not capable of cooling a circulating fluid would be out of scope and would not be regulated for energy efficiency or performance. In addition, suppliers of chillers with AHRI heat pump (water heating) certification would be allowed to re-rate their chillers to EN 14825 SCOP conditions.

Minimum energy performance standards for chillers

The MEPS for cooling that E3 will propose to the COAG Energy Council are set out in Tables 1 and 2 in the Appendix to this paper. Important points to note:

- A supplier only needs to demonstrate compliance with MEPS under just one of the four options and pathways.

⁶ An adiabatic chiller would be defined as a chiller incorporating purpose built evaporative pads or netting to evaporate water and pre-cool air, before that air reaches the air-cooled condenser, and where no water is evaporated on the condenser itself. An air-cooled chiller with aftermarket pads would not be excluded from the requirement to be registered and to comply with MEPS. Such a chiller would have to be tested and rated without the evaporative pads.

- A supplier can choose to demonstrate compliance under either the Eurovent or AHRI pathways and can choose either the MEPS specified in Option 1 or the MEPS specified in Option 2.
- Reverse cycle chillers will not be required to meet a specified Energy Efficiency Ratio (EER) under the Eurovent pathway or a Coefficient of Performance (COP) under the AHRI pathway.
- The SEER values under the Eurovent pathways are the exact EU requirements, with the IPLV derived by using the same conversion ratios as were used to create the SEER values from the ASHRAE 90.1 IPLVs.
- Note that the EER values indicated are inclusive of the pump energy factor.

In addition, positive displacement, water-cooled chillers would be subject to a lower MEPS than centrifugal, water-cooled chillers for three years, before the MEPS for positive displacement, water-cooled chillers would increase to the same level as centrifugal, water-cooled chillers. This is reflected in Tables 1 and 2 in the Appendix on pages 8 and 9.

Implementation

Start date and transition arrangements

If the COAG Energy Council accepts the recommendations of E3, the new MEPS levels and the other changes proposed by E3 in this paper would take effect no earlier than 1 January 2021. Chillers that are not covered by the existing determination and regulations, such as reverse cycle chillers and chillers between 100 KW and 350kW in capacity, that are imported into, or manufactured in Australia or New Zealand before the start date of 1 January 2021, would be treated in one of two ways:

- 1) If they meet the new MEPS levels in Table 1, they would need to be registered, before being sold in Australia or New Zealand.
- 2) If they do not meet the new MEPS levels in Table 1, all remaining stock could be offered for sale, but no new non-compliant chillers could be manufactured or imported into Australia or New Zealand.

In Australia, voluntary registrations to the new determination would be allowed as soon as the determination has been signed and published. The five year registration period for the new determination would commence no earlier than 1 January 2021, for products registered prior to this date.

The existing determination would remain in place until 31 December 2020, for companies who wish to register under this determination. After this date, the current determination would no longer be available for new registrations. From 1 January 2021, chillers registered under the superseded determination that meet the new MEPS levels would be allowed to see out the remainder of their five year registration period. Chillers registered under the superseded determination that do not meet the new MEPS would not be allowed to be manufactured or imported from the start date, but existing stock could still be offered for sale.

In New Zealand, subject to Cabinet approval, the Energy Efficiency (Energy Using Products) Regulations 2002 would be amended to align with the measures and dates of this proposal.

Development of the determination

E3 will propose to the COAG Energy Council that the new MEPS levels for chillers be published in a determination under the GEMS Act, rather than referenced in an Australia/New Zealand standard. E3 considers that it is an unnecessary step to call up an Australia/New Zealand standard for the new MEPS levels, when there would be no relevant Australia/New Zealand test standard and the international approaches through AHRI and Eurovent are prevalent in the Australian market. E3 recognises the concerns industry stakeholders have with this approach. For this reason, E3 proposes the following process for consultation on the development of the determination.

- 1) E3 will publish all major drafts of the determination for public comment and submissions. E3 expects that there would be a minimum of two exposure drafts of the determination before a final exposure draft is published for public comment and submissions. E3 will hold industry meetings during the submission period to explain its thinking to companies and to understand any concerns chiller suppliers have with the draft determinations.

- 2) Interested stakeholders would have a minimum of four weeks (28 days) from the date of publication to consider and provide a submission on an exposure draft of the determination and a minimum of two weeks (14 days) from the date of publication to consider and provide a submission on the final exposure draft.
- 3) The first exposure draft of the determination will not be published before 29 January 2019.
- 4) The final draft of the determination will not be forwarded to the Commonwealth Minister for Energy for signature until after the period for comment and submissions on the final exposure draft has closed.
- 5) If there are major issues identified in the final exposure draft of the determination, E3 will publish another exposure draft and call for submissions from interested stakeholders and stakeholders will have a minimum of two weeks (14 days) from the date of publication to consider this new draft and provide a submission.

Once the new determination has been signed by the Commonwealth Minister for Energy, subject to New Zealand Cabinet approval, the material would be incorporated into the New Zealand Energy Efficiency (Energy Using Products) Regulations 2002.

Compliance

The issue of the relevant legislation not being well suited to the regulation of bespoke commercial and industrial equipment applies particularly to the check testing of chillers to ensure compliance with MEPS level requirements. In consideration of this, and in light of the proposed new determination, in Australia GEMS inspectors are engaging with the chiller industry to ensure that the GEMS Regulator can monitor and enforce compliance effectively, both now and into the future. EECA is also engaging with relevant stakeholders in New Zealand. Initial proposals indicate that any new approaches to compliance monitoring and enforcement activities should include closer engagement with the international certification bodies to maximise compliance activity.

Appendix

Table 1 Cooling MEPS from 1 January 2021 for air-cooled and water-cooled chillers

Chiller type	Size (kW)	Eurovent pathway				AHRI pathway			
		Option 1		Option 2		Option 1		Option 2	
		EER	SEER	EER	SEER	COP	IPLV	COP	IPLV
Air-cooled	100 to <350	2.785	3.218	2.674	3.712	2.836	3.846	2.723	4.436
	350 to <528	2.931	3.387	2.814	3.907	2.985	4.048	2.866	4.669
	≥528	2.931	3.462	2.814	3.982	2.985	4.137	2.866	4.758
Water-cooled, positive displacement	100 to <264	4.591	4.411	4.414	5.294	4.694	5.867	4.513	7.041
	≥264 to <350	4.781	4.726	4.591	5.402	4.889	6.286	4.694	7.184
	≥350 to <528	4.890	4.726	4.591	5.402	5.000	6.286	4.694	7.184
	≥528 to <700	5.217	5.034	5.063	6.178	5.334	6.519	5.177	8.001
	≥700 to <1000	5.379	5.034	5.063	6.178	5.500	6.519	5.177	8.001
	≥1000 to <1055	5.672	5.034	5.063	6.178	5.800	6.519	5.177	8.001
	≥1055 to <1500	5.672	5.228	5.509	6.630	5.800	6.770	5.633	8.586
	≥1500 to <2110	5.868	5.228	5.509	6.630	6.000	6.770	5.633	8.586
	≥2110	6.148	5.437	5.886	7.154	6.286	7.041	6.018	9.264
Water-cooled, centrifugal	100 to <528	5.644	4.813	4.954	6.016	5.771	6.401	5.065	8.001
	≥528 to <1055	5.644	5.034	5.422	6.178	5.771	6.519	5.544	8.001
	≥1055 to <1407	6.148	5.228	5.787	6.971	6.286	6.770	5.917	9.027
	≥1407	6.148	5.437	5.886	7.154	6.286	7.041	6.018	9.264

Note: Capacity is measured under the standard rating conditions of an inlet temperature of 12 °C and an outlet temperature of 7 °C.

Table 2 Cooling MEPS from 1 January 2024 for air-cooled and water-cooled chillers

Chiller type	Eurovent pathway					AHRI pathway			
	Size (kW)	Option 1		Option 2		Option 1		Option 2	
		EER	SEER	EER	SEER	COP	IPLV	COP	IPLV
Air-cooled	100 to <350	2.785	3.218	2.674	3.712	2.836	3.846	2.723	4.436
	350 to <528	2.931	3.387	2.814	3.907	2.985	4.048	2.866	4.669
	≥528	2.931	3.462	2.814	3.982	2.985	4.137	2.866	4.758
Water-cooled	100 to <528	5.644	4.813	4.954	6.016	5.771	6.401	5.065	8.001
	≥528 to <1055	5.644	5.034	5.422	6.178	5.771	6.401	5.544	8.001
	≥1055 to <1407	6.148	5.228	5.787	6.971	6.286	6.770	5.917	9.027
	≥1407	6.148	5.437	5.886	7.154	6.286	7.041	6.018	9.264