Australian Government

WATER RATING

Improving the water efficiency of commercial ice makers

Impact Analysis

Prepared by the Department of Climate Change, Energy the Environment and Water

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Executive Summary

This Regulatory Impact Analysis considers policy options to improve the water efficiency of commercial ice makers (CIMs) supplied in Australia and recommends a staged approach to implementation.

Ice is used for a wide range of applications in the production, transport, preparation, display and service of food, beverages, medicines, and other perishable products. Common uses include cubed ice served in drinks, and flaked ice as a bed for displaying seafood.

Ice makers generally use potable water to produce food-grade ice. The majority of CIMS are air-cooled, however some models also use water (not necessarily potable) as the cooling medium. At present, CIM suppliers make very little information available to purchasers about the water use of the products they offer in Australia, although water represents the largest component of lifetime operating costs after energy.

A Determination under the *Greenhouse and Energy Minimum Standards (GEMS) Act 2012* came into force on 3 March 2025 and imposes Minimum Energy Performance Standards on CIMs supplied or offered for supply after 3 March 2026. The *Greenhouse and Energy Minimum Standards (Commercial Ice-makers) Determination 2025* (GEMS Determination) defines CIMs as automatic ice makers with provision for both water supply and drainage connections and a production capacity up to 1,000 kg/24hr when tested in accordance with specified standards. It excludes manual-fill ice makers and those built into domestic refrigerators.

The GEMS Determination requires suppliers to declare CIM energy use to the GEMS Regulator. It also allows for the voluntary declaration of CIM water use rates. It is uncertain whether suppliers will voluntarily declare water use information in sufficient numbers and whether the information will be disseminated in ways and at times that can usefully inform CIM purchasing decisions.

The Water Efficiency Labelling and Standards (WELS) scheme has the objective of reducing the water consumption of selected products. The *Water Efficiency Labelling and Standards Act 2005* (WELS Act) provides for the mandatory registration of products, application of water rating labels, and Minimum Water Efficiency Standards. At present it regulates showers, taps, flow controllers, toilets, urinals, clothes washers and dishwashers.

CIMs consume significant quantities of water – over 6.1 Gigalitres (litres x 10^9) per annum in Australia, equivalent to the water use of about 35,000 households. Water efficiency varies widely across product types (e.g. batch versus continuous production) and within types. Purchasers could make substantial lifetime savings if they compared the water use of alternative models and selected the more efficient models on offer.

About 10,500 CIMs are sold in Australia each year, with an estimated installed stock of about 65,000. There is only one Australian manufacturer, and most of the market is supplied by imports from Europe, China and the USA. CIM water use is increasing due to growth in population and in the foodservice and food retailing sectors.

Purchasers are rarely aware of the water consumption or operating costs of the models they are considering because the information is either unavailable or presented in ways that make it difficult or impossible to compare. This is a significant information failure, preventing purchasers from identifying water efficient products. This results in purchasers spending more on water use than if they were properly informed and could compare the water use of products prior to purchase.

Furthermore, some CIMs are purchased by intermediaries who may be unconcerned with the operating costs, which will be borne by the end user.

WELS has developed a range of options to improve the water efficiency of CIMs, leveraging the GEMS Determination and using the same tests standards and product scope definitions. The objective is to make trusted, reliable, consistent, comprehensive and readily accessible information available to purchasers, regarding the complete operating costs of CIMs.

The costs and benefits of the following options have been modelled and compared with the status quo (Option 1). The status quo represents CIM suppliers being able to voluntarily declare water use data to the GEMS Regulator.

- Option 2: Voluntary declaration with WELS support (no new regulation). WELS works with suppliers and purchasers to encourage the declaration of water use to the GEMS Regulator, with the aim of at minimum 80% of registrants declaring water use and representing at minimum 80% of models (ensuring less water efficient models are also covered).
- Option 3A: Product registration, information declaration and labelling (regulated under WELS Act).
- Option 3B: Product registration, information declaration and labelling (regulated under WELS Act) - accelerated implementation without assessing the success of Option 2 if implemented.
- Option 4A: Product registration, Minimum Water Efficiency Standards and information declaration (regulated under WELS Act). This option would exclude the least water efficient products from the market.
- Option 4B: Product registration, Minimum Water Efficiency Standards and information declaration (regulated under WELS Act) – accelerated implementation.

The benefit under each option is calculated as the net present value (NPV) of the projected savings in water supply and wastewater charges due to the purchase of CIMs that are, on average, more water efficient than under the status quo (Option 1). The modelling covers all CIMs expected to be sold in Australia between 2025 and 2040.

The costs of each option comprise:

- Industry administration, revising brochures and advertising, interacting with the WELS Regulator and purchasers, and payment of registration fees (for regulatory options only). There are no testing costs beyond the status quo, as the test reports required for GEMS registration include water use measured under the same standard test.
- WELS Regulator administration, beyond that covered by registration fee income.
- Purchaser price increases due to improvements in the average water efficiency of CIMs, whether forced by Minimum Water Efficiency Standards or voluntarily incurred through exercising a preference for more efficient models.

The costs and benefits are summarised in the following table. They are expressed in terms of the present value (PV) in real 2025 dollars (ignoring inflation), with expenditures and savings in future years discounted at 7%. The sensitivity of outcomes to key inputs and to discount rates of 3% and 10% have also been modelled. Outcomes are cost-effective (Gross Benefits/Total Costs ratio >1) under the scenarios modelled.

	Costs ($M PV) compared with status quo				**Benefits ($M NPV)**		**Gross Benefits/ Tot Costs**	**GL water saved**	
	Industry	**WELS**	**Purchasers**	**Total**	**Gross**	**Net**		**In 2040**	**2025-48**
Option 2	0.8	0.8	2.4	4.0	13.9	9.9	3.5	0.5	5.8
Option 3A	3.2	0.7	3.7	7.6	17.6	10.0	2.3	0.7	7.3
Option 3B	3.6	0.8	4.1	8.4	19.9	11.5	2.4	0.7	8.3
Option 4A	2.9	0.9	13.7	17.6	55.3	37.7	3.1	1.9	22.9
Option 4B	3.2	0.7	11.6	15.5	48.2	32.7	3.1	1.6	20.0

Consultations

A draft Regulatory Impact Analysis was published on the Department of Climate Change, Energy, the Environment and Water (DCCEEW) Consultation Hub on 12 May 2025, inviting submissions up to 27 June 2025 (subsequently extended to 18 July 2025). Stakeholders were invited to register for online information sessions on 27 and 29 May 2025. Respondents were invited to make a written submission, complete a structured online survey or both (see Appendix A).

Twenty-one industry members attended the information sessions.

The rates of survey completion and submission provision were low – one survey and four submissions were received, representing about 40% of the Australian CIM market. An additional three submissions provided to the GEMS Regulator in 2023 were also considered, where relevant water use comment was provided.

These rates of engagement were like those experienced by the GEMS Regulator in 2023.

Stakeholders questioned some of the assumptions in the draft Regulatory Impact Analysis, such as the market share of water-cooled CIMs and the tendency to install them with cooling water recirculation, which significantly reduces the consumption of mains supplied water. The cost-benefit modelling was adjusted accordingly, and revised values have been included in the Regulatory Impact Analysis.

Questions were also raised about the possible exclusion of models that sell in low numbers from any WELS regulatory requirements, the need to add water quality criteria to test standards for CIMs, and possible star rating scales in the event of WELS labelling. The implications of these proposals are discussed in Section 5, but none of them are recommended for adoption.

These views were used to redraft the Regulatory Impact Analysis and to amend some of the underpinning cost benefit assumptions.

Preferred implementation approach

Given the projections of costs and benefits, feedback from stakeholders and the risks associated with the various options, a staged implementation approach is preferred. This involves:

- Stage 1: Operate under Option 1 (status quo) until March 2026. In this period all CIM suppliers must register products with the GEMS Regulator and may make voluntary water use declarations during the registration process. Post March 2026, the number of voluntary declarations made, and the range of models covered will be analysed.
- Stage 2: Based on Stage 1 analysis, decide if there is a need to implement Option 2 (supporting non-regulatory water use declaration and information) or move to Option 3A (regulatory).
- Stage 3: When sufficient data on model water use in response to Stages 1 and 2 become available, consider proceeding to Option 4A, Minimum Water Efficiency Standards (set at a level to be determined from the declared water use data).

Options 3A/3B and 4A/4B (if adopted) would be implemented through revision of the WELS Standard (AS/NZS 6400), amendment to the existing *Water Efficiency Labelling and Standards Determination 2013 (No. 2)*, and the establishment of a registration and cost recovery process for CIMs.

Glossary

AS/NZS	Australian/New Zealand Standard
AHRI	Air Conditioning, Heating and Refrigeration Institute (USA)
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
Batch	Mode of production for shaped ice
BAU	Business as usual
CIM	Commercial ice maker
Cont(inuous)	Mode of production for flaked ice
DCCEEW	Department of Climate Change, Energy the Environment and Water
E3	Equipment Energy Efficiency program
EECA	Energy Efficiency and Conservation Authority (New Zealand)
ES	Energy Star program of the USEPA
GEMS	Greenhouse and Energy Minimum Standards (Commonwealth Act, 2012)
GL	Gigalitres (litres x 10^9)
HE	High efficiency
IMH	Ice making head (configuration of CIM)
ISO	International Standards Organization
kg/24hrs	Maximum production capacity of a commercial ice maker (at a defined rating point)
kL	Kilolitres (litres x 10^3)
kWh/kg	Electrical energy (kWh) consumed to produce a kg of ice (at a defined rating point)
L/kg	Water (litres) consumed to produce a kg of ice (at a defined rating point)
MEPS	Minimum Energy Performance Standards
NAFES	National Association of Food Equipment Suppliers
NPV	Net Present Value: PV of projected costs less PV of projected benefits
PV	Present value of a stream of projected values, calculated using a specified discount rate
Rating point	A CIM operating condition defined by ambient air and supplied water temperatures
SCU	Self-contained unit (configuration of CIM)
RCRC	Remote condensing (i.e. split) and remote compressor (configuration of CIM)
RCU	Remote condensing unit (i.e. split) but not remote compressor (configuration of CIM)
Split	A CIM in which the IMH and condenser are physically separate (RCRC and RCU)
TTMRA	Trans-Tasman Mutual Recognition Act
USDOE	US Department of Energy
USEPA	US Environmental Protection Agency
WELS	Water Efficiency Labelling and Standards (Commonwealth Act, 2005)

1. Background and problem

1.1 Commercial Ice Makers

Commercial ice makers (CIMs) are part of the standard equipment needed to operate food, catering and hospitality businesses. They consume potable water to produce food-grade ice. The majority of CIMs are air-cooled, however some models also use water (not necessarily potable) as the cooling medium. At present, CIM suppliers make very little information available to purchasers about the water use of the products they offer, although water represents the largest component of lifetime operating costs after energy.

As there is a wide range in the water efficiency of different models, many purchasers select products which consume more water than would be the case if they had access to this information prior to their purchase, or if all CIMs were subject to Minimum Water Efficiency Standards. The difference can amount to hundreds or even thousands of dollars in excess running costs over the CIM's service life.

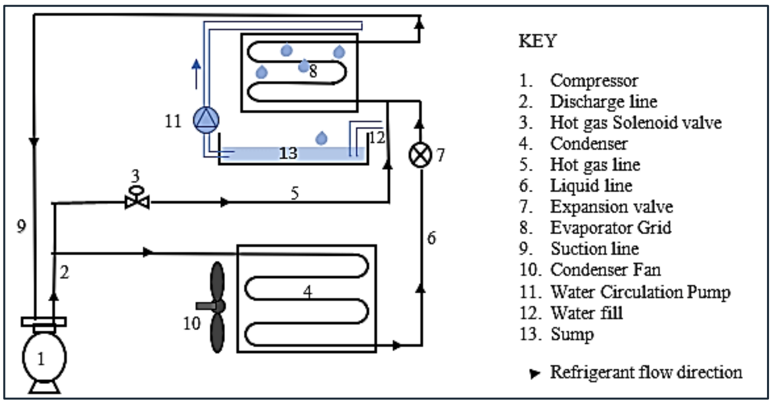
Technology

Ice is used for a wide range of applications in the production, transport, preparation, display and service of food, beverages, medicines, and other perishable products. Common uses include cubed ice served in drinks, and flaked ice as a bed for displaying seafoods. Ice makers generally use potable water to produce food-grade ice, although there is also non-potable industrial ice, for specialised uses such as slowing the curing of concrete.

Ice is made by freezing water, essentially using the same refrigeration cycle as other freezers. Water is run or sprayed over a shaped panel that is cooled by evaporation of a refrigerant gas. The gas absorbs heat from the evaporator and is pumped around a closed circuit to a condenser, where it transfers the heat to the ambient air (or in some cases, water) and condenses to a liquid (Figure 1).[1] The process consumes electrical energy in a number of ways: mainly in the motor driving the refrigeration compressor, but also in other fans, pumps and heaters, depending on the design of the ice maker.

[1] Ice may also be used as a thermal storage medium, e.g. to reduce air conditioner peak loads by making ice at off-peak times and melting it to assist cooling at peak times. In those cases, the water/ice is usually contained in a closed circuit. The present report deals with equipment where the ice is consumed and lost.

FIGURE 1 ICE MAKER REFRIGERATION CYCLE



Product categories

There are many ways to categorise ice makers – by type of ice made, production capacity (usually expressed in kg ice/24 hrs), physical configuration and other factors. For the purposes of this document, the scope and classifications are identical to those adopted for regulating CIMs with regard to their energy efficiency under a Determination made under the *Greenhouse and Energy Minimum Standards (GEMS) Act 2012* (GEMS Act).

This covers ice makers with plumbed connections and which are capable of producing up to 1,000 kg of ice per 24 hrs, when tested in accordance with the AS/NZS 4865 standard or an equivalent.[2] The following types are explicitly excluded from the scope of the *Greenhouse and Energy Minimum Standards (Commercial Ice-makers) Determination 2025* (GEMS Determination):

- Manual-fill ice makers, which lack a water supply connection point and a drain point.
- Ice makers built into domestic refrigerators.

Of the ice makers within scope, self-contained units have both the ice maker and the storage bin built into the one cabinet (Figure 2, left). The storage bin capacity is typically a third to a half of the 24-hour production capacity. Most self-contained units are designed for under counter installation, but there is also dispenser models designed to sit on countertops for high-turnover beverage service applications. Modular ice makers, also called ice-maker heads (IMH) are designed to sit on top of separate ice storage bins (Figure 2, centre), so production capacities and bin volumes can be matched according to usage patterns. All ice makers are designed to automatically cease operation once the bin is full, and resume once the ice level in the bin falls, whether from usage or melting. The storage may be designed so that ice is removed manually or dispensed automatically without being handled (Figure 2, right).

[2] Most CIM advertising claims production capacities at rating points (combinations of air and water temperature) that are more favourable than the rating point in AS/NZS 4865. This means that models commonly advertised with production capacities up to 1,400 kg/24hrs could be within scope.

FIGURE 2 SELF-CONTAINED ICE MAKER, MODULAR ICE MAKER WITH ICE STORAGE BIN AND ICE MAKER WITH DISPENSER

Most ice makers sold use air to cool the condenser, but models where cooling water is run over the condenser are also available. These use less energy per kilogram of ice made but consume significant quantities of cooling water if continuously run to waste. Their most common use is in installations with chilled water recirculation systems coupled with cooling towers that can serve several ice makers as well as air conditioner heat exchangers. Water cooling also reduces the heat load where ice makers are installed in air-conditioned spaces. Another way to reduce heat load is to locate the condenser remotely from the ice maker and link the two by refrigerant lines. This configuration is called a split system. The compressor can be housed either with the ice making head or with the remote condenser.

Apart from the physical configuration and mode of cooling, ice makers are also classified by the type of ice they make and how they make it (Table 1). Cubed or shaped ice is hard, clear, dry, slow to melt and intended mainly for adding to beverages. It can be produced in a range of sizes and shapes such as dice, crescents, balls and cylinders. It is made in batches where water is sprayed or run on to a shaped evaporator, and once the ice reaches the required shape and size the batch is harvested. This occurs by either momentarily heating the evaporator with hot refrigerant gas or running warmer inlet water behind the ice, which has the advantage of pre-cooling the water for the next batch.

Some of the potable water used for batch ice is flushed away to remove impurities, but this loses both the water and the energy used to cool it. Batch ice makers can use as much potable water in the flushing and harvesting as is contained in usable ice. Some designs can minimise water loss while maintaining ice quality. Some CIM models can be adjusted in the field to compensate for the quality of the water available. Alternatively, a filter can be installed on the water inlet.

Table 1 Classes of Commercial Ice Maker

Configuration	Product class (GEMS)	Cooling mode	Production mode
Modular (Ice Maker Head)	1	Air	Batch
	2	Air	Continuous
	3	Water	Batch
	4	Water	Continuous
Self-contained (SCU)	5	Air	Batch
	6	Air	Continuous
	7	Water	Batch
	8	Water	Continuous
Split system (remote, condensing, no remote compressor)	9	Air	Batch
	10	Air	Continuous
Split system (remote, condensing, remote compressor)	11	Air	Batch
	12	Air	Continuous

Source: *Greenhouse and Energy Minimum Standards (Commercial Ice-makers) Determination 2025*.

Flaked or granular ice is shapeless and contains some entrapped water and air. It is ideal for preserving and displaying perishable foods such as fish or vegetables, since it accommodates irregular shapes and the water content means it does not bruise or dry the produce. However, it melts faster than cube ice. Flaked ice is made by a continuous process in which water is sprayed onto or inside a rotating cylindrical evaporator and removed as it forms by a scraper or augur. The manufacture of flaked ice is less energy-intensive and quieter than for cubed ice and there is very little potable water wastage.

Nugget or tubular ice is generally made by a continuous process, and the ice is then shaped or compressed by a secondary operation. Nugget ice is often used in lower-value soft drinks, in quick service restaurants and in hospitals, where it is easier for patients to chew.

The industry

Most ice makers sold in Australia are imported. The one company still manufacturing CIMs in Australia and New Zealand also imports several models to supplement its locally made range.

The ice maker industry is dominated by global brands including Scotsman and Manitowoc brands (originally based in the USA), Hoshizaki (Japan), Brema, Simag, Icematic, and Ice-o-matic (Italy) and ITV (Spain). These companies have expanded their manufacturing to Mexico, Britain and China.

Some global brands supply models for rebadging by local importers (e.g. Skope and Moffat) while also selling under their own brands. In some cases, variants of the same model may be made in different company owned factories, depending on the market for which they are intended.[3] Chinese companies have also started to supply the Australian market under their own brands (e.g. Blizzard).

At a higher level of aggregation, the Italian Ali Group owns many global commercial cooking equipment and refrigeration brands, including the ice maker brands Scotsman, Icematic, Moffat, Ice-o-matic, Simag and Kold-Draft, which together account for about a third of the Australian market.

Users of ice

The primary market for ice and CIMs is the hospitality and food services industry: hotels, bars, restaurants and cafes. Quick service restaurants and juice bars consume large volumes of lower-quality ice (e.g. nuggets), whereas bars, hotels and restaurants mainly use cubed or shaped ice. Some venues prefer smaller cubes that can be more easily crushed and blended into drinks. Institutional facilities such as hospitals and aged care also use ice.

In recent years, the mining and construction industries have emerged as major markets for CIMs. Workers typically fill their personal drink and food coolers with ice from dispensing bins at the beginning of their shift, so ice production capacity must be adequate to supply two or three shift starts each day.

As with all perishable products, ice is subject to problems of peak demand, storage and distribution. Ice makers are usually left on continuously. The bin is generally full when a shift or trading session starts and ice making resumes as ice is drawn off steadily over the session. Over a 24-hour period, an ice maker will typically make 70 to75% of its rated 24-hour production capacity.

Some facilities will have ice demand that peaks weekly or irregularly – for example, event venues or convention centres. In such cases, the ice makers may be run for several days to build up ice stocks, which are then stored in freezers, either bagged or in bins.

Flake ice is produced and used at all stages in the food production, processing and delivery chain. Fishing boats have on-board ice makers or go to sea with ice on board. Perishables may be packed in ice for transport, if suitable chilled-space transport is not available. Many supermarkets and food retailers have flaked ice makers for daily fish, meat, and vegetable display. There is also extensive non-food use of ice in healthcare, scientific and pathology applications, to preserve tissue and samples and to control temperatures for chemical reactions.

The daily ice needs of households have traditionally been met by domestic refrigerators – ice trays in the freezer or more recently, through the door ice dispensers. The occasional demand for larger quantities is generally supplied by bagged ice, available from supermarkets, bottle shops and service stations. With rising incomes and falling product prices, there is now a significant market for home ice makers, which are manually filled and emptied. These non-CIMs have relatively low production capacity and tend to be used irregularly, which limits their total energy and water consumption. However, the industry reports a growing

[3] One major design variant relates to the electricity supply in the target market. Europe, China, Australasia and eastern Japan are 230V/50Hz regions. North America is a 115V/60Hz region. Western Japan is a 230V/60Hz region.

market for small CIMs for installation in larger, more expensive homes and for home treatment of exercise and sports injuries.

Operating costs

The typical operating life of a CIM is 8 to 9 years. The cost to the purchaser comprises:

a) The initial capital cost (including installation, which is more expensive for water-cooled models).

b) The present value (PV) of the projected lifetime energy costs (with future costs appropriately time discounted. For example, $100 to be spent next year has a lower PV than $100 spent this year.

c) The PV of the projected lifetime potable water costs.

d) For water-cooled CIMs, the PV of the projected lifetime cooling water costs.

e) The PV of servicing, cleaning and consumables such as water filters over the operating life.

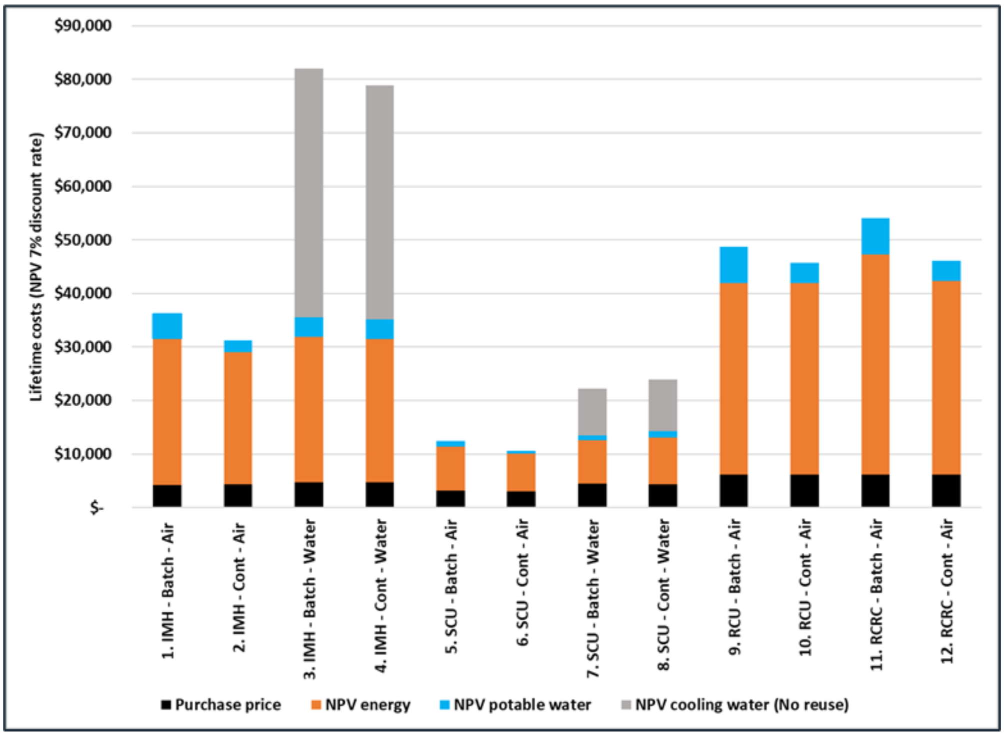
In theory, the NPV of any expected resale price could be deducted from the capital cost, but industry sources advise that the second-hand market for CIMs is negligible. The assumptions used to calculate cost components (a) to (d) are detailed in Appendix B. It is assumed that component (e) is independent of energy and water consumption and is excluded from further consideration.

Figure 3 illustrates the estimated average lifetime operating cost components for each of the 12 CIM classes described in Table 1. These are based on the average size, retail price and daily ice production of CIMs purchased in each category, and the Australian average prices for:

- Electricity supplied to non-residential consumers (35c/kWh in 2025).
- Potable water supplied to non-residential consumers ($3.03 per kilolitre in 2025).
- Volumetric wastewater discharge prices to non-residential customers ($1.38 per kilolitre in 2025). Not all water authorities charge for wastewater on a volumetric basis, and those that do generally apply a discharge factor to allow for the fact that some of the potable water supplied may not end up in the sewer (e.g. it may be used on a garden). For businesses such as hotels and restaurants, supply authorities assume that up to 95% of the supplied water will be sent to the sewer. An average discharge factor of 90% has been assumed, giving an effective average wastewater charge of $1.24/kL ($1.38*0.90).

For air-cooled CIMs, the major cost component is electricity, accounting for 65-78% of lifetime costs. The balance is divided between the capital cost and the potable water cost. These are averages, and models producing the same quantity and type of ice may vary considerably regarding both energy and water use.

FIGURE 3 NPV OF LIFETIME OPERATING COSTS BY CLASS OF CIM (7% DISCOUNT RATE)



Source: Appendix B Table 16

For water-cooled CIMs, the lifetime cost of the cooling water depends on its source and whether it is used once (single pass) and discharged as waste, or recirculated. The top of the cost bar for water-cooled products indicates the lifetime cooling water cost if all the cooling water were potable and discarded after a single pass (i.e. no reuse). In that case, cooling water would account for 38-55% of the lifetime costs., compared with 33-36% for electricity. Importantly, stakeholders have indicated that this is a highly unlikely scenario. State and Territory water authorities discourage or prohibit single pass cooling, so representation of this in Figure 3 relates to unusual cases.

Where large capacity water-cooled CIMs are installed in buildings such as clubs, hotels, convention centres or hospitals, they are almost invariably connected to a cooling water circuit. The system designers are generally aware that single pass cooling is uneconomical, even if it were permitted by the water authority. However, smaller self-contained CIMs are also offered as air-cooled and water-cooled variants, on the proposition that water-cooling requires less energy, is quieter and does not discharge heat into the internal space.

For the cost-benefit analysis it is assumed that 95% of water-cooled CIM installations recirculate their cooling water through cooling towers (or use a free source of non-potable water). Only 5% take their cooling water from the potable supply. On this assumption, water costs (ice-making plus cooling) make up 10-16% of the lifetime costs of water-cooled CIMs.

Availability of information

Information of the kind illustrated in Figure 3 can be estimated for any specific model of CIM if there is reliable data on its energy and water use. The one market where this information is readily available is the USA, which has Department of Energy (USDOE) mandated Minimum Energy Performance Standards (MEPS) for all types of CIMs, and mandated cooling water efficiency standards for water-cooled types (but no standards for potable water efficiency).

There is also a voluntary Energy Star program, operated by the US Environmental Protection Agency (USEPA) for air-cooled CIMs that exceed the MEPS levels by specified margins and meet specified levels of potable water efficiency (but no standards for cooling water efficiency).

All the data published by USDOE and the Energy Star program are based on the same standard test conditions: an ambient temperature of 90°F (32.2°C) with potable water supplied at 70°F (21.1°C). This contrasts with the information published by Australian suppliers, which offer little information beyond a nominal capacity (kg of ice produced in 24 hours), usually based on lower ambient and water temperatures which exaggerate the production capacity, and without reference to a test standard.

The US data indicate that for products that meet the stringent USDOE or Energy Star requirements, the quantity of energy and water needed per kilogram of ice made can vary from model to model by a factor of 2:1 or more (see Appendix C). As there will be many models on the Australian market which fall short of the US standards, the range in water efficiency could be even wider. The correlation between energy efficient and water efficient CIMs is weak, so purchasers would need to consider both aspects separately. They cannot rely on an energy efficient CIM to be water efficient or vice versa.

CIM purchasers usually have firm requirements regarding the type of ice they need, the capacity and the physical configuration (IMH, SCU or split), but if comprehensive and reliable efficiency information were available to Australian CIM purchasers, they would be able to:

- make a more informed choice between air-cooled and water-cooled models
- select the more water efficient of the models on offer in their category
- make a judgement about whether to adopt single pass cooling, use alternative water supplies or recirculate cooling water, in the case of water-cooled models
- select the more energy efficient of the models on offer in their category.

As Section 2 shows, reliable information on energy use should become available under current regulatory settings, but the availability of information about water use remains uncertain.

1.2 Current regulations

In Australia, CIMs have in the past only been subject to general electrical safety requirements and the WaterMark Certification Scheme applicable to all water-using products. In 2021 the Equipment Energy Efficiency (E3) program of the Commonwealth, state, territory and New Zealand governments began investigating the costs and benefits of adopting MEPS for CIMs. Following the usual process of Regulatory Impact Analysis and stakeholder consultation, Energy Ministers decided to adopt the recommended MEPS levels and DCCEEW was tasked with developing a Determination under the GEMS Act to give them effect (equivalent New Zealand regulations will also be implemented under the Energy Efficiency Regulations). The GEMS Determination for CIMs was gazetted on 3 March 2025, with compliance being mandatory for all CIMs supplied or offered for supply in both countries from 3 March 2026.

The GEMS Determination defines a CIM as an automatic ice maker with provisions for both water supply and drain connections, and with a production capacity of up to 1,000kg per 24hr when tested under the conditions specified in *AS/NZS 4865.1:2008: Performance of commercial ice makers and ice storage bins, Part 1: Test methods for ice makers—Environmental performance* or the equivalent US and ISO standards. All three approved standards use near identical test conditions and methods in which production capacity, energy and water consumption (potable and for cooling if applicable) are all measured during the one test.

The GEMS Determination will require all models of CIMs offered for supply in Australia:

- To be tested in accordance with one of the approved standards.
- To be registered with the GEMS Regulator.
- To declare, at the time of registration, the production capacity (kg/24hr) and the energy efficiency (kWh/kg ice).
- To meet the MEPS formula required for its class and production capacity (derived from *AS/NZS 4865.3:2008: Performance of commercial ice makers and ice storage bins, Part 3*: *Minimum energy performance standard (MEPS) requirements*).
- To display the current GEMS registration number whenever a product covered by the GEMS Determination is advertised for sale or supply, whether in print, in store or online. This is to direct purchasers to a website where they can compare the performance of models, and to assist regulators with market monitoring and compliance checks.

Given that GEMS mandates MEPS for all CIM models, purchases who do not want to or do not place value on energy consumption, will receive a product that meets a minimum level of energy efficiency.

In addition, CIM registrants may choose to voluntarily declare the potable water use rate (L/kg ice), and for water-cooled products, the cooling water use (L/kg ice) as measured on the standard tests. The GEMS Act does not empower the Minister to set requirements for matters not directly related to energy performance, although if water related performance is declared to the GEMS Regulator it must be in accordance with the specified standards. The proportion of suppliers who will choose to voluntarily declare data on water use is currently unknown.

The GEMS Regulator will publish the registered information on the GEMS Energy Rating website. The website lists all models of product types regulated under GEMS. If registrants choose to declare a water use rate, that information will be listed against the entry for that model.

At time of writing, registration was due to be made available during March 2025, to give a year for suppliers to register products before the GEMS Determination takes effect. It was not clear whether registrants would have to enter all the model characteristics at the one time, or whether they could declare the voluntary water use data later. This will depend on the design of the online registration process and ability to make later registration modifications.[4]

1.3 The problem

The Australian Government Guide to Policy Impact Analysis discusses several market characteristics and failures which may warrant government intervention. The one most relevant to the CIM market is information asymmetry, leading in turn to irrational behaviour:

> *Markets may not allocate resources efficiently if one party in a transaction has significantly more information than another…Intervention may be an option to impose the obligation to declare or certify relevant information* (OIA 2013,18)

At present, CIM suppliers make very little information available to purchasers about the energy performance of the products they offer in Australia and even less about the water performance. The GEMS Determination will ensure that CIMs supplied from March 2026 will meet minimum levels of energy efficiency and that their energy performance will be declared but does not ensure the same for water use or water efficiency.

As indicated in Figure 3, this means that water use rates which account for a significant share of lifetime operating costs in all CIMs, and potentially the majority of costs in water-cooled models, could remain invisible to purchasers.

While suppliers will have the option of declaring water use information to the GEMS Regulator they may choose not to do so, even though they would have the data from the energy tests and so incur no further testing costs. The reasons for a lack of declaration may include that suppliers:

- do not see a commercial advantage in declaring the information, especially for models with poor water performance
- do not wish to draw attention to the high water use of water-cooled variants
- do not wish to increase their liability should the water use values be found to be incorrect in regulatory check testing
- may wish to continue to publish more favourable water values based on non-standard operating conditions
- as an industry, may not wish to provide Australian regulators with information that might enable the setting of Minimum Water Efficiency Standards because it may lead to additional costs associated with redesign or sourcing of products to meet the standards, or reduce the range of products that can be offered to the market.

[4] GEMS allows multiple CIM models to be registered as a single family if they share a test report, are of the same class and have the same tested capacity and energy consumption rate. The GEMS Determination does not specify same water consumption rate, but potable water use rates are unlikely to vary within the one model family. If WELS registration were to be also required, GEMS family members would be treated as distinct models for calculating WELS fee tiers under current rules.

Even if water use is made public on the GEMS Energy Rating website, purchasers may be unaware of its availability at time of purchasing, as there are no requirements to provide the information at point of sale, or in advertising or product display. Furthermore, if purchasers were aware that water use information was available on the GEMS Energy Rating website to inform their purchasing decision, they may have difficulty in interpreting it.[5]

The problem is the possible continuation of market failure regarding the provision of trusted, reliable, consistent, comprehensive and readily accessible information regarding the complete operating costs of CIMs. Consequently, the total water consumption of CIMs would be significantly higher than if purchasers had the information to make cost-effective decisions.

The need for such information is especially acute without the protection of Minimum Water Efficiency Standards, unlike the purchaser protection offered by MEPS, which will exclude the least energy efficient models from the market.

Another common form of market failure is the externalisation of environmental costs. If water consumption is higher than necessary to achieve an objective (in this case the production of ice) then the externalities not included in the price of potable water are also higher. In the absence of an explicit carbon price, the costs of damage due to climate change are external to the pricing of energy. The inclusion of a shadow price for CO_2 emissions from electricity supply increased the value of projected energy saving from CIM MEPS by about 6.5% (E3 2023, p10).

Electricity is also used in the pumping and treatment of water and wastewater. While water and wastewater prices include the financial costs of that energy, the value of the associated emissions needs to be internalised. However, the calculated price impact is less than 1.5% (see Section 4.3).

It is uncertain whether the long run marginal cost of supplied water includes the environmental costs of additions to supply infrastructure. In its 2018 evaluation of the WELS scheme, the Institute of Sustainable Futures estimated the present value of deferring a $1.5 billion supply increment (whether dam or desalination plant). In south-east Queensland the present value of a 10-year deferment was equivalent to 5% of the water supply price and for Sydney the value of a 16-year deferment was 25% of the supply price (ISF 2019, p74). However, all mainland state capital cities are served by desalination plants commissioned between 2006 and 2012. As these are all operating below capacity, the need for further supply increments is likely to be pushed out beyond the cost-benefit analysis horizon of CIM water efficiency measures.

The direct costs of CIM water use and wastewater disposal are incurred in the first instance by CIM owners and operators. A café, bar or restaurant must cover all its operating costs, so the costs of food and drink to customers will reflect both the capital and the running costs of equipment. To the extent that the sum of

[5] The product lists on www.energyrating.gov.au allow users to manipulate the data by (a) limiting searches by selected brand, product class or capacity and (b) re-sorting entries by values (highest to lowest or vice versa). There is also an energy cost calculator so users can input their $/kWh tariff to get annual energy costs. The GEMS Energy Rating website could be set up so that the L/kg values could be sorted in order and $/kL values input (or defaults used) to calculate annual water costs. For water-cooled products, users could also be asked to indicate a single pass or recirculation installation.

these is lower due to greater water efficiency, the price of the food and drink supplied can be less. Therefore, greater water efficiency is anti-inflationary.

The same applies on a larger scale for institutions such as hospitals or aged care facilities. Savings on equipment operation can be passed on as a reduction in costs of treatment, accommodation and services to patients and residents. Ultimately, all Australians purchase raw food or consume prepared food and drink where ice has been used in the production, transport, retail and service chain. Therefore, the problems of higher than necessary water use, and the benefits of reducing it are distributed throughout the entire population and economy.

2. Objectives of government intervention

CIMs consume significant quantities of water and energy. Both water efficiency and energy efficiency vary widely across product types (e.g. air versus water-cooled) and within types. Purchasers could make substantial lifetime savings if they compared the water use of alternative models and selected the more efficient models. However, they are unable to, because:

- Consistent and reliable Information about water and energy consumption and efficiency is almost impossible to access in Australia.
- Where information is made available it is in a form that makes comparisons across models difficult.
- The information is not provided to the purchaser directly through product advertising or at point of sale.
- As a group, purchasers are relatively uninterested in operating costs, even though these make up at least two thirds of time-discounted lifetime ownership costs (Figure 3).

There is evidence of the following market failures:

- Information asymmetry.
- Split incentives: some CIMs are purchased by intermediaries who may be unconcerned with operating costs because they will be borne by the end user.
- Irrational market behaviour, or 'bounded rationality': according to industry sources[6], CIM purchasers are relatively indifferent to both water and energy running costs.

Consequently, the users of CIMs are significantly worse off financially than if they had been aware and responded to information about water and energy use and efficiency. At the level of the economy, this also results in an inefficient allocation of resources and higher negative externalities.

After considering the issues and conducting a Regulatory Impact Analysis, the Commonwealth, state, territory and New Zealand governments decided to implement MEPS through the GEMS Act, to take effect on 3 March 2026. The analysis and the regulations were restricted to energy, which makes up the majority of CIM operating costs. Water efficiency is outside the scope of the GEMS Act.

The same market failures are evident regarding CIM water use, which is substantial. CIMs use over 6.1 Gigalitres (litres x 10^9) per annum in Australia, equivalent to the water consumption of about 35,000 households.[7] The GEMS Determination provides for voluntary declaration of water use rates and sets parameters for the source, quality and format of such declarations. However, declared water use rates alone would not indicate the likely magnitude of product annual water use and operating cost, which may have more impact on purchasers.

[6] The Australian Government Guide to Regulatory Impact Analysis (OIA 2023) notes that: *Experience with behavioural insights tells us that people do not always make rational, considered decisions even in an otherwise efficiently functioning market.* (p19)

[7] Average Australian household water use in 2021/22 was 175,300 litres - see ABS Water Accounts.

If water and energy use were closely linked, the imposition of MEPS by the GEMS Regulator would also lead to significant water savings, and there would be limited scope for government intervention to increase water savings. However, analysis of the available data indicate that the water/energy use relationship is weak (Appendix C). Water efficient products are not necessarily energy efficient and vice versa.

The market does not provide consistent, reliable or accessible information on either water or energy use. Some suppliers provide no information apart from the maximum litres per 24 hrs and maximum kW electricity demand, which are useful for sizing electrical and plumbing connections but convey no information about water or energy efficiency (expressed in litres per kg of ice and kWh per kg of ice).

Where suppliers do publish information about water and energy efficiency, it is generally at an arbitrary rating point (combination of air and water temperatures) that shows their own models in the best light. Often the rating point is not disclosed. This makes it very difficult for even motivated purchasers to accurately compare the performance of different models.

The CIM industry has not attempted to introduce a label or to standardise information on water and energy use. Voluntary water and energy labelling programs have had limited impact without either a strong industry association to establish and enforce them, or the expectation of government intervention (so incentivising early movers and the hope of avoiding such intervention). This is partly due to industry fragmentation. There is no single association representing the CIM industry, although some suppliers are members of the National Association of Food Equipment Suppliers (NAFES).

Where voluntary labelling programs have been introduced, whether by an unusually powerful industry association or by government, suppliers have tended to label only their better performing products, so purchasers are unable to identify and avoid the least efficient ones.

Suppliers consulted during the development of MEPS indicated that they believed only a few purchasers were interested in energy use and even fewer in water use. In effect, information failures and bounded rationality reinforce each other. If purchasers are not made aware of the magnitude of water and energy use and running costs, they cannot take them into account in purchasing decisions.

Consumer surveys conducted after the implementation of mandatory energy labelling in Australia in the 1980s and 1990s showed that purchaser awareness of the high energy use of appliances, and preference for more energy efficient models, increased only after the introduction of government-enforced labelling (GWA 1993).

Evaluation of the WELS scheme, established in 2005, also found that consumer awareness of the WELS label and use of it increased over time, reaching 53% in 2008 and stabilising at 87% in 2014 (Quantum 2014) and 86% in 2023 (Water Night Survey 2023). The fact that the label was administered by Government rather than industry contributed to its credibility:

> *The credibility of water rating labels remains very high amongst consumers in Australia, with 83% believing the scheme to be either 'very' or 'quite' credible. Consumers understand that WELS is a*

government funded initiative that is properly regulated and meets a set of Australian standards, which gives consumers confidence to trust the information they see on water rating labels (Quantum 2014).

The objective of the proposed government intervention is to address market failures using proportionate and proven policy instruments. Information declaration and minimum performance standards have demonstrated their effectiveness in overcoming market and information failures in a wide range of appliance and equipment markets, as the WELS and E3/GEMS programs have demonstrated.[8]

The introduction of GEMS requirements for CIMs offers an opportunity to leverage measures to increase CIM water efficiency at relatively low cost. The status quo will mean that CIM suppliers will need to have products tested for energy and water use and register their energy efficiency with the GEMS Regulator. However, registration of water use with the GEMS Regulator and inclusion of that information in product data or on products remain optional under the status quo.

As information on CIM water use is not currently available, it is difficult to predict how CIM suppliers and purchasers will respond. For example, it raises the following questions:

- How many CIM suppliers will take up the option to declare water use when registering products with the GEMS regulator?
- Will CIM suppliers declare water use information for only their more water efficient products or for their entire range?
- How widely will the information be disseminated: only on the GEMS Energy Rating website, on product information and advertising, or on physical products themselves?
- Will CIM purchasers become aware of the water use information and if so, will they change purchasing decisions as a result?
- If information alone cannot address market failures regarding water use rates or water efficiency, is it more effective to proceed to Minimum Water Efficiency Standards (as is the case with the GEMS Determination)?

There are opportunities for a staged WELS response, starting with non-regulatory measures, proceeding to mandatory information declaration, labels and ratings (which do not oblige suppliers to change their product offerings), through to mandatory Minimum Water Efficiency Standards (which are likely to limit CIM product offerings).

Although a limited number of suppliers have stated an intention to declare water use to the GEMS Regulator, there is no reason to believe that the majority of CIM suppliers will do anything beyond the minimum required to meet their GEMS obligations. That is, to ensure that the models they offer for supply after 3 March 2026 comply with MEPS and to register the production capacity and energy efficiency of those models as determined under standard tests.

[8] See Independent Review of the WELS Scheme 2020 and Independent Review of the GEMS Act 2019.

Historically the industry has not chosen to publicise the standardised water or energy efficiency of products and is not likely to do so without intervention. While the GEMS Determination requires the GEMS registration number to be included in product advertisements and at the point of sale, this will only provide an identifier by which motivated purchasers can check the standardised energy efficiency of the product (and if declared, the water use). Suppliers can continue to withhold the standardised data and, confusingly for purchasers, continue to provide non-standardised data that shows their product in a better light. Purchasers are protected to some extent regarding CIM energy use because of the application of MEPS, but there is no such protection regarding CIM water use.

Government intervention appears necessary to ensure supplier participation, credibility and purchaser awareness of both water and energy efficiency information. However, if Government decides to intervene to address market failures regarding CIM information asymmetry and bounded rationality, it does not necessarily need regulation beyond the status quo to do so.

One 'no new regulation' measure would involve using existing programs and policy levers. The WELS scheme is well established, well regarded and has been found to be effective in reaching purchasers and promoting greater water efficiency in the products it regulates. Existing WELS processes and resources could be used to encourage CIM suppliers to declare product water use rates to the GEMS Regulator and for WELS and GEMS to jointly use this information to promote awareness of water efficiency among CIM purchasers. This would require relatively modest government resources and avoid the need for new regulation. Information declaration responses can be sequenced to make use of data as it accumulates. For example, if a high proportion of suppliers voluntarily declare product water use rates to the GEMS Regulator, then the additional benefits of mandating product registration and labelling through the *Water Efficiency Labelling and Standards Act 2005* (WELS Act) would be reduced.

The success of interventions, whether regulated or not, can be measured through specific, measurable, achievable, relevant, and time-bound (SMART) targets. For example, reasonable success criteria for voluntary declaration might be that at least 80% of suppliers voluntarily register water use to the GEMS Regulator by 3 March 2026, and that at least 80% of models are covered (otherwise, declaration might be limited to the most water efficient models).

The achievement of these participation targets could be measured though the GEMS Energy Rating website. The impact of water use information on purchasers would need to be monitored through surveys and by tracking changes in the average declared water use of models over time.

Another objective of government intervention is flexibility. Options that are more onerous for stakeholders, including government itself, should only be implemented if simpler and cheaper options prove inadequate. If a government led voluntary information program for CIMs is successful, it should not be necessary to proceed to regulation. If information alone addresses the identified market failures, it should not be necessary to proceed to Minimum Water Efficiency Standards. If it emerges that market factors such as split incentives are severely limiting the impact of information measures, there would be a case for proceeding to Minimum Water Efficiency Standards.

Section 3 presents a range of options regarding the combination and sequencing of both non-regulatory and regulatory measures.

3. Policy options

3.1 Option 1. Status quo

The status quo is the requirement to register CIMs with the GEMS Regulator and the implementation of MEPS from 3 March 2026. MEPS works by requiring a minimum energy efficiency for all products that can be offered to purchasers. As such, purchasers do not need to be aware of or make an active choice about energy efficiency, as all products meet the minimum standard. It does not rely on purchaser choice or the need for government to encourage purchasers to prefer the more energy efficient models, although it enables those strategies.

The GEMS registration process offers suppliers the option to voluntarily declare the potable water use (L/kg of ice produced) for all CIMs and condenser water use for water-cooled CIMs.

Total CIM water consumption under the status quo should be somewhat lower than if there were no GEMS Determination, because:

- some suppliers may take the opportunity to change their model range to more water efficient models as well as more energy efficient models, in the expectation that both factors will deliver a commercial advantage; and
- better informed purchasers may show greater preference for models where water efficiency has been declared.

The extent to which purchasers can exercise a preference for CIMs with lower water use rates using the data on the GEMS Energy Rating website will depend on the proportion of models where water use has been declared and if the information is brought to their attention prior to their purchasing decision. While the GEMS Determination requires the GEMS registration number to be included in product advertisements and at the point of sale, suppliers are not obliged to publicise the registered data or prevented from providing non-standardised data that shows their product in a better light.

During consultations for GEMS and for this Regulatory Impact Analysis, CIM suppliers were asked whether they intend to register water use rates with the GEMS Regulator and why. The response rate was low, but most respondents indicated that they intended to do this, whether for all models or some only is not known. At the time of writing this Regulatory Impact Analysis no CIM models had yet been registered. The effectiveness of Option 1 by businesses will not be apparent until March 2026.

The voluntary declaration of water use rates may be encouraged but not mandated or enforced by the GEMS Regulator. The role for the WELS Regulator under the status quo is restricted to observation, collection and analysis of declared water related data published on the GEMS Energy Rating website. The risk is that suppliers will choose not to declare standardised water use rates to the GEMS Regulator and/or continue to present alternative water-related information (or none) to purchasers.

3.2 Option 2. Voluntary declaration with WELS support (non-regulatory)

This option involves WELS offering support to and enhancement of the status quo, to increase the probability that suppliers will choose to register CIM water use with the GEMS Regulator and to encourage purchaser preference for water efficient CIMs. Both the WELS and GEMS Regulators are part of the same department (DCCEEW), which assists in facilitating co-ordination and information sharing. No new regulation is required.

The measures which WELS might employ include:

- encouraging suppliers to make voluntary water use declarations when registering their CIMs with the GEMS Regulator
- encouraging manufacturers and suppliers to include standardised water related information in CIM product data, manuals, advertising and at point of sale
- adding text about CIMs to the WELS website and linking to the GEMS Energy Rating website
- reproducing on the WELS Water Rating website the CIM water use rates from the GEMS Energy Rating website
- making clear to the industry that failure to declare water use rates could result in mandatory WELS measures. There could be explicit threshold targets, e.g. at least 80% participation rate by CIM suppliers by a target date, and 80% of models with water use rates declared (to counter the tendency in voluntary programs to limit declaration to efficient models only)
- working with industry to develop voluntary labelling or water use information at point of sale. This may involve developing CIM labelling requirements for inclusion in AS/NZS 6400.

Logically, these measures should result in higher levels of declaration, stronger purchaser preference for more water efficient products and lower overall CIM water consumption than under the status quo, at relatively small additional cost.

This option may include the development of a CIM water efficiency label which suppliers could choose to apply to models for which water use rates have been registered with GEMS. There is no energy label requirement for CIMs, since MEPS has been selected as the best option to drive energy efficiency. However, there are requirements for models to be identifiable by their GEMS registration number.

There is precedent for inclusion of a voluntary use label in the WELS Standard (AS/NZS 6400), which currently only covers mandatory WELS labels. The E3 Committee operated a voluntary energy labelling scheme for swimming pool pumps from 2010 to 2022. It permitted and controlled the voluntary use of an energy label which was part of a published standard.[9] The voluntary scheme was intended as a transition to a mandatory scheme, which took longer than expected to implement. As expected, suppliers only labelled their most efficient pool pumps until labelling and MEPS became mandatory in October 2022.

[9] *AS5102.2-2009 Performance of Household Electrical Appliances – Swimming Pool Pump-Units Part 2: Energy labelling and minimum energy performance standard requirements.*

Voluntary water and energy labelling programs have had limited impact without either a strong industry association to enforce them, or the expectation of government intervention (so incentivising early movers with the hope of avoiding such intervention). It became apparent during the consultations that there is no CIM industry association willing or able to lead an industry-wide voluntary program, even though some suppliers are members of NAFES. Therefore, the main incentive for voluntary adoption of a water use label under Option 2 would be to forestall regulatory action.

Apart from the rates of voluntary declaration, the success of Option 2 could be measured by factors like the rate of adoption of voluntary labelling and the number of website visits. The main risk for the WELS scheme of Option 2 is that a significant number of suppliers could still choose not to declare the water use of their products or continue to use non-standardised data in their advertising and product information. This could delay effective regulatory action.

3.3 Option 3A. Product registration and information declaration (regulatory)

This option involves product registration with the WELS Regulator and application of mandatory product labelling and/or information provisions. It would require amendment to the existing *Water Efficiency Labelling and Standards Determination 2013 (No. 2)* (WELS Determination), revision of the WELS Standard (AS/NZS 6400) and the establishment of a registration process for CIMs, with applicable registration fees. If there is no parallel New Zealand regulation, mandatory WELS options may also require a ruling under the Trans-Tasman Mutual Recognition Act (TTMRA) under which a product lawfully manufactured in or imported into either Australia or New Zealand can be exported to the other. Without such an exemption, the risk presented is that New Zealand importers of CIMs would be able to re-export them to Australia even if they did not meet WELS registration or labelling requirements.

The WELS Determination would require suppliers to register their products and include the WELS registered water efficiency information in their CIM product information and advertising. This would need the inclusion of a CIM water efficiency label in the WELS Standard (AS/NZS 6400) to convey information via a comparative star rating, a water intensity value (L/kg ice produced), estimated annual water use (kL/yr) or a combination of these.

Mandatory labelling requirements could be restricted to batch-production (shaped ice) CIM product classes, where there is a wide range in water efficiency. Continuous production (flaked ice) CIMs all use similar amounts of potable water per kg of ice produced, so labelling would be less informative, although it would still alert buyers to take water use into consideration.

This option would be implemented if the status quo (Option 1) or Option 2 (if implemented) proved ineffective. The main risk is that effective action would therefore be delayed, resulting in higher water use and higher operating costs for possibly tens of thousands of CIM sales. The significant lead times to revise the WELS Standard (AS/NZS 6400) and to amend delegated legislation add to this risk.

3.4 Option 3B. Product registration and information declaration - accelerated implementation (regulatory)

Option 3B is like Option 3A, except regarding the timing. While Option 3A could be implemented sequentially after Option 2 if voluntary participation is low, Option 3B would be initiated sooner, as an alternative to Option 2 rather than a potential follow-up.

The main risk is that greater costs will be imposed on both suppliers and the WELS Regulator than under a voluntary approach, without knowing whether a voluntary approach would have been effective.

3.5 Option 4A. Product registration, Minimum Water Efficiency Standards and information declaration (regulatory)

This option involves mandatory product registration with the WELS Regulator, application of Minimum Water Efficiency Standards, and (optionally) application of mandatory product labelling and/or information provision at point of sale.

This is the most stringent option as it would impose the heaviest burden on suppliers and for some, force changes to their model range. However, it should result in the lowest aggregate water use and may be the most cost-effective option if projected benefits outweigh costs by a sufficient margin.

Minimum Water Efficiency Standards (expressed as maximum L/kg limits, possibly varying with output capacity) may be applied to potable water use, condenser water use or both. If the minimum standards are intended to be the main policy drivers for greater water efficiency, then mandatory labelling as in Options 3A and 3B may not be necessary. The GEMS Regulator has taken this approach by mandating MEPS without labelling, while leaving open the option of mandating energy labelling for CIMs in the future. The GEMS Regulator has also flagged a review of the MEPS levels no sooner than two years after implementation of the initial GEMS Determination (i.e. no sooner than March 2028).

The impact on the model range if CIMS are regulated for both minimum energy efficiency and minimum water efficiency is not known, but logically it should reduce the model range in the short term. The more stringent the minimum standards, the greater the restriction. The extent could be significant, and this would need to be determined as part of establishing the minimum standards. The intent of regulation is not to disrupt the market but rather to cost-effectively drive product design and purchaser choice to more water efficient (and energy efficient) models.

Setting L/kg limits will remain subject to a high degree of uncertainty until reliable information on CIM water use rates becomes available, i.e. after the status quo, Option 2 (if successful), and/or Option 3A or 3B have been implemented.

It may be feasible to implement Option 4A without passing through Options 2, 3A or 3B. A proposed set of standards somewhat less stringent than the USDOE and USEPA Energy Star levels could be published for consultation and a decision to proceed (or modify) informed by stakeholder responses. The model range on the Australian market overlaps to some extent with the model range on the US market, for which water use and energy use data are published by the USEPA and the USDOE. The greater the overlap, the greater the confidence with which average water use in Australia can be estimated even before GEMS registered data becomes available.

The main risk with Minimum Water Efficiency Standards is in setting the optimum standard levels. If too low, few models will be excluded and there will be little benefit. If too stringent, the market will face disruption and purchaser choice will be limited in some product segments. Some suppliers may have to leave the market entirely, so reducing competition. These risks can be managed in Option 4A by setting the MEPS levels only after data becomes available for a significant share of the market, i.e. following prior implementation of Option 2, 3A or 3B.

3.6 Option 4B. Product registration, Minimum Water Efficiency Standards and information declaration - accelerated implementation (regulatory)

Option 4B is like Option 4A, except regarding the timing and the approach to setting Minimum Water Efficiency Standards. While Option 4A could be implemented sequentially after the information measures (Options 2, 3A or 3B), Option 4B is the immediate implementation of mandatory product registration, Minimum Water Efficiency Standards and possibly information disclosure, informed solely by overseas standards.

As with Option 4A, the main risk is in setting the optimum standard levels. As these would need to be set before there is comprehensive data on models on the Australian market, it would be prudent to set less stringent levels than in Option 4A.

3.7 Timing and sequencing of options

Estimating costs and benefits relies in part on the timing of measures. Table 2 presents an indicative timeline for the phasing and sequencing of options. For each option there is an analysis phase which ends with a government decision that is conveyed to stakeholders, a notice period during which industry can test and register products, and an implementation phase which begins when all CIMs supplied or offered for supply must comply. No final choice of option can be made before the conclusion of the Regulatory Impact Analysis process, which will occur in the second half of 2025.

For Option 1 (status quo), the research and analysis phase ended, and the notice period started when the GEMS Determination was gazetted on 3 March 2025. GEMS registrations have since opened and all CIM models must be registered by 3 March 2026.

Energy Ministers agreed to consider the possibility that more stringent MEPS levels could take effect at least two years after implementation, i.e. not before March 2028. If so, investigations and discussions with industry would need to start in mid-2026 and higher MEPS levels would need to be set no later than March 2027 to give at least one year’s lead time. The analysis of options for higher MEPS could start once all current models are registered. This timetable is relevant to possible Minimum Water Efficiency Standards because it would be less disruptive for industry to introduce them at the same time as futures MEPS changes.

Table 2 Indicative Timing of options

Option	WELS Act Regulation	Requirements	2025	2026	2027	2028
			J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D
1	No	Voluntary water use declaration (GEMS Act)		Research MEPS 2 options		
2	No	WELS support for Option 1		Satisfactory response to Opt 1		
3A	Yes	Mandatory water use declaration		Poor response to Opt 1 or 2		
3B	Yes	Mandatory water use declaration				
4A	Yes	Mandatory WELS standard (& label?)		Research WELS standard options		
4B	Yes	Mandatory WELS standard (& label?)				

Orange = Research & analysis phase, Yellow = Industry notice period, Green = Implementation phase.

If Option 2 (Voluntary declaration with WELS support) is adopted, the WELS Regulator could give early notice to industry and reinforce the efforts of the GEMS Regulator to encourage higher levels of voluntary declaration of water use during the GEMS registration process.

The extent of voluntary declaration should become apparent as the GEMS registration proceeds, although registrants may be able to add water use later by way of seeking amendment to their GEMS registration. all CIMs must be registered with GEMS by 3 March 2026, the WELS Regulator should have enough information by then to decide whether the rate of declaration is high enough to continue with the status quo, adopt Option 2 or move to a mandatory option.

Option 3A in Table 2 is the introduction of mandatory registration with the WELS Regulator and mandatory information declaration, in the event of poor adoption of voluntary declaration of water use rates to the GEMS Regulator. In this option, time will be needed to amend the WELS Determination, add a CIM label and testing standards to the WELS Standard (AS/NZS6400) and give notice to industry. The earliest practical compliance date would be early 2027, but it could take up to a year longer.

Option 3B is the immediate introduction of mandatory registration with the WELS Regulator and information declaration without waiting to see the extent of voluntary water use disclosure to the GEMS Regulator. If this option is adopted, time will be needed to amend the WELS Determination, add a CIM label and testing standards to the WELS Standard (AS/NZS 6400) and to give notice to industry. The earliest practical compliance date would be early 2026, but it could take up to a year longer.

Co-ordinating Option 3B with the introduction of GEMS requirements in March 2026, if that were practicable, would give certainty to industry, who would have the water use data for products registered with the GEMS Regulator. On the other hand, implementing any mandatory WELS option before March 2028 might conflict with the E3 Consultation Regulation Impact Statement, which may have raised the expectation with suppliers that there would be no changes to the CIM regulatory regime for at least two years.

Option 4A proposes Minimum Water Efficiency Standards in addition to mandatory registration and potentially, information declaration, to be informed by information gathered under Options 2, 3A or 3B. If Option 4A is adopted after Option 2, time will be needed to add a CIM label and testing standards to the WELS Standard (AS/NZS 6400), to set Minimum Water Efficiency Standards, amend the WELS Determination (or amend the WELS Standard or WELS Determination again, if Option 4A follows 3A or 3B) and to give notice to stakeholders.

The earliest by which analysis of the water use data registered with GEMS could be completed is mid to late 2026. If the WELS Standard was published by early 2027 to take effect in early 2028, it could by coordinated with the Stage 2 GEMS requirements (should those proceed). This would give suppliers a year to review their model range and only import models that meet both the WELS and the GEMS requirements.

Option 4B proposes Minimum Water Efficiency Standards in addition to mandatory registration and potentially, information declaration, informed by overseas standards and market information but without complete data on the Australian market.

Following agreement by Energy Ministers, the GEMS Regulator introduced MEPS without a mandatory or voluntary information disclosure stage. However, there were factors present for energy that are not present to support moving directly to Minimum Water Efficiency Standards:

- *AS/NZS 4865.3:2008 Performance of commercial ice makers and ice storage bins Part 3: Minimum energy performance standard (MEPS) requirements* includes MEPS and HE (high efficiency) levels previously agreed by a standards committee comprising ice maker industry stakeholders. The 2008 HE levels were adopted for the initial MEPS. There are no equivalent Australian reference standards for CIM water efficiency.
- While the energy performance data currently available from suppliers is poor, the availability of water use and efficiency data is worse.

For these reasons, there would be an elevated risk to proceed immediately to Minimum Water Efficiency Standards without first obtaining reliable Australian data on CIM water use and efficiency. The risks of Option 4B could be partly mitigated by setting less ambitious standards than in Option 4A, since they would be based on less market information. On the other hand, an advantage of Option 4B is that it could take effect at least a year earlier than Option 4A.

Table 3 summarises the options. As nearly all products on the Australian market are imports, it would add to supplier burden if the timing of these policy measures overlapped with regulatory changes in the countries of origin. However, this does not appear to be the case. In 2023 the USDOE published an intention to increase the US MEPS levels for CIMs but not change water efficiency requirements.[10] With the change in US administration in January 2025 these proposals are unlikely to proceed.

TABLE 3 SUMMARY OF PROPOSED OPTIONS

	Status quo	Option 2	Option 3A	Option 3B	Option 4A	Option 4B
New WELS regulation needed	No	No	Yes	Yes	Yes	Yes
Earliest implementation	Under way	2026	2027	2026	2028	2027
Additional tests needed	No	No	No	No	No	No

[10] https://energy.gov/sites/default/files/2023-04/acim-ecs-nopr.pdf

Addresses information asymmetry	Possibly	Probably	Yes	Yes	Yes (if with labelling)	Yes (if with labelling)
Addresses bounded rationality	Possibly	Probably	Yes	Yes	Yes	Yes
Addresses split incentives	No	No	No	No	Yes	Yes
Burden on WELS	Very low	Low	Moderate	Moderate	Higher	Higher
Burden on suppliers	No extra burden	Low	Moderate	Moderate	Higher	Higher
Risks	Low participation	Low participation	Water/cost savings delayed	Option 2 may have worked	Water/cost savings delayed	Standards too high or too low

4. Projected costs and benefits

4.1 Scenarios modelled

The costs and benefits of the following scenarios have been modelled and compared with the Option 1 (status quo) scenario.

- Option 2: Voluntary declaration with WELS support (non-regulatory).
- Option 3A: Product registration and information declaration (regulatory).
- Option 3B: Product registration and information declaration - accelerated implementation (regulatory).
- Option 4A: Product registration, Minimum Water Efficiency Standards and information declaration (regulatory).
- Option 4B: Product registration, Minimum Water Efficiency Standards and information declaration – accelerated implementation (regulatory).

The timing of each of these measures is illustrated in Table 2, Section 3.7.

The data and assumptions used in the cost-benefit analysis are based on information about CIM products and the Australian CIM market, gained through analysis of published data sheets and through interviews with the CIM suppliers conducted for the Regulatory Impact Statement for MEPS. The 15 suppliers interviewed covered over 90% of the market. Additional data on the US market was obtained from the USDOE and USEPA, as detailed in Appendix C. The assumptions were modified based on information received during consultations on the draft Regulatory Impact Analysis (see Section 5.3 5.3 Response to feedback).

4.2 Projected benefits

The projected benefits of each option are derived from the money saved on potable water and wastewater charges, through CIM owners purchasing more water efficient models than would otherwise have been the case without the market impacts of that option.

The price per kL of water supplied and wastewater removed in each State and Territory is projected in Appendix B. It is assumed that the prices reflect the long run marginal cost of supplying those services, apart from the externality of greenhouse gas emissions associated with electricity used in pumping and water treatment. A shadow price was calculated for these emissions, based on the $/tonne CO_2 values adopted by the Australian Energy Market Commission (AEMC 2024). This had relatively little impact, representing less than 1.5% of the water and wastewater charges.

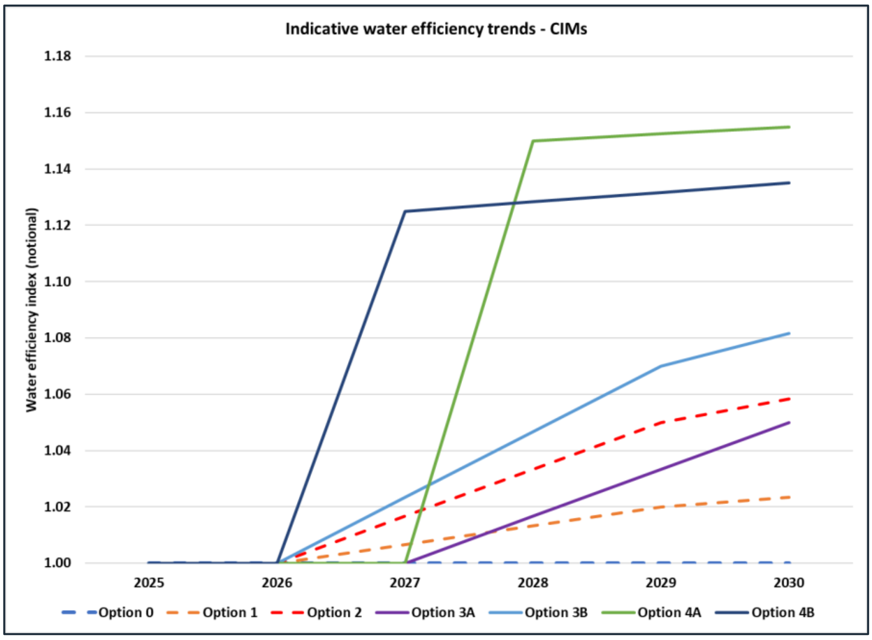
It is assumed that suppliers will be more inclined to provide information when there is encouragement and incentive to do so. For Option 2 the incentive is partly to gain a commercial advantage for models with low water use and partly to avoid the application of regulatory options.

For Options 4A and 4B all models must meet the Minimum Water Efficiency Standards by the implementation date. The increase in the average water efficiency of products sold after that time will depend on the stringency of the adopted standards. At the time of writing, there was minimal data on the range of water-efficiencies on the Australian market, so for modelling purposes the Minimum Water Efficiency Standard levels were set somewhat less stringently than the USDOE and USEPA Energy Star levels (see Appendix C). A longer lead time to implementation (Option 4A) would enable the setting of more rigorous standards because more Australian market data would be available, delivered either through the Option 1, Option 2, Option 3A or Option 3B.

If information declaration is implemented alongside Minimum Water Efficiency Standards in Option 4A or 4B, as is the usual practice for WELS products, water efficiency would continue to increase above the minimum standard level due to better informed purchasing decisions, but this would occur at a lower rate than in Option 3A or 3B because the standards would exclude the least efficient products from the market and the range between most and least water efficient models would be narrowed.

Figure 4 illustrates the effects of the options on CIM water efficiency in relation to a notional starting efficiency level of 1.0 in 2025 (the actual values used in the modelling are in Appendix B). Option 1 assumes a modest degree of voluntary water use declaration to the GEMS Regulator, and hence some increase in average water efficiency compared with a case in which GEMS had not regulated CIMs (Option 0).

FIGURE 4 INDICATIVE WATER EFFICIENCY TRENDS BY OPTION



Benefits and costs are calculated from the viewpoint of mid-2025, when it is assumed that a decision about which option to adopt will be made. They are calculated separately for each of the 12 classes of CIM and for each of the 8 Australian states and territories.

The modelling considers the projected capital and water usage costs of the CIMs that are expected to be purchased in Australia from 2025 to 2040 (i.e. 16 calendar years). It is assumed that 100% of each year's cohort survives to the 8th year, 50% to year 9, and none to year 10, implying an average service life of 8.5

years. The model calculates the net present value (NPV) of total national CIM water consumption as far out as 2048 (capturing the lifetime water consumption of units sold up to 2040), using the range of discount rates required by the Office of Impact Analysis (OIA) (3%, 7% and 10%).

Figure 5 illustrates the total water consumed by new CIMs purchased from 2025 to 2040 inclusive in each jurisdiction under Option 1 (status quo). The share of the national CIM market allocated to each jurisdiction is weighted by population, by share of national commercial and service sector GDP and by confidential market information from suppliers. Figure 5 does not cover the total consumption of the entire CIM stock, since the consumption of products in operation prior to 2025 will be unaffected by any of the options. The estimated operating life of CIMs is 8.5 years, so by 2033 almost the entire stock will consist of CIMs purchased in 2025 or later. Each new post-2025 cohort adds about 1 gigalitre per annum of water consumption. The consumption trend flattens after 2033 because post-2025 models start reaching the end of their service lives and start retiring from the post-2025 stock.

FIGURE 5 WATER CONSUMPTION BY JURISDICTION, CIMS PURCHASED 2025-40, AUSTRALIA

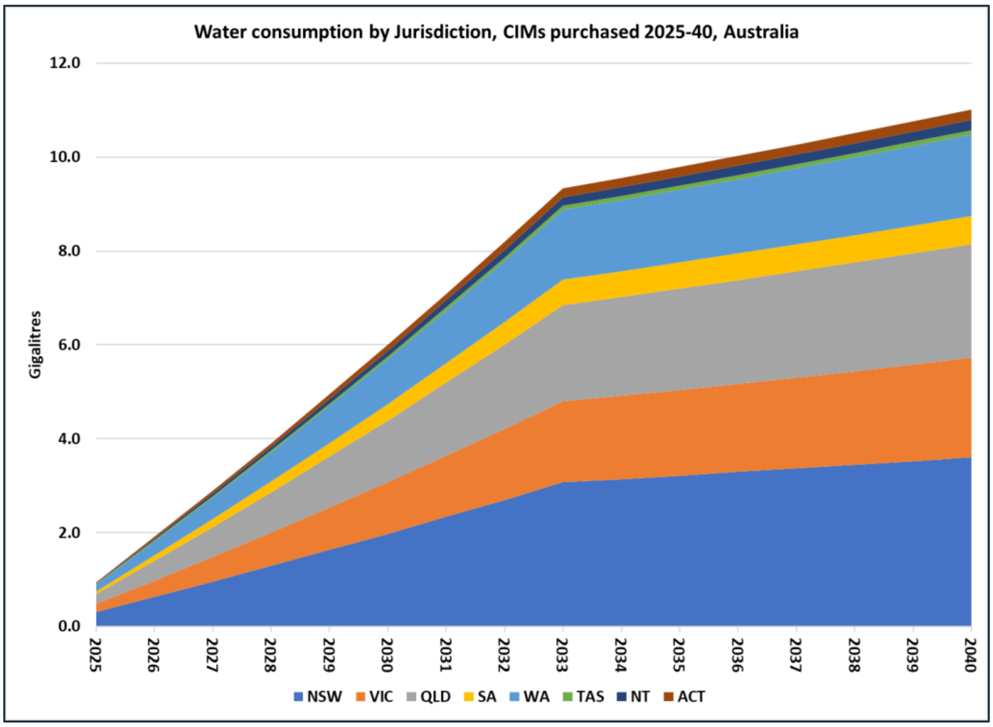


Figure 6 breaks down the same quantity of water as in Figure 5 by purpose: water converted to ice (whether cubed, shaped or flaked, including potable water losses during ice-making) and mains-supplied water used for cooling. Only about 2% of CIMs sold are water-cooled but those units can consume more than 10 times as much mains cooling water per kilogram of ice made as the potable water in the ice itself.

Water-cooled CIMs may be installed so that the cooling water is discharged to waste after a single pass (if regulatory conditions can be met) or connected to a water cooling circuit that serves the building's air conditioning system. According to the CIM stakeholders, purchasers of large-capacity CIMs, most of which are installed in buildings with air conditioning cooling towers, are aware of the high water charges for single pass cooling and use recirculation cooling (unless they have access to a free non-mains supply).

Some purchasers of smaller CIMs however find it convenient to use single pass water cooling to avoid fan noise and the heat load that air cooling would add to a bar or café. For modelling purposes, it is assumed that on average, 5% of all CIM cooling water is taken from the supply mains. The other 95% is met either by recirculated water or from a free source of non-potable water. The cost-benefit analysis is sensitive to these assumptions. The higher the recirculation rate, the lower the total value of the saving from increased efficiency of cooling water use. Overall, water cooling accounts for a little more than 1% of all the mains water used by CIMs.

FIGURE 6 WATER CONSUMPTION BY PURPOSE, CIMS PURCHASED 2025-40, AUSTRALIA

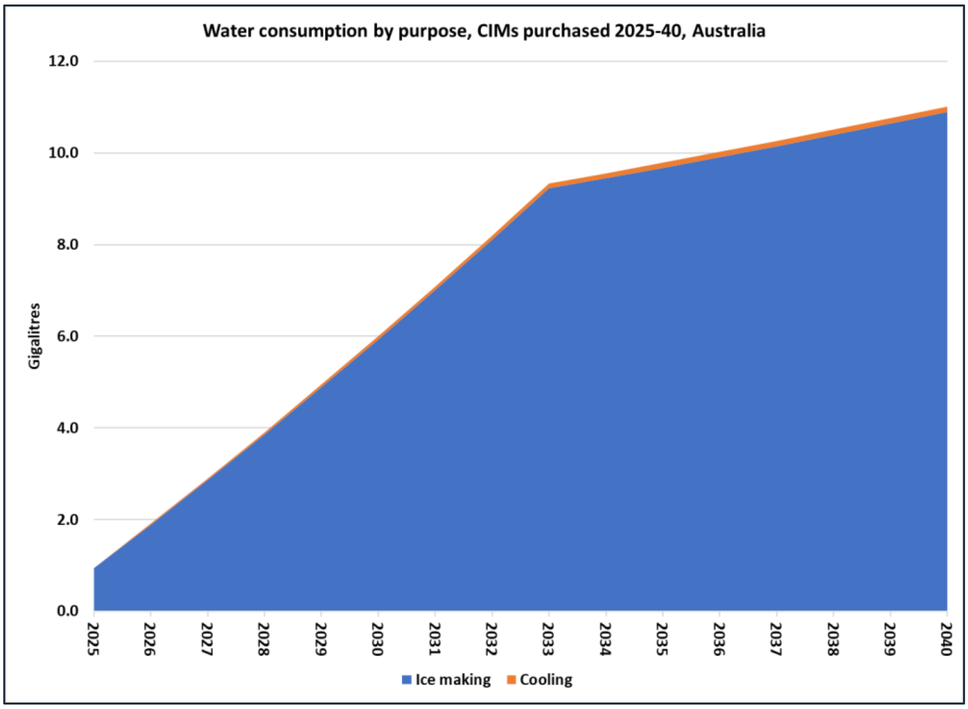
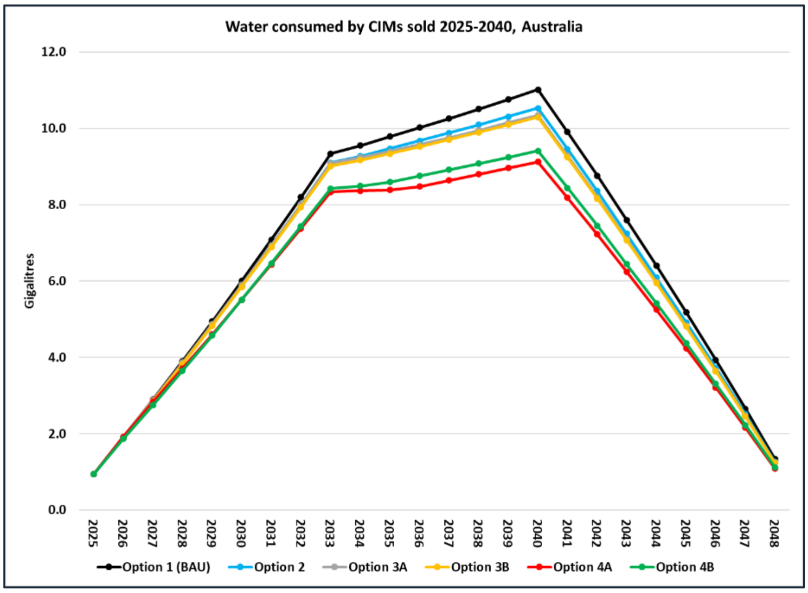


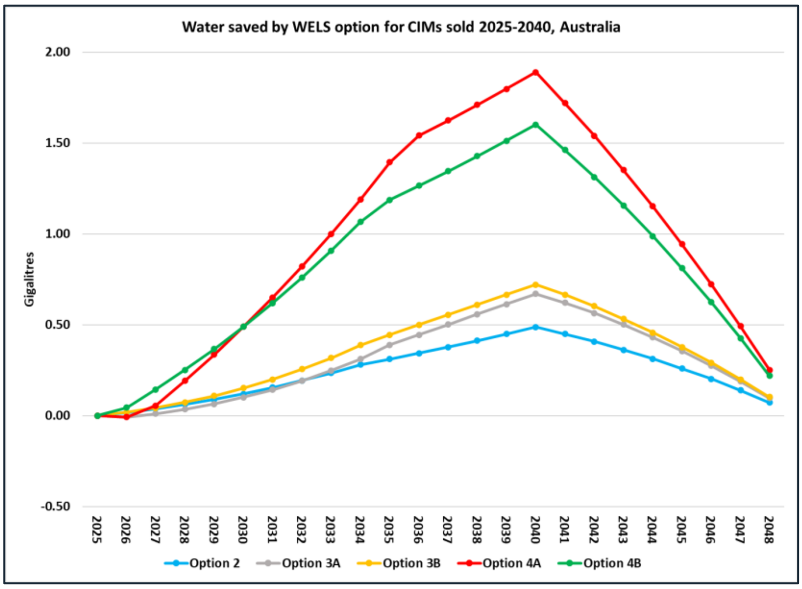
Figure 7 illustrates the projected total water used by CIMs purchased between 2025 and 2040 under all options. The top line corresponds to the total water use in Figure 5 and Figure 6 (Option 1).

FIGURE 7 WATER CONSUMED BY CIMS SOLD 2025-2040, AUSTRALIA



The area between the Option 1 line and each option line in Figure 7 represents the water saved by that option. Figure 8 illustrates the water savings at a larger scale. The water saving from Option 2 are projected to peak around 48,000 kilolitres (0.048 GL) per year in 2040 and then decline as CIMs retire. The maximum savings are from the Mandatory Water Efficiency Standards Option 4A (1.86 GL in 2040). This is higher than Option 4B because more stringent minimum standards can be set under Option 4A, due to the gathering of market data through implementation of Options 2, 3A or 3B.

FIGURE 8 WATER SAVED BY WELS OPTION FOR CIMS SOLD 2025-2040, AUSTRALIA



4.3 Projected costs

Regulatory Burden

The regulatory burden of the options has been calculated in accordance with OIA's Regulatory Burden Measurement Framework and includes consideration of the following regulatory costs:

- Administrative costs incurred by regulated entities primarily to demonstrate compliance with the policy (usually record keeping and reporting costs). These are mainly time costs incurred by suppliers in interacting with the WELS Regulator and with distributors under Options 2, 3A, 3B, 4A and 4B. Testing costs would normally be included, but there are no additional testing costs beyond those needed under the status quo. The same tests measure both water and energy use, and if the test report is in the form as required by the GEMS Determination it will include the required water use data.
- Substantive compliance costs incurred by suppliers to deliver the outcomes being sought (mainly training to employees and providing information to purchasers, including by way of physical labelling).
- Delay costs: expenses and loss of income incurred through application or approval delays. These are effectively zero in this case as testing and registration is required for every CIM model as part of compliance with the GEMS Determination and other regulatory requirements, e.g. electrical safety and WaterMark certification. It is assumed that the period required for WELS registration would run in parallel.

Table 4 presents the estimates of the number of suppliers and secondary distributors that would incur a regulatory burden on account of the proposals, and the annual cost to each entity. It is estimated that the administrative costs would be borne mainly by the suppliers, and the substantive compliance costs by the distributors. All costs are additional to the status quo. That is, they are beyond the costs imposed by compliance with the GEMS Determination. It is assumed that these costs are higher in the introduction phase and then fall to a lower constant level.

Table **5** summarises the present value of the projected stream of regulatory burden costs. The direct regulatory burden would fall on the businesses that supply and distribute CIMs, not on community organisations or on individuals (Table 6).

Table 4 Estimates of Regulatory Burden Costs per liable entity

	Option 2	Option 3A	Option 4B	Option 4A	Option 4B
Number of suppliers	30	30	30	30	30
Secondary distributors (2025, 2040)	40, 50	40, 50	40, 50	40, 50	40, 50
Administrative cost per liable entity importer; Year 1 of implementation)	$5,000	$10,000	$10,000	$10,000	$10,000
Administrative cost per liable entity; Year 2 etc)	$2,500	$5,000	$5,000	$5,000	$5,000
Substantive compliance cost per liable entity (Year 1)	0	$5,000	$5,000	$5,000	$5,000
Substantive compliance cost per liable Admin entity (Year 2 etc)	0	$2,500	$2,500	$2,500	$2,500
Delay cost per liable entity	0	0	0	0	0

Table 5 Estimate of total regulatory burden

	Option 2 $/yr	Option 3A $/yr	Option 3B $/yr	Option 4A $/yr	Option 4B $/yr
Administrative costs	$82,500	$150,000	$165,000	$135,000	$150,000
Substantive compliance costs	0	$112,355	$122,725	$101,810	$112,355
Delay costs	0	0	0	0	0
Total $M	$82,500	$262,355	$287,725	$236,810	$262,355

Note: Figures represent the $/yr average regulatory burden over the period 2025-2034.

Table 6 Change in costs ($ million) by sector

	Business $/yr	Community organisations $/yr	Individuals $/yr	Total change in costs $/yr
Option 2	$82,500	0	0	$82,500
Option 3A	$262,355	0	0	$262,355
Option 3B	$287,725	0	0	$287,725
Option 4a	$236,810	0	0	$236,810
Option 4B	$262,355	0	0	$262,355

Note: Figures represent the $/yr average regulatory burden over the period 2025-2034.

WELS Regulator burden

For Options 3A, 3B, 4A and 4B, industry would have to register their products with the WELS Regulator, which would impose fees on the registrant. It is assumed that the current approach to charging and cost recovery would apply. This involves the application of a tiered fee structure at the time of applying to register products, and for the renewal of registration every 12 months if the supplier wanted to keep supplying the models to the market.[11]

The WELS Regulator would incur costs for:

- preparing the necessary legislative amendments
- revisions to the WELS Standard (AS/NZS 6400)
- modifications to the WELS registration database
- identifying and communicating with businesses affected by the regulation
- staff time need for establishing new processes, assessing product registration applications, processing payments and providing education and support to registrants.

The WELS Regulator would also incur costs associated with compliance monitoring at various points of sale, to ensure the integrity of the WELS scheme. While the GEMS Regulator will likely undertake check tests to ensure the integrity of MEPS compliance, the models targeted for water related compliance checks may be different. The possible sharing of check test costs between regulators has not been considered in the costings. The registration and regulator costs are summarised in Table 7.

TABLE 7 ESTIMATES OF COSTS TO WELS REGULATOR

	Option 2	Option 3A	Option 4B	Option 4A	Option 4B
Registration costs per year per supplier	$2,900	$2,900	$2,900	$2,900	$2,900
WELS administration costs per year	$75,000	$150,000	$150,000	$150,000	$150,000
Check tests (Yr 1 of implementation)	4	6	8	8	8
Check tests (Yr 2, etc)	2	3	4	4	4
Cost per check test	$6,250	$6,250	$6,250	$6,250	$6,250
Cost per label	NA	$0.50	$0.50	$0.50	$0.50

Note: These costs are held constant in real terms but may rise in nominal terms with inflation.

Purchaser burden

It is assumed that all compliance costs initially borne by industry and by the WELS Regulator are ultimately passed on to CIM purchasers. Purchasers also incur the costs of price increases due to improvements in the average water efficiency of CIMs, whether forced on them by Minimum Water Efficiency Standards which

[11] At the time of writing, a modified WELS charging structure was being considered. This structure involves the application of a fee-for-service (per model) at time of registration application; and a levy (per model) at time of annual product registration renewal.

remove the cheapest and least water efficient models from the market or voluntarily incurred through exercising a preference for more water efficient models.

The relationship between product price and water efficiency is captured in modelling by assuming a Price/Efficiency (P/E) ratio. A P/E ratio of 1.0 implies that a 10% increase in water efficiency brings about a 10% increase in price. A P/E ratio of 0.5 implies a 5% price increase for every 10% increase in efficiency and so on.

The projected price impacts of energy efficiency improvements due to MEPS are already built into the unit price trends in Option 1. In addition, the following technical changes will be happening under Options 2, 3A, 3B, 4A and 4B:

- Improvements in potable water efficiency. A P/E ratio of 0.1-0.15 has been assumed for information declaration options (2, 3A and 3B) and 0.2-0.3 for options that include Minimum Water Efficiency Standards (4A and 4B).
- For water-cooled products, improvements in cooling water efficiency. A P/E ratio of 0.2-0.3 has been assumed for cooling water efficiency improvements under all options.

Note that the price increase effects are additive: for water-cooled categories, separate cost and price effects are estimated for potable water efficiency and condenser water efficiency improvements, since they involve different technological pathways.

Goods and Services Tax (GST) effects are not included in the modelling on either the cost or the benefits side. Volumetric water charges are not subject to GST in any case, and though GST is charged on CIM sales, CIM purchasers are businesses which can claim back any GST payments.

4.4 Benefit/cost analysis

The value of projected water savings for states and territories under each option is calculated by multiplying the quantity of water and wastewater saved (i.e. the equivalent of Figure 8 for that jurisdiction) by the projected water supply and wastewater price in that jurisdiction (Figure 12 in Appendix B). The present value in 2025 of the stream of savings is calculated at a 7% discount rate.[12]

The present value of projected costs is estimated over the period 2025 to 2040. The period of savings accumulation is longer because even if a market intervention option terminates in 2040 through abandonment or adoption of a more stringent measure, the CIMs purchased before then will continue to accumulate water savings until they are retired from use.

Table 8 and Figure 9 summarise the projected costs, benefits and water savings of each option. Program cost is the sum of the burden on business and the WELS Regulator. Table 8 shows that Options 2, 3A, 3B have very similar net benefits. The additional water savings delivered by Options 3A and 3B are largely negated by the costs of regulation.

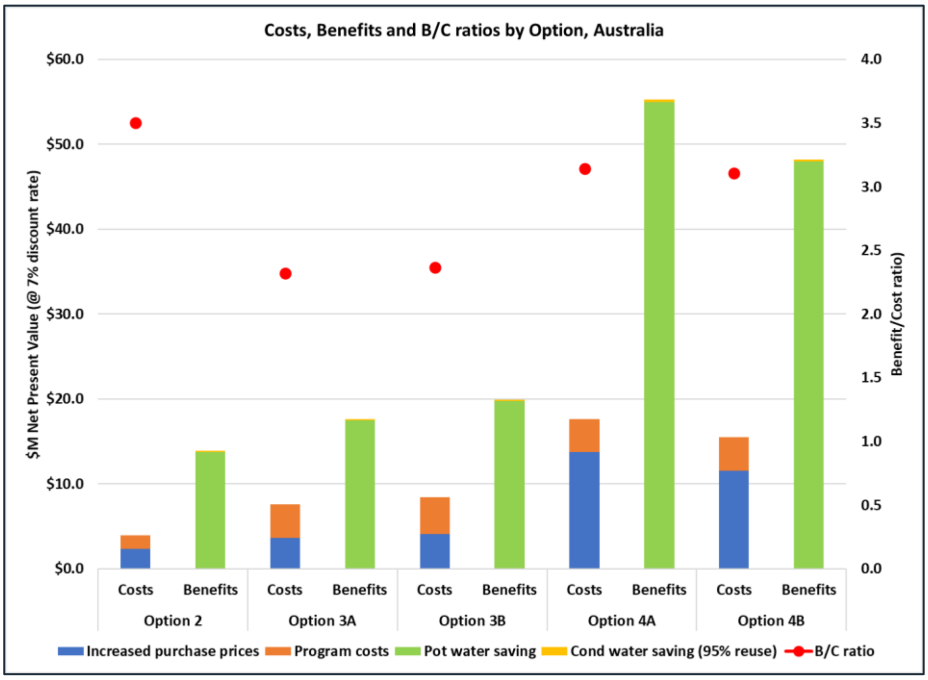
[12] The rate that converts future values into present values is known as the discount rate. If the discount rate were constant at *r* per cent per year, a benefit of B_t dollars received in *t* years is worth $B_t/(1+r)^t$ now. OIA requires the calculation of net present values at a 'central' discount rate of 7%, with additional calculations at 3% and 10%.

TABLE 8 SUMMARY OF PROJECTED COSTS AND BENEFITS, AUSTRALIA

	Costs $M PV			Benefit $M PV			Net Benefit	Total Benefit/ Total Cost	Increase in CIM prices	GL water saved	
	Price	Prog (a)	Total	Potable	Cooling	Total				In 2040	2025-48
Option 2	$2.4	$1.6	$4.0	$13.8	$0.1	$13.9	$9.9	3.5	0.4%	0.5	5.8
Option 3A	$3.7	$3.9	$7.6	$17.5	$0.2	$17.6	$10.0	2.3	0.7%	0.7	7.3
Option 3B	$4.1	$4.3	$8.4	$19.8	$0.2	$19.9	$11.5	2.4	0.8%	0.7	8.3
Option 4A	$13.7	$3.9	$17.6	$55.0	$0.3	$55.3	$37.7	3.1	2.6%	1.9	22.9
Option 4B	$11.6	$3.9	$15.5	$48.0	$0.2	$48.2	$32.7	3.1	2.2%	1.6	20.0

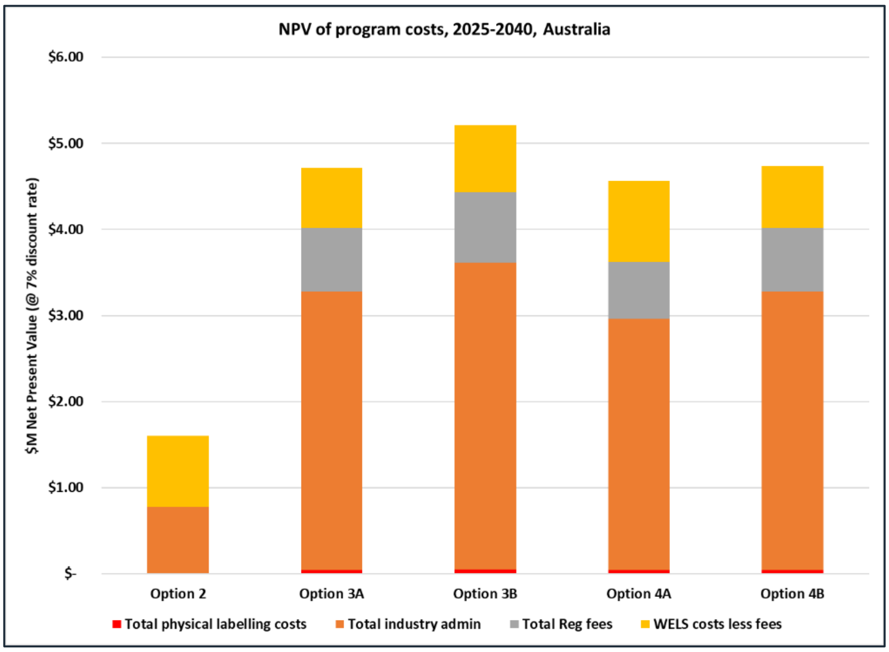
Note: The B/C ratio is total benefits divided by total costs. PV is present value, at 7% discount rate. The price increases are additional to those projected to occur because of compliance with MEPS.
Note: (a) represents program costs which are the sum of costs to industry and to the WELS Regulator.

FIGURE 9 COSTS (C), BENEFITS (B) AND B/C RATIOS BY OPTION, AUSTRALIA



The program costs indicated in Figure 9 are disaggregated in Figure 10. The product registration fees incurred by CIM suppliers are in effect transfer payments to the WELS Regulator, so the actual cost to the Regulator is net of this income. Physical labelling costs are estimated at $0.50 per applied label and make a negligible contribution to program costs.

FIGURE 10 NPV OF PROGRAM COSTS, 2025-2040, AUSTRALIA

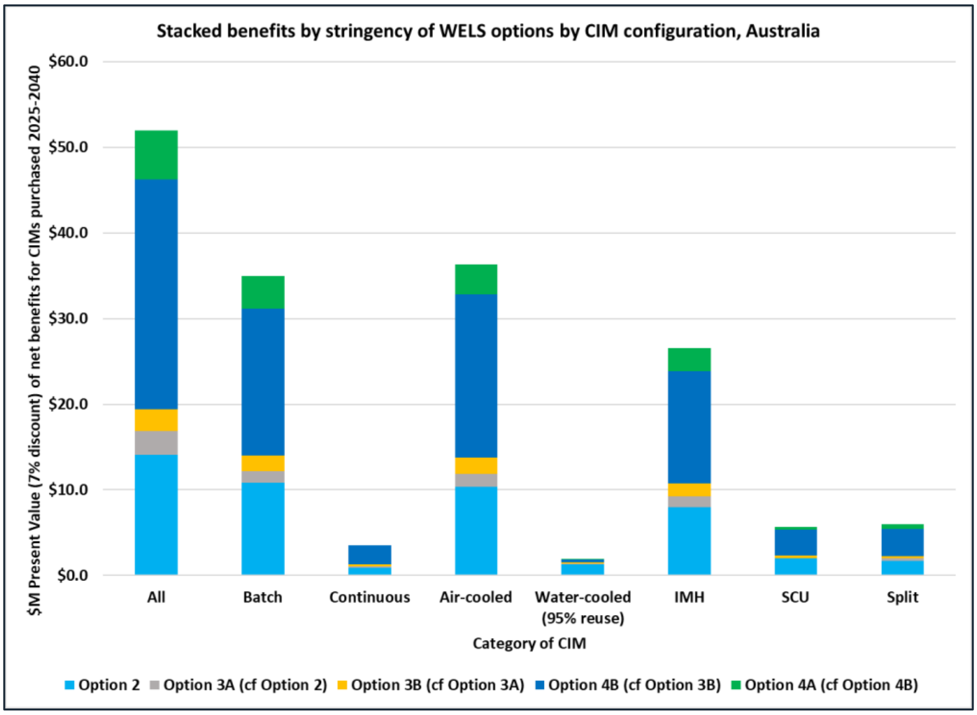


Ultimately, it is assumed that all costs, whether borne initially by industry or by the WELS Regulator are passed on to CIM purchasers as higher product prices (although technically the unrecovered share of WELS Regulator costs are borne by the taxpayer). All benefits accrue to CIM purchasers.

Figure 11 shows the stacked benefits for each option, starting with the lowest projected benefit (Option 2, $M 13.9) up to the highest benefit (Option 4A, $M 55.3). This is a visual indicator of the additional benefit from moving to progressively more stringent measures. It shows that:

- There is little difference in benefit between Option 2 (Voluntary declaration with WELS support) and Options 3A and 3B (Product registration and information declaration), if Option 2 has high take-up by suppliers. If Option 2 is not successful, then Option 3A would become more attractive.
- The Minimum Water Efficiency Standards options (4A and 4B) lead to a near tripling of benefit, at slightly higher B/C ratios.
- Most of the benefits come from IMH models, because of their high average ice production, and from batch production (cube ice) models, which have far greater scope to increase potable water efficiency than continuous (flaked ice) models.
- Water-cooled models deliver significantly less benefit than air-cooled models, because of the high recirculation rate of cooling water.

FIGURE 11 STACKED BENEFITS BY STRINGENCY OF WELS OPTIONS BY CIM CONFIGURATION, AUSTRALIA



Uncertainty and sensitivity

As with all projections, there are uncertainties due to both imperfect information about the present and assumptions about the future. It is impossible to calculate statistical uncertainties of the impacts of any given WELS option without having reliable information about the CIM models available on the Australian market, which will only become available once all CIMs on the market are tested to the same standard and their water use rates declared.

Calculating the sensitivity of outcomes to the discount rate assumptions is more straightforward. Table 9 summarises the NPV of net benefits and B/C ratios for Australia, at discount rates of 3% and 10%, as well as the central rate of 7%. The lower the discount rate the higher the net benefit, because the value of future water savings are not discounted as heavily. On the other hand, future capital costs due to water efficiency increases are also discounted less and so have a higher PV.

The projected outcomes are moderately sensitive to discount rates, but B/C ratios are favourable even at the highest discount rate (10%). By way of comparison, the projected net benefit of the CIM MEPS option implemented by GEMS was estimated at $M 246.6, with a B/C ratio of 7.7 at the 7% discount rate (E3 2023).

TABLE 9 SENSITIVITY TO DISCOUNT RATE ASSUMPTIONS, AUSTRALIA

	$M NPV net benefit at discount rates			B/C ratio at discount rates		
	3%	7%	10%	3%	7%	10%
Option 2	$16.0	$9.9	$7.0	3.9	3.5	3.3
Option 3A	$16.5	$10.0	$6.9	2.5	2.3	2.2
Option 3B	$19.2	$11.5	$7.8	2.6	2.4	2.2
Option 4A	$60.1	$37.7	$27.0	3.4	3.1	3.0
Option 4B	$52.4	$32.7	$23.0	3.4	3.1	2.9

Another significant uncertainty is the value of cooling water savings. If water-cooled CIMs become more water efficient in their cooling water use, but all their cooling water is effectively zero cost because it is recycled or obtained free from a non-potable supply, the value of cooling water savings would approach zero. Water-cooled CIMS would also be subject to measures aimed at improving their potable water use, so they would still be expected to return some water savings.

Table 10 indicates the lack of sensitivity of the findings to assumptions about the rate of cooling water reuse. The central assumption, based on industry information, is that 95% of ice makers are connected to water recirculation circuits, with only 5% using single pass cooling water supplied from the mains.

The higher the cooling water reuse rate, the less the total value of mains water and wastewater saved, but this effect is tempered by the low market share of water-cooled products (reduced from an estimate of 8% to 2% after consultations). As program costs remain the same, the net benefits fall slightly with higher reuse rates, but the difference between 85% reuse and 100% reuse assumptions are almost unnoticeable.

TABLE 10 SENSITIVITY TO COOLING WATER REUSE ASSUMPTIONS

	$M NPV net benefit at 7% discount rate, at various levels of cooling water reuse				B/C ratio at various levels of cooling water reuse			
	85%	90%	95%	100%	85%	90%	95%	100%
Option 2	$10.1	$10.0	$9.9	$9.9	3.5	3.5	3.5	3.5
Option 3A	$10.2	$10.1	$10.0	$9.9	2.3	2.3	2.3	2.3
Option 3B	$11.7	$11.6	$11.5	$11.4	2.4	2.4	2.4	2.4
Option 4A	$37.9	$37.8	$37.7	$37.6	3.2	3.1	3.1	3.1
Option 4B	$32.8	$32.8	$32.7	$32.6	3.1	3.1	3.1	3.1

Finally, Table 11 indicates the sensitivity of outcomes if the increases in CIM prices were twice as great as estimated in Table 8. This may occur if, for example, some suppliers withdrew and so lessened price competition in the market. This is very unlikely for the information only options (2, 3A and 3B) but is a risk for the Minimum Water Efficiency Standards options (4A, 4B). Additionally, the estimated average CIM load factor (the ratio of actual to maximum output) is reduced from 70-80% to 50% (equivalent to 12 hours operation pe day). Even with these extreme assumptions all options would remain cost effective.

Table 11 Summary of projected costs and benefits, Australia (Price doubled, reduced load factor)

	Costs $M PV, 7% discount rate			Benefit $M PV, 7% discount rate			Net	B/C	% increase in
	Price	Program	Total	Potable	Cooling	Total	Benefit	ratio	CIM prices
Option 2	$4.7	$1.6	$6.3	$9.1	$0.2	$9.3	$3.0	1.5	0.9%
Option 3A	$7.3	$3.9	$11.2	$11.5	$0.3	$11.8	$0.6	1.1	1.4%
Option 3B	$8.2	$4.3	$12.5	$13.1	$0.3	$13.4	$0.9	1.1	1.6%
Option 4A	$27.5	$3.9	$31.3	$36.3	$0.6	$36.9	$5.6	1.2	5.2%
Option 4B	$23.2	$3.9	$27.1	$31.7	$0.5	$32.1	$5.0	1.2	4.4%

Note: The B/C ratio is total benefits divided by total costs. PV is present value, at 7% discount rate. The price increases are additional to those projected to occur because of compliance with MEPS.

4.5 Stakeholder impacts

Suppliers

There are about 30 CIM importers, one Australian manufacturer and about 40 secondary distributors, who would need to respond to any new water efficiency measures.[13] The importers and manufacturer will have to register their CIM models with the GEMS Regulator in accordance with the GEMS Determination that comes into effect in March 2026. This will mainly involve obtaining energy and water consumption test results from overseas suppliers. Local test laboratories have also shown interest in offering AS/NZS 4865 testing but will be reluctant to obtain the necessary accreditation until there is a demand for the service.

Models for which the necessary test data are not available by the time the GEMS Determination takes effect would have to be withdrawn from the market, either permanently or until they can be tested. WELS adoption of the same CIM definitions, categories, test standards and water and energy test methods means that there should be no extra costs to obtaining water performance data.

The WELS Regulator can leverage the GEMS Determination and help suppliers assess how their decisions to declare water use rates to the GEMS Regulator might influence future WELS options. If the WELS Regulator implements the non-regulatory Option 2 with the intention of moving to a regulatory option if there is insufficient voluntary take-up, all parties would benefit from knowing what the trigger criteria would be (e.g. if fewer than 80% of suppliers and 80% of models participate voluntarily).

Options 2, 3A and 3B do not impose any restrictions on the CIM model range and leave it to suppliers to make commercial decisions about which models to promote or remove. These decisions will no doubt be informed by a supplier’s perception about how, or whether, purchasers use the information made available to them.

Options 4A and 4B would set limits on water consumption which could exclude a significant number of models. Given the present limitations of water use information for CIMs on the Australian market, setting any Minimum Water Efficiency Standard carries risk. If set too low, the Minimum Water Efficiency Standards will have no effect, and if set too high they could exclude so many models that the market would

[13] In March 2025 the manufacturer, Stuart Ice Makers, was acquired by Heatlie Pty Ltd and moved its operations from Sydney to Adelaide. https://www.icemachines.com.au/

be disrupted, and some suppliers may have to exit the market entirely. The number of models excluded at any given Minimum Water Efficiency Standard cannot be known until all models are registered. Logically, the more stringent the standard the more models excluded.

However, most importers have access to a wide range of products, manufactured and sold in different parts of the world. Those intended for the US market are likely to be the most water efficient, because of the impacts of the USDOE mandatory cooling water efficiency standards and the USEPA Energy Star program. The possibility of changing models from the existing global product range should enable most importers to meet a water efficiency standard that is equal to or less stringent than the USA levels, without a significant reduction in the range of products on offer in Australia.

Purchasers

Purchasers of CIMs from importers or secondary suppliers may face higher average prices but would benefit from a greater saving in lifetime costs. Table 8 indicates the estimated price increase for each option resulting from the relationship between water efficiency and price described earlier. The mean price increase ranges from 0.4% for Option 2 up to 2.6% for Option 4A, averaged over all CIMs projected to be purchased over the period 2025-2040.

The years required for the savings in water use costs to match the increase in capital costs is indicated in Table 12. These estimates are based on the average production capacity by CIM type: about 70 kg/24 hrs for SCUs, 300 kg/24 hrs for IMHs and 400 kg/24 hrs for split units. The larger the capacity, the higher the purchase price and the higher the savings in running costs, all else being equal.

Most of the payback periods are less than two years. Commercial catering businesses surveyed by the NSW Department of Environment in 2020 indicated that they would expect a 2 to 4-year payback for investments in more efficient equipment (E3 2023). All the proposed measures would meet that criterion for most types of CIM, with a few exceptions.

A payback period longer than 8 years carries the risk that the unit will fail before payback. In general, the payback periods for batch-production models are significantly shorter than for continuous-production models, because the potable water consumption per kilogram of ice is much greater and there is more scope for water saving.

For water-cooled products, there will be a very short payback period if the unit is installed for single pass cooling (0% reuse) but a very long payback (exceeding the product lifetime) if it is connected to a cooling water recirculation system (100% reuse). The high water costs of single pass cooling (unless the cooling water is free) should be communicated as part of any CIM information program devised by the WELS Regulator, especially under Option 2.

Apart from the product price increases expected from a rise in average CIM water efficiency, it is assumed that the program costs initially borne by suppliers (administration, registration and labelling) will also be passed on to purchasers. As these costs are not model or type-specific, it is difficult to know how they will be allocated. Suppliers may adjust the prices of some models more than others. The second group of payback periods in Table 12 calculates payback periods if industry costs incurred in 2030 are allocated evenly to every model sold in 2030. For Options 2, 3A and 3B, the recovery of supplier costs from purchasers can significantly lengthen the payback period.

Ice makers are essential equipment for restaurant, hospitality, foodservices, food retail and similar businesses, and it is unlikely that they would hesitate to purchase a new or replacement unit because the price of a typical $5,000 product increases by $20 (0.4%) to $135 (2.7%). At the margins, however, some businesses that currently rely on bagged ice may defer purchasing an ice machine if they face higher purchase prices.

None of the proposed options are expected to impact on the average service life of CIMs. According to suppliers, the most significant factors affecting service life are frequency of cleaning and servicing.

Table 12 Simple payback period (years) for CIM purchasers

Category	Cooling water Reuse	Water efficiency related price increases only					With industry costs equally distributed				
		Option 2	Option 3A	Option 3B	Option 4A	Option 4B	Option 2	Option 3A	Option 3B	Option 4A	Option 4B
IMH-Air-Batch	NA	0.8	1.0	0.9	1.1	1.0	1.2	2.5	2.2	1.4	1.4
IMH-Air-Cont	NA	2.7	1.4	2.1	2.2	2.2	7.3	6.1	8.2	3.2	3.2
IMH-Water-Batch	100%	1.9	2.1	2.0	1.1	1.5	2.2	3.4	3.1	1.3	1.8
	0%	0.1	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.2
IMH-Water-Cont	100%	8.6	4.6	6.6	3.9	3.0	12.5	8.5	11.7	4.7	3.8
	0%	0.2	0.2	0.2	0.4	0.4	0.3	0.3	0.3	0.5	0.6
SCU-Air-Batch	NA	2.5	2.9	2.9	3.9	3.7	3.6	7.4	6.8	4.9	4.9
SCU-Air-Cont	NA	4.9	5.7	5.3	6.7	6.4	11.7	26.0	22.6	9.6	10.4
SCU-Water-Batch	100%	4.5	5.2	5.6	2.4	3.3	5.3	8.5	8.5	3.2	4.2
	0%	0.7	0.9	0.9	0.7	0.9	0.9	1.4	1.4	0.9	1.1
SCU-Water-Cont	100%	21.2	18.7	18.1	16.4	11.7	26.5	34.4	31.4	18.5	14.8
	0%	0.6	0.7	0.7	1.2	0.8	0.7	1.3	1.2	1.3	1.0
RCU-Air-Batch	NA	0.7	0.8	0.8	0.7	0.7	0.8	1.4	1.3	0.9	0.9
RCU-Air-Cont	NA	2.0	1.5	1.9	1.5	1.5	3.9	4.6	5.3	2.1	2.1
RCRC- Air-Batch	NA	0.7	0.8	0.8	0.7	0.7	0.8	1.4	1.3	0.9	0.9
RCRC-Air-Cont	NA	2.0	1.5	1.9	1.4	1.4	3.9	4.6	5.4	2.1	2.1

Note: Cases highlighted yellow may exceed the service life of the product, and those highlighted red do exceed it.

WELS Regulator

In both Option 1 (status quo) and Option 2 (Voluntary declaration with WELS support) the GEMS Regulator is responsible for registering products and checking compliance. In Option 2, the WELS Regulator encourages suppliers to declare water use rates through a range of information measures directed at purchasers of CIMs.

Options 3A, 3B, 4A and 4B would formally include CIMs within the WELS scheme. This would involve:

- Working with Standards Australia to amend AS/NZS 6400 to include CIM water consumption tests (which would be those already specified in the GEMS Determination) and possibly a WELS label and Minimum Water Efficiency Standards for CIMs.

- Amending Section 6 of the WELS Determination to add CIMs (with definitions) as a WELS product; and amending Section 7 to reference the amended version of AS/NZS 6400 (the current reference is to the 2016 edition).
- Amending the WELS Registration system to enable CIM product registration and charging.

As with all other products subject to WELS labelling and standards, there will be administrative costs for assessing registration applications, operating a registration system, maintaining a public registration database, enforcing compliance and maintaining the Water Rating website to support stakeholder education. These are projected to cost the WELS Regulator an average of AUD $150,000 per year between 2025 and 2040 (equivalent to the salary and on-costs for one full-time APS 6 officer). It is estimated that about half the costs will be covered from WELS registration fee income and the rest will need to be made up from Government contributions.

The criteria for accepting test results for registration would need to be aligned with the GEMS Determination, to minimise costs to both registrants and the WELS Regulator. Any potential future check testing program would rely on accredited independent laboratories, of which there are presently none in Australia. While there are no laboratories known to have NATA accreditation for AS/NZS 4865 testing at present, this situation is common whenever a new product is made subject to regulation. There are several laboratories in Australia with the necessary equipment and capability, so once there is a commercial demand it is expected that at least one will get accreditation.

In 2022, the NSW Government commissioned trial testing at an Australian laboratory which confirmed the practicality of the AS/NZS 4865.1 test and confirmed that the results were very close to the US tests. As the GEMS Determination will be in place first, the GEMS Regulator should have established a framework for check testing before the WELS Regulator may need to test products.

Impacts on competition

Some impacts are likely to increase market competition while others might reduce it. In the short term, the withdrawal of the least water efficient models (under Options 4A and 4B) could reduce the range of models on the market, at least until importers secure supplies of more efficient ones, which are known to exist on the global market.

On the other hand, reliable information about the water efficiency of every model will be available for the first time, which should enhance competition based on differences in water-intensity. It is also likely to sharpen competition between air-cooled and water-cooled products.

There are no apparent negative or anti-competitive implications for international trade. Any WELS regulations would apply equally to both imports and locally manufactured products. Products may be tested and registered under three different (but near-identical) test standards: the AS/NZS standard, the ASHRAE/AHRI test used in the US and Canada and the ISO test standard. This expands choices for global suppliers. Overall, the impact on supplier and model competition is likely to be minimal.

5. Consultations

5.1 Consultation procedure

A draft Regulation Impact Analysis was published on the DCCEEW Consultation Hub on 12 May 2025, inviting submissions up to 27 June 2025. This closing date was subsequently extended to 18 July 2025. Stakeholders were invited to register for online information sessions on 27 and 29 May 2025. Respondents were invited to make a written submission, complete a structured online survey or both (see Appendix A).

WELS sent invitations and notifications to stakeholders regarding the CIM information sessions and publishing of the draft Regulatory Impact Analysis. The stakeholder distribution list used had been compiled by the GEMS Regulator for the 2023 MEPS Regulatory Impact Statement consultation. This distribution list was refined and expanded upon by WELS.

WELS consultation approach:

Date	Description	Channel	Stakeholder
10/02/2025	Request: Introductory meeting requested with industry representative groups	Email	Australian Industry Group Consumer Electronics Suppliers Association Australian Hotels Association Foodservice Suppliers Association of Australia National Association of Food Equipment Suppliers Restaurant & Catering Australia
25/02/2025	Meeting: Introductory meeting with CIM industry	Virtual	Various NAFES members
3/03/2025	Notification: Introduction of WELS and CIM Regulatory Impact Analysis work	Email	CIM distribution list
6/05/2025	Invitation: CIM information session	Email	CIM distribution list
6/05/2025	Invitation: CIM information session	Email	WELS Advisory Group (industry representatives)
12/05/2025	Notification: Publishing of Regulatory Impact Analysis and Have Your Say survey	Email	CIM distribution list
13/05/2025	Request: NAFES to forward information session and survey link to members	Email	NAFES
22/05/2025	Notification: Reminder of invitation to information sessions	Email	CIM distribution list
27/05/2025	Meeting: CIM Regulatory Impact Analysis information session	Virtual	CIM industry members
29/05/2025	Meeting: CIM Regulatory Impact Analysis information session	Virtual	CIM industry members
16/06/2025	Notification: Extending the Regulatory Impact Analysis consultation period	Email	CIM distribution list

There are about 40 known CIM suppliers and the 15 largest (accounting for an estimated 95% of the market) had been interviewed during the development of the GEMS Regulatory Impact Statement. While the GEMS consultations had concentrated on CIM energy use they also included several relevant questions on water use. These responses were considered as part of the broader WELS consultation.

Consultation highlights were:

- Twenty-one industry members attended the information sessions, with views shaping the draft Regulatory Impact Analysis and some of the underpinning cost benefit assumptions.
- Rates of survey completion and submission provision were low – one survey and four submissions, representing about 40% of the Australian CIM market were received. Three of the respondents were members of the National Association of Food Equipment Suppliers (NAFES), which has some coverage of the CIM industry. NAFES itself did not participate.
- An additional three submissions provided to the GEMS Regulator in 2023 were also considered, where relevant water use commentary was provided.
- Rates of engagement were like those experienced by the GEMS Regulator in 2023.

5.2 Feedback received

Market composition assumptions

Some stakeholders questioned the source of the assumptions about the size and composition of the CIM market, and particularly the market share of water-cooled products. In the absence of any industry-wide data collection system the market size in the Regulatory Impact Analysis had been estimated from confidential interviews with major suppliers and analysis of Australian Border Force Integrated Cargo System import data.

Stakeholders asserted that the market share of water-cooled products was significantly lower than estimated in the Regulatory Impact Analysis and where used were connected to cooling water recirculation systems rather than single pass cooling. This is for both economic reasons (the cost of wasted water) and strong discouragement, if not outright prohibition of single pass cooling by water authorities and State and Territory environmental protection agencies. One respondent stated that any data on cooling water-intensity would be misleading because of differences in installations and flow rates; and that discussing water cooling in the Regulatory Impact Analysis was legitimising a wasteful practice.

WELS requested further data on the market share issues, and some respondents subsequently provided data which supported these arguments.

Questions were raised about why the Regulatory Impact Analysis did not cover through the door ice makers in domestic refrigerators. It was explained that they were excluded from the scope for the same reasons as for the GEMS CIM regulation: because the volume of water they consume and ice they produce over their operating life is negligible compared with commercial machines.

One stakeholder indicated that they already provide information about CIM water use to purchasers. It was pointed out that there was no evidence that the information provided was derived from a standard test, and that it was not expressed in a form that permitted comparison with other models.

Several participants advocated closer integration of GEMS and WELS administrative, registration and data management functions.

Some participants questioned the assumption in the cost-benefit modelling that IMH type units operate at an average load factor of 80% (equivalent to 19.2 hours per day) and SCU types at a load factor of 70% (equivalent to 16.2 hours per day). They suggested that 12 hours per day (50%) is more representative for most businesses. It was explained that the average load factor values were determined during the GEMS consultations, based on the responses from 15 stakeholder interviews. No doubt, some CIMs will work at 50% load factor or less, but others (probably the larger ones) may work at up to 90%.

Water Quality

The Regulatory Impact Analysis dealt exclusively with the quantity of potable water that CIMs consume to manufacture ice, and in the case of water-cooled products the quantity of water used to dissipate heat from the refrigeration cycle.

One respondent submitted that the performance of CIMs is also affected by the quality of the water, in particular the presence of total dissolved solids (TDS), with the following implications:

- The test results for CIMs would be affected by the quality of the water supplied to the test laboratory. A CIM tested with purer water would need to reject less of it to waste to produce a given quantity of ice.
- Some CIMs are capable of adjustment to adapt to the water quality, so if installed in a location of poor water quality would consume more water than the value declared based on laboratory tests.

None of the three methods adopted by GEMS for testing of CIM energy and water performance specify the quality of water to be used in the tests, although they do specify inlet temperature and pressure. All three methods instruct the test laboratory to set up the CIM in accordance with the manufacturer's instructions. Most suppliers would recommend installation of a water filter in the event of poor water quality, so if the laboratory is supplied with water of poor quality it should follow this recommendation. On the other hand, as test laboratories are likely to be in areas served by mains water, it would be expected that the water supplier would ensure that the water met reasonable standards.

One of the test methods (ANSI/ASHRAE 29 and AHRI 810) has been used for many years as the basis for mandatory CIM standards by the USDOE and for the US Energy Star certification program. The absence of water quality specifications does not appear to have arisen.

If a regulatory WELS option is chosen, it would involve amending the WELS Standard (AS/NZS 6400). This would provide an opportunity to add a cross-reference to the Australian Drinking Water Guidelines. While not mandatory (unless referenced in legislation) the Guidelines cover all aspects of potable water quality including pathogens and those physical characteristics which may impact on the performance of a CIM:

6.2.1 An overview of physical characteristics

The appearance, taste, odour, and 'feel' of water determine what people experience when they drink or use water and how they rate its quality; other physical characteristics can suggest whether corrosion and encrustation are likely to be significant problems in pipes or fittings. The measurable characteristics that determine these largely subjective qualities are:

- *true colour (the colour that remains after any suspended particles have been removed);*
- *turbidity (the cloudiness caused by fine suspended matter in the water);*
- *hardness (the reduced ability to get a lather using soap);*
- *total dissolved solids;*
- *pH;*
- *temperature;*
- *taste and odour;*
- *dissolved oxygen.*

Colour and turbidity influence the appearance of water. Taste can be influenced by temperature, TDS, and pH. The 'feel' of water can be affected by pH, temperature, and hardness. Rates of corrosion and encrustation (scale build-up) of pipes and fittings are affected by pH, temperature, hardness, TDS and dissolved oxygen. (NHMRC 2025)

AS/NZS 6400 could reference those parts of the Guidelines which deal with characteristics that might affect CIM performance: e.g. turbidity, hardness and total dissolved solids. However, this would place an additional burden on test laboratories to measure and record these parameters when using AS/NZS 6400 to conduct tests on CIMs (and possibly other WELS products).

The deviation of operational performance from tested performance is an issue common to all water and energy labelling and standards programs. A product operating in the field will rarely encounter laboratory operating conditions (for CIMs, a steady 32°C ambient air temperature and 21°C water temperature). Consequently, all GEMS energy labels include variants of the qualifying phrase: "When tested in accordance with AS/NZS [XXX]. Actual energy use and running costs will depend on how you use the appliance." A similar qualifying phrase could be added to WELS labels and related communications.

Comparative water efficiency ratings

One respondent suggested that there is no significant difference between water use within types of ice makers, and that the following type rating (rather than a product-specific rating) would be adequate:

- Flake, nugget and cubelet ice machines have very little (± 1%) water wastage and should be rated 5 stars.
- Square cube ice machines waste between 30% to 40% of potable water used and should be rated 3 stars.
- Gourmet cube ice machines waste between 50% to 60% of potable water used and should be rated 1 star.

This approach is inconsistent with the way that users select CIMs, which is likely to follow the following order of priority:

- Ice type
- Configuration and suitability for the space available
- Production capacity
- Brand reputation and reliability
- Capital cost

- Running cost – provided there is reliable and accessible information on the model's energy and water use.

No purchaser will choose a flake ice machine if they want gourmet cube ice, even if it has a 5 star water rating. Furthermore, the Energy Star data (analysed in Figure 19 to Figure 27 in Appendix C) indicate that models of the same type can and do vary significantly in their water and energy use per kg of ice produced. Therefore, a model-specific rating is preferable (even if, say, batch and continuous types have different rating scales).

Low-volume products

It was suggested that if a regulatory WELS option was adopted, models with low sales could be exempt. This would not be an issue if the non-regulatory Option 2 was adopted. The rationale for exemption is that one-off costs such as testing or registration would impact more on the average price of products that sell in low numbers. This would put them at a commercial disadvantage against models that sell in larger numbers, where the one-off costs can be spread across more units.

The GEMS Act offers a precedent for special treatment of low volume products. The *Greenhouse and Energy Minimum Standards (Computers) Determination 2013* designates a "deemed to comply" sub-class of computers. A computer model qualifies as a member of this sub-class if:

- No more than 200 computers of the same model have been or will be supplied in any one year.
- The model still passes a more limited energy test than that which applies to other computers.

However, the GEMS Determination does not provide for the creation of any exemption sub-classes, whether based on sales or any other criterion. All models within the GEMS scope must be tested for both energy and water consumption. Nevertheless, it may be possible to exempt low selling CIM models from any future WELS registration or information requirements or, in the case of Options 4A and 4B, Mandatory Water Efficiency Standards.

Exemption from an obligation to register a model carries high risk if left entirely to the discretion of suppliers. The WELS Regulator may remain unaware of the existence of models that could turn out to sell in large enough numbers to have significant impact on the water consumption of the CIM stock. This risk is mitigated in this instance because all CIM models would have to be registered with the GEMS Regulator in any case. Exemptions could only be properly enforced if the WELS Regulator had the power to require reporting of sales data, or at least to require regular declarations from the supplier of exempt models that sales remain under the threshold.[14]

Support for the Proposed Options

Of the five written submissions:

[14] Under the New Zealand counterpart of the GEMS Act, imports, exports and sales in New Zealand of every NZ-registered model must be reported annually to the Energy Efficiency and Conservation Authority.

- A majority supported the principle that the potable water consumption of commercial ice makers, and cooling water consumption where relevant (expressed as litres/kg ice) should be publicly available.
- None opposed this principle, although there were some reservations about the value of addressing cooling water given the low market share.
- A majority indicated that they would voluntarily report the water consumption (L/100 kg ice) of ice maker models that they supply, even if not required to do so by law.

The only direct response on preference for options proposed in the Regulatory Impact Analysis ranked them in the following order:

1. Mandatory registration and declaration of product information at point of sale (i.e. Option 3A/3B).
2. Encourage businesses who register CIMs makers with the GEMS Regulator to declare water use rates, and to publish water use rates to inform consumers (Option 2).
3. Regulate CIMs under the WELS Act and require mandatory registration; declaration of product information at point of sale; and application of Minimum Water Efficiency Standards (Option 4A/4B).

One stakeholder suggested that the adoption of Minimum Water Efficiency Standards, whether for energy or water, could drive some importers out of the Australian market and so lessen competition. However, another respondent indicated that they import models that are among the most energy- and water-efficient in the USA, so mandatory declaration would give them a commercial advantage.

If Minimum Water Efficiency Standards are adopted, they are likely to initially be less stringent than the USDOE and Energy Star criteria currently applied in the USA. The share of models that would be affected cannot be known until there is reliable information on the performance of models on the Australian market.

5.3 Response to feedback

Following consideration of the consultation responses, changes were made to the draft Regulatory Impact Analysis. Additionally, some approaches and assumptions have been retained.

Market composition assumptions

The most a significant change to the cost-benefit analysis involves the assumptions related to water-cooled products:

- The water-cooled market share has been reduced from 8% to 2% (i.e. to one quarter of the original estimate).
- The proportion of water-cooled units installed with single pass cooling has been reduced from 25% to 5% (i.e. to one fifth of original estimate).

These changes result in a 95% reduction in the estimated mains water demand for CIM cooling water (1/4 x 1/5 = 1/20) and a commensurate reduction in the scope for cooling water savings.

However, commercial in confidence data submitted by respondents indicated that the market share of IMHs compared with SCUs is significantly higher than estimated in the draft Regulatory Impact Analysis. As IMHs are on average much larger in capacity and produce more ice, this increases the scope for potable water savings.

The revised market share assumptions are tabulated along with the previous assumptions in Table 15, Appendix B. Section 4, Projected costs and benefits, has been recalculated on the basis of the revised assumptions. In addition, an extra calculation has been added to test the sensitivity of the findings to a reduction in estimated average operating hours (load factor).

As a result of these changes there has been a major reduction in the influence of water cooling in the projected benefits. Reducing cooling water is highly cost-effective in terms of the cost of technical changes in relation to the volume of water saved ($/GL saved). The changed assumptions result in a 95% reduction in the most cost-effective means of saving water in CIMs. The reduction in cooling water saving is offset by an increase in potable water savings due to the higher market share of IMHs compared with SCUs. However, the technology costs ($/GL saved) are much higher for the potable water made into shaped ice, so the overall net benefit goes down while the volume saved stays about the same.

Water quality

There does not seem to be a compelling case for taking any immediate action regarding the specification of water quality, given that:

- there is no evidence that lack of water quality specification has been an issue for the USDOE standards or USEPA Energy Star programs
- manufacturers can specify that a filter be used when the product is set up for testing
- wherever test laboratories are located, they are likely to be connected to a reticulated drinking water supply. As such, the water should be of reasonable quality, even if not conforming to the Australian Drinking Water Guidelines or their local equivalent.

If variable water quality emerges as an issue in the administration of the GEMS requirements for CIMS (or WELS regulatory requirements if implemented), the most efficient way to address them may be to include cross-references to the Australian Drinking Water Guidelines in AS/NZS 6400. This would involve additional obligations for manufacturers and laboratories.

Comparative water efficiency ratings

The format of any information declarations made at point of sale, in CIM advertising or in supporting information, is yet to be determined. If made mandatory, the format would be specified in the WELS Standard (AS/NZS 6400) and may include a system of comparative ratings, such as star rating bands.

While the Standards Committee responsible for AS/NZS 6400 and CIM industry experts would determine these details, a specific star rating based on a model’s tested water use would be useful to purchasers to enable comparison of models producing the same type of ice. The alternative of aligning star ratings simply to CIM type could conceal significant differences in water use between models producing a similar type and quality of ice. In addition to a star rating, the actual tested water use in litres/100kg ice should also be labelled.

6. Recommended approach to implementation

There is significant scope for reducing the water consumption of commercial ice makers (CIMs) through addressing market failures. The objectives of the proposed government intervention are to address the failures detailed in Section 2, by:

1. making purchasers aware of lifetime water costs
2. ensuring that consistent and reliable information about water consumption and efficiency is available to CIM purchasers in a form that enables comparison across models
3. ensuring that the information is provided to the purchaser through product advertising or at point of sale, at a time when it can influence product choice
4. overcoming split incentives (where CIMs are purchased by intermediaries not concerned with operating costs) through the adoption of minimum water efficiency standards.

The options summarised below meet these objectives in slightly different ways. All options build on a recent Determination under the GEMS Act which imposes Minimum Energy Performance Standards on CIMs to be supplied or offered for supply after 3 March 2026. It requires suppliers to declare CIM energy use to the GEMS Regulator and allows for the voluntary declaration of CIM water use, measured under the same standard laboratory tests. Therefore, the GEMS Determination may address some water-related objectives as well, but its impact will not be known for some time.

The status quo (Option 1) is for the WELS Regulator to take no additional action, other than to monitor the rate of voluntary declarations to the GEMS Regulator and the way CIM suppliers disseminate that information. It is uncertain whether suppliers will voluntarily declare water use information in sufficient numbers and whether the information will be disseminated in ways and at times that can usefully inform CIM purchasing decisions.

Stakeholder feedback during consultations on the draft Regulatory Impact Analysis suggests that suppliers with significant combined market share plan to voluntarily declare water use when they register their models with the GEMS Regulator. This will not become apparent until early 2026, in the lead up to the GEMS Determination taking effect. Option 1 may well produce some benefit for CIM water consumption at no additional regulatory or administrative cost, but the magnitude of the impact is at present unknown.

This Regulatory Impact Analysis has developed options and compared their projected outcomes with Option 1. Three of the options enhance or mandate the provision of information, and two go further by establishing Minimum Water Efficiency Standards:

- Option 2: Voluntary declaration with WELS support (no new regulation). WELS works with suppliers and purchasers to encourage the declaration of water use to the GEMS Regulator, with the aim of a minimum 80% of registrants declaring water use and representing at minimum 80% of models (ensuring less water efficient models are also covered).
- Option 3A: Product registration, information declaration and labelling (regulated under WELS Act).

- Option 3B: Product registration, information declaration and labelling (regulated under WELS Act) - accelerated implementation without assessing the success of Option 2 if implemented.
- Option 4A: Product registration, Minimum Water Efficiency Standards and information declaration (regulated under WELS Act). This option would exclude the least water efficient products from the market.
- Option 4B: Product registration, Minimum Water Efficiency Standards and information declaration (regulated under WELS Act) – accelerated implementation.

All the options support objectives 1, 2 and 3 as described at the start of this section. Options 4A and 4B support objective 4.

The analysis of costs and benefits, refined after feedback from stakeholders, indicates that all the options would be cost-effective and would result in significant water savings compared with Option 1, unless Option 1 succeeds beyond expectations. Options 2, 3A and 3B are roughly similar in their impacts and net benefits. Minimum Water Efficiency Standards (Options 4A and 4B) indicate significantly higher impacts and net benefits, provided the standards can be set at the optimum levels. If too stringent, they could exclude so many models that they would disrupt the market and possibly exclude some suppliers altogether. If not demanding enough, there would be little or no impact.

It would be risky to set Minimum Water Efficiency Standards without comprehensive data on the water use of the CIM models on the Australian market. Sufficient information may become available under Option 1, and if not, then under Options 2, 3A or 3B. Options which encourage or mandate the disclosure of information are therefore preferable in the first instance.

This is consistent with the feedback received from stakeholders, who supported the principle that the water use of CIMS should be publicly available. While most stakeholders indicated they would voluntarily report the water use for the models they supply, even if not required to do so by law, one respondent advocated mandatory registration and declaration of product information at point of sale (i.e. Option 3A/3B) in preference to a non-regulatory approach (Option 2).

Recommended approach

Given the projections of costs and benefits, feedback from stakeholders and the risks associated with the various options, a staged approach is recommended.

The staged approach would involve:

- Stage 1: Operate under Option 1 (status quo) until March 2026. In this period all CIM suppliers must register products with the GEMS Regulator. Suppliers may make voluntary water use declarations during the registration process. Post March 2026, the number of voluntary declarations made, and the range of models covered will be analysed.
- Stage 2: Based on Stage 1 analysis, decide if there is a need to implement Option 2 (supporting non-regulatory water use declaration and information) or move to Option 3A (regulatory).

- Stage 3: When sufficient data on model water use in response to Stages 1 and 2 become available, consider proceeding to Option 4A, mandatory Minimum Water Efficiency Standards (set at a level to be determined from the declared water use data).

Options 3A/3B and 4A/4B (if adopted) would be implemented through revision of the WELS Standard (AS/NZS 6400), amendment to the existing WELS Determination, and the establishment of a registration process for CIMs, with applicable registration fees.

International context

The recommended approach links to international CIM test standards though its alignment with GEMS Determination requirements. The GEMS Determination allows product registration based on US test standards (the most used), the recently introduced ISO test standard and AS/NZS 4865:2008. The laboratory conditions in each of these three standards are near identical and they give similar results, within the usual limits of testing variance. As nearly all the CIMS supplied in Australia are imported, the acceptance of results from international test standards reduces compliance costs.

Minimum Water Efficiency Standards is a separate issue. Currently, the only legislated CIM Minimum Water Efficiency Standards are those relating to cooling water use under US DOE regulations. Given the low market share of water-cooled CIMs on the Australian market and the high rate of cooling water recirculation there is no case for adoption of the US DOE standards at present, although this may change in future.

The US Energy Star program sets voluntary Minimum Water Efficiency Standards for the efficiency of potable water use for CIMs to be eligible for Energy Star certification. These standards provide a benchmark for potential future WELS Minimum Water Efficiency Standards. However, until there is reliable information on the potable water efficiency of products on the Australian market, it is not known whether adoption of the Energy Star criteria, or some other level, is feasible.

Regarding potential WELS star rating labelling for CIMs, there is no international precedent. The Energy Star program allows certified products to carry an endorsement label but not a comparative rating. In fact, the Australian WELS label based on AS/NZS 6400 is the most comprehensive in the world. If labelling was deemed necessary as indicated under Stage 2 of the recommended approach, it would be logical to incorporate a CIM water label into AS/NZS 6400.

7. Evaluation of option

The Impact Assessment process began with consideration of five self-contained and at least initially, mutually exclusive options. Following consultation and consideration of the options, it has been concluded that the most relevant approach would be to combine elements of various options into a specific sequence of staged actions, depending on measured and achieved outcomes at various stages.

The first critical decision point in the preferred staged approach is whether to follow Option 1 with Option 2 or Option 3A.

The decision on which option to adopt is time-bound. By March 2026, it should be apparent whether suppliers have chosen to voluntarily declare water use information to the GEMS Regulator. There is a risk that some may choose not to do so, even though they would have the data from the energy tests and so incur no further testing costs. The reasons for a lack of declaration may include that suppliers:

- do not see a commercial advantage in declaring the information, especially for models with poor water performance
- do not wish to incur any further administrative effort no matter how minor
- do not wish to increase their liability should the water use values be found to be incorrect in subsequent regulatory testing
- may wish to continue to publish more favourable water use values based on non-standard operating conditions.

Even if water use is made public on the GEMS Energy Rating website, there is a risk that purchasers may be unaware of its availability at the time of their purchase decision, as there are no requirements to provide the information at point of sale, in advertising or product display. The only link to the GEMS Energy Rating website is the requirement in the GEMS Determination to include the GEMS registration number whenever a product is advertised or offered for sale or supply, whether in print, in store or online.

The GEMS registration number will be in the format “AIMXXXX” or “NIMXXX” depending on whether the models was registered with the Australian or the New Zealand regulator. Its main value of the registration number is for compliance checking by the GEMS Regulator. Without additional explanatory text, the simple appearance of the number is not likely to prompt a purchaser to go to the GEMS Energy Rating website to check and compare model energy and (if available) water use.

The success of Option 1 will need to be measured regarding the following criteria:

- The proportion of suppliers registering CIMs with the GEMS Regulator that have voluntarily declared water use for any model by 3 March 2026. The suggested threshold is 80%. This can be evaluated solely through analysis of the GEMS Energy Rating website.
- The proportion of CIM models registered with the GEMS Regulator for which water use has been declared by 3 March 2026. The suggested threshold is 80% across all suppliers. This can be evaluated solely through analysis of the GEMS Energy Rating website.

- The extent to which CIM suppliers highlight standardised water use data and/or refrain from including non-standard data in their product information and advertising. This will be more difficult for WELS to evaluate because numerous websites and other data sources will need to be monitored, and the assessments will include subjectivity.

If Option 1 is found to fail these evaluation criteria it will be necessary to decide whether to proceed with Option 2 (non-regulatory) or Option 3A (regulatory). If the shortfalls are relatively minor, and there is evidence that suppliers are moving in the direction of making water use data more consistent and prominent in their communications and are prepared to work constructively with WELS, Option 2 would be appropriate. If this result is not achieved and there are major shortfalls in the quantified targets and lack of evidence of engagement, it would be necessary to move to Option 3A.

The recommended staged approach to implementing is time-bound. If a decision is made in mid-2026 to proceed from Option 1 to Option 3A it would take at least two years to develop the criteria, amend the WELS Standards (AS/NZS 6400) and to consult and make the necessary amendments to the WELS Determination. Registration system changes and associated funding approval may take a further 12 months to obtain and deliver. Consideration would also be needed regarding phasing in the mandatory requirements, such as the 12 months given by the GEMS Regulator, for suppliers to register products with the WELS Regulator once the WELS registration system has been enabled to accept CIM registration applications. Noting that some of these processes may overlap to a degree, complete data on the water use of all WELS registered CIMs would not be expected to become available to the WELS Regulator until after 2028.

The effects of longer lead times have been tested in the cost-benefit modelling. The further the program is pushed into the future, the lower the present value of both costs and benefits. An implementation delay of two years would mean that the present value (in 2025 $) of costs and benefits would be 0.87 times as great as under the current timing assumptions, at the central discount rate of 7%. At 3% discount rate the multiplier would be 0.94 and at 10% discount rate it would be 0.83.

Under the recommended approach, some key decision points will be in the future: mid 2026 to decide if Option 1 is adequate; and later still for deciding whether to set Minimum Water Efficiency Standards, and at what level. These timing uncertainties would not invalidate the conclusion that all options are cost-effective.

When the WELS registration system is populated with water use data it could be analysed to measure the following:

- The model-weighted average water-intensity (L/kg) for each of the 12 classes of CIM (as distinct from the sale-weighted average, which would require confidential sales information which suppliers are generally reluctant to share).
- The margin by which the average water-intensity values fall above or below comparable minimum standards for their class (e.g. the USDOE and USEPA Energy Star standards).
- The number of existing models that would be excluded, and the consequent change in average water-intensity that would result from setting Minimum Water Efficiency Standards at various levels (noting that new models may be introduced in response to such standards).

The more information there is on CIM product sales the more the analysis can be fine-tuned. In general, an initial minimum standard (whether for energy or water performance) might be set a level that excludes about a third of the products of that type at time of implementation. Removal of a greater proportion of products would disrupt the market and removal of fewer products would mean the impact is too limited.

A decision about whether to proceed from Option 2 or Option 3A to Option 4A (Water Efficiency Minimum Standards) could be made by 2029. If it was found that information alone was impacting the market sufficiently, then minimum standards would not be necessary. If this was not the case, Minimum Water Efficiency Standards would need to be introduced into the WELS Standard (AS/NZ6400). The WELS Determination would then need to be amended, WELS registration system updated, and provision of appropriate notice to industry of the changes.

Implementation Risks

The preferred staged approach is to implement Stage 1 (Option 1) until March 2026, then if this is not sufficiently effective proceed to Stage 2. Stage 2 involves either adoption of Option 2 (if the shortfall from targets is minor) or Option 3A (if the shortfall is major). The case for Stage 3 (Option 4A - Minimum Water Efficiency Standards), can only be determined once Stages 1 or 2 have yielded sufficient information.

There are risks to the delivery of the recommended approach, as well as risks to its effectiveness.

Implementation will require the commitment of WELS Regulator resources over several years to monitor the relevant water related data collected by the GEMS Regulator (and possibly the WELS Regulator), to analyse and evaluate, and to make decisions at key points. Access to the necessary data should be facilitated by the fact that both Regulators are within the same Australian Government department. To maintain the recommended approach for the necessary duration it should be incorporated into the WELS work plan, alongside those related to other WELS products.

The administrative resources required under the non-regulatory Options 1 and 2 are relatively minor. They would increase if the staged approach led to Option 3A, which would involve amendment of the WELS Standards (AS/NZS 6400), WELS Determination and WELS registration system. As these changes are likely to be required for other new WELS products there would be economies of scale in managing them together.

Table 13 shows identified implementation risks and approaches to mitigate.

TABLE 13 IMPLEMENTATION RISKS AND MITIGATION

Risk	Consequence/Likelihood	Mitigation/Potential control
Lack of awareness by CIM suppliers of regulatory testing and reporting requirements.	Potential to undermine both supplier compliance with mandatory GEMS requirements and voluntary declaration of water use. The likelihood of this consequence occurring is low.	Use of the Water Rating website, newsletters and other information channels to advise businesses of the recommended approach and to urge participation by CIM suppliers.

Low rates of voluntary declaration of product water-use.	Insufficient data available for analysis to inform Option 4 requirements. The Likelihood of this consequence is low (based on statements made by stakeholders during consultation).	The staged approach to implementation of options and the Stage 1 decision point, is designed to address this risk.
Misreporting of voluntary water use rates, either inadvertently or deliberately.	Potential to mis-lead purchasers when considering competing products. Likelihood of this consequence occurring is low.	The WELS Regulator can reduce this risk by establishing its own check test processes, in addition to those undertaken by the GEMS Regulator. The costs have been factored into the Impact Analysis (Table 7). Additionally, as the commercial value of product water-efficiency becomes more apparent and valued, it is likely that competitors will alert the Regulators to anomalies.
Indifference of purchasers to the information provided. Even if there is high supplier participation and the information is accurate, it is possible that CIM purchasers will remain unaware of it or, if aware, choose not to make use of it in their decisions.	Information declaration will not deliver expected reductions in water use. Likelihood of this occurring is moderate (based on stakeholder views that water use considerations are currently a low priority for purchasers.	Levels of awareness and engagement can be monitored through stakeholder surveys. If awareness remains low, and the data available to the WELS Regulator reveals a widespread range in CIM water use, this will support a case for proceeding to Mandatory Water Efficiency Standards. The provision for deciding whether to proceed from Stage 2 to Stage 3 is specifically intended to address this risk.

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Appendix A Questions for stakeholders

General survey questions

1. Are you a member of an industry association that represents your commercial ice maker interests?
    a. Yes
    b. No
    c. Question not relevant to my business/organisation

    1.1. Please list industry association memberships.

2. Do you see a competitive advantage for manufacturers and suppliers to promote the water use or water efficiency of commercial ice makers in Australia?
    a. Yes
    b. No

3. Are you a commercial ice maker supplier?
    a. Yes
    b. No

    3.1. What percentage of your commercial ice makers are water-cooled?

4. In your view, is the total Australian market share of water-cooled commercial ice makers:
    a. Increasing
    b. Decreasing
    c. Remaining steady
    d. Don't know

Survey questions relating to Options 1 and 2 of the Regulatory Impact Analysis

5. The Greenhouse and Energy Minimum Standards (GEMS) Regulator has implemented Minimum Energy Performance Standards (MEPS) for commercial ice makers, to come into effect in March 2026.

    As part of this regulation, the GEMS Regulator has introduced the voluntary declaration of a model's potable water use rate and condenser water use rate (for water-cooled products) in litres/kg ice produced. This is part of the product registration process. Water use rates are measured during the test for production rate and energy use.

    When registering your products for MEPS, do you intend to declare potable water use rates and condenser water use rates (for water-cooled products)?
    a. Yes, all models
    b. Yes, some models

c. No
d. I do not have responsibility for registering commercial ice makers with the GEMS Regulator

5.1 Please indicate why you are choosing to declare your product's water use rate.

5.2 Please indicate why you are choosing not to declare your product's water use rate.

6. On a scale of 1 to 5, with 1 being completely unsupportive and 5 being completely supportive, please rate your level of support for the principle that the potable water use (L/kg ice) should be declared for all commercial ice maker models.

1	2	3	4	5	6
Completely unsupportive	Unsupportive	Neutral	Supportive	Completely supportive	Don't know

6.1. Please explain why.

7. On a scale of 1 to 5, with 1 being completely unsupportive and 5 being completely supportive, please rate your level of support for the principle that the condenser water use (L/kg ice) should be declared for all water-cooled commercial ice maker models.

1	2	3	4	5	6
Completely unsupportive	Unsupportive	Neutral	Supportive	Completely supportive	Don't know

7.1. Please explain why.

8. Should information about the water performance of commercial ice makers be published on a government website and made public?
   a. It should not be required.
   b. It should be a business decision for industry (manufacturers and suppliers).
   c. Industry should be actively encouraged by other parties to publish the information (such as industry associations, water authorities and/or the Australian Government).
   d. It should be mandatory for industry to publish the information.

   8.1. Please explain why.

9. If a supplier volunteers to declare the water use rates of their commercial ice maker models as part of their GEMS registration, would it be useful to establish rules for standard information provided to purchasers of CIMS, so they can easily compare products?

   a. No - leave it to the market.

b. Yes - the information should be available to purchasers and should be standardised.

9.1. Please explain why.

Survey questions relating to Option 3 of the Regulatory Impact Analysis

10. On a scale of 1 to 5, with 1 being completely unsupportive and 5 being completely supportive, please indicate how strongly you support the principle that there should be mandatory water efficiency information (of potable and condenser water use) at point of sale for purchasers, and that products must be registered under the Water Efficiency Labelling and Standards Act 2005?

1	2	3	4	5	6
Completely unsupportive	Unsupportive	Neutral	Supportive	Completely supportive	Don’t know

10.1. Please explain why.

11. Are there any product types or categories falling within the definition of commercial ice makers (as specified in the consultation draft Regulatory Impact Analysis) that should be excluded from the requirement to declare water use rates or water efficiency?
    a. Yes
    b. No
    c. Don’t know

11.1. Please explain why.

Survey questions relating to Option 4 of the Regulatory Impact Analysis

12. On a scale of 1 to 5, with 1 being completely unsupportive and 5 being completely supportive, please indicate how strongly you support the principle that there should be Minimum Water Efficiency Standards for commercial ice makers (potable water use and condenser water use [when relevant]), expressed as a maximum L/kg ice in relation to production capacity?

1	2	3	4	5	6
Completely unsupportive	Unsupportive	Neutral	Supportive	Completely supportive	Don’t know

12.1. Please explain why.

13. If Minimum Water Efficiency Standards were adopted for potable water consumption, should they be:
    a. The same as the commercial ice maker water use standards adopted by the US Energy Star program?

b. Less stringent (i.e. allow for more potable water use per kg ice)?
c. More stringent (i.e. allow for less potable water use per kg ice)?
d. Unsure

14. If Minimum Water Efficiency Standards were adopted for condenser water consumption, should they be:
    a. The same as the commercial ice maker water use standards adopted by the US Department of Energy?
    b. Less stringent (i.e. allow for more condenser water use per kg ice)?
    c. More stringent (i.e. allow for less condenser water use per kg ice)?
    d. Not sure

15. Are there any product types or categories falling within the definition of commercial ice makers (as specified in the Regulatory Impact Analysis) that should be excluded from Minimum Water Efficiency Standards?
    a. Yes
    b. No
    c. Don't know

    15.1 Please explain why.

Closing survey questions

16. Do you agree with the assumptions in the Regulatory Impact Analysis regarding market size, water use, water efficiency, costs or any other aspects of the analysis?
    a. Agree
    b. Don't agree

    16.1. Please explain why and if possible, provide additional data or information on any of the assumptions.

17. Please rank the policy options to improve the water efficiency of commercial ice makers in order of effectiveness – **with 1 being the most effective**. Please don't allocate a ranking to options you don't believe can help improve water efficiency.

    Rank up to 4

    a. To not regulate commercial ice makers under the WELS Act (Status quo).
    b. To encourage businesses who register commercial ice makers with the Greenhouse and Energy Minimum Standards Regulator to declare water use rates, and to publish water use rates to inform consumers.

c. To regulate commercial ice makers under the WELS Act and require mandatory registration and declaration of product information at point of sale.
d. To regulate commercial icemakers under the WELS Act and require mandatory registration; declaration of product information at point of sale; and application of minimum water efficiency standards.

17.1. Why do you feel this way?

18. What opportunities or difficulties would the proposed options create for your business or the industry?

19. Do you have additional comments you would like to provide?
   a. Yes
   b. No

19.1. Please provide further information.

Appendix B Cost-benefit modelling details

Information on the size of the Australian market for CIMs (units with water supply and drainage connections, with production capacity up to 1000 kg/24 hr at 32/21 degrees) was obtained from interviews with suppliers and from analysis of Australian Border Force Integrated Cargo System import data (E3 2023). It is estimated that the market is currently about 10,500 units per year. Given that the typical service life of each unit is 7 to 10 years and considering stock growth of about 2.0% per annum, the estimated total stock is currently about 63,000 units.

The modelling considers the projected capital costs of the CIMs that are expected to be purchased in Australia from 2025 to 2040 (i.e. 16 calendar years). It is assumed that 100% of each year's cohort survives to the year 8, 50% to year 9, and none to year 10. This implies an average service life of 8.5 years. Therefore, the model calculates the net present value (NPV) of total national CIM maker water consumption as far out as 2049, using the range of discount rates required by the OIA (4%, 7% and 10%).

Water Prices

The model is structured by jurisdiction (states and territories) because water and wastewater prices vary, as indicated in Table 14.

TABLE 14 ESTIMATED MAINS-SUPPLIED WATER CHARGES BY JURISDICTION, 2025

	Region	Businesses ('000)		Total $/kL	Supply $/kL	Waste $/kL
NSW	Metro	148.4	51%	3.99	2.69	1.30
	Other	143.6	49%	3.20	2.47	0.73
	Total	292.0		3.60	2.58	1.02
Victoria	Metro	172.7	72%	4.79	3.30	1.49
	Other	66.9	28%	4.30	2.49	1.80
	Total	239.6		4.66	3.08	1.58
Queensland	Metro	77.3	63%	7.44	4.90	2.54
	Other	45.5	37%	3.25	3.25	0.00
	Total	122.8		5.89	4.29	1.60
SA	Total	60.0		3.21	3.21	0.00
WA	Metro	67.1	85%	7.10	2.85	4.25
	Other	12.2	15%	3.71	3.71	0.00
	Total	79.3		6.58	2.98	3.59
TAS	Total	22.4		1.22	1.22	0.00
NT	Total	10.0		3.86	3.86	0.00
ACT	Total	10.9		2.20	2.20	0.00
Australia		837.0		4.41	3.03	1.38

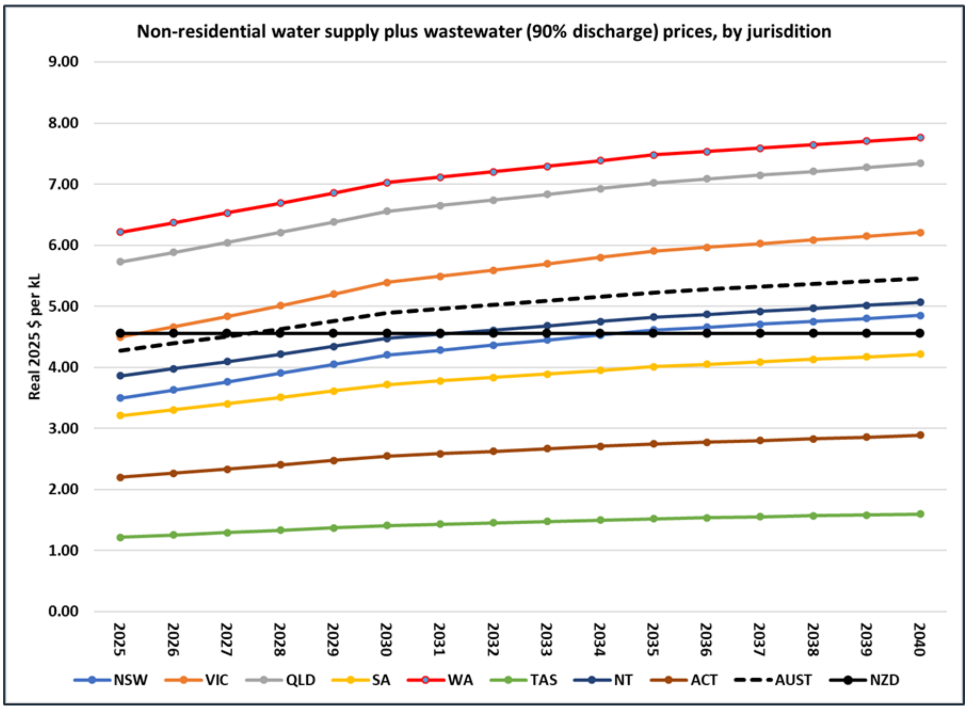
The prices in Table 14 are derived from the ABS National Water Accounts.[15] They are based on the non-residential (i.e. business, excluding industrial) volumetric tariffs published by the metropolitan water authorities and the three largest non-metro suppliers in each jurisdiction. A state/territory average price was calculated from the number of non-residential customers reported by each water authority. The components of the water price are:

- Supply charge ($/kL, taking the second-highest tier where there are different steps); plus
- Wastewater charge ($/kL) where wastewater is charged on a volumetric basis, assuming 90% of the portable water supplied is discharged to the sewer (water authorities levy wastewater charges on as much as 95% of supplied water volumes for restaurants and cafes; less for larger institution such as hotels or hospitals).

Some authorities do not levy a volumetric wastewater charge, but a fixed annual fee based on rated property value or some other metric. In those cases, there will be no wastewater cost saving to the CIM user from an increase in its water efficiency.

Figure 12 projects real business water prices to 2040 (excluding the effects of inflation). The early years are informed by price rises already announced by major water authorities and the rest are author estimates. Some water authorities have the power to impose surcharges in years when water storages are low, and desalination plants need to be run. These have not been applied.

FIGURE 12 PROJECTED WATER PRICES BY JURISDICTION



[15] https://www.abs.gov.au/statistics/environment/environmental-management/water-account-australia/latest-release#data-downloads.

Operating costs

Table 15 summarises the estimated breakdown of the CIM market in 2025, based on Australian Border Force Integrated Cargo System import data and information provided by suppliers during consultations. The industry does not maintain any centralised data collection. These market share estimates were published in the GEMS MEPS Regulatory Impact Statement (E3 2023) and there was no disagreement from stakeholders. Industry estimates are that IMH and split units operate at about 80% of their maximum capacity (i.e. equivalent to 19.2 hrs per day) and SCUs at 70% (16.8 hrs/day). This enables calculation of their average annual ice production, and hence total annual energy and water consumption under each water-intensity scenario. SCUs account for 60% of sales but are a much smaller output capacity than IMHs, so account for only 20% of ice made.

TABLE 15 CAPACITY, MARKET SHARE AND BAU WATER-INTENSITY BY CIM CLASS

	Average kg/24 hr capacity	Market share (Draft IA)	Market share (Final IA)	Potable water		Condenser water	
				litres/kg ice - BAU		litres/kg ice - BAU	
				2025	2040	2025	2040
1. IMH - Batch - Air	281	21%	29%	2.00	1.94		
2. IMH - Continuous - Air	281	11%	11%	1.13	1.11		
3. IMH - Batch - Water	330	3%	0.5%	2.00	1.94	17.50	17.18
4. IMH - Continuous - Water	330	1%	0.5%	1.13	1.11	16.40	15.79
5. SCU - Batch - Air	55	51%	43%	2.50	2.46		
6. SCU - Continuous - Air	65	5%	9%	1.23	1.21		
7. SCU - Batch - Water	72	3%	0.5%	2.50	2.46	17.00	16.83
8. SCU - Continuous - Water	85	1%	0.5%	1.23	1.21	16.25	16.09
9. RCU - Batch - Air	420	1%	3%	2.00	2.00		
10. RCU - Continuous - Air	420	1%	1%	1.13	1.11		
11. RCRC - Batch - Air	424	1%	1%	2.00	1.99		
12. RCRC - Cont - Air	424	1%	1%	1.13	1.11		
		% sales		% of total ice made			
IMH total		36%	41%	69%			
SCU total		60%	53%	16%			
Split total		4%	6%	15%			
Air-cooled total		92%	98%	98%			
Water-cooled total		8%	2%	2%			
Batch total		80%	77%	72%			
Continuous total		20%	23%	28%			

Table 16 presents the lifetime operating cost of each of the CIM types in Table 15 under a 'no-measures' scenario, before the impacts of MEPS or any WELS measures (this is called Option 0). These are calculated for units with the average characteristics for that class as purchased in 2025, Australian-average projected energy prices (as detailed in E3 2023) and the projected water prices in Figure 12. The streams of future energy and water expenditures are discounted at 7% to bring them to a present value (PV). This type of information is currently unavailable to prospective CIM purchasers.

TABLE 16 ESTIMATED LIFETIME CAPITAL AND OPERATING COSTS FOR INDIVIDUAL ICEMAKERS, 2025 (AUSTRALIAN AVERAGE)

	Purchase price	NPV energy	NPV potable water	NPV cooling water (95% reuse)	NPV cooling water (0% reuse)	Total (for water-cooled types @ 95% reuse)	Total (for water-cooled types @ 0% reuse)	Potable and cooling water as a % of total cost (for water-cooled types @ 95% reuse)	Potable and cooling water as a % of total cost (for water-cooled types @ 0% reuse)
1. IMH - Batch - Air	$ 4,287	$ 27,301	$ 4,546	-	-	$ 36,134	$ 36,134	12.6%	12.6%
2. IMH - Cont - Air	$ 4,323	$ 24,688	$ 2,174	-	-	$ 31,184	$ 31,184	7.0%	7.0%
3. IMH - Batch - Water	$ 4,734	$ 27,107	$ 3,737	$ 2,320	$ 44,075	$37,877	$ 79,653	9.9%	60.0%
4. IMH - Cont - Water	$ 4,734	$ 26,718	$ 3,737	$ 2,184	$ 41,493	$37,373	$ 76,682	10.0%	59.0%
5. SCU - Batch - Air	$ 3,165	$ 8,283	$ 973	-	-	$ 12,421	$ 12,421	7.8%	7.8%
6. SCU - Cont - Air	$ 3,025	$ 7,099	$ 559	-	-	$ 10,683	$ 10,683	5.2%	5.2%
7. SCU - Batch - Water	$ 4,530	$ 7,991	$ 1,019	$ 433	$ 8,229	$13,973	$ 21,770	7.3%	44.5%
8. SCU - Cont - Water	$ 4,400	$ 8,671	$ 1,203	$ 481	$ 9,144	$14,756	$ 23,418	8.2%	44.2%
9. RCU - Batch - Air	$ 6,184	$ 35,702	$ 6,859	-	-	$ 48,745	$ 48,745	14.1%	14.1%
10. RCU - Cont - Air	$ 6,184	$ 35,702	$ 3,875	-	-	$ 45,761	$ 45,761	8.5%	8.5%
11. RCRC - Batch - Air	$ 6,120	$ 41,194	$ 6,794	-	-	$ 54,109	$ 54,109	12.6%	12.6%
12. RCRC - Cont - Air	$ 6,120	$ 36,142	$ 3,839	-	-	$ 46,101	$ 46,101	8.3%	8.3%

Projected trends

Water-intensity is projected to change at different rates under each WELS option. The trends for the largest-selling product classes are illustrated in Figure 13 to

Figure 18. In these diagrams:

- Option 0 is the 'no-regulations' case, without either GEMS or WELS impacts. In this scenario water-intensity is not expected to change.
- Option 1 (status quo) shows the effects of the GEMS Determination. While this are mainly directed at energy-intensity, it is expected that there will be some reduction in water-intensity as well, as suppliers review their product range.
- Option 2 shows a faster reduction in water-intensity due to WELS efforts to encourage declaration of water-intensity values and promote the importance of water use to CIM purchasers.
- Options 3A and 3B show a faster reduction in water-intensity than Option 2 due to mandatory WELS labelling, though the later implementation of Option 3A leads to a small delay in the rate of improvement in the first years.
- Options 4A and 4B involve Minimum Water Efficiency Standards (expressed as water-intensity values). These are shown as a set of horizontal lines:
    - 'USEPA std': for a CIM to qualify for the USEPA's Energy Star certification its potable water-intensity use must be at or below this value.
    - 'USEPA Max (2024)': the highest declared water-intensity value by any Energy Star certified CIM (of that class) at the end of 2024 (see Appendix C).
    - 'USEPA Min (2024)': the lowest declared water-intensity value by any Energy Star certified CIM (of that class) at the end of 2024 (see Appendix C).
    - 'USEPA Avg (2024)': the average declared water-intensity value by all Energy Star certified CIMs (of that class) at the end of 2024 (see Appendix C).
    - 'Option 4B WELS Std': this proposed mandatory value is less stringent (i.e. more conservative) than the USEPA standard, because it would be based on very little data on the Australian product range.
    - 'Option 4A WELS Std: this proposed mandatory value is more stringent than Option 4B WELS Std (i.e. less conservative) because it would be based on complete data on the Australian product range.
- Under the Minimum Water Efficiency Standards options, all products must meet the standard by the prescribed date but are free to better it and are encouraged to do so under the influence of WELS labelling. 'Option 4A Avg' and 'Option 4B Avg' show these trends.

For continuous production CIMS (e.g. Figure 14) the potable water-intensity range is much narrower than for batch CIMs. The existing water-intensity range in the Australian market is probably already below the USEPA standard and there is less scope for further improvement.

Figure 15 and Figure 16 show the equivalent cooling water efficiency projections for water-cooled IMH models. The L/kg values are much higher and the reference standards on the diagrams are USDOE rather than USEPA (the USDOE sets cooling water standards, while the USEPA sets potable water standards).

FIGURE 13 PROJECTED WATER-INTENSITY TRENDS FOR IMH-AIR-BATCH CIMS

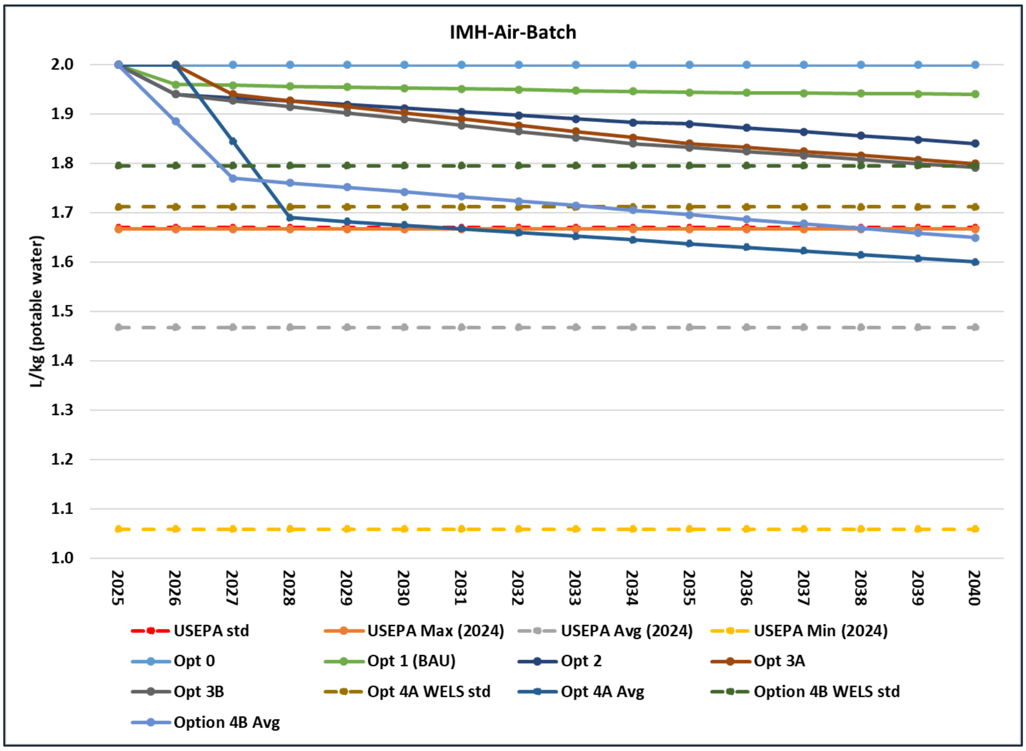


FIGURE 14 PROJECTED WATER-INTENSITY TRENDS FOR IMH-AIR-CONT CIMS

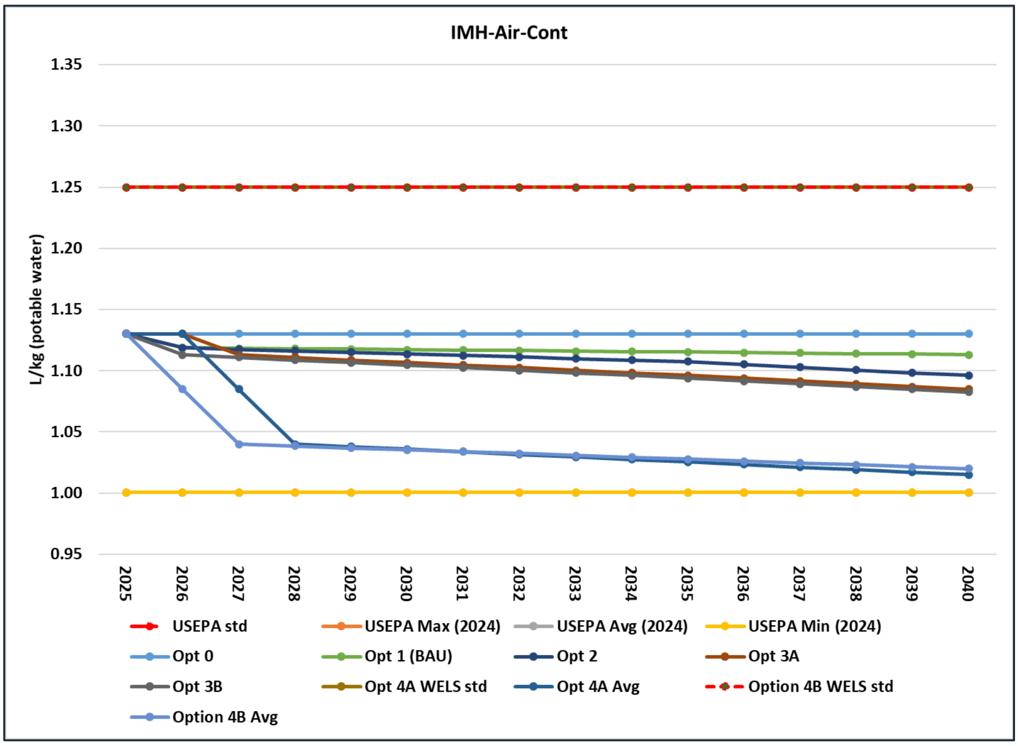


FIGURE 15 PROJECTED COOLING WATER-INTENSITY TRENDS FOR IMH-WATER-BATCH CIMS

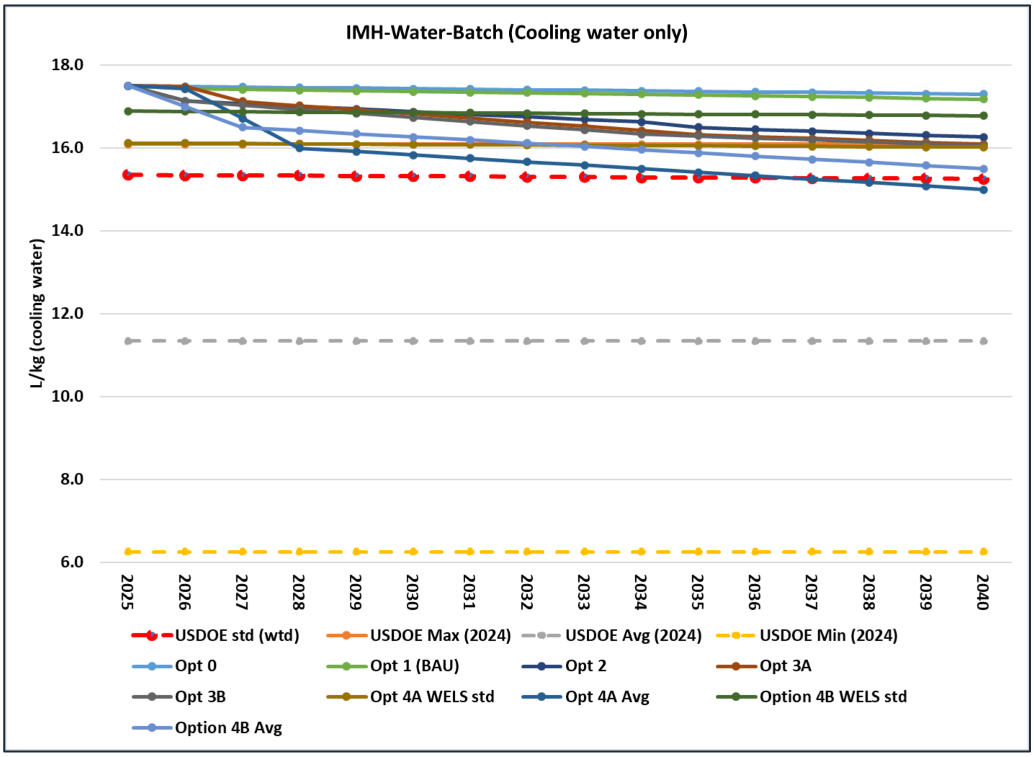


FIGURE 16 PROJECTED COOLING WATER-INTENSITY TRENDS FOR IMH-WATER-CONT CIMS

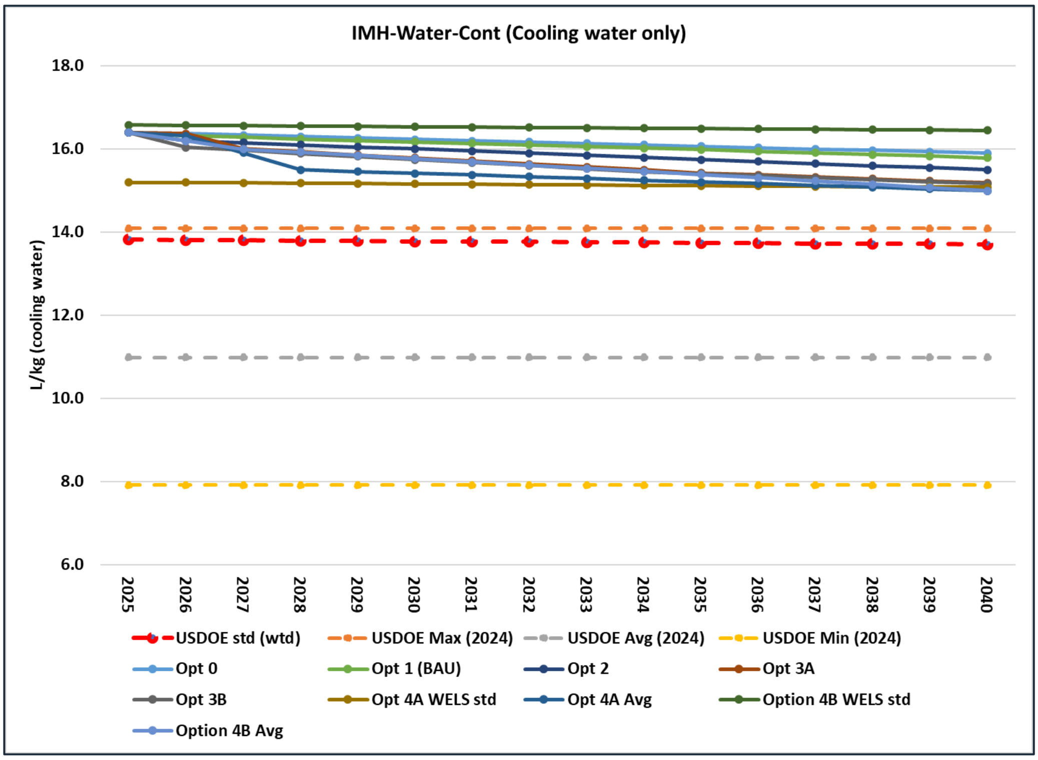


FIGURE 17 PROJECTED WATER-INTENSITY TRENDS FOR SCU-AIR-BATCH CIMS

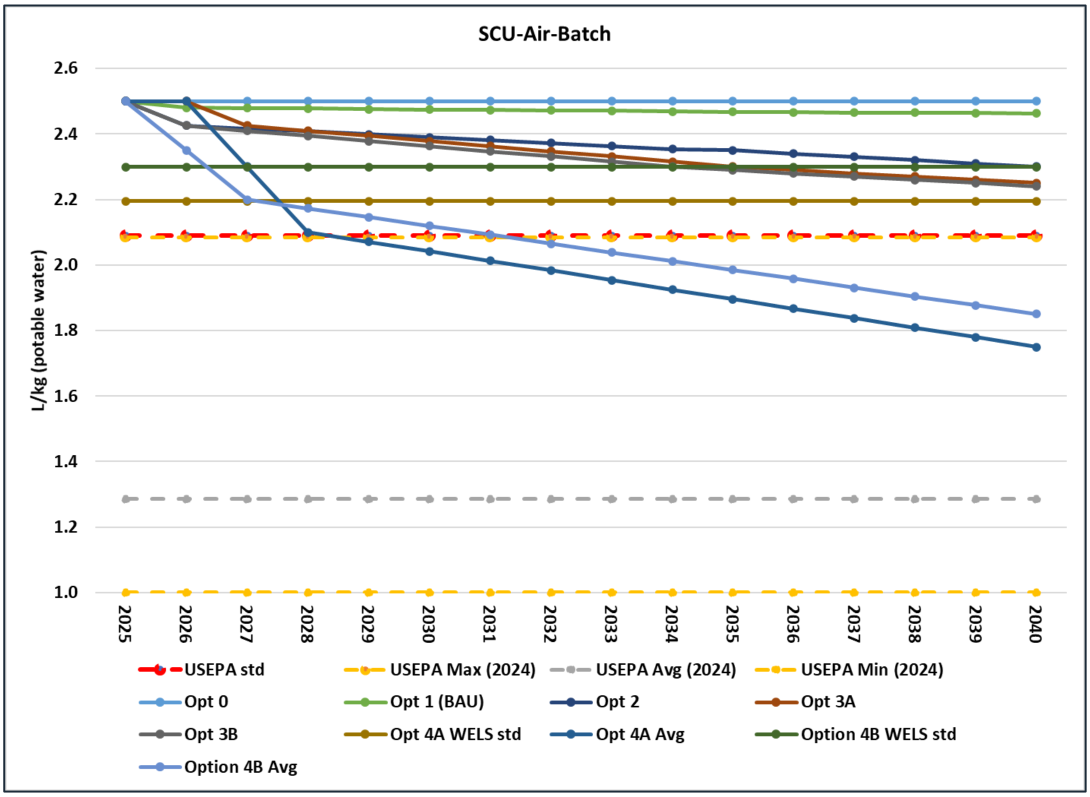
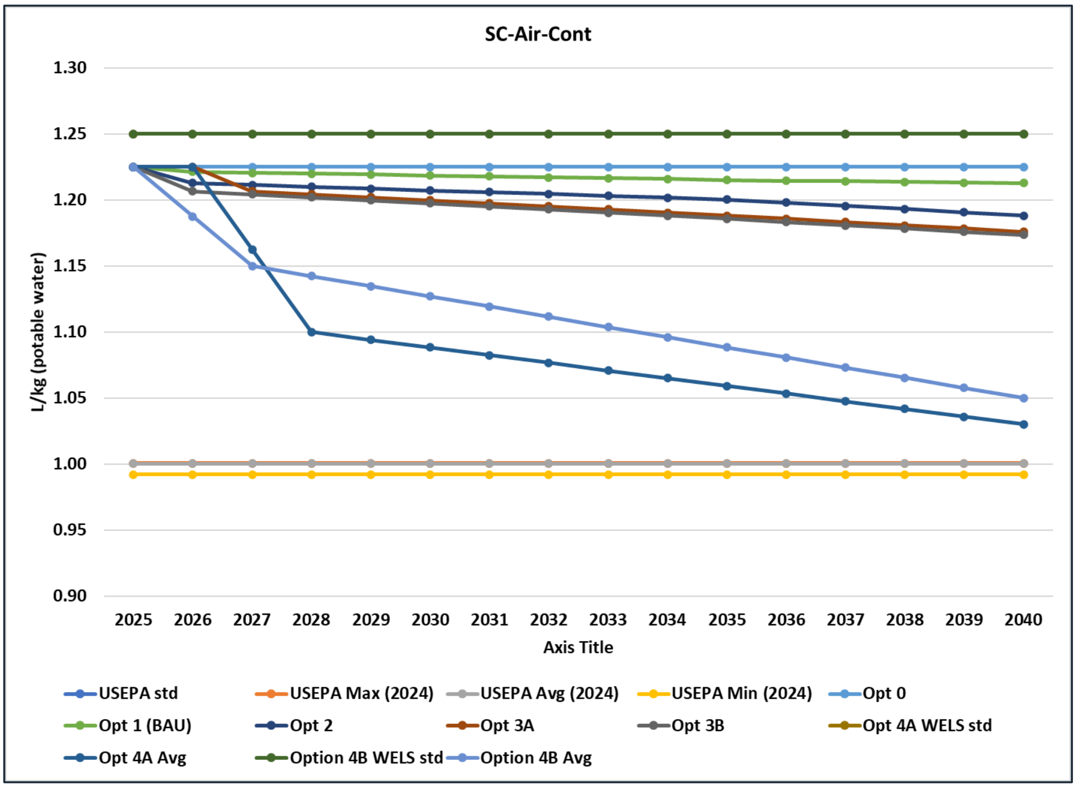


FIGURE 18 PROJECTED WATER-INTENSITY TRENDS FOR SCU-AIR-CONT CIMS



The kilolitres of water saved under each option is represented by the area between the trendline for that option and the Option 1 (status quo) trendline, multiplied by the number of units entering service, the average kg of ice produced annually per unit, and the average number of years in service. The savings increase as each new cohort enters service up to the end of the modelling period (2040), after which savings decline as units retire. The aggregate water savings for the whole of Australia are illustrated in Section 4.2.

Product prices

It is prudent to assume that there is a relationship between the water efficiency of a product and its cost of production. A more water efficient product may contain higher quality components or more complex sensors and controls. The costs of research and development will also need to be recovered. In fact, these relationships have been found to be more complex in practice, and for some products the introduction of MEPS had no apparent impact on prices (E3 2011). The re-engineering of products can lead to material and production savings, and the replacement of electro-mechanical with electronic controls may bring both cost and water savings. Furthermore, changes in production costs may not be passed on at all if the market is highly competitive or over-recovered by charging a premium for high-efficiency products.

The relationship between price and water efficiency can be captured in modelling by assuming a Price/Efficiency (P/E) ratio. A P/E ratio of 1.0 implies that a 10% increase in water efficiency brings about a 10% increase in price. A P/E ratio of 0.5 implies a 5% price increase for every 10% increase in efficiency and so on.

Three types of technical change will be happening simultaneously:

- Improvements in average energy efficiency due to the GEMS regulations. The GEMS Regulatory Impact Statement estimated P/E ratios in the range 0.3–0.6 (depending on category of CIM) at the time of MEPS implementation, rising to 0.5-0.8 by year 15 as further technical improvements become more difficult. These price increases are built into the status quo (Option 1) of the Regulatory Impact Analysis.
- Improvements in potable water efficiency. There is a very wide range in potable water efficiency for batch production CIMs, but very little in continuous production types. A P/E ratio of 0.1-0.15 has been assumed for information only options (2, 3A and 3B) and 0.2-0.3 for the Minimum Water Efficiency Standards options (4A and 4B).
- Improvements in cooling water efficiency (for water-cooled products). There is a very wide range in condenser water efficiency across water-cooled products. A P/E ratio of 0.2-0.3 has been assumed for cooling water efficiency improvements under all options.

The price increase effects are additive: for water-cooled categories, separate cost and price effects are estimated for potable water efficiency and condenser water efficiency improvements. Both volumetric water charges and price impacts are net of goods and services tax (GST), which is a transfer payment – nearly all CIM users are businesses which can claim back any GST payments.

The impact of any given change in average water-intensity on product purchase price in any year is calculated separately for each of the 12 product classes as follows:

$$\frac{\text{Status quo average L/100kg} - \text{post-measure average L/100kg}}{\text{Status quo average L/100kg}} \times \text{Status quo average \$/unit} \times \text{P/E ratio}$$

Administrative costs

Apart from an increase in CIM prices for purchases, WELS interventions will carry costs for both industry and the WELS Regulator. Table 4**Error! Reference source not found.** in Section 4.3 presents the cost e stimates used in the modelling.

CIM importers will bear the costs of interacting with the WELS Regulator and for the mandatory options, registering products, fixing labels and ensuring compliance. Secondary distributors (who obtain CIMs from the importers to on-sell) would also incur compliance costs, for ensuring that labels and other information requirements apply at the points of advertising and display. It is assumed that adding CIMS to the WELS workload costs $75,000 per year for Option 2 (non-regulatory) and $150,000 per year for the mandatory options – the equivalent of a full-time APS 6 officer, including overheads.

It is assumed that the WELS Regulator will commission some check tests each year even in Option 2 to ensure the integrity of the voluntary declarations. Suppliers are more inclined to participate in voluntary programs if they believe that all parties are making accurate declarations.

The present values in 2025 of the stream of future administrative costs for each option are illustrated in Figure 10. They are combined with water efficiency induced increases in purchase price in Figure 9.

Appendix C US data on CIM water use

The USEPA Energy Star (a voluntary accreditation program) only covers air-cooled products, which account for the great majority of the market, both in the USA and in Australia (i.e. GEMS Classes 1,2,5,6,9-12). To qualify for Energy Star, a SCU batch type ice maker (Class 5) must have a potable water consumption of no more than 25 gals/100 lb ice (2.08 litres per kg) and no more than 20 gals/100 lb ice (1.67 litres per kg) for other air-cooled configurations. A continuous type CIM must use no more than 15 gals/100 lb ice (1.25 litres per kg), whatever the configuration.

The only consistent data set on the potable water use of CIMs is the USEPA's list of Energy Star certified models. Analysis of the current list reveals that for batch type CIMS, some models just meet the Energy Star limit, but most are considerably more water efficient (Table 17). The most water efficient batch models convert all the potable water to ice (i.e. 1.0 litre/kg) and use half the water of the least water efficient certified product. As three quarters of the air-cooled CIM models on the US market are not certified for Energy Star, it may be safely assumed that many of those use more potable water than the Energy Star limit.

For continuous production models, there is very little variation in potable water efficiency. All models claim around 1.0 litres/kg, well below the Energy Star limit of 1.25.

Table 17 Potable water use by USEPA Energy Star certified CIMs, 2024

Production	Configuration	Models	L/100kg				
			ES limit	Max	Min	Avg	Max/Min
Batch	Ice Making Head	141	1.67	1.67	1.06	1.47	157%
	Remote Condensing	67	1.67	1.67	1.12	1.52	149%
	Self Contained	49	2.08	2.08	1.00	1.29	208%
Continuous	Ice Making Head	18	1.25	1.00	1.00	1.00	100%
	Remote Condensing	9	1.25	1.03	1.00	1.00	103%
	Self Contained	61	1.25	1.00	0.99	1.00	101%

Energy Star only covers air-cooled models, but data on condensing water consumption of water-cooled models is available from the USDOE (see Table 18). The USDOE has different product classifications than the USEPA and sets limits on cooling water-intensity based on the production capacity of the unit, so there is no single limit value as there is for Energy Star. All water-cooled models on the market must fall below that limit. As Table 18 shows there is a wide range in condenser water use per kg of ice, and condenser water use is typically 8 to 10 times potable water use.

Table 18 Condenser water use by USDOE Registered water-cooled CIMs, 2024

Production	Configuration	Models	L/100kg			
			Max	Min	Avg	Max/Min
Batch	Ice Making Head	166	16.1	6.3	11.3	257%
	Self Contained	23	15.2	7.7	12.4	198%
Continuous	Ice Making Head	46	14.1	7.9	11.0	178%
	Self Contained	9	11.3	8.9	10.1	127%

The USEPA and USDOE data sets allow the analysis of the links between energy-intensity, water-intensity and production capacity. If energy and water use were closely linked it could be assumed that the imposition of MEPS by the GEMS Regulator would also lead to significant water savings, and there would be limited scope for WELS to increase water saving further. However, the energy/water correlation is weak, so there is considerable scope for additional WELS measures.

Figure 19 to Figure 24 (US Energy Star data) show:

- A much weaker relationship between potable water efficiency and capacity than between energy efficiency and capacity. Purchasers may think that because a larger unit usually has a lower energy-intensity (kWh/kg) it may also have a lower water-intensity (L/kg). This is not the case as higher capacity products are not necessarily more water efficient.
- Hardly any relationship for continuous types: very narrow band of potable water efficiency.

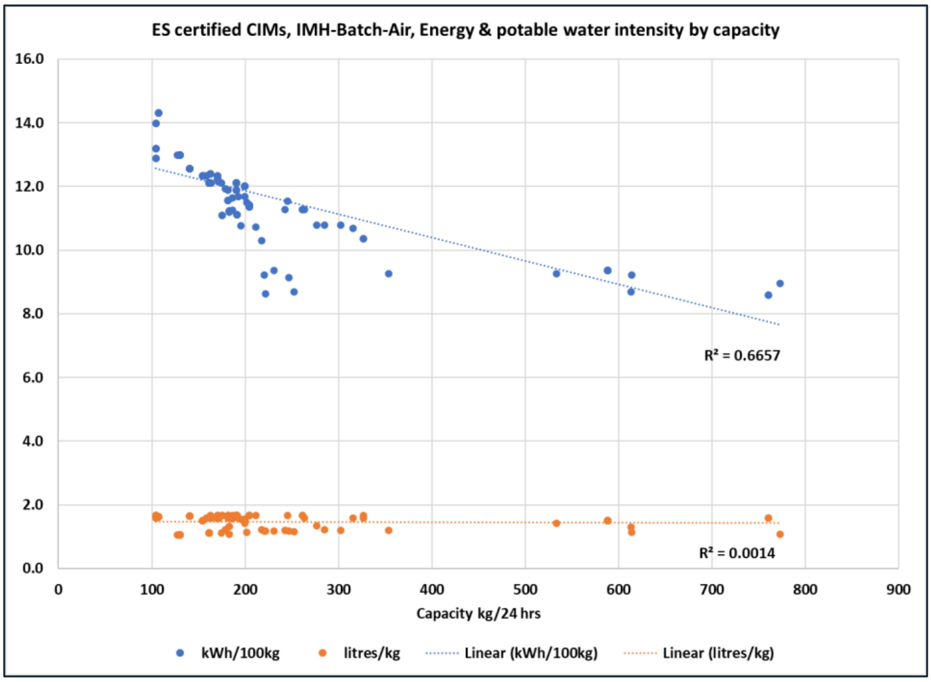
Figure 25 to Figure 27 (US Energy Star data) show:

- No apparent relationship between energy and potable water efficiency. An energy efficient CIM is not necessarily water efficient, so additional information (or standards) for water is valuable.
- At any given energy efficiency level there is a range of water-efficiencies (for batch products).

Figure 28Figure 28 to Figure 31 (USDOE data) show:

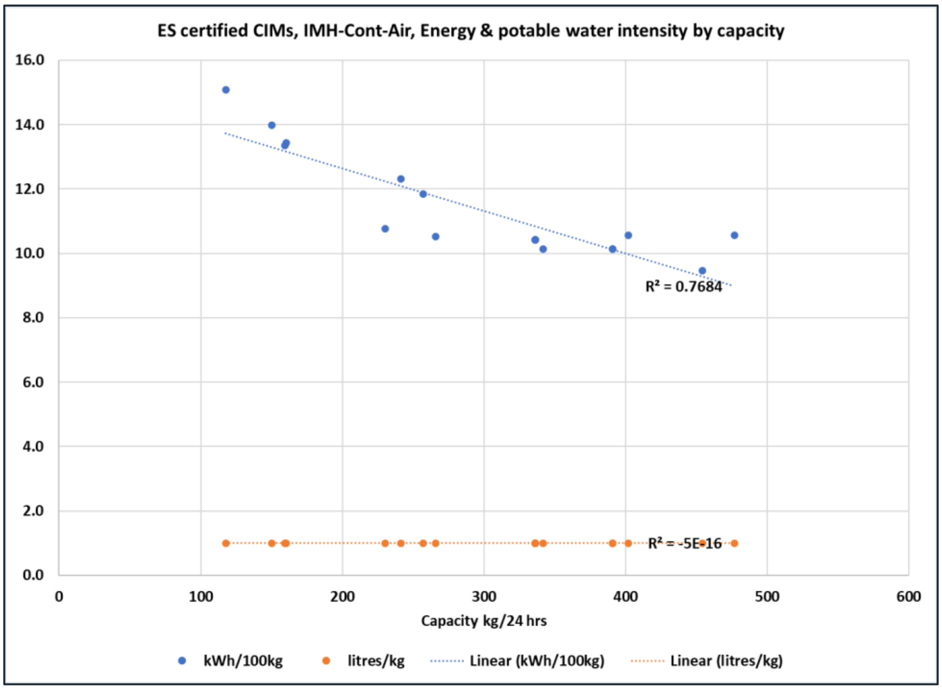
- For water-cooled products, there is no apparent relationship between capacity and cooling water efficiency.
- There are several groups of models (presented as horizontally clustered dots) with different capacity but the same cooling water efficiency, suggesting that the same cooling circuit is being used across a model family (rather than optimised according to the cooling load). This may lead to technical inefficiencies and presents one pathway for improvement.

Figure 19 ES certified CIMs, IMH-Batch-Air, Energy & potable water intensity by capacity



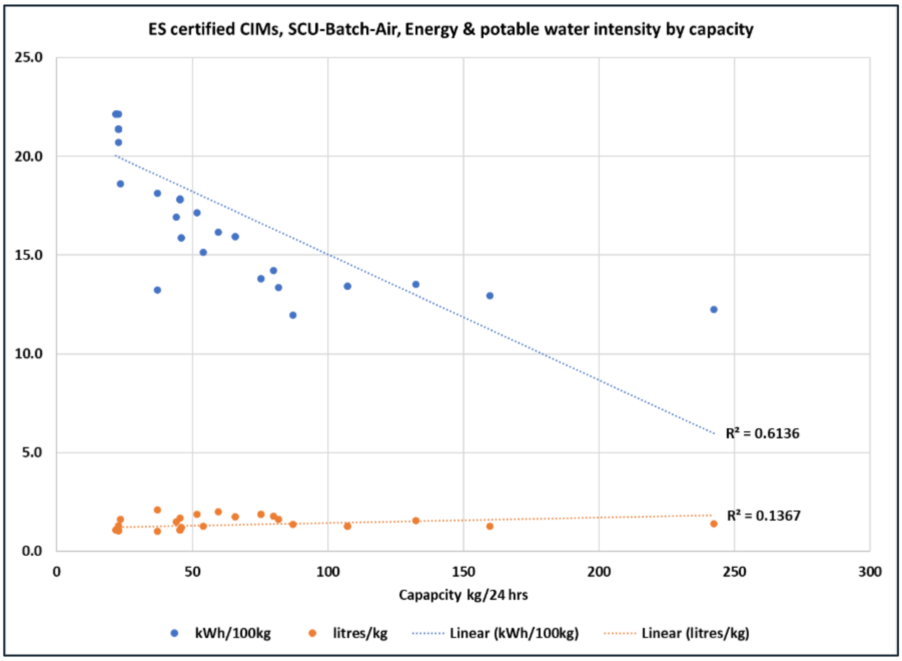
Note: Each pair of vertically aligned dots represent a CIM model.

Figure 20 ES certified CIMs, IMH-Cont-Air, Energy & potable water intensity by capacity



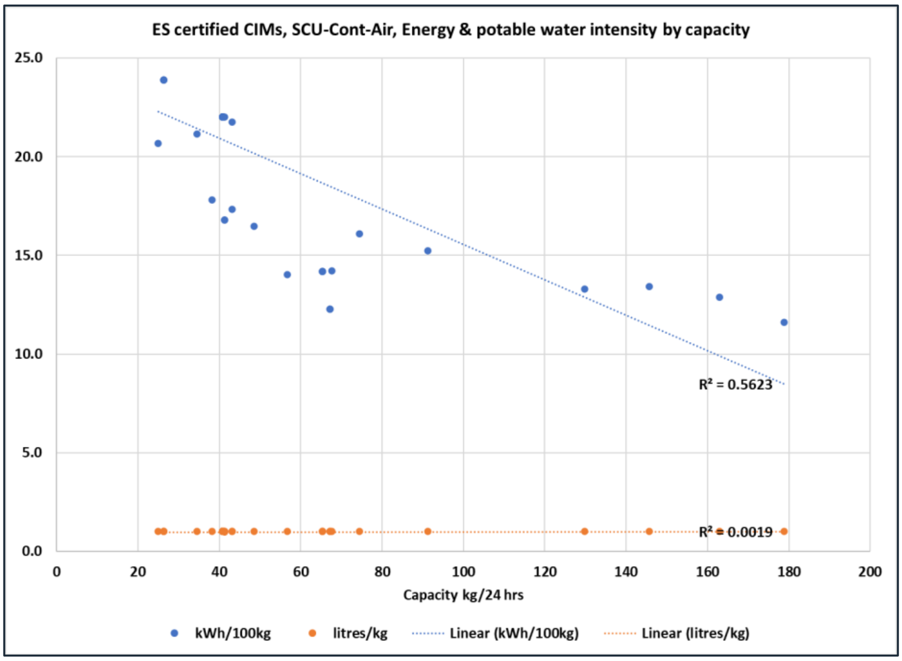
Note: Each pair of vertically aligned dots represent a CIM model.

FIGURE 21 ES CERTIFIED CIMS, SCU-BATCH-AIR, ENERGY & POTABLE WATER INTENSITY BY CAPACITY



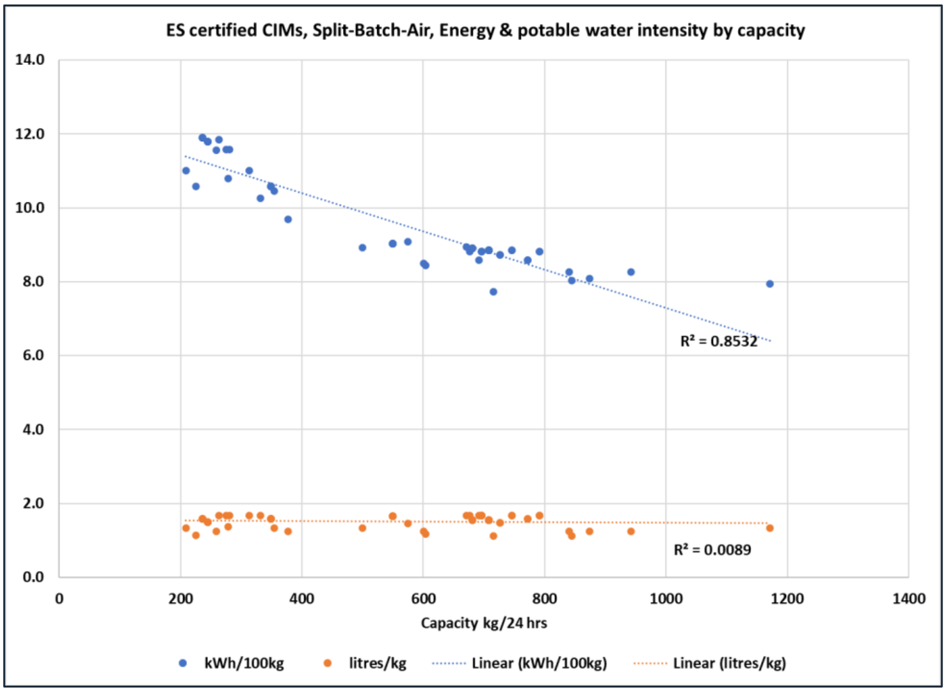
Note: Each pair of vertically aligned dots represent a CIM model.

FIGURE 22 ES CERTIFIED CIMS, SCU-CONT-AIR, ENERGY & POTABLE WATER INTENSITY BY CAPACITY



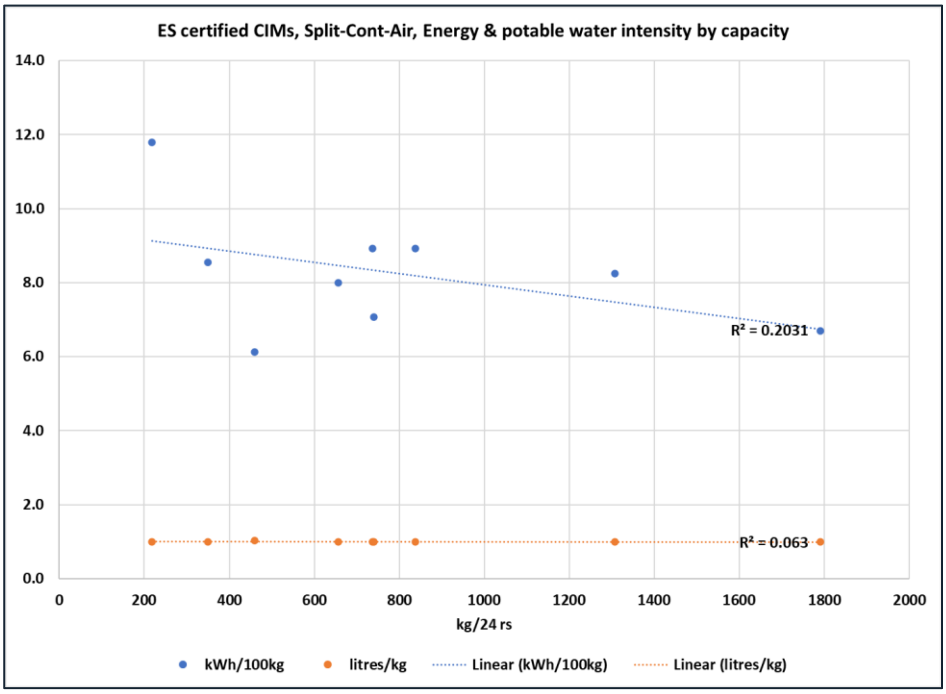
Note: Each pair of vertically aligned dots represent a CIM model.

FIGURE 23 ES CERTIFIED CIMS, SPLIT-BATCH-AIR, ENERGY & POTABLE WATER INTENSITY BY CAPACITY



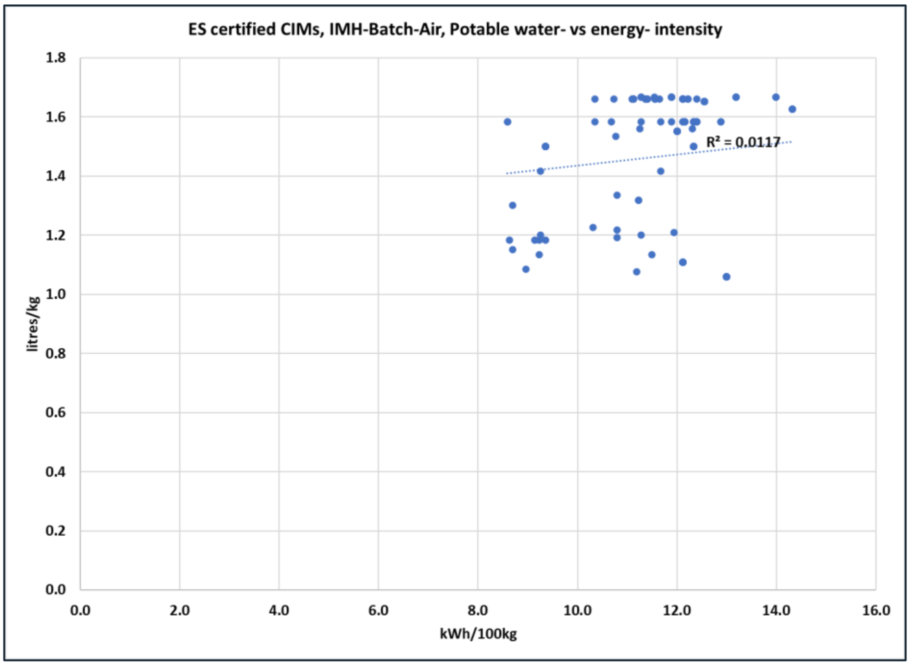
Note: Each pair of vertically aligned dots represent a CIM model.

FIGURE 24 ES CERTIFIED CIMS, SPLIT-CONT-AIR, ENERGY & POTABLE WATER INTENSITY BY CAPACITY



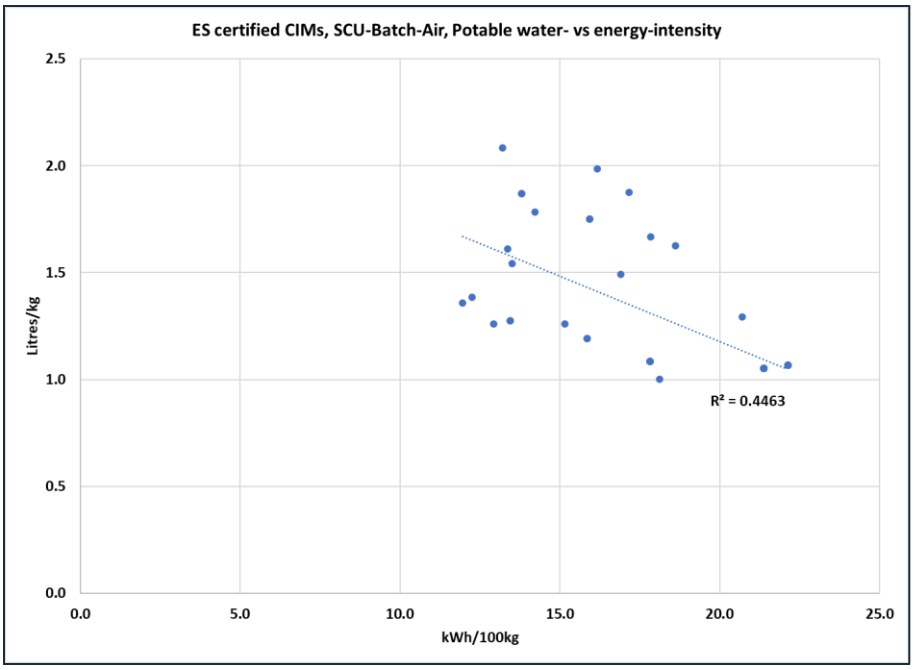
Note: Each pair of vertically aligned dots represent a CIM model.

FIGURE 25 ES CERTIFIED CIMS, IMH-BATCH-AIR, POTABLE WATER- VS ENERGY- INTENSITY



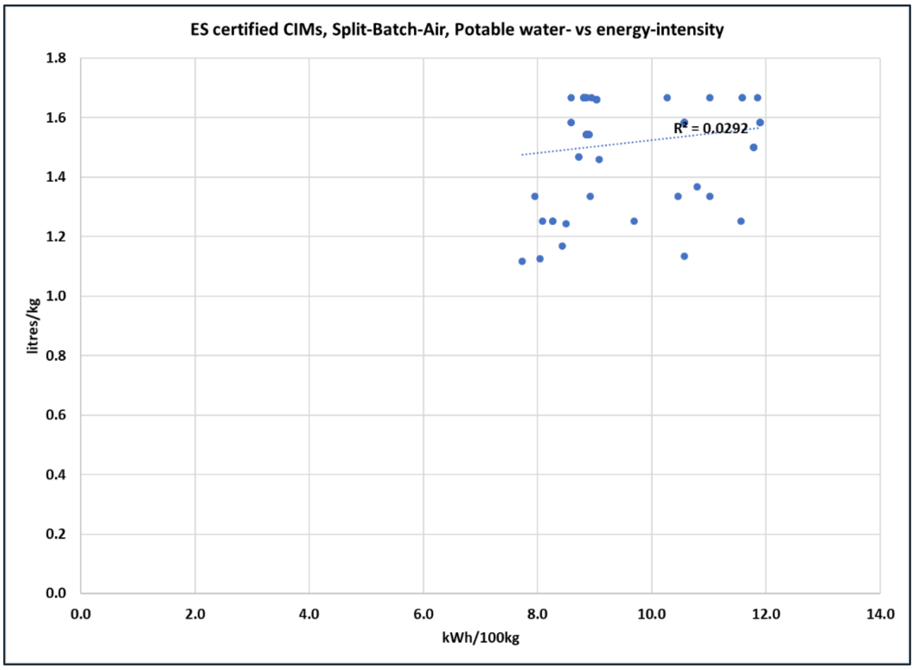
Note: Each pair of vertically aligned dots represent a CIM model.

FIGURE 26 ES CERTIFIED CIMS, SCU-BATCH-AIR, POTABLE WATER- VS ENERGY-INTENSITY



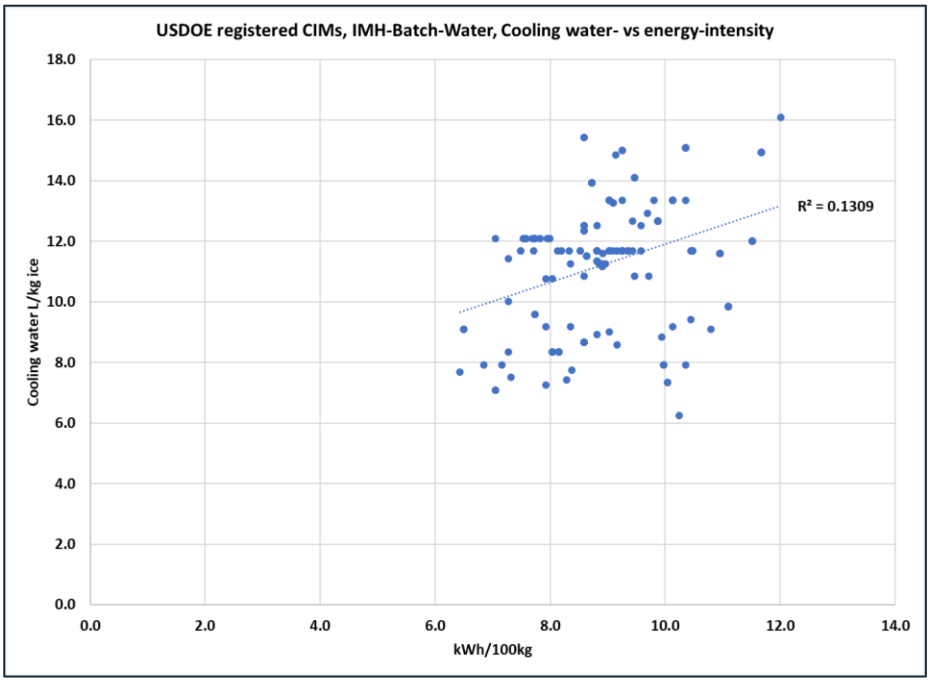
Note: Each pair of vertically aligned dots represent a CIM model.

FIGURE 27 ES CERTIFIED CIMS, SPLIT-BATCH-AIR, POTABLE WATER- VS ENERGY-INTENSITY



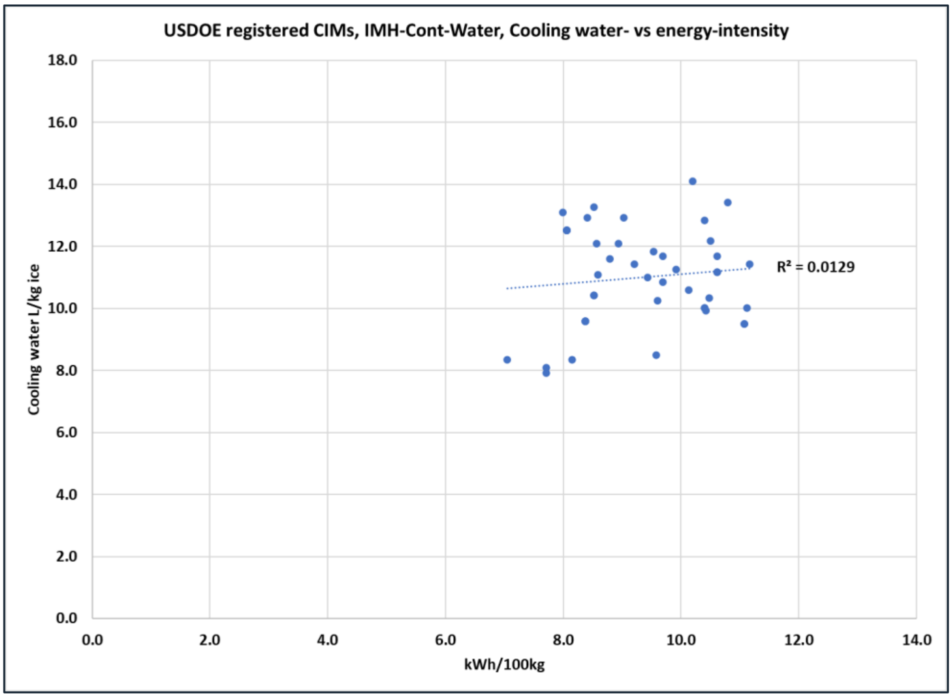
Note: Each dot represents a CIM model

FIGURE 28 UDDOE REGISTERED CIMS, IMH-BATCH-WATER, COOLING WATER-VS ENERGY-INTENSITY



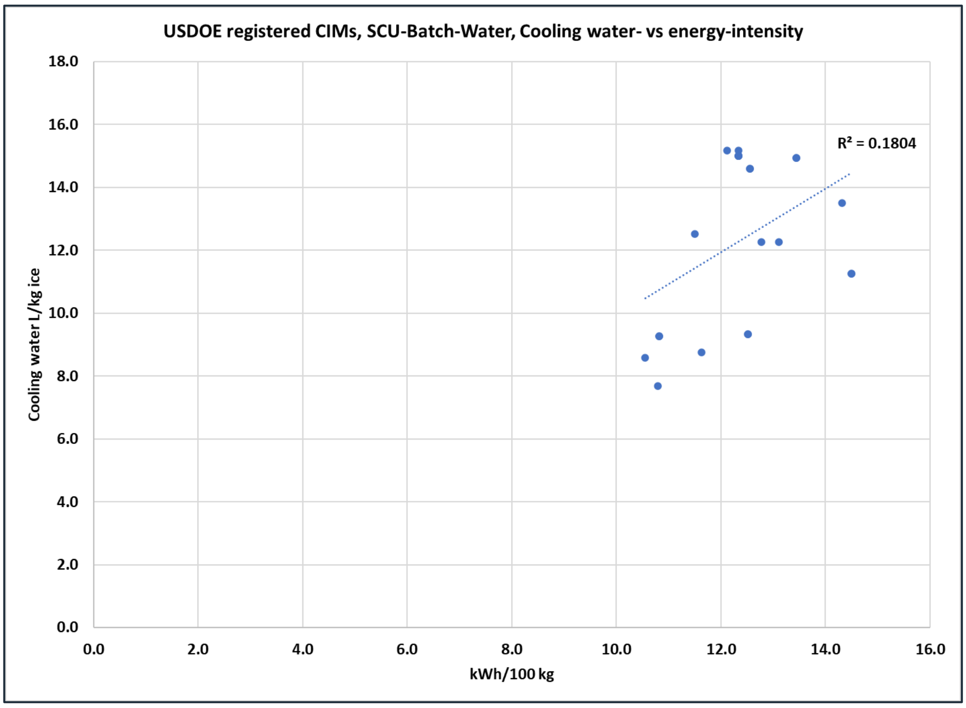
Note: Each dot represents a CIM model

FIGURE 29 USDOE REGISTERED CIMS, IMH-CONT-WATER, COOLING WATER-VS ENERGY-INTENSITY



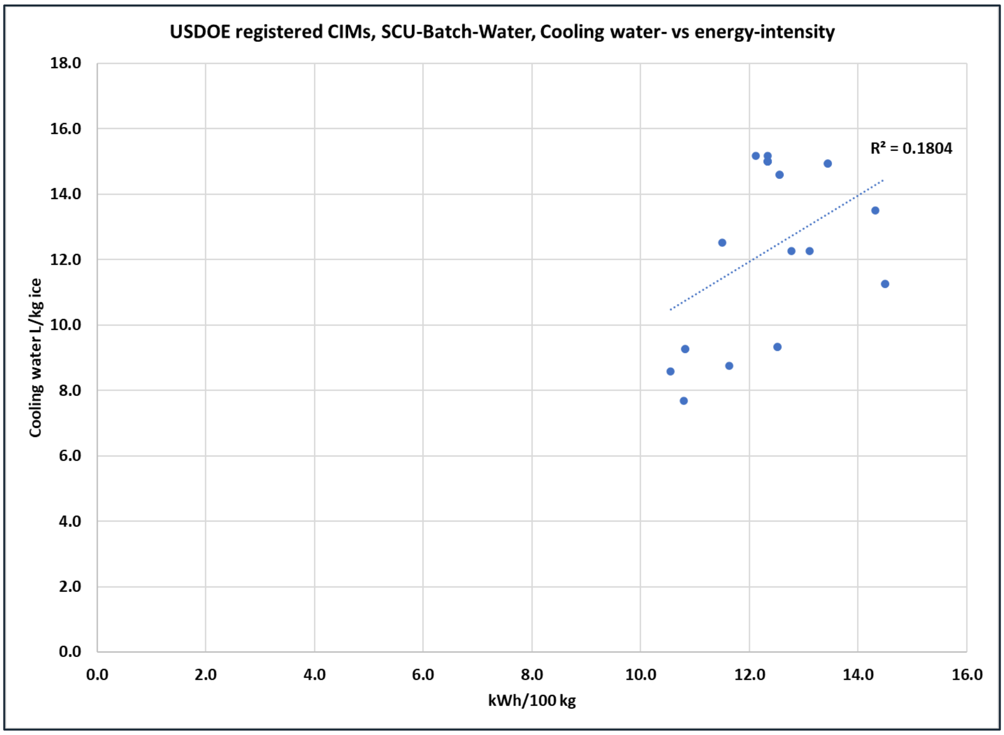
Note: Each dot represents a CIM model

FIGURE 30 USDOE REGISTERED CIMS, SCU-BATCH-WATER, COOLING WATER-VS ENERGY-INTENSITY



Note: Each dot represents a CIM model

FIGURE 31 USDOE REGISTERED CIMS, SCU-CONT-WATER, COOLING WATER-VS ENERGY-INTENSITY



Note: Each dot represents a CIM model

Appendix D New Zealand costs and benefits

It is estimated that the New Zealand market is about a sixth the size of Australia's (for about a fifth the population). This equates to 1600 to 1800 units per year, and national stock of about 10,500 CIMs.

The same international brands dominate the market as in Australia. The products are mostly imported direct to New Zealand from the country of manufacture, although some Australian companies ship to New Zealand as well and New Zealand companies such as Skope ship to Australia. The primary importers supply other local distributors as well. It is assumed that average CIM prices are equivalent to those in Australia, but 10% higher in New Zealand dollar (NZD) terms allowing for the currency exchange rate.[16]

An average water supply price of $4.56 has been estimated for New Zealand, based on 2022 data supplied by Water New Zealand, updated for subsequent price increases reported by the largest suppliers. The supply price comprises $1.84/kL supply charge and $2.72/kL wastewater charge. No further real price increases are projected for the modelling period (see Figure 12 for comparison with water prices in Australian jurisdictions).

MEPS for CIMs will be introduced in New Zealand via the *Energy Efficiency (Energy Using Products) Regulations 2002*, administered by the Energy Efficiency and Conservation Authority (EECA), at the same time as they take effect in Australia under the GEMS Act. The target implementation date is March 2026. This is the status quo (Option1).

CIMs offered for supply in either country will have to be registered with one of the Regulators: EECA in New Zealand or the GEMS Regulator in Australia. There will be a common registration system and the information for each registered model will be published on the GEMS Energy Rating websitehttp://www.energy-rating.gov.au/. There is no registration fee for models registered with the New Zealand Regulator but there is a requirement to report annual sales, which is not the case in Australia. Registration requires mandatory declaration of the production capacity (kg/24hrs) and energy-intensity (kWh/kg of ice produced) for each model, measured under standard test conditions. Voluntary declaration of water-intensity (L/kg ice produced) measured at the same test conditions is available. It remains to be seen how many suppliers will choose to register water related information.

New Zealand already participates in the WELS scheme via its *Consumer Information Standards (Water Efficiency) Regulations 2017* administered by the Ministry for the Environment.

The same range of options has been modelled for New Zealand as for Australia. All are compared with the Option 1 (status quo) scenario.

- Option 2: Voluntary declaration with the support of the New Zealand agencies responsible for encouraging the efficient use of water (non-regulatory).
- Option 3A: Product registration, information declaration and labelling (Regulatory). It is assumed this would be implemented via amendment to the *Consumer Information Standards (Water Efficiency) Regulations 2017*.

[16] All values in this section are in 2025 New Zealand dollars.

- Option 3B: Product registration, information declaration and labelling (Regulatory) – accelerated implementation.
- Option 4A: Product registration, Minimum Water Efficiency Standards and information declaration (Regulatory). It is possible that new regulations would be required to enforce Minimum Water Efficiency Standards as the *Consumer Information Standards (Water Efficiency) Regulations 2017* only covers labelling. However, the regulation references the WELS Standard (AS/NZS 6400), so if Minimum Water Efficiency Standards are included in the WELS Standard they could be enforced.
- Option 4B: Product registration, Minimum Water Efficiency Standards and information declaration (Regulatory) – accelerated implementation.

In the New Zealand WELS scheme there is no registration for products or for suppliers. Therefore, assessing the effectiveness of each option in New Zealand would rely largely on monitoring GEMS, EECA and WELS registrations. It is assumed that each option is as effective at reducing CIM water use as it is in Australia. The differences in water saving are due to the smaller market size.

Figure 32 illustrates the projected total water use under each option of CIMs purchased in New Zealand between 2025 and 2040. The diagram goes to 2048 because it captures the lifetime water consumption of units sold as late as 2040 (the end of the sales projection period), which will still be operating in 2048 given average service lives.

The area between the lines represents the water saved by that option. Figure 33 illustrates, at larger scale, the intervals between the lines in Figure 32. The water saving from Option 2 is projected to peak around 80,000 kilolitres (0.08 gigalitres) in 2040 and then decline as post-2025 CIMS retire. The maximum saving is from the Minimum Water Efficiency Standards Option 4A (0.31 GL in 2040). These are higher than Option 4B, as even though they come into effect a year later, the standard levels are more stringent.

The present value of these saving can be calculated by multiplying the kL of water saved in each year by the cost of water ($4.56/kL). The stream of savings is brought to a present value by applying a 5% discount rate as specified by the New Zealand Treasury.

The costs of the measure are incurred initially by three groups: CIM suppliers, the program administrator/regulator and CIM purchasers. There are however transfers of costs between groups, as is described in the cost/benefit analysis methodology (Appendix B).

As neither additional testing nor payment of registration fees would be required in New Zealand, industry costs comprise the administration time costs of dealing with the regulator and purchasers, reprinting brochures and changing website contents, and attaching physical labels if required. It is assumed that these costs are higher at the introduction phase and then reduce to a lower constant level. The dollar value estimates for each activity are summarised in Table 19.

FIGURE 32 WATER CONSUMED BY CIMS SOLD 2025-2040, NEW ZEALAND

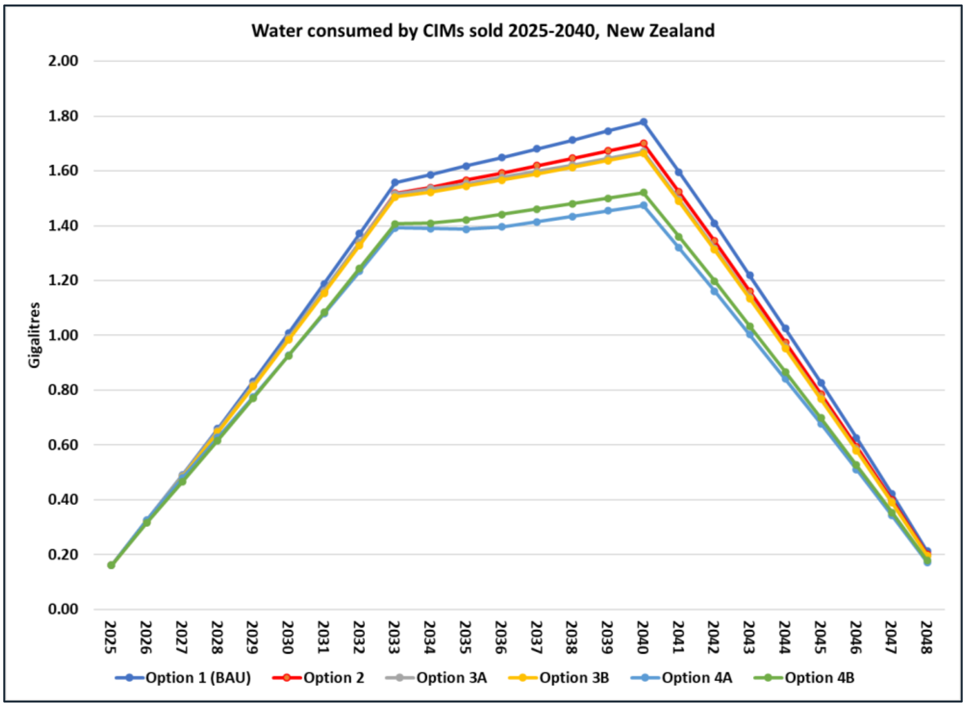


FIGURE 33 WATER SAVED BY WELS OPTION FOR CIMS SOLD 2025-2040, NEW ZEALAND

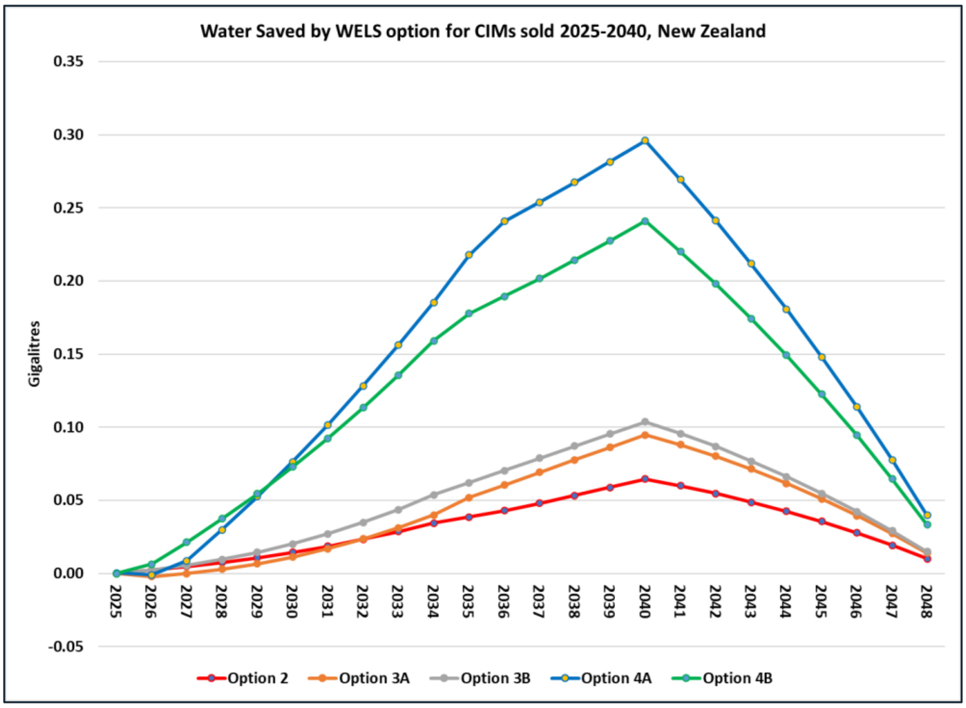


Table 19 Estimates of cost to New Zealand industry and Regulators

	Option 2	Option 3A	Option 3B	Option 4A	Option 4B
Importers	10	10	10	10	10
Secondary distributors	20	20	20	20	20
Models (2025, 2040)	300-400	300-400	300-400	300-400	300-400
Admin cost per importer (Yr 1)	$5,000	$7,000	$7,000	$7,000	$7,000
Admin costs per importer (Yr 2 etc)	$2,500	$5,000	$5,000	$5,000	$5,000
Registration costs/yr per importer	0	0	0	0	0
Admin cost per distributor (Yr 1)	0	$2,500	$2,500	$4,000	$4,000
Admin costs per distributor (Yr 2 etc)	0	$2,500	$2,500	$2,500	$2,500
Regulator Admin costs per year	$30,000	$50,000	$50,000	$50,000	$50,000
Check tests (Yr 1)	0	1	1	2	2
Check tests (Yr 2, etc)	0	1	1	1	1
Cost per check test	$6,250	$6,250	$6,250	$6,250	$6,250
Cost per label	NA	$0.50	$0.50	$0.50	$0.50

Note: These costs are held constant in real terms but may rise in nominal terms with inflation. All values are in NZ dollars.

There are no additional costs for product testing, because this will be required for every CIM model as part of compliance with the *Energy Efficiency (Energy Using Products) Regulations 2002*. The same tests measure both energy and water use, and if the test report is in the form required by EECA and the GEMS Regulator it will include the water use data as a well.

It is assumed that no mandatory options for CIMS would be introduced in New Zealand unless the same options were introduced in Australia. As most New Zealand CIM suppliers would need to comply with the Australian requirements in any case, the additional costs of meeting New Zealand requirements would be less than in Australia.

Administrative costs to the regulator are estimated to be a third of the Australian level, because the costs of registration would be largely borne by the Australian GEMS and WELS Regulators. Nevertheless, there would be staff costs for engagement with industry and purchasers and verifying compliance with regulations. Allowance has been made for a small number of check tests in case the regulator needs to verify performance claims for models not sold in Australia.

Table 20, Figure 34 and Figure 35 summarise the projected costs and benefits of each option. All three information only options (2, 3A and 3B) have very similar net benefits. While the water savings increase by mandating information declaration, the costs of regulation partially offset the extra savings.

TABLE 20 SUMMARY OF PROJECTED COSTS AND BENEFITS, NEW ZEALAND

	Costs $M PV, 5% discount rate			Benefit $M PV, 5% discount rate			Net	B/C	% Price
	Price	Program	Total	Pot	Cond	Total	Benefit	ratio	increase
Option 2	$0.5	$0.6	$1.1	$2.4	$0.0	$2.4	$1.3	2.1	0.6%
Option 3A	$0.8	$1.6	$2.4	$2.8	$0.1	$2.9	$0.5	1.2	0.8%
Option 3B	$0.9	$1.7	$2.6	$3.2	$0.1	$3.3	$0.7	1.2	0.9%
Option 4A	$3.0	$1.6	$4.6	$8.4	$0.1	$8.5	$3.9	1.8	3.0%
Option 4B	$2.5	$1.7	$4.2	$7.5	$0.1	$7.6	$3.4	1.8	2.5%

FIGURE 34 NPV OF COSTS AND BENEFITS, 2025-2040, NEW ZEALAND

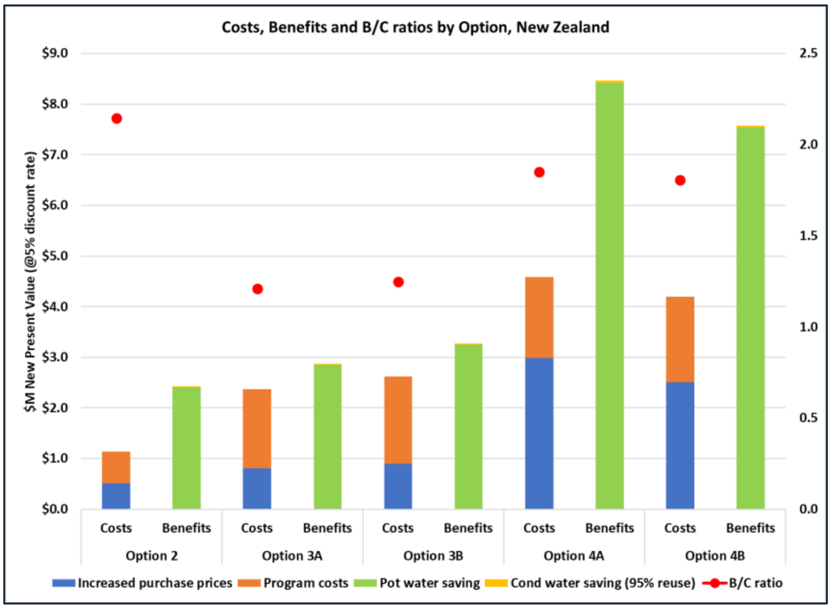


FIGURE 35 NPV OF PROGRAM COSTS, 2025-2040, NEW ZEALAND

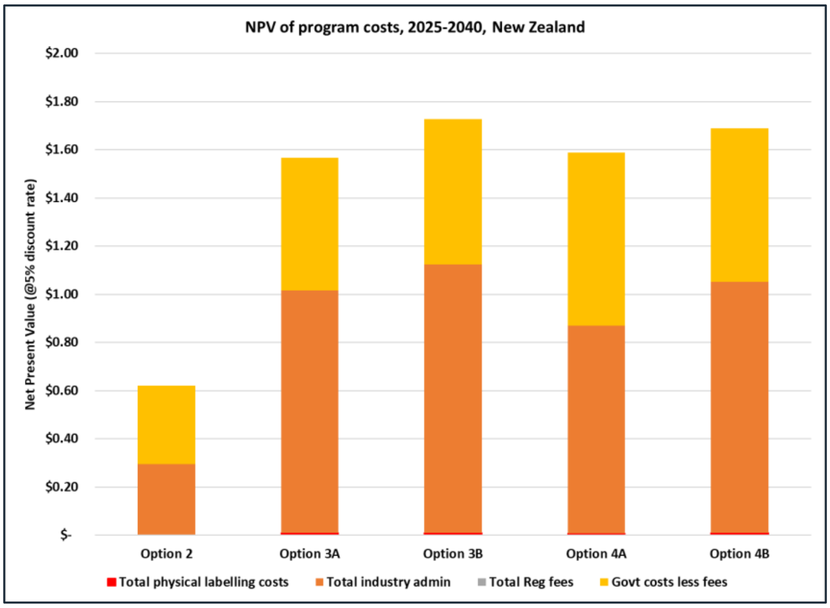


Table 21 indicates the sensitivity of outcomes to discount rates higher and lower than the central 5% discount rate used by New Zealand Treasury. All options are cost-effective under all discount rates, although the net benefits are modest.

TABLE 21 SENSITIVITY TO DISCOUNT RATE ASSUMPTIONS, NEW ZEALAND

	$M NPV at discount rates			B/C ratio at discount rates		
	2%	**5%**	**8%**	**2%**	**5%**	**8%**
Option 2	$2.1	$1.3	$0.8	2.4	2.1	1.9
Option 3A	$1.2	$0.5	$0.1	1.4	1.2	1.1
Option 3B	$1.5	$0.7	$0.2	1.4	1.2	1.1
Option 4A	$6.5	$3.9	$2.4	2.1	1.8	1.7
Option 4B	$5.6	$3.4	$2.1	2.0	1.8	1.6