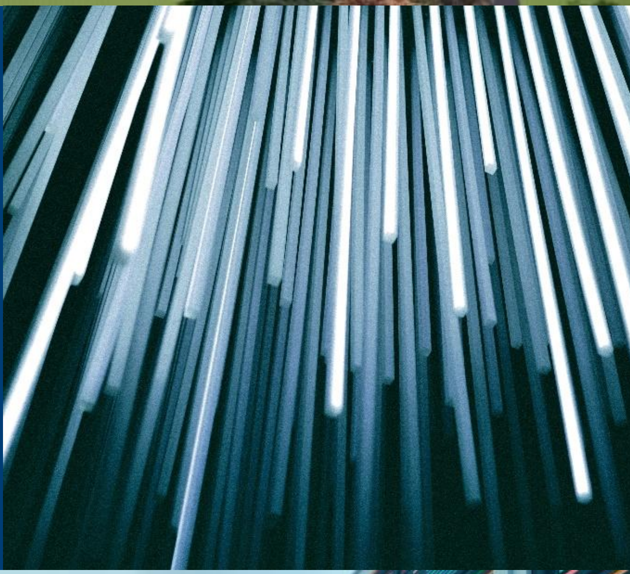
WATER SERVICES
ASSOCIATION OF AUSTRALIA

DATA CENTRES AND WATER IN AUSTRALIA

A resource for sustainable data centre development



An information resource for sustainable data centre development

December 2025

Contents:

Water Services Association of Australia (WSAA) is the peak body representing the water sector. Our members provide water and wastewater services to over 24 million customers in Australia and New Zealand and many of Australia's largest industrial and commercial enterprises. This paper focusses on Australia but is also relevant for New Zealand.

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1. Summary and key considerations

The purpose of this information paper is to raise awareness of the importance of water to the success of the data centre sector. It is intended to inform water and data sector planners, policy-makers and stakeholders, about dimensions of data centre operations and potential water needs. Many aspects of water planning will influence the successful expansion of data centres here.

Data centres are a vital part of the AI revolution. Australia is experiencing rapid growth in data centre investment, with forecasts[1] of a $40 billion (AU) 'investable universe' by 2028. This is a valuable opportunity and will help boost national productivity. Data centres underpin our digital economy, supporting AI development, cloud storage, transport, health, defence, banking, public and consumer services.

The Australian water sector looks forward to continuing to work with data centres. Their expansion will see a large increase in water use, mainly in cities where they are highly concentrated. It will be important to align this with Australia's water management objectives, like leading jurisdictions globally. Good management can drive significant community benefits. Internationally, early flexible planning settings are being refined into clearer regulatory frameworks, helping channel investment towards competitive, sustainable outcomes and long term benefits for communities and data centres. The water sector welcomes the direction in Australia's National AI Plan2 to set data centre principles that encourage best practice in efficient cooling.

Australia has a great opportunity to develop collaborative, transparent and beneficial partnerships between the data, water, energy sectors and communities – to establish Australia as a showcase of sustainable and efficient data centre development. Water utilities will work with data centres to provide reliable, fit for purpose services to support their operations, alongside the needs of other customers. WSAA sees five clear priorities for enabling this, with early steps already underway. Together, these priorities outline a practical set of policy levers for governments, regulators and utilities to steer data centre growth towards efficient, community-beneficial outcomes:

1. Early engagement between data centre customers and water utilities

Early engagement is the most important enabler of sustainable data centre development. Water utilities encourage data centre customers to consult them at the feasibility stage – before land acquisition, power agreements, or anchor tenants are locked in – to understand water availability, servicing requirements, infrastructure timelines and costs at different locations. Policy settings should enable integrated planning and assessments that consider local and cumulative impacts for land, water, energy and carbon, system capacity, climate resilience, and long term community needs.

[1] 1 October 2024, CBRE, Australia's data centre investible universe set to double in four years
[2] Australian Government, Department of Industry, Science and Resources, National AI Plan, December 2025

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2. Building trust through transparent reporting of water and energy use metrics

The water sector supports strong transparency in data centre resource use. Public reporting of Water Usage Effectiveness (WUE), Power Usage Effectiveness (PUE), and associated load/utilisation metrics is growing. Making this standard practice will improve accountability, strengthen community trust, and drive continuous improvement across the sector. Many global regions are starting to require this as a way of attracting sustainable investment.

3. Minimum efficiency standards to embed best practices across the market

Australian governments should consider setting minimum WUE and PUE standards for new facilities, with appropriate guidance for different climate zones. Cooling technology choices are the main driver of data centre water use. Water efficient cooling systems exist and are available to be built into data centre designs. International markets are moving towards performance thresholds to ensure efficient cooling is deployed across the market.

These standards should be technology-neutral, fit for context and reflect modern designs and data. Australian data centres can already achieve Water Use Effectiveness as low as 0.01 (Section 3.5), many globally commit to voluntary frameworks of 0.4 in water stressed regions, and global reports predict levels under 1.0 (Section 3). The water sector can work with governments and data centres to develop suitable standard levels. NABERS expanding their Data Centre Energy Tools to water would be a good starting point.

This will encourage investment in high-performing, efficient, lower-carbon cooling solutions. It will position Australia as a leader in sustainable digital infrastructure and drive community benefit and trust. In addition, application assessment frameworks should prioritise projects that demonstrate strong water and energy performance, and mature investment readiness.

4. Recycled water and circular economy solutions are preferred pathways

The water sector will prioritise recycled water where feasible for data centre customers and where this supports best value outcomes for communities. Planning frameworks and investment pathways should enable connection to wastewater mains with adequate flows and space for treatment assets. Utilities will encourage and support data centre customers to pursue circular economy initiatives such as heat recovery, onsite water recycling, and water-positive design. This will reduce pressure on drinking water supplies, support climate-resilient cooling, and deliver broader environmental benefits. Offsetting arrangements, where used, should be directed toward local priority issues and independently assessed.

5. Fair, consistent and future-ready regulatory and cost-recovery frameworks

Any infrastructure required to service data centres – network connections, water supply assets, and wastewater management – should not be funded by other customers. To support this, utilities will work with governments, regulators and customers on clear and fit for purpose regulatory arrangements that keep pace with evolving technologies, and price signals that encourage efficient use of water. This will provide proponents with certainty to invest while ensuring existing customer needs can be serviced equitably and in parallel. Within these frameworks, utilities aim to give data centres clear pathways to secure the water services needed to support their operations.

The urban water sector, with revenue of over $22 billion and capital expenditure of over $9 billion a year, is the silent partner to all successful industries across Australia, while serving residential and commercial customers, enabling growth and protecting the environment. Planning for new customers is part of our business; even if the water volumes are large scale, our planning, regulatory and environmental frameworks are well-established.

Australia is a key global growth market for data centres, for our energy resources, stable political and economic systems, and data sovereignty. Data centres already exist in Australia, for example 90 already in NSW[3] and 40 in Victoria[4]. Unlike other industries, they are heavily concentrated in urban areas shared by communities, like Sydney. Most data centres require higher levels of water reliability than other customers, including at peak usage times. Eliminating disruptions for business customers in a dry city is a challenge. It will require a partnership between the water utility and the customer itself.

The current water use of data centres is low, because existing facilities are generally smaller, legacy centres or still ramping up. However, future generations of data centres are likely to be larger, with greater water use. Exactly how much, depends largely on cooling choices and water sources. Estimates vary – for example estimates for Sydney range from 1.9% of water supply (data centre sector estimate) in 2030, to around 15 - 20% of supply in 2035 (Sydney Water estimates based on for data centre proponent servicing enquiries). Melbourne is also seeing strong interest.

Australian water utilities are receiving many approaches from data centres, often seeking high water volumes (5 to 40 million litres a day (average day demand), 20 times the largest single customer or 70,000 - 80,000 households) in short timeframes. Utilities have unique visibility of the market through actual applications and enquiries. Utilities exclude some as less likely to proceed (known as ‘phantom’ demand). Actual water use is hard to predict with certainty, and will vary with broader market conditions and many factors.

A more constructive focus is on the level of productivity that can be gained from the water used, whatever the ultimate figure. Efficient data centres will provide more ‘digital bang’ for the ‘water buck’. Policy settings that support balanced resource efficiency can maximise community trust, while enabling any entrants that demonstrate efficiency, to participate in the market and produce digital services in a beneficial way.

Data centres are not all the same, and their water management approaches vary. Many centres in Australian market are leaders in efficiency already; making these practices standard will support smart, productive use of water resources. Global trends towards water-efficient cooling and greater use of recycled water show how the sector can meet its needs while easing pressure on drinking water supplies. Embedding these trends in Australia’s policy settings would help data centres integrate smoothly into the Australian water community. Clear expectations around water efficiency and life cycle maturity would give investors confidence, speed up approvals, and support sustainable resource planning.

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[3] Property Council of Australia, NSW Needs a Data Centres Strategy to Unlock Digital Growth, May 2025
[4] Victorian Premier media release, Putting People First in a Future With AI, 27 November 2025

The next sections give a high level overview of data centres, how they use water, and key planning considerations (including key trade-offs in Box 1). They outline the 'Water Usage Effectiveness' metric used globally, the accompanying power metric, and levels currently being achieved. They detail how other jurisdictions including Singapore, Malaysia, Europe and the US are channelling digital investment to maximise competitive, sustainable outcomes. Australia can leverage these learnings in shaping our policy frameworks.

The water sector is keen to learn more and understand various perspectives. WSAA will be populating a new Data Centres and Water Resource Library. Please direct any enquiries, ideas, case studies or opportunities for cross-sector learning to info@wsaa.asn.au.

Box 1: Factors and resource needs jurisdictions will balance in planning data centres

Water is a valuable resource that communities care deeply about and want to see managed well. Water is just one part of sustainable data centre development – alongside energy, carbon, land, noise, connectivity and costs. Integrated resource planning is key to optimising outcomes. This information paper is an entry-point reference which outlines key water and data centre aspects, to inform broader policy. Individual jurisdictions and utilities will develop more detailed guidance.

Trade-offs can include:

1. Water and energy in cooling choices: AI is driving greater power density and cooling need. Air cooling saves water but uses more energy, and faces limitations in hot regions; traditional evaporative cooling uses a lot of water but can save energy. Energy is usually a larger cost for data centre operations than water. The aim is to choose cooling that supports high productivity while managing water and energy use efficiently.

2. Inland vs coastal sites: Inland areas may offer lower land costs and good energy availability, but face water scarcity and complex discharge challenges. Coastal sites may access recycled/desalinated water more easily, but land may cost more.

3. Land vs utility costs: Cheaper land may be far from existing water infrastructure, increasing capital costs and lead times. Proximity to treatment plants may reduce costs as transporting water over distances can be high cost.

4. All water sources including desalinated and especially recycled water can be used, though both can be allocated already. Advanced water purification systems cost more upfront, but produce ongoing savings. Best value options for communities is the priority.

5. Cost and investment: Water pricing reflects supply costs. Data centres may need to fund or co-fund infrastructure and enter long-term agreements. Water efficient cooling systems can have high upfront costs, as can large water infrastructure. The trade-offs between 'creating' enough water and enough energy will be complex and site-specific.

1.1 Key questions

1. How can the data sector know how much water is available around Australia?

Water utilities have close knowledge of availability across their region and catchments and plan accordingly. Rainfall, drought, changing industry and community usage patterns and infrastructure upgrades can quickly shift a region's water outlook. Utilities can advise on any constraints in greenfield or densely populated areas, and on recycled water availability.

2. When should data centre proponents consult water utilities?

For data centres, speed to market is a primary driver for investment. Water servicing involves time, cost and complexity. Therefore, integrating water and wastewater into the initial site selection matrix with energy, land use planning, and fibre connectivity can reduce risk in project timelines. Water utilities encourage data centres to include water in their early strategic planning: approach the water utility during the feasibility assessment stage for sites. The water sector looks forward to welcoming data centres as part of our customer base.

3. How can we balance water and energy requirements?

It's important to achieve the optimal energy/water mix to maximise digital output. Water may often be a smaller proportion of costs, but water resources are an asset the whole community depends on. Data centres often see water as a tool to reduce energy use costs – but all water sources need to be carefully stewarded for all water users. Similarly, low water use facilities in some locations may strain local energy grids, with cost and carbon impacts, and water intensive cooling there may support better outcomes. Providing both energy and water involves time and cost – the best solution will vary by location. Broad scale integrated planning across sectors will lead to best overall outcomes.

4. How do other parts of the world integrate data centres?

Other countries adopt a range of measures to integrate data centres into their servicing landscape, aligned with their climate and resource context. Examples of gateways, planning approvals for efficiency, recycling, offsetting, pricing and other aspects that Australia can learn from, are outlined in this paper. There are also global reports predicting trends towards low water use cooling systems, and how these are scaling. A steady focus on both water and energy efficiency in Australia, the driest inhabited continent on earth, is to be expected.

5. Could residential water bills rise to subsidise data centres?

Under water's established regulatory frameworks, data centre infrastructure costs are not cross-subsidised by residential customers. If a data centre needs services earlier than a utility plans to service that location, it can forward fund the infrastructure. The more water-efficient their operations, the easier it is to meet their needs.

Water bills are likely to rise with or without data centres. While costs are rising due to ageing infrastructure, urban growth, and climate variability, Australian water bills have remained flat for a decade. Investment is essential to continue delivering safe and reliable water services, and governments and regulators must support reasonable price paths so utilities can build the infrastructure needed without becoming a handbrake on the digital economy or housing.

6. Why are water efficiency and recycling important?

All industries need to use water efficiently. Many business customers pursue efficiency for cost and sustainability benefits. The speed and geographic concentration of this emerging segment's growth presents a unique planning scenario for cumulative demand. In Sydney, data centres could be 15 - 20% of water use within a decade[5]. There is a compelling driver for a forward-looking, collaborative approach to infrastructure planning beyond that used for more incremental industrial growth. The water sector welcomes the direction in Australia's National AI Plan[6] to set data centre principles to encourage best practice in efficient cooling.

7. Does setting standards create compliance costs for data centres?

Compliance can have some costs, but they are a common practice for sectors with significant resource use. International markets are moving towards performance thresholds to embed efficient cooling throughout the data centre market. Compliance costs are part of business operations, and may be balanced by broader benefits such as community trust. Also, setting clear 'goalposts' will enable faster approvals and investment certainty.

8. Will data centres be paying the same water costs as other customers?

Usually business customers pay the same charges as other customers. However, very large water users may have bespoke arrangements to cater for unique needs and level of service requirements. Timing is key – to accelerate service provision to a location ('out of sequence' with planned rollouts), governments, regulators and the sector may set up direct contracts and/or cost recovery mechanisms at suitable prices. This is an opportunity for partnerships – globally, some data centres fund infrastructure to support their own and community needs.

9. Does servicing data centres 'compete' with housing?

Both can proceed in parallel. Water utilities continuously plan for the long term needs of residents, businesses, and the environment. If new infrastructure is needed for a business segment, those customers will fund those augmentations. Concurrent land use and water planning can help communities have the water they need while enabling new industries to grow sustainably. With good planning, new data centre demand can also help underpin the case for infrastructure to provide services to existing and future communities.

10. What happens during drought?

Consult your water utility about this. Water restrictions can apply to business customers during drought. Community needs are carefully prioritised. For customers with stringent client agreements, establishing clear protocols for drought is paramount. Ultimately businesses are responsible for business continuity. This may involve significant on-site storage as a primary mitigation measure in case of system disruptions, as for power supply.

11. Do recycling and desalination mean that water supplies are no longer limited?

Water utilities plan for cumulative demand (total water and wastewater), and local demand (e.g. a cluster in a built-up area could mean reservoirs, pipes and pumps need enlarging).

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[5] Sydney Water estimates based on data centre servicing enquiries with a degree of certainty to proceed

[6] Australian Government, Department of Industry, Science and Resources, National AI Plan, December 2025

Water supplies are becoming more resilient with the addition of climate-independent sources like recycling and desalination. But many places are only at an early stage of the rainfall independent water transition, and gains are often offset by existing growth needs. Also, these sources are expensive, and need to be used wisely. Regulatory frameworks require high demand certainty to invest in them, and building them takes time. The water sector welcomes the willingness of data centre proponents to partner in funding these assets.

Choices should also have regard to community benefit, as they have real consequences. For example, Sydney needs to increase its drinking water supply in the next 5 – 10 years to meet community needs. Purified recycled water, as used in over 35 cities globally (Section 2.2), is emerging as the most cost-effective option. If this water is allocated for data centre supply, the community may need to pay a premium for higher cost alternatives, such as desalination, requiring billions[7] of dollars of additional funding to be raised through household water bills. Sydney Water is investigating additional recycled water sources for data centres, to meet their preference for recycled water while ensuring the lowest cost sources benefit the community first.

12. What are the constraints on water service availability?

Water utilities will make every effort to accommodate, but in some locations, water and wastewater services may not be available (or at the volumes sought). There can be constraints on creating capacity in the short term. If so, the customer could forward fund the infrastructure, or reduce its water demand through cooling choices to a level that can be provided. Assessment frameworks could also prioritise applications with strong water efficiency, as in Spain, Singapore and Malaysia, as these centres will require less water.

Utilities will negotiate timing and cost recovery arrangements for large infrastructure expansions where needed. Water utilities may develop a staged servicing approach that enables businesses to set up quickly, but balances water security. This may involve limited potable supplies initially, with a managed transition to alternative supplies such as recycled water later. Additional elements like efficiency benchmarks, water use disclosure and fees may be built into different stages. In a recent example in the energy sector, an Australian data centre received approval for only a portion of the power sought, with the remainder offered as 'flexible' power, i.e. potentially not available in peak usage conditions[8].

13. What are 'speculative' or 'phantom' data centre applications?

Data centre applications vary in certainty – some will not proceed. The degree is hard to gauge. Water utilities assess all applications fairly and on their merits. Speculative, incomplete or duplicative proposals (including multiple bids for a single centre) create churn and inefficiency in planning. Clear information on project status in applications (see Checklist) will help hasten planning.

Clear, prioritised approval standards based on water efficiency and life cycle maturity will also help. This would provide investment certainty and accelerate approvals, while

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[7] Costings developed for implementation of the Greater Sydney Water Strategy
[8] Australian Financial Review article, 30 November 2025

supporting efficient, sustainable resource planning. Options include conditional or priority water approvals aligned with progress through planning processes; non-refundable application fees or bonds; proof of tender success, land or power agreements, or anchor tenants; and cautious demand forecast discounting (e.g. assuming some will not proceed, the way airlines overbook flights, though this carries risk). Some countries already use gateway processes that prioritise efficient proposals. Setting minimum WUE standards will help ensure data centre development remains sustainable and productive, whatever scale it ultimately reaches. Developing practical standards and gateways requires detailed work; utilities, governments and data centre proponents should all have input.

14. How much water will data centres need in Australia?

Some existing centres, concentrated in Sydney and Melbourne, are small and use relatively little water; newer ones are still ramping up. Future facilities will be more powerful and need more cooling. Their water use will depend on the cooling systems adopted. Estimates vary: for example the industry-commissioned Data Centres as Enabling Infrastructure report projects Sydney's data centre demand at 10.5 billion litres a year by 2030 (around 1.9% of supply), based on energy forecasts[9] and a flat water use assumption. By comparison, Sydney Water forecasts 90 billion litres a year by 2035 (around 15-20% of supply), using information from real market applications and enquiries, and estimates of which are likely to proceed.

Either may prove true - predicting future water use with certainty is difficult[10]. Actual outcomes will depend on broader market conditions, technology choices and planning decisions, and new water infrastructure will be needed under a range of scenarios. A more valuable focus than any single forecast or point in time, is ensuring high productivity for every litre used, which will also keep future use lower (see Section 4). Policy settings promoting water-efficient design can reduce ultimate water use and help ensure all water is used effectively and beneficially, whatever the sector's eventual scale. Expansion is likely to be heavily concentrated in Sydney, Melbourne and other urban centres.

15. Are there wastewater issues to consider also?

Yes. Collecting, treating, and discharging water after use (into sewers, stormwater channels or waterways) can involve as much infrastructure, cost, and complexity as water. Blowdown management can be challenging, and most utilities have specific trade waste acceptance requirements for discharges such as cooling tower blowdown or process water, including liquid trade waste approvals and limits on temperature, pH, and chemical composition.

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[9] The July 2025 AEMO-commissioned Oxford Economics report Data Centre Energy Demand implies a large increase in the energy footprint of Australian data centres (from ~3.9 TWh in FY25 to ~12.0 TWh by FY30 under the Step Change scenario). It does not directly model data centre capacity, or water.

[10] American Water Works Association Cooling the Cloud: Water Utilities in a Data-Driven World, October 2025 - changes in data centre design and operation, cooling choices and technology usage introduce substantial uncertainty to near- and long-term water and power demand forecasts. One study estimates direct water consumption for US data centre cooling will grow from 21 billion litres a year in 2014 to around 145 - 270 billion litres a year by 2028. Another study notes that the water needed to produce the same digital output can vary by 10,000 times due to cooling system differences, power grid water intensity and computing efficiency.

2. Overview of water in Australia

This section is aimed at both data centres and policy-makers. Its purpose is to increase understanding of the key features driving the provision of water

2.1 Water providers in Australia

1. Public water utilities are the main water providers to urban areas in Australia.
2. Water is largely regulated at state/territory level.

In Australia, water is provided to customers by:

- Public water utilities – there are over 150 across Australia. In some capital and large cities the public utility is a stand-alone statutory corporation. In regional areas, water services may be delivered by local councils. Some utilities are fully integrated, managing the entire water cycle – from bulk water supply and treatment, through to distribution, retail, wastewater, and stormwater services. In other regions, these functions may be disaggregated and shared between one or more stand-alone utilities and one or more local councils.
- Some states have competition or licensing regimes that enable private water utilities to provide the same water services (operational and/or retail) as public water utilities – such as NSW and South Australia. Private water utilities may also be able to provide services to data centres, which may or may not involve purchasing and on-selling the water and wastewater services of the public utility.
- Some desalination plants can supply water directly to customers, depending on their licensing arrangement. However, in capital cities their capacity is largely allocated to the public water utility before and during drought, so there can be limitations on how much water can be purchased, or how continuously.
- Some types of high water use industries can obtain their water directly, rather than through a water utility: for example mining, agriculture or energy projects. Unlike data centres, these are often in remote locations. This typically requires special access licences to access groundwater, rivers, dams, lakes or other nearby water supplies. Such licences are granted and managed by state and territory water authorities. Current data centre demands and future applications are heavily concentrated in cities, not dispersed across the country, and drawing on the urban water supplies of a handful of key utilities servicing urban communities.

Water is largely regulated at state/territory level – in some jurisdictions a single provider services nearly the entire state/territory, whereas in the eastern states the water sector is far more disaggregated. This WSAA page graphically shows the arrangements for water utilities around Australia: Australian Urban Water Industry Archives - Water360.

Data centre companies unsure who to contact, are welcome to contact WSAA at info@wsaa.asn.au for guidance.

2.2 Water sources

1. Australia is increasing its water supply with rainfall-independent sources like desalination, recycled water and purified recycled water. However, the capacity of existing plants is often allocated.
2. All sources can contribute; all have costs, lead times and energy requirements to implement.
3. There is excess water available in some parts of Australia, depending on source and location.

The water cycle includes many sources:

- rivers and dams ('surface water')
- groundwater (from aquifers and bores, important in some regions but heavily allocated)
- recycled water (different quality grades for different end uses)
- purified recycled water for drinking
- rainwater (captured directly from rooftops, in tanks)
- stormwater (runoff from rain that flows over roads and landscapes, collected in drains)
- seawater (which can be desalinated for use).

Australian water utilities manage these sources through integrated systems to support communities, enable growth, and protect the environment. Water is very location-specific, based on each region's geography and climate. Traditional supplies from rivers and dams are usually fully allocated, plus their yields vary with climate conditions. The water sector has begun complementing these with desalination, recycling and purified recycled water which offer rainfall-independence, though all can involve high costs, long lead times and be energy-intensive. For example, the Sydney Desalination Plant was valued at $2.4 billion on completion in 2012 (capacity 250 million litres/day).

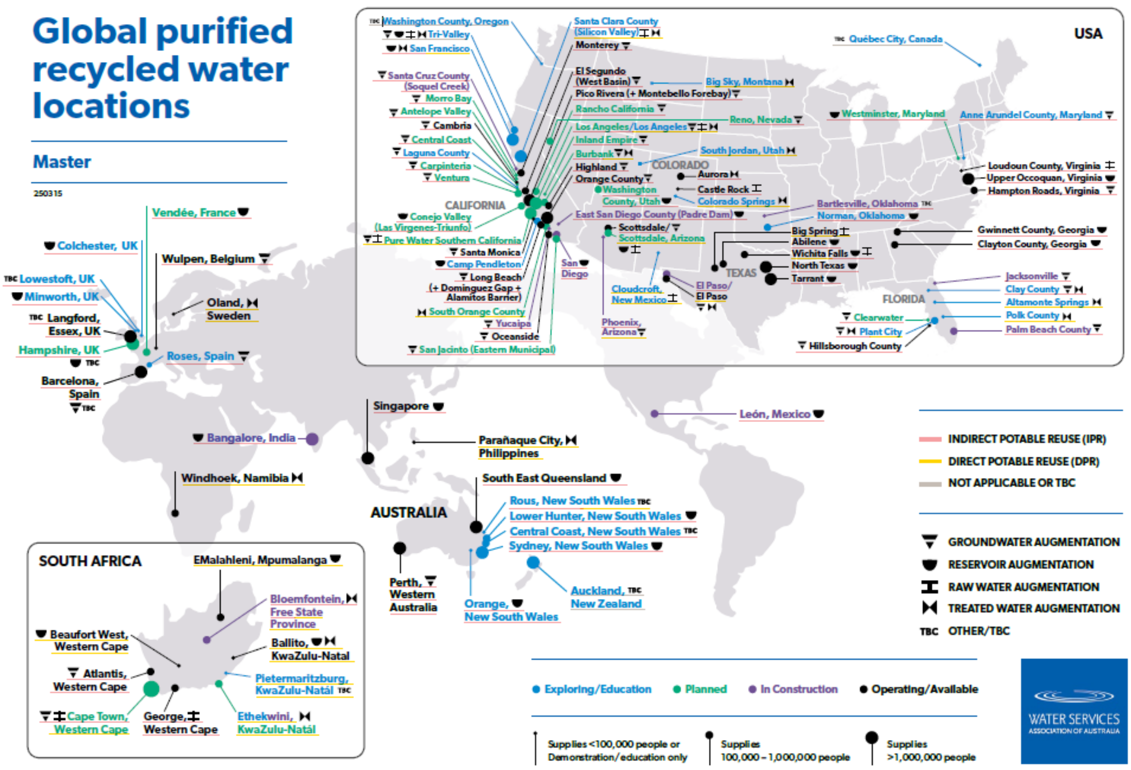
Seawater desalination and recycling are key rainfall-independent water supplies

- Both have large potential yield, especially desalination (oceans are vast)
- Recycling can work in coastal or inland areas, desalination better suits coastal sites (it is costly to pipe water over long distances)
- Both can produce drinking quality water. Recycling can produce a range of different quality levels, using different processes, for different end uses
- They have different recovery rates through the treatment process (~40 - 45% for desalination, 70 – 95% for recycling)
- Recycled water has less salt than seawater, so less energy is needed to pump it through membranes in the treatment process
- Both generate brine that must be managed
- Both require large infrastructure, new plants can take 2 - 10+ years to plan and build
- Recycled water has strong community support for business use

Many are unaware that Australia's six major desalination plants are already actively used, especially during droughts, floods or bushfire – events which all place pressure on providing safe water. As the plants are usually allocated to public supply once dam levels drop below certain thresholds, continuous supply for new customers is not typically guaranteed.

Similarly, recycled water is increasingly recognised as a valuable resource, and often used to meet existing customer and environmental needs. It may be more available in some urban locations, but can still require significant infrastructure. Over 35 cities globally — including Perth and Brisbane — have already adopted purified recycled water as part of their drinking water supply or strategy. Sydney and other regions are exploring this for the future as it will be substantially lower cost to the community than other options. Sydney Water has a demonstration plant that can be visited and toured.

Figure 1: WSAA maps, Purified recycled water for drinking around the world



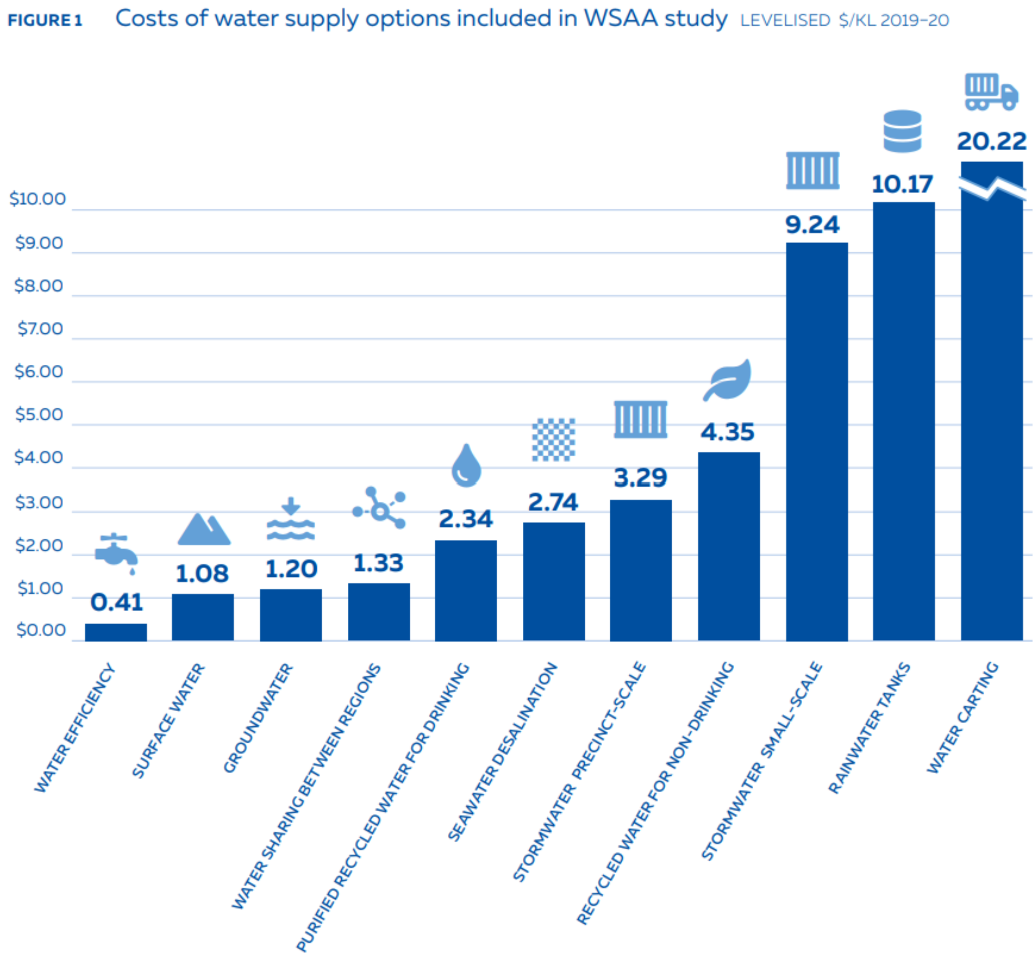
Recycled water isn't always 'spare' and available, nor low cost. There may also be differences in the reliability[11] or continuity of the supply between recycled and drinking water. Co-locating[12] alongside water recycling plants may be a strategic opportunity, as there may be available recycled water capacity, land, and connections to distribution pipelines, energy, and fibre. Some plants also use renewable energy from biogas, adding further benefit.

[11] Uptime Institute outlines that alternative water sources can be less predictable especially during drought
[12] 'Co-locating' in the water sector often means locating adjacent to a property to enable beneficial interactions such as using each other's by-products as inputs in circular economy applications.

State planning departments can advise on any growth areas or activation precincts with dedicated water and infrastructure plans that could suit data centres looking to cluster. Working collectively with other data centres may produce time and cost efficiencies.

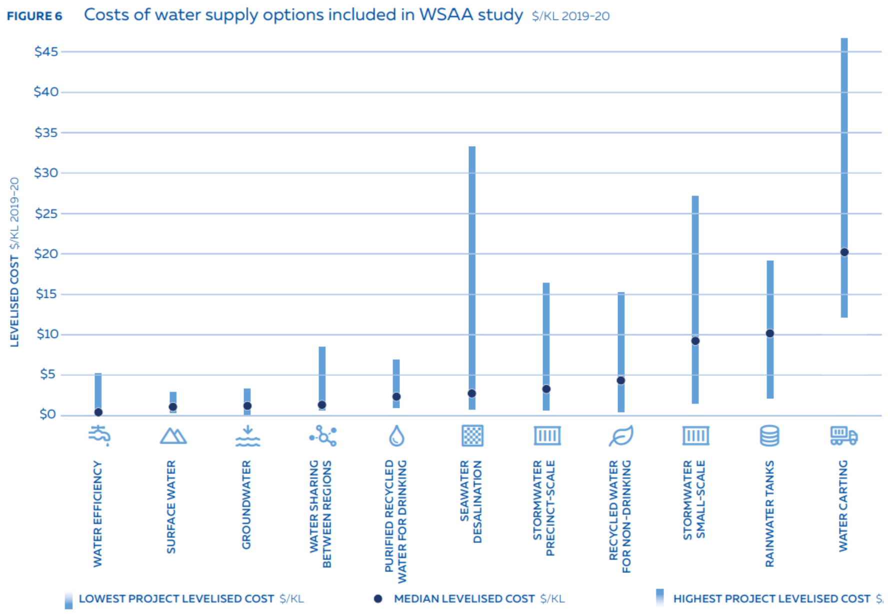
WSAA's 2020 All Options on the Table – Urban Water Supply Options report included the largest known database of water projects costs in Australia (330+ projects). It contained high level guidance on the levelised costs, yield and energy use of different water supply options and technologies. Levelised cost means the total cost (capital and operating) as calculated by a water utility per unit of water over the life of the asset. The extent of distribution infrastructure included varies (reflecting the actual situations of participant projects). This information is indicative only, several years old and not a base for current commercial arrangements. Actual costs and commercial considerations will vary, and water utilities will provide applicants with current estimates of costs for specific projects.

Figure 2: WSAA report, Levelised costs of Australian water supply options



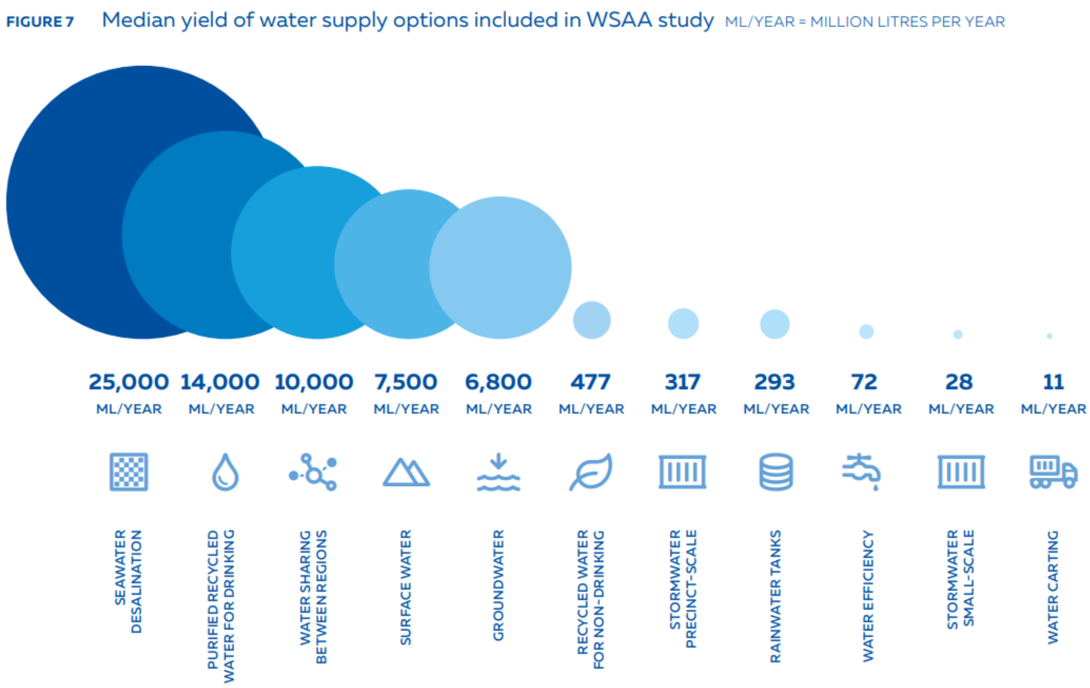
Some options have more variability in cost than others as shown in Figure 3:

Figure 3: WSAA report, Range of levelised costs of Australian water supply options



In terms of yield (how water each can provide), all options can make valuable contributions to secure water supplies. However for large cities, typically the main options that can meet the demand/supply gaps that already exist for the future, will be large scale options like desalination, purified recycled water for drinking and water sharing (transfer pipelines, which offer less rainfall independence):

Figure 4: WSAA report, Yield of Australian water supply options



The report also includes high level guidance on energy use of water supply options:

Figure 5: WSAA report, Energy use of Australian water supply options

TABLE 1 Energy use for water supply options

WATER SUPPLY SOURCE	TYPICAL ENERGY USE (KWH/KL)	REFERENCE
Groundwater including water treatment	0.2 – 2.5	Beca Consultants (2015)
		Plappally and Lienhard (2012)
Rainwater tanks	0.59 – 4.9	ISF (2013)
		Tjandraatmadja et al (2012)
		Retamal et al (2009)
Purified recycled water for drinking	1.3 – 3.8	Lam et al (2017)
		ISF (2013)
Recycled water for non-drinking	0.5 – 8.0	ISF (2013)
Seawater desalination	3.3 – 8.5	Lam et al (2017)
		ISF (2013)
		Cook et al (2012)
		Plappally and Lienhard (2012)
Stormwater harvesting and reuse	Limited data available[1]	
Surface water including water treatment	0.1 – 1.0	Lam et al (2017)
		Biswas and Yek (2016)
		ISF (2013)
		Plappally and Lienhard (2012)
		WSAA data
Water carting	Limited data available[2]	
Water sharing between regions	0.01 – 3.3	Lam et al (2017)
		Plappally and Lienhard (2012)

1 Similar to recycled water for non-drinking options, stormwater harvesting and reuse options have variable energy use
2 Water carting energy use arises primarily from fuel use by the truck carting the water. The distance travelled influences the energy (fuel) use

2.3 Water planning and timeframes

1. Many current water security plans pre-date recent demands from data centres.
2. Water planning is a detailed process with extensive community input.
3. Early engagement and detailed forecasts from large water use customers is key.

State governments and water utilities carefully manage limited and largely climate-dependent water resources. Strategic planning for each region takes 2 – 5 years, with plans covering a 25 – 50 year horizon. These plans consider all sources and uses of water, including residential, industry, agriculture, environmental flows, and cultural uses. They must meet regulated criteria for 'yield', 'reliability' and 'sustainability' (volumes provided, frequency and duration of drought restrictions) – and are shaped through engagement with communities, governments, and Traditional Owners.

Water use also varies by season, requiring networks that can cope with peak summer demand. Regional differences matter; some areas can shift water across catchments (e.g. Brisbane and Victoria's water grids), others like the Illawarra are more locally constrained.

Many jurisdictions are already planning to balance future demand/supply gaps with expected urban growth. Climate variability – including droughts, floods, bushfires and changing rainfall patterns – is adding pressure. Desalination and recycling investments are helping but have limited spare capacity and long lead times for expansion. New supply projects can take 5 – 10 years or more, with planning, environmental approvals and construction timelines. Other necessary accompanying upgrades (to distribution networks, and wastewater systems) incur time and costs as well, and there are limits to how much construction can be delivered in a competitive infrastructure marketplace.

The expanding needs of data centres including 'hyperscalers' (see Section 3.1) are sudden and recent. Many current water plans do not account for them, and planned recycling and desalination capacity may be already earmarked for community needs. Data centre applications in a region already expecting residential growth may bring forward the need for new water assets. This can be managed; in fact it creates opportunities for partnerships to accelerate growth. The water sector welcomes the openness of data centres to partner in funding needed assets. Where growth is planned collaboratively, data centre demand can help underpin the business case for beneficial infrastructure – such as recycled water schemes or network upgrades – that also serve surrounding communities.

Water utilities understand that speed to market is key for data centre investment. Given this, early, strategic engagement with the local water utility is essential. Water planning and new asset creation require a high level of certainty, so proponents should provide realistic and detailed water use projections (see Checklist). Data centres working together to prepare combined projections across developments will help address cumulative impacts.

Some Australian jurisdictions have water readily available for data centre use. WSAA encourages utilities with available capacity to share their details via WSAA's Data Centres and Water Resource Library (www.water360.org.au).

2.4 Wastewater

1. There is as much cost and complexity in wastewater as water supply.
2. Customers may have to install pre-treatment systems onsite for blowdown.
3. There are opportunities for circular economy approaches.

Collecting and treating used water is a major cost for utilities. Coastal Water Resource Recovery Facilities are usually larger and discharge to the ocean, while inland plants discharge to rivers. Sensitive waterways can require higher treatment standards and lower volumes. Accepting new flows depends on spare network and plant capacity and whether local infrastructure is sized for future growth. In some cases, new transfer pipelines may be needed to move used water from customers to coastal facilities - often a large capital cost.

Data centres that use large volumes of water will also discharge high liquid trade waste to sewers and water resource recovery facilities. Where networks are at capacity, larger assets may need to be built. This also creates opportunities for centralised recycling and localised sewer-mining: extracting wastewater from a nearby main, treating it on site for fit for purpose use, and returning residuals to sewer. Feasibility is site-specific, depending on proximity to a sewer main, sufficient volumes available in that main, space for treatment infrastructure to be built amid existing urban development, environmental and land use constraints.

Blowdown management can impact site viability and water source choices

In cooling towers, when water evaporates, salts and dissolved solids remain behind, which concentrates dissolved solids in the circulating water. To control scaling, corrosion and biofouling, operators discharge this ‘blowdown’ and add make-up water. Operators often prioritise high purity water as it maximises the number of ‘cycles of concentration’ water could be used for, reducing overall water use, discharge volumes and costs. Achieving 8 cycles versus 4, for example, can materially reduce costs and water intensity but depends on water chemistry, treatment and monitoring. Recycled water can be an appealing option, but it has more dissolved solids than potable water and would generally only allow 3 – 4 cycles of concentration, which could double the water demand. Advanced treated recycled water, such as high quality reverse osmosis water, is costly but would enable more cycles (for example it may enable 8 or 9).

Blowdown can be warm and saline, increasing pipe corrosion and scaling risk (especially in precincts) and affecting biological processes in wastewater treatment systems. Utilities may require costly pre-treatment (e.g. inhibitors, softening, reverse osmosis, heat exchange) to manage these risks. Trade waste agreements usually set limits on temperature (e.g. <38 °C), salinity/TDS, pH, chemicals and metals, and may require on-site pre-treatment, performance monitoring, instantaneous and total flow measurement, audits and reporting. Charges often reflect risk and impact: business wastewater/trade waste fees can exceed potable water charges, and customers with higher-risk discharges may need to fund upgrades. Early, careful consideration of water sources, treatment process, cooling configuration, reuse options and costs can help prevent blowdown becoming a major issue.

2.5 Water costs and bill examples

1. Water is charged on a volumetric basis and pricing is often regulated.
2. However, overall water has a larger fixed component than energy pricing, mainly to cover wastewater costs.
3. Data centres will pay a range of recurrent water, wastewater and trade waste charges, plus infrastructure contributions which may be large.
4. Data centres will have the opportunity to forward fund infrastructure if they wish to be serviced ahead of schedule.

In many large cities, water prices are set by independent regulators in 3 – 5 year periods through detailed public processes involving customer engagement and formal submissions. These reviews set allowable capital and operating expenditure and aim to avoid cross-subsidisation between customer groups. There is heavy scrutiny for the prudency and efficiency of proposed spend, and a high degree of demand certainty is needed. Large-scale new customer demand typically needs to be flagged several years in advance.

Upfront infrastructure contributions, forward funding and bespoke agreements

Large water and wastewater infrastructure may be needed to meet the unique needs of data centres. Infrastructure contributions (or developer charges) regimes enable cost recovery for growth-related development, and are sometimes a variable price per lot paid by the developer of the land. These differ by jurisdiction and can range from zero to tens of millions or more. Utilities will provide applicants with detailed cost estimates.

Given the unique needs and high level of service requirements of data centres, new, fit for purpose cost recovery mechanisms may be developed. The Data Centres As Enabling Infrastructure report[13] acknowledges that 'Water regulators…will need to work closely with industry to anticipate and plan for the concentrated infrastructure requirements of large-scale data centre developments.'

If a data centre seeks large volumes of water before planned augmentations in a new area, it can forward fund infrastructure – for example to fund treatment systems or local network assets. Utilities may require bespoke contracts and/or long term 'take or pay' arrangements. These are used in the gas sector, whereby customers pay regardless of whether they take the agreed quantities. This ensures cost recovery, diligent planning and avoids 'stranded assets' (infrastructure investments that cannot recover their costs if expected demand does not eventuate, due to delays, downsizing, customer market withdrawals, or data centres changing technologies[14]).

[13] November 2025, Data Centres as Enabling Infrastructure, commissioned by data centre organisations and produced by Mandala, November 2025 Appendices
[14] American Water Works Association, Cooling the Cloud: Water utilities in a data driven world, October 2025

Water prices reflect scarcity and investment costs
Creating new water sources requires significant investment. Existing lower cost sources (e.g. rivers or dams, which are low cost and largely already paid for by previous generations) are usually fully allocated. Regulators often set water pricing at a level that reflects the cost of generating the next increment of water supply (long run marginal cost).

Water prices across Australia are likely to go up in future years, reflecting a range of cost, growth, climate and financing drivers. Water utilities try to keep bills as low as possible while delivering essential services to entire communities. All customers seeking high water volumes need to plan ahead, budget for upfront infrastructure/developer contributions and a range of recurrent charges, and be prepared for prices to increase due to climate, growth, and financing pressures. Customers can make cooling technology choices in consideration of the expected costs of different resources and policy requirements.

Recurrent (ongoing) charges

Water prices are generally structured to send signals to use water efficiently. Usage charges tend to be the largest component of ongoing bills, but water pricing in Australia differs from energy pricing, with a higher proportion of fixed charges that are unavoidable regardless of usage. Water charges include fixed and variable components.

Typical water charges (excluding infrastructure contributions) include:

- **Fixed availability (service) charges** for water and recycled water, usually based on meter size.
- **Volumetric usage charges**, which vary with consumption and may include seasonal or tiered pricing (e.g. uplift during drought, or a higher tariff for large users).
- **Wastewater service charges**, typically fixed based on meter size or property class.
- **Variable wastewater charges**, based on discharge factors multiplied by water use.
- **Liquid trade waste charges**, which vary by volume and contaminant strength (e.g. bio-chemical oxygen demand (BOD), TDS, total suspended solids (TSS), nitrogen). Includes fixed fees and contaminant load charges.
- **Recycled water and stormwater charges**, where applicable.

Examples of recurrent charges (excludes infrastructure contributions)
This section models some hypothetical, example ongoing water bills. There are many variables in water pricing, so these are not actual water bills and do not constitute guidance on likely water bills for any particular customer or jurisdiction. They are indicative only and aim to give a snapshot of potential ongoing water charges. They should not be used for comparison or estimation purposes:

Table 1: Hypothetical worked examples of Australian water bills over 1 year for large water use customers such as data centres (illustrative only, excludes infrastructure or developer contributions)

	Smaller			to				Larger
Scenario	**22kl/day drinking water**	**0.7 ML/d of drinking water, 1.75 ML/d of recycled water**	**1 ML/d of drinking water, 1ML/d of recycled water**	**2.5 ML/d of drinking water, 1 ML/d of recycled water**	**2.5 ML/d of drinking water, 1 ML/d of recycled water**	**3 ML/d of drinking water, 5ML/d of recycled water**	**20 ML/d of drinking water, 5ML/d of recycled water**	**30 ML/d of drinking water, 1ML/d of recycled water**
	Location A	Location B	Location C	Location D	Location E	Location F	Location G	Location H
Water								
Water Availability charge	$ 2,919.00	$ 14,248	$ 820	$ 13,405	$ 345	$ 812	$ 2,949	$ 20,100
Water usage Charge	$ 26,920.00	$ 1,419,303	$ 2,387,100	$ 3,091,053	$ 3,091,053	$ 3,504,000	$ 23,141,000	$ 35,806,500
Wastewater								
Wastewater availability	$ 13,695.00	$ 13,421	$ 4,800	$ 553	$ 545	$ 15,605	$ 9,518	$ 117,500
Wastewater usage	-	$ 791,411	$ 308,000	$ -	$ 2,553,318	$ 1,460,730	$ 3,942,000	$ 4,774,000
Recycled Water								
Recycled water availability	$ -	$ -	$ -	$ 6,122	$ -	-	$ -	
Recycled Water usage	$ -	$ 3,545,063	$ 2,387,100	$ 865,053	$ 1,034,638	$ 5,256,000	$ 5,201,250	$ 1,193,600
Trade Waste charges	$ 970.20	$ -	$ -	$ 1,883,074	$ 1,721,227	$ 7,762	$ 5,186	$ 3,200
Total Data centre charges	**$ 44,504.20**	**$ 5,783,445**	**$ 5,087,820**	**$ 5,859,260**	**$ 8,401,125**	**$ 10,244,909**	**$ 32,301,902**	**$ 41,914,900**

Notes:

- Water utilities are receiving enquiries for larger water volumes than this for future centres.
- Recycled water prices are frequently bespoke and based on a range of factors. They can be lower, equal to or higher than drinking water prices. These scenarios reflect different hypothetical, illustrative price levels for recycled water, in some cases simply the drinking water price.

3. Overview of data centres

This section is aimed at the water sector, policy-makers and stakeholders. It gives a high level overview of what data centres are, how they use water, the importance of cooling choices, and various factors that go into optimising plans for individual data centres. It details how water efficiency and power efficiency are evolving and how they are measured, along with examples of how different countries are integrating data centres. It provides practical signposts, to build understanding and enable policy consideration in future, through further detailed work.

'Most outsiders see cooling as an afterthought. In truth, it's now a frontline differentiator.'[15]

'Waterless cooling systems, closed-loop and refrigerant-based, will expand as water scarcity and regulatory pressure mount. Expect WUE to appear alongside PUE in ESG disclosures, as investors demand accountability.'[16]

[15] What's inside a data centre – the 5 core components explained, globaldatacenterhub+data-centers@substack.com 28 August 2025
[16] From CRAC to Liquid: Why Cooling Is Now the Biggest Risk (and Opportunity) in Data Centers, Global Data Centre Hub, 19 September 2025

3.1 What are data centres

1. Data centres are facilities that house IT equipment. Their scale is measured by their processing capacity (in megawatts).
2. Models include enterprise, cloud, hyperscale and AI training/inference centres.
3. Some data centres house their own operations, others lease space to clients.

Data centres are facilities that house IT systems (servers, processors and storage), plus supporting infrastructure (cooling systems and backup power generation). They power a range of digital services (data storage, analytics, cloud computing, artificial intelligence (AI)). They are often measured by their processing capacity in megawatts (MW), although future centres are moving towards gigawatt (GW) capacity[17]. Some key types, and approximate processing capacity in megawatts (also known as their 'white floor' space) include:

- **Traditional (Edge or Enterprise)**: used for internal IT support: ~0.5 – 5 MW
- **Cloud**: host virtualised storage/services: ~5 – 50 MW
- **AI Training**: train models like ChatGPT. Rapidly growing segment with the highest computing intensity: ~10 – 100+ MW
- **AI Inference/Search**: delivers AI responses (e.g. ChatGPT): ~5 – 50 MW
- **Hyperscale**: massive, multi-purpose: ~50 – 300+ MW – moving to GW in future
- **'Co-location'**: Mixed occupancy centres where multiple companies lease space[18].
- **Data centre operator**: Operate centres for clients, rather than their own operations.

Data centres serve a large customer base that operates many core consumer, government and business services: consumer services, health and medical operations, transport and defence systems, financial, manufacturing, banking and essential services. Some data centres are recognised as critical infrastructure under legislation that protects essential digital architecture. They are key to modern life and as such often seek a higher level of service (i.e. greater reliability, less interruptions) than other customers.

Data centres contain racks, or shelves, of servers in secure, temperature controlled spaces. The sector strives to increase 'rack density' – more power in each rack, measured in kW/rack of 'compute power'. Greater rack densities enable greater operational activity (their commercial output). AI is ushering in a generational change in how computing works: and as rack densities increase, data centres are getting bigger or more importantly, hotter.

Five large data centre organisations in Australia[19] commissioned the Empowering Australia's Digital Future report. It stated that Australia had 1,350 MW of data centre capacity in October 2024, and forecast this to reach 3,100 MW by 2030 (a 120% or 1,750 MW increase). This figure is not updated in the 2025 report 'Data Centres as Enabling Infrastructure'.

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[17] Recently approved centres of 650 MW in Eastern Creek and 504 MW in Marsden Park may be the largest in the southern hemisphere.
[18] In water, co-location has a different meaning – of establishing alongside a business to utilise by-products.
[19] AirTrunk, Amazon Web Services, CDC, Microsoft and NextDC – report prepared by Mandala Partners

3.2. Where are data centres located

1. Australia has about 270 existing and planned centres.
2. Sydney and Melbourne are current hotspots, with lower activity elsewhere so far.

Data centres are located all over the world. The public Data Centre Map of existing and future centres shows that they are widespread, with concentrations in Europe and North America.

Data centres are not new to Australia, but the existing stock includes smaller and legacy centres. Newer developments include larger, more power-dense hyperscale centres. Centres usually locate close to customers to enable low latency (or lagging time). AI training centres can theoretically suit more remote locations. Data centres also often choose to 'cluster' together to utilise similar infrastructure.

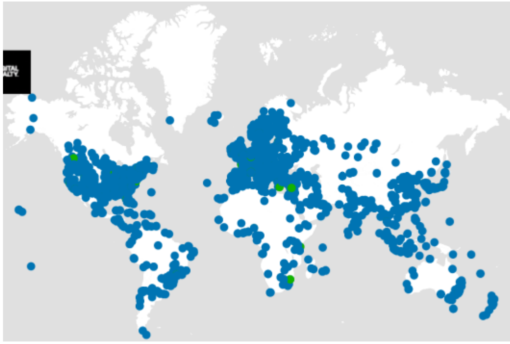

Figure 6: Map of data centre global distribution

Investment is highest in NSW and Victoria – Sydney and Melbourne are 'hotspots'. One driver for this is undersea fibre cables which carry much of Australia's global data traffic. Sydney has about 35% of the centres, Melbourne about 20%, and Brisbane, Adelaide, Canberra and Perth about 8% each. But in capacity terms Sydney dominates, with larger centres and hyperscale-ready campuses in areas like Western Sydney. CBRE's 'Australian Data Centres 2024' report suggests Sydney has roughly 55-60% of national capacity, Melbourne about 30% and 10% elsewhere[20]. Data Centres as Enabling Infrastructure estimates Sydney will use 67%, and Melbourne 21%, of data centre electricity[21].

Figure 7: Australian distribution of data centres (Data Center Map)

Market	Data Centers
Sydney	97
Melbourne	55
Perth	26
Brisbane	25
Adelaide	20
Canberra	20
Hobart	5
Darwin	5
Total Data Centers:	283

Imprint 5 December 2025

[20] Australia's Data Centres 2024 | CBRE Australia workings from p22 chart, incorporating existing built-out capacity and future. This breakdown aligns with a Commo report showing Sydney has over 50%.
[21] Data Centres as Enabling Infrastructure, Mandala (commissioned by the data centre sector), November 2025, Appendices

3.3 How data centres use water

1. Cooling system choices are the prime determinant of on-site water use. Water is also used offsite as an input to energy production processes.
2. AI and modern chips are driving greater power density in racks, leading to more sophisticated cooling innovations, which some[22] providers are rolling out.
3. Water and energy use are complex and inter-related. The optimal mix will vary with each location and its integrated planning needs.

Data centre sites mainly use water for cooling, but also fire suppression, hygiene, cleaning, and landscaping. Data centres have high reliability requirements i.e. a very low tolerance for occasional water service interruptions, as they support many medical, transport and operational systems that operate on a constant basis. Water planning needs to consider:

- **Cumulative supply quantity:** How much water is needed for all the data centres in a region, and when? How does that fit with existing long term demand plans?
- **Local distribution system capacity:** How much water is needed in a local area for the realistic expected customers (including any 'clusters'), and are the reservoirs, pipes, pumps and wastewater systems adequately sized? How will average and peak flows be managed between the utility and the customers?

Data centres are high energy users[23], due to cloud computing and particularly the AI revolution, which is an entirely new era of computing. It involves greater computing intensity, challenging the power and cooling capabilities of existing infrastructure[24]. The data centre industry is going through a step change in its fundamental architecture, to accommodate the next generation of powerful equipment with fit for purpose cooling technologies. Data centre design is driven by the 'kit' of computing hardware and its thermal management needs. While dry, air-based cooling has been a traditional method, rapidly rising power densities and processing loads are making data centres hotter, reducing its effectiveness, as water is a more effective medium for heat transfer.

Data centres are not homogenous: their water use varies based on their cooling system choices, location, water source and water quality. Cooling systems tend to be either air based (which uses little water), liquid-based (where the liquid can be water, or synthetic fluids; these systems use less water but can require more energy), or a hybrid of both.

Global Data Centre Hub noted[25] in September 2025 that 'as AI workloads drive heat densities far beyond historical norms, cooling is moving from engineering detail to boardroom issue…..The paradox is simple: *the more power you add, the harder cooling becomes*.…Regulators and communities are scrutinizing data center water use, and open-loop cooling systems in particular face rising political and ESG risks.' The International

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[22] Industry article

[23] An article in Nature stated that data centres consume 10 – 50 times more energy per square foot than typical commercial office buildings.

[24] Uptime Institute article

[25] From CRAC to Liquid: Why Cooling Is Now the Biggest Risk (and Opportunity) in Data Centers, Global Data Centre Hub, 19 September 2025

Energy Agency estimates[26] the data centre sector consumes over 560 billion litres of water annually and that this could reach 1,200 billion litres by 2030.

Data centres can use all sources of water for cooling (drinking water, recycled, raw seawater, desalinated, rainwater and stormwater). Treating the water to a desired quality level for a particular cooling system can be done either centrally by a water utility, or onsite by a data centre, or both. While water treatment is not the core business of a data centre, it may be cost-effective for them to procure raw water and treat it onsite as an alternative to purchasing treated water from a utility. There are global examples of data centres taking on this role to obtain the reliability they seek. For example, a data centre in Hamina, Finland, uses raw sea water for cooling since 2011[27], and for projects in Singapore and Malaysia, the data centre companies are partnering with local utilities to build water recycling plants.

Holistic accounting for total water footprint

True analysis of data centre water needs should consider both onsite water use in the cooling system (similar to Scope 1 energy use), and offsite water usage through energy generation (similar to Scope 2, sometimes called indirect, embedded or embodied water). The water needs of these two phases may be supplied by different water sources: onsite water use usually comes from a city's urban water supply. The water used in the energy process (e.g. at power plants, water spins turbines, generates steam, and provides cooling) often comes from surface, ground or seawater held under separate water access licences. While this is a separate source, all water should be stewarded carefully.

Just as water is a hidden ingredient in making electricity, electricity is a hidden ingredient in producing water. Treating water to various quality levels, and treating wastewater, can use substantial electricity, with associated carbon impacts. These interdependencies are complex. One 2021 US study[28] estimates that about 75% of data centre water footprint is from indirect water consumption, including electricity generation and electricity consumption of utilities servicing data centres. A 2024 Singapore/US study[29] showed that total water use can vary a lot as grid energy sources shift over time, between low-water renewables and water-intensive thermal generation.

Governments should lead integrated planning and assessment to identify sustainable pathways for Australia's digital expansion, aligned with broader sustainability and emissions goals. Sphere Infrastructure notes: 'This intersection between electricity demand and water use highlights the need for integrated resource planning that ensures new energy capacity is delivered efficiently while water usage is managed sustainably.'[30] As capacity scales from megawatts to gigawatts[31], leading nations are recognising that how they manage water and

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[26] Cited in Government Digital Sustainability Alliance, UK, Rich Kenny, Report: Water Use in AI and Data Centres and IEA report Energy and AI, 2025 (p242)
[27] Detailed in Nature Partner Journals 2021 article
[28] Siddik, Shehabi, and Marston, "The environmental footprint of data centers in the United States," 2021
[29] A Dataset for Research on Water Sustainability, arXiv
[30] Sphere Infrastructure: AI, data centres and water: Australia's next infrastructure test (10 September 2025)
[31] SemiAnalysis article

energy resources is a frontline of digital growth. Strong planning frameworks can steer investment towards competitive, sustainable cooling technologies.

A framework being developed and worth exploring is the Green Grid's Data Center Resource Effectiveness (DCRE) metric[32], a holistic metric based on the inter-relationship of energy, water use, water stress and climate zones. It proposes the Water Usage Impact (WUI) metric, a proxy of water usage and water stress where the data centre is located.

Peaks and averages matter

Data centres can have high peak water use on very hot days, which may not arise regularly. Data centres with water-based systems have to work harder to keep the facility cool on those days, using more water. Peaks are for limited duration, and if facilities use very little water across the bulk of the year, this magnifies the perception of the peak as it can appear large relative to annual use.

Planning for peak usage is important, as utilities need to size assets for such times, even in very efficient centres. Water efficiency is typically measured over a year. Annual figures are a far more accurate representation of overall water use than occasional peak periods. Some recent media coverage appears to misinterpret peak usage for average, exacerbating community concerns about water use of data centres. Accurate portrayal is important.

Optimising all resources is a balancing act

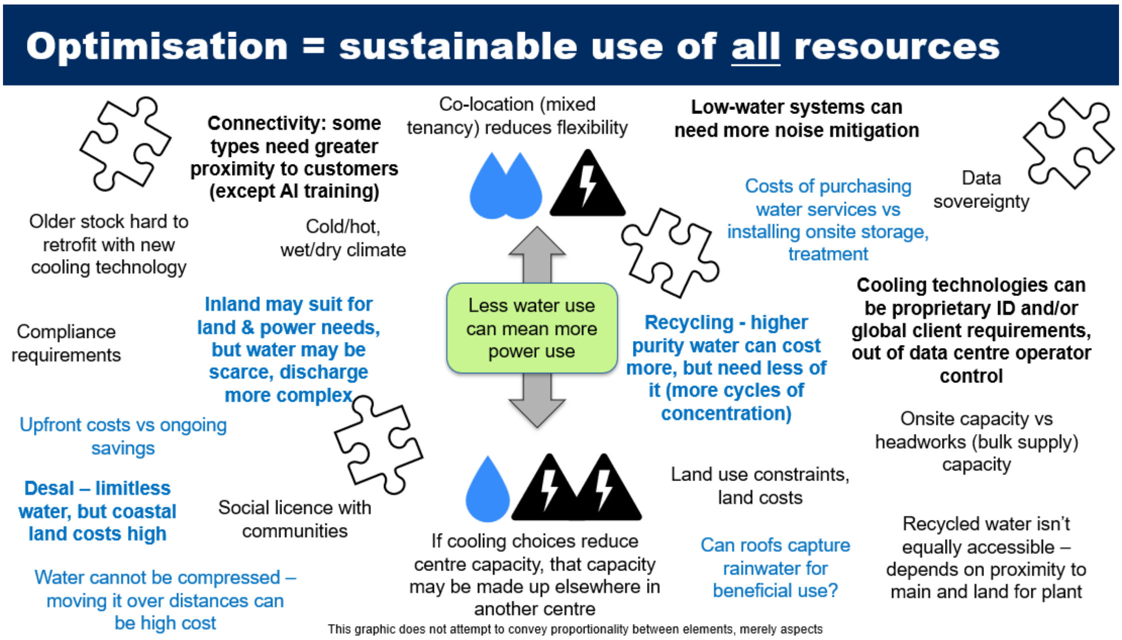
Cooling approaches present trade-offs between water and energy use. Locational feasibility varies – some suburbs or regions can be energy-favourable but challenging for water, or vice versa, or constrained on both. At a country level, cooler climates (e.g. southern Australia, New Zealand) may reduce cooling needs. Inland locations can benefit from low humidity, reducing corrosion. In other countries nuclear energy is sometimes used as a power source.

Optimisation is a complex balancing act of environmental sustainability, productivity, noise, setup and operating costs. Water is typically a lower cost resource than energy. All aspects should be considered – conserving one resource without regard to others is not holistic. There will be sites where water-based cooling avoids large local energy augmentations. Holistic planning assessments can identify where more water intensive cooling options, especially with recycled water, deliver better overall outcomes across water, energy, carbon, cost and reliability. Optimal outcomes will be site-specific.

Australian communities will be interested in the individual and cumulative efficiency of data centres. Actual water and energy usage figures are not widely reported, as they are often considered commercial in confidence. In any case, they are hard to evaluate given that data centres vary widely in power density, location and function.

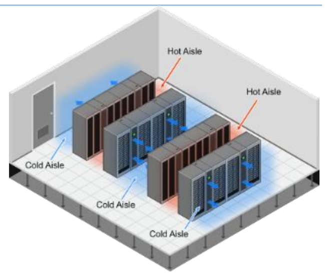
[32] The Green Grid, White Paper 93: Data Center Resource Effectiveness (DCRE) v1 Metric, February 2025

Figure 8: Optimising data centres requires a balance of many resources

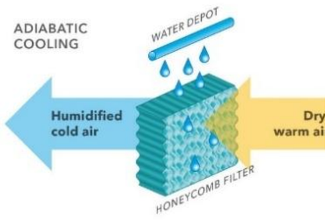
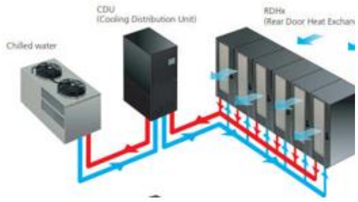
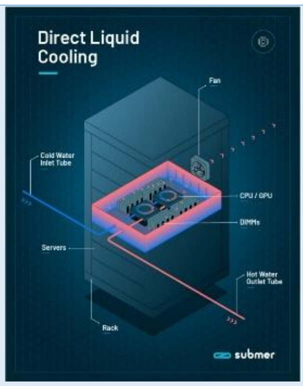


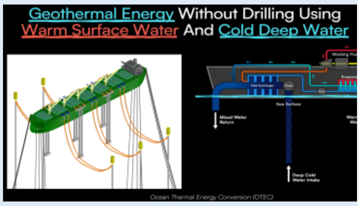
How much water do different cooling methods use?

Some traditional data centre cooling methods include:

Air cooling	In small or legacy centres, using outside or mechanically cooled air to remove heat, similar to traditional fans and air conditioning. Some larger centres use air cooling in hybrid systems along with chillers (that cool water to be circulated) or liquid cooling.	
Evaporative cooling These conventional cooling methods are increasingly impractical and inefficient for AI loads. Newer innovations that	This includes pad/media air coolers and cooling towers. Where warm air passes through water-saturated pads, the water evaporates, removing heat from the air and cooling the IT equipment. While energy-efficient, it can be water-intensive, as the evaporated water (around 80%[33]) is lost and must be continuously replenished. Once-through systems do not reuse water; recirculating systems (cooling towers) re-use remaining water through multiple 'cycles of concentration', before 'blowdown' and discharge.	

[33] Government Digital Sustainability Alliance, UK, Rich Kenny, Report: Water Use in AI and Data Centres

some are moving towards (often in hybrid set-ups) include:	**Adiabatic cooling**: also known as 'evaporative assist', it pre-cools air using mist or spray, which can create water loss.	
	Rear-door heat exchangers: chilled water/refrigerant at rack level, reducing the overall cooling load	
Closed loop	Chilled water or another coolant circulates within a sealed network of pipes. The liquid absorbs heat from the servers and releases it elsewhere, without ever being exposed to air. Because the fluid isn't lost to evaporation, this approach can result in an extremely low water consumption. However, facilities still release the heat rejected from the closed loop system through a second facility loop in the overall building, which may be water-cooled (with high water use), or air-cooled (more water efficient).	
Direct-to-chip cooling	A high precision method whereby a 'cold plate' sits directly on the hottest components (chips). A liquid coolant flows through the plate, absorbing heat at the source. This manages the heat from AI processors and reduces the need for broad cooling of the whole facility (i.e. the entire building systems).	
Immersion cooling	Fully submerges servers in a non-conductive (dielectric) fluid that directly contacts components, absorbing heat more effectively than air. An efficient way to cool high-density racks used for AI, where feasible. This method has been estimated to reduce on-site water use	

	by 30 to 91%[34]. There is a well-known US prototype. Another Australian company is innovating with high-performance, low water use immersion cooling.	
Geothermal	Uses cold water from deep in aquifers or oceans.	
Hybrid systems	Can employ a mix of systems. Water efficiency can vary. The internal 'technology loop' that cools the servers may use an advanced water-efficient system. But this efficiency may be diminished in centres where the outer 'facility loop', which expels the heat from the overall building, uses a more water-intensive method. Even advanced liquid cooling methods like direct-to-chip often transfer heat to a central building water system, which may still use water-intensive evaporative cooling to reject the building's total heat load.	

The water-energy trade off in cooling

Assessing the sustainability of data centre cooling is complex. Energy, water and emissions should be evaluated across the whole life cycle including energy generation. A wealth of sub-options and literature exists on this topic. Broadly[35], closed-loop, direct-to-chip, immersion and dry air-cooled systems generally use less water than adiabatic and evaporative cooling. These newer methods can drive competitive performance and are part of the technology future for data centres.

Even among evaporative systems, water use varies[36], with factors such as higher 'cycles of concentration' (recirculating the water several times) reducing bleed-off. Evaporative cooling is also less effective in humid areas as the air contains more moisture already. Singapore has issued guidance to reduce water use in evaporative systems (see section 3.9).

The Australian market includes both hyperscalers adopting high-efficiency cooling for AI loads, while some traditional developers continue to design for conventional evaporative cooling, which saves energy but uses more water. More water efficient technologies are readily available and expanding with global research and innovation. It is often expressed that water efficient systems lead to much higher energy usage. Available evidence indicates this is not automatically the case, as systems are in use today in Australia that achieve both high water efficiency and efficient energy performance. It is imperative for long term

[34] Industry article, Infosys article

[35] Based on industry discussions, scientific and commercial literature such as ScienceDirect, Environmental and Energy Institute, NSF Pubs, Science Direct, Uptime Institute - Nature - Life cycle assessment quantifies the benefits of advanced cooling methods, such as cold plates and immersion cooling, in reducing greenhouse gas emissions (15–21%), energy demand (15–20%) and blue water consumption (31–52%) in data centres

[36] The US Department of Energy's 'Cooling Water Efficiency Opportunities for Federal Data Centres' outlines a range of options to reduce the water intensity of evaporatively-cooled data centres, as does this NREL article.

sustainability outcomes and sector competitiveness, that a balance between power efficiency, water efficiency, carbon impacts and resource productivity for each location is achieved.

Best outcomes for all resources will be achieved through a combination of integrated resource planning, appropriate price signals for energy and water, and well developed policy settings. The water sector can work with governments and the data centre industry, to embed the transition towards efficient cooling that optimises all resource impacts. This may involve creating incentives and policies that drive its adoption quickly and competitively, across the whole market.

Initiating this work quickly is important as once built, data centres operate continuously and have limited scope to make major changes such as to cooling systems. The early design choices lock in long term water use, so embedding efficient practices in new builds will have lasting impact. Shifts towards direct liquid cooling, for example, in existing centres are not simple: '…this is not a retrofit. Direct liquid cooling requires rethinking rack design, manifolds, leak detection, and service contracts. It is an architectural shift.[37]'.

Alternative sources - recycled water, purified recycled water, desalination, rainwater, regional stormwater basins or sewer mining with on-site treatment and storage – can also ease pressure on drinking water supplies but must still be used wisely as they are also valuable resources. Choosing the lowest-cost sources for community benefit, within a transparent and principled allocation framework, is essential. These choices have real consequences: for example Sydney needs to increase its drinking water supply in the next 5 – 10 years to meet community needs. Purified recycled water is emerging as the most cost-effective option, as used in over 35 cities globally (Section 2.2). If this water is allocated for data centre supply, the community may need to pay a premium for higher cost alternatives to meet its needs, such as desalination, requiring billions[38] of dollars of additional funding to be raised through household water bills. Sydney Water is investigating additional recycled water sources for data centres, to meet their preference for recycled water while ensuring the lowest cost sources benefit the community first.

The resource efficiency picture will keep evolving. With global moves towards whole-of-life accounting (e.g. embodied energy in water and embodied water in energy), judging efficiency by cooling type alone is overly simplistic. More reliable, nuanced metrics are Water Usage Effectiveness and Power Usage Effectiveness. These are outlined next.

WSAA will be populating its Data Centres and Water Resource Library with reliable information about water use and cooling.

[37] From CRAC to Liquid: Why Cooling Is Now the Biggest Risk (and Opportunity) in Data Centers, Global Data Centre Hub, 19 September 2025
[38] Costings developed for implementation of the Greater Sydney Water Strategy

3.4 Water efficiency in data centres - WUE

1. Globally, data centre water efficiency is measured by Water Usage Effectiveness.
2. Power Usage Effectiveness is the equivalent power metric.
3. An international standard (ISO) governs WUE measurement and reporting.

Resource efficiency is important for data centres. There are inherent cost, reputational and Environmental/Social/Governance drivers towards greater efficiency. Australian communities and investors will also be interested in this. 'Water Usage Effectiveness' is a global metric for measuring water efficiency, developed by The Green Grid[39]:

Water Usage Effectiveness (WUE): Litres / kWh – litres needed to power computing

$$\text{WUE} = \frac{\text{Annual water use (L)}}{\text{Annual IT energy use (kWh)}}$$

Worked example:

A 100 MW data centre, using 3 ML/day of water

$$= \frac{(3{,}000{,}000 \times 365)\ \text{L/yr}}{(100{,}000 \times 24 \times 365)\ \text{kWh/yr}}$$

$$= \frac{1{,}095{,}000{,}000}{876{,}000{,}000}$$

= WUE of 1.25 L/kWh

WUE[40] changes with time, based on factors like:

- **Load:** in its early days a data centre might be only 20% deployed (i.e. at 20% occupancy), but as it still needs cooling, the WUE will be high and gradually decrease as more of the site's capacity is utilised.
- **Design vs operational:** In effect, WUE reflects the maximum water a centre could use (or 'design capacity' – but many use less[41] in 'operational WUE').
- **Weather,** month and season, as explored in this Singapore/US study.

Water efficiency should not be considered in isolation, given the balancing act between water use and energy use. Data centres track their energy efficiency with the 'Power Usage Effectiveness' (PUE) metric, which measures energy use for the computing output versus overall facility energy use (including cooling, lighting etc). Data centres pursue lower values (closer to 1) to maximise their energy use to power computing versus their overheads.

Empowering Australia's Digital Future report states that 'the average PUE of data centres globally has improved by 37 per cent since 2007, falling from 2.5 to 1.58. Data centres in Australia are even more efficient, with design PUEs as low as 1.15 and a median value of 1.30...up to 1.63[42]'. A Nature article notes an instance where a US company has achieved a PUE of 1.12.

[39] A not for profit industry consortium of companies, government agencies, and educational institutions dedicated to advancing energy efficiency in data centres
[40] WUE is often expressed as L/kWh-IT (which simply specifies that it reflects the water use for computing)
[41] For example see Oxford Economics estimate of 0.79 and Californian estimate of 67%
[42] Empowering Australia's Digital Future, 2024, pages 6, 22 and 32, citing DataCenterMap and interviews

For the PUE calculation, the centre's capacity is calculated as the hourly load (i.e. a 100 MW data centre uses 100 MW/hour for computing):

Power Usage Effectiveness (PUE):

$$PUE = \frac{\text{Total facility energy}}{\text{IT equipment energy}}$$

Worked example:

A 100 MW data centre, with whole-of-site metered power use of 1,201,350 MWh

$$= \frac{1{,}201{,}350 \text{ MWh}}{(100 \times 365 \times 24) \text{ MWh}}$$

$$= \frac{1{,}201{,}350}{876{,}000}$$

= PUE of 1.371

WUE and PUE need to be considered in combination. While PUE is widely reported, there is less reporting of WUE[43], or the reporting is caveated or general[44] in nature (such as global mission statements). More public reporting, particularly of PUE, will occur in future as part of:

- Australian climate related financial disclosure requirements – these do not name PUE or WUE, but push operators to disclose material energy and water metrics – many will use PUE and WUE
- Australian Commonwealth procurement rules, which require data centres hosting government workloads to maintain a NABERS[45] Energy for Data Centres 5-star rating (roughly PUE at or below 1.4)
- ESG reporting trends
- a European Union Energy Efficiency Directive requires most data centres to report efficiency metrics – this can pull in multi-national organisations operating in Australia
- anecdotally, there is increasing expectation from financiers, customers and other stakeholders for transparency on power and water use. For example WUE requirements may be bult into Sustainability Linked Loans.

This is a positive step. Better visibility of both will help communities and policy-makers understand the trade-offs and incentivise efficiency. Some data centre market entrants are already reporting voluntarily on their sustainability – examples are provided in the next section.

WUE can vary with local context. Places that are water-rich can tolerate higher WUE, whereas in hot and dry places that are water-stressed, lower WUEs may be a priority.

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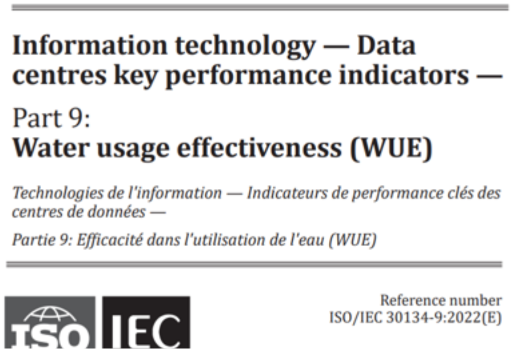
[43] Data searches confirm this, and this Environmental and Energy Study Institute article cites a 2016 report that less than a third of data centre operators track water use. The UK Government Digital Sustainability Alliance reports that only two fifths of data centre operators actively track their water use metrics
[44] Nature Partner Journals provides an overview (2021) of water use reporting by major players
[45] National Australian Built Environment Rating System. Data centre tools here

International Standard for WUE

There is an international standard for Data Centres – Key Performance Indicators: ISO/IEC 30134 9:2022[46]. Part 9: Water Usage Effectiveness has detailed guidance on how to calculate and report WUE. This is important to ensure consistency, and enable fair and transparent comparison. Some relevant aspects include:

- **Period:** WUE figures should be annualised average data, for a minimum of one year measured water and IT energy (measured use, not modelled use, and the same period for both energy and water)
- **Boundary:** It applies to all water used within the data centre boundary, including staff amenity, landscaping and on-site energy production. It includes (inner) technology loops and (outer) facility loops. This includes cooling tower evaporation losses and filtration losses (e.g.reverse osmosis reject water).


Information technology — Data centres key performance indicators —

Part 9:
Water usage effectiveness (WUE)

Technologies de l'information — Indicateurs de performance clés des centres de données —

Partie 9: Efficacité dans l'utilisation de l'eau (WUE)

Reference number
ISO/IEC 30134-9:2022(E)

Figure 9: The International Standard for Data Centres covers a Water Usage Effectiveness methodology

- **Energy Water Intensity Factor (optional):** considers water linked to energy production offsite e.g. at power plants (also known as embodied water)
- **Sources of water:** the standard accounts for different water sources e.g.drinking water, rainwater, recycled water
- **Water Reuse Factor:** outlines tracking for water captured and reused on- or off-site
- **Derivatives:** InterimWUE, partialWUE, designWUE, qualityWUE and peakWUE may be reported before full metering is available, and must be documented.

WUE may also be reported at portfolio level (e.g. per company or region, not per centre).

There are other variations of WUE referenced internationally[47] – for example Water Security Usage Effectiveness (WSUE), WUE_{site} and WUE_{source} (which measures embodied water). All these may be of interest in devising Australian policy frameworks.

The natural next question is what are typical and good WUE levels. Examples are provided in the next section.

[46] Available for purchase at around $255 AUD
[47] NSW Pubs outlines these measures and some US case studies in an academic article.

3.5 Actual WUE examples

1. There is increasing reporting of WUE globally, but still less than PUE.
2. The often quoted 'industry average' of 1.8 is out of date and should not be considered a contemporary benchmark.
3. Various organisations globally and in Australia are reporting WUE below 0.4.

While ISO/IEC 30134 9:2022 details how to measure WUE, it does not set or recommend threshold WUE levels that data centres should aim for. This may be an area of public interest. In Australia some data centres already have to achieve a five star NABERS rating for energy, but any water requirements are still emerging.

Reporting of WUE is not widespread globally, but is increasing, and this section lists some examples found in the public domain that give a sense of what data centres are achieving. It does not attempt to evaluate or contextualise these examples or the nuances that sit behind individual WUE scores, such as timing and load. Some WUEs are portfolio-wide outcomes, blending the performance of old and new facilities in different climates, not just design WUEs for new builds. In future, reporting of both WUE and PUE will provide more meaningful data.

1.8 is commonly referenced, but is not a current benchmark

Data Centre Knowledge website states in a 2025 article that 'the average WUE across data centers is 1.8 L/kWh…Beating that average is a reasonable WUE goal. The most efficient data center operators, however, report WUE metrics that are much lower than the average' and goes on to note that one large data centre company reports that its WUE is 0.19 L/kWh, which it assumes arise from economies of scale.

This 'average' of 1.8 L/kWh is widely quoted, and seems to be used as a 'rule of thumb' in the industry. However, it is outdated and should be considered a historical benchmark[48] only. It comes from[49] a 2016 study, 'United States Data Center Energy Usage Report', which is based on historical data centre electricity consumption back to 2000, and forecasts consumption out to 2020 – very old data in the fast moving data centre world.

Modern data centre designs, particularly for hyperscale and AI, are achieving significantly lower WUEs, making 1.8 unrepresentative of current best practice. Claims that this should be a starting point for WUE goals ignore the substantial pace, innovation and progress made in recent years, and the far lower levels that are being achieved at many centres, particularly those adopting next generation fit for purpose cooling technology.

[48] It reflects a range of US locations and appears to focus mainly on centres using water-based cooling: 'in medium to larger size data centers that employ cooling tower based chillers to improve energy efficiency, water is consumed at the data center site itself. Cooling towers use water evaporation to reject heat from the data center…. In larger data centers this on site water consumption can be significant..In this study, on-site water consumption is estimated at 1.8 liters… per kWh of total data center site energy use for all data centers except for closet and room data centers, which are assumed to use direct expansion (air-cooled chillers). Ernest Orlando Lawrence Berkeley National Laboratory report, p28

[49] Data Center Knowledge article cites a US Department of Energy's Lawrence Berkeley National Laboratory study. It also notes that 'As the report points out, far more water is used to generate electricity that powers data centers than to cool them. It takes about 7.6 liters of water on average to generate 1kWh of energy in the US'.

Because the analysis spans US locations with differing water scarcity, an average calculated for water-scarce regions only – relevant to much of Australia – may be lower. The US study may also include old and new facilities in a company's portfolio.

Recent WUEs suggesting moderate efficiency (data only)

One Australian provider reports a WUE over recent years as FY21 0.73, FY22 0.83, FY23 0.94, and 0.97 L/kWh in FY2024[50], alongside a PUE of 1.32. It reports that 53% of its portfolio water use was from recycled water supply.

Another provider reports[51] WUE as 1.74 in FY21, 1.61 in FY22, 1.73 in FY23, 2.16 in FY24, and 2.25 L/kWh in FY25. It states its total water use as 773 ML in FY25. It reports a PUE target of below 1.4, and PUE of 1.4 in FY21, 1.38 in FY22, 1.39 in FY23, 1.42 in FY24.

Another provider reports[52] a global average WUE of 0.3 L/kWh alongside a global average PUE of 1.16, and publishes this table of FY24 results:

Table 2: WUEs and PUEs of US regions of one large global provider (recreated)

Geography	PUE	WUE (L/kWh)
Arizona	1.18	1.63
Illinois	1.35	0.74
Iowa	1.16	0.14
Texas	1.28	0.25
Virginia	1.14	0.14
Washington	1.15	0.95
Wyoming	1.11	0.13
Singapore	1.34	0.01
Ireland	1.19	0.02
Netherlands	1.14	0.06
Sweden	1.16	0.09

Data for July 1, 2023 – June 30, 2024, based on datacenters which we fully own and control, and which were operational for 12 months at the time of calculation.

It also published a graph of WUE in different regions of its global operations in 2022:

- Americas: WUE design goal – 0.52, actual WUE 0.55
- Asia Pacific: WUE design goal – 0.99, actual WUE 1.65
- Europe, Middle East, Africa - WUE design goal – 0.01, actual WUE 0.1
- Global: WUE design goal – 0.39, actual WUE 0.49

This arXiv article 'Making AI Less "Thirsty": Uncovering and Addressing the Secret Water Footprint of AI Models' also reports some onsite and offsite WUE and PUE, involved in inferences (queries) of a major AI search engine:

[50] AirTrunk Sustainability Report FY24 – also notes that the WUE is increasing with capacity growth
[51] NEXTDC FY25 Environmental, Social & Governance Report
[52] Microsoft Datacenters webpage

Table 3: Estimated operational water consumption footprint of major AI search engine

"*" denotes centres under constructions at July 2023, with project WUE and PUE

Location	PUE	On-site WUE (L/kWh)	Off-site EWIF (L/kWh)	Water for Training (million L)			Water for Each Request (mL)			# of Requests for 500ml Water
				On-site Water	Off-site Water	Total Water	On-site Water	Off-site Water	Total Water	
U.S. Average	1.170	0.550	3.142	0.708	4.731	**5.439**	2.200	14.704	**16.904**	**29.6**
Arizona	1.180	1.630	4.959	2.098	7.531	**9.629**	6.520	23.406	**29.926**	**16.7**
Georgia*	1.120	0.060	2.309	0.077	3.328	**3.406**	0.240	10.345	**10.585**	**47.2**
Illinois	1.350	0.740	2.233	0.952	3.880	**4.833**	2.960	12.060	**15.020**	**33.3**
Iowa	1.160	0.140	3.104	0.180	4.634	**4.814**	0.560	14.403	**14.963**	**33.4**
Texas	1.280	0.250	1.287	0.322	2.120	**2.442**	1.000	6.590	**7.590**	**65.9**
Virginia	1.140	0.140	2.385	0.180	3.499	**3.679**	0.560	10.875	**11.435**	**43.7**
Washington	1.150	0.950	9.501	1.223	14.063	**15.285**	3.800	43.706	**47.506**	**10.5**
Wyoming	1.110	0.130	2.574	0.167	3.677	**3.845**	0.520	11.429	**11.949**	**41.8**
Australia*	1.120	0.012	4.259	0.015	6.138	**6.154**	0.048	19.078	**19.126**	**26.1**
Denmark*	1.160	0.010	3.180	0.013	4.747	**4.760**	0.040	14.754	**14.794**	**33.8**
Finland*	1.120	0.010	4.542	0.013	6.548	**6.561**	0.040	20.350	**20.390**	**24.5**
India*	1.430	0.000	3.445	0.000	6.340	**6.340**	0.000	19.704	**19.704**	**25.4**
Indonesia*	1.320	1.900	2.271	2.445	3.858	**6.304**	7.600	11.992	**19.592**	**25.5**
Ireland	1.190	0.020	1.476	0.026	2.261	**2.287**	0.080	7.027	**7.107**	**70.4**
Mexico*	1.120	0.056	5.300	0.072	7.639	**7.711**	0.224	23.742	**23.966**	**20.9**
Netherlands	1.140	0.060	3.445	0.077	5.054	**5.131**	0.240	15.708	**15.948**	**31.4**
Sweden	1.160	0.090	6.019	0.116	8.986	**9.101**	0.360	27.927	**28.287**	**17.7**

Another European provider published the following WUE and PUE data:

Table 4: Published WUE, PUE data and cooling system of European provider

Data center	PUE	WUE	Power source	Cooling system
DC2 PAR1 Paris	1.45	0.009	100% wind or hydro - Guarantee of origin (GO)	Chilled water system
DC3 PAR1 Paris	1.39	0.00009	100% wind or hydro - Guarantee of origin (GO)	Indirect free cooling with a closed-circuit high-temperature chilled water system
DC4 Paris	1.44	0.00002	100% wind or hydro - Guarantee of origin (GO)	EC (direct) with variable compressor (VRV)
DC5 PAR2 Paris	1.25	0.25	100% wind or hydro - Guarantee of origin (GO)	Direct free cooling with adiabatic cooling
AMS1 Amsterdam	1.38	1.64	100% wind or hydro - Guarantee of origin (GO)	EC with hot water system in a closed circuit
AMS2 Amsterdam	1.4	NA	100% wind or hydro - Guarantee of origin (GO)	NA
AMS3 Amsterdam	1.2	NA	100% wind or hydro - Guarantee of origin (GO)	NA
WAW1 Warsaw	1.5	NA	100% wind - Guarantee of origin (GO)	Free-cooling, free-chilling & immersion systems
WAW2 Warsaw	1.24	NA	100% wind - Guarantee of origin (GO)	Free-cooling, free-chilling, immersion systems & air conditioning
WAW3 Warsaw	1.5	NA	100% wind - Guarantee of origin (GO)	Free-cooling, free-chilling & immersion systems

Some public WUE reporting in hot/dry climates include:

- Pheonix, Arizona, USA – site specific WUE of 2.24 in 2022, using outside air with direct evaporative cooling (water used <50% of the year)[53] – noting this organisation is shifting towards zero water for cooling designs in future
- Other Arizona sites will be air-cooled (not water), ie a WUE around zero[54]

Efficient WUEs using advanced cooling

Some organisations operating in Australia are achieving much lower WUE results. Some already report WUE and PUE voluntarily. Market-wide, consistent reporting across the sector would improve transparency, support broader performance uplift and build community trust.

For example, one leading Australian operator using closed loop cooling since 2007 achieves 0.01 L/kWh[55], and PUE of 1.38, by using the original water continuously without replacement in a technology loop, combined with air cooling, saving 5 billion litres a year.

Another provider reports[56] a global, portfolio-wide WUE of 0.18 L/kWh in FY23, and 0.15 L/kWh in FY24, and states a global PUE of 1.15, versus a stated industry average of 1.25. The organisation announced a commitment to be water positive by 2030 and reports being 53% of the way there by FY24.

A TechTarget article cites one large organisation publishing an average WUE of 0.24 L/kWh in 2017, substantially below a cited industry average at the time. The same organisation also published fleet-level WUE[57] (average annual across its fleet) in its annual Environmental Data Index as 0.30 (2020), 0.26 (2021), 0.2 (2022), 0.18 (2023), 0.19 L/kWh (2024).

It also cites other examples of large data centre company reports[58] of their WUE levels:

- 0.31 L/kWh (as early as 2011, noted for not using chillers in its approach)
- 0.19 L/kWh;
- 0.30 L/kWh;
- 0.49 L/kWh;
- 1.52 L/kWh;
- 0.02 L/kWh.

Global Water Intelligence forecasts trends for WUE levels of below 1.0

Global Water Intelligence noted in 2025 that while global data centre water use is rising (forecast to grow 58% by 2030), efficiency is also improving. Direct-to-chip cooling, more recycling, and smart design

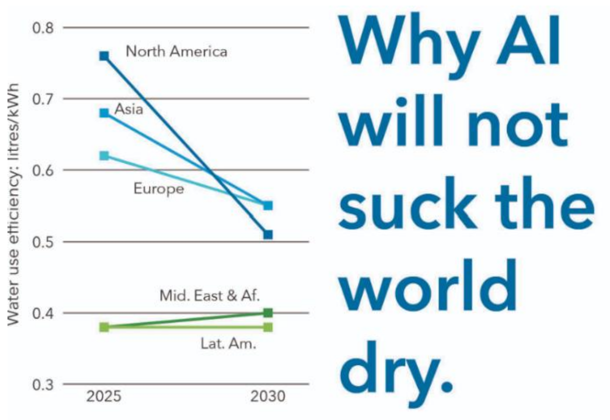


Figure 10: Global Water Intelligence estimate of WUE in global regions in future

53 Industry webpage
54 12news article, industry webpage, industry webpage
55 CDC 2024 Sustainability Highlights and 2025 Sustainability Report
56 Amazon Web Services 2024 Sustainability Report
57 Industry publication
58 The article does not detail whether a standardised format (e.g. annual average demand) has been used, but WSAA assumes this is likely in alignment with the ISO for WUE reporting

are helping major players manage water risk. It claims data centre water use has been declining over the past decade. The report, based on interviews with global industry experts, includes this graphic predicting global WUE trends.

There is a large performance gap

Even with limited data, it is clear there is a large performance gap. Given that WUE reporting is not widely mandated yet, the WUE levels for much of the market are unknown; it may be fair to assume that many of those reporting voluntarily are those with lower WUE results.

For existing facilities, the true spread of WUE across the market will only become clear under consistent public reporting. For new data centres, requiring proponents to submit full design WUE (alongside PUE and cooling configuration) at the application stage – as outlined in the Checklist – would give planners and communities better visibility from the outset.

Setting WUE standards for the Australian context is a valuable next step

Sustainability is a site-specific balancing act. As outlined in Section 3.3, sustainability has many factors, so simplistic judgements should be avoided. Nonetheless, there is a strong case to steer investment in Australia's digital future towards efficient, sustainable, competitive practices. Incentives, transparency, and standards can accelerate this shift.

Global Data Centre Hub[59] stated, 'The next decade will likely be defined by hybrid environments, where enterprise workloads remain air-cooled while AI workloads demand liquid solutions. Operators must design facilities capable of supporting both. Waterless cooling systems, closed-loop and refrigerant-based, will expand as water scarcity and regulatory pressure mount. Expect WUE to appear alongside PUE in ESG disclosures, as investors demand accountability.'

Australian governments should develop minimum WUE and PUE standards for data centres. This paper outlines this in concept; further work is needed to develop actual standard levels suitable for the Australian context. Water utilities, data centres and other stakeholders should all have input into this work. Expanding the NABERS Data Centre energy tools to water would be a good starting point. Standards should be outcome-focussed, technology-neutral and incorporate flexibility for different contexts. They may consider different water sources – such as a lower potable-only WUE, prioritising recycled water use. Simple averages or medians might be misleading; a more nuanced framework might be valuable.

Standards can create compliance costs, which is a consideration. However, standards are common practice and international markets are moving towards performance thresholds to embed efficient cooling throughout the market. The costs may be balanced by broader benefits such as community trust. Also, setting clear 'goalposts' will enable faster approvals and investment certainty.

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[59] From CRAC to Liquid: Why Cooling Is Now the Biggest Risk (and Opportunity) in Data Centers, Global Data Centre Hub, 19 September 2025

3.6 Holistic frameworks can cover multiple aspects of resource use

1. The Climate Neutral Data Centre Pact voluntary framework matches WUE targets to local climate context. The Green Grid's developing Data Center Resource Effectiveness (DCRE) Metric is also worth exploring.
2. Different levels for different water sources is a useful concept if used properly. High WUE should only apply to seawater and recycled water before treatment.
3. An Australian version of these could be adapted for our unique climate contexts.

A voluntary European framework provides one example that Australian policy-makers can explore. The Climate Neutral Data Centre Pact was created in 2021 by data centre proponents as a framework for responsible water use in data centres. It has a detailed methodology which sets technology-neutral target WUE levels for locations with different climate conditions and water sources. Signatories commit to adopting cooling technologies to achieve these levels in new data centres from 2025, and in existing data centres by 2040:

Figure 11: WUE targets in Climate Neutral Data Centre Pact

Potable/Fresh water	Cold climate	Hot climate
Low water stress	1.20 l/kWh	1.32 l/kWh
Low-medium water stress	1.00 l/kWh	1.10 l/kWh
Medium-high water stress	0.72 l/kWh	0.79 l/kWh
High water stress	0.40 l/kWh	0.44 l/kWh

For example, where drinking water is used, the model sets a maximum WUE of:

- 0.44 L/kWh in Madrid, Spain, and
- 2.2 L/kWh in Tallinn, Estonia.

The methodology includes different targets for different water sources:

Figure 12: WUE targets for different water sources in Climate Neutral Data Centre Pact

Grey water	Cold climate	Hot climate
Low water stress	3.60 l/kWh	3.96 l/kWh
Low-medium water stress	3.00 l/kWh	3.30 l/kWh
Medium-high water stress	2.16 l/kWh	2.38 l/kWh
High water stress	1.20 l/kWh	1.32 l/kWh

Black/Salty water	Cold climate	Hot climate
Low water stress	7.20 l/kWh	7.92 l/kWh
Low-medium water stress	6.00 l/kWh	6.60 l/kWh
Medium-high water stress	4.32 l/kWh	4.75 l/kWh
High water stress	2.40 l/kWh	2.64 l/kWh

A framework like this could be a useful reference for Australia. However, WSAA notes that:

- In Australia, grey water means water recycled from showers, baths and sinks. It is not generally collected at municipal scale - most industrial recycling here uses blackwater (sewage). This document's reference to 'grey' water may mean non-potable recycled water, such as that used in Belgium (Section 3.9).
- Black and salty water (recycled water and salty water) are grouped together here. However they have quite different costs, environmental and social impacts, and should be considered separately. There is also usually a higher recovery rate for recycled water than for sea water (as seawater has much higher salt content).
- All water is valuable. When setting target levels for alternative water sources, the target should refer to the source water before treatment. A higher WUE may be fair for raw seawater or wastewater, to allow for recovery losses during treatment. But if the data centre is purchasing recycled water that has already been treated (e.g. reverse osmosis), the water often meets or exceeds drinking water quality, and warrants a strict efficiency target, potentially on par with drinking water.

Another framework in development integrates several key resource factors in one. The Green Grid's Data Center Resource Effectiveness Metric[60], DCRE, can consider both power use, direct water use and indirect water use in power generation, plus climate zone:

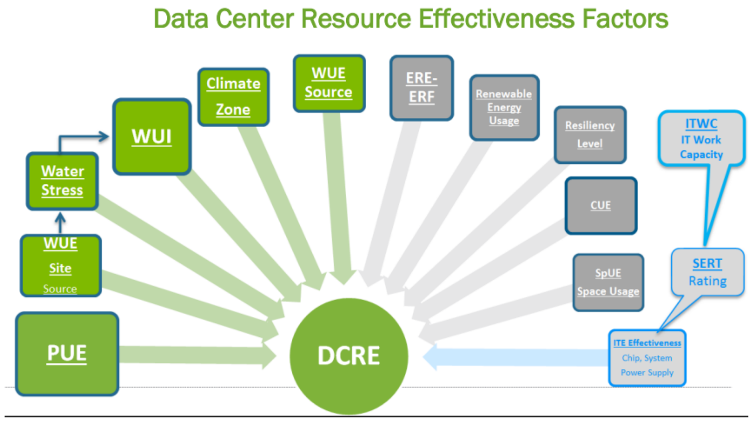
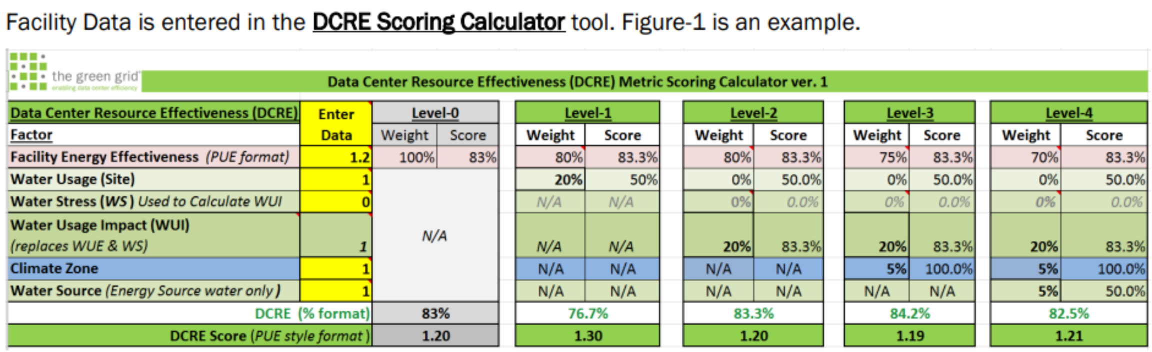


Figure 13: Excerpt from the Green Grid White Paper on the DCRE metric. Future versions will incorporate the factors show in grey.



Facility Data is entered in the **DCRE Scoring Calculator** tool. Figure-1 is an example.

the green grid — Data Center Resource Effectiveness (DCRE) Metric Scoring Calculator ver. 1

Data Center Resource Effectiveness (DCRE)	Enter	Level-0		Level-1		Level-2		Level-3		Level-4	
Factor	Data	Weight	Score	Weight	Score	Weight	Score	Weight	Score	Weight	Score
Facility Energy Effectiveness *(PUE format)*	1.2	100%	83%	80%	83.3%	80%	83.3%	75%	83.3%	70%	83.3%
Water Usage (Site)	1	N/A		20%	50%	0%	50.0%	0%	50.0%	0%	50.0%
Water Stress (*WS*) *Used to Calculate WUI*	0			N/A	N/A	0%	0.0%	0%	0.0%	0%	0.0%
Water Usage Impact (WUI) *(replaces WUE & WS)*	1			N/A	N/A	20%	83.3%	20%	83.3%	20%	83.3%
Climate Zone	1			N/A	N/A	N/A	N/A	5%	100.0%	5%	100.0%
Water Source *(Energy Source water only)*	1			N/A	N/A	N/A	N/A	N/A	N/A	5%	50.0%
DCRE (% format)		83%		76.7%		83.3%		84.2%		82.5%	
DCRE Score *(PUE style format)*		1.20		1.30		1.20		1.19		1.21	

Figure 14: Example shown in the Green Grid White Paper on the DCRE metric

60 The Green Grid, White Paper 93: Data Center Resource Effectiveness (DCRE) v1 Metric, February 2025

3.7 Offsetting and circular economy opportunities

1. Offsetting can enable water recycling, efficiency and other benefits.
2. Offset frameworks must be local, independently administered and audited.
3. Circular economy approaches are a great sustainability opportunity.

There is a growing global 'water positive' movement, which encourages organisations to contribute more to water availability and quality than they consume. Some proposals consider water offsetting, where companies fund water recycling or efficiency projects in other locations than their own site, in exchange for 'credits' that are counted against their drinking water use. This is similar to carbon offsetting, where emissions in one location are counterbalanced by reductions or removals in another.

However, unlike carbon, water is a localised resource. While offsetting can have benefits, the benefits need to be local to have value (as projects in other regions or water catchments would do little for a community or city's water supply system). It also needs to meet the additionality principle – a project that would not have happened otherwise. It should also be independently administered and assessed by an independent entity, involve regular monitoring, auditing and reporting.

In Australia, coNEXA, a supplier of recycled water, is exploring the establishment of a Sustainable Water Infrastructure Market (SWIM) with Sustainable Water Investment Certificates (SWIC). It incorporates all the sound governance principles discussed here. This is attracting market interest and could form a valuable part of the data centre and water ecosystem. coNEXA have established a non-profit Sustainable Water ANZ Ltd to own the IP in SWIM / SWIC and independently manage the scheme.

There have been global questions about whether water savings 'replenish the basins that need it most[61]'; or are not local (for example an organisation claiming credit for water savings from water stewardship projects not completed at the source where water is extracted and consumed[62]), However, the practice is now better established and better governance frameworks have sprung up.

There may be greater demand for some types of 'offsets' than available initiatives to generate the 'credits'. Globally, offsetting frameworks are being applied to recycling plus a broader range of water resilience initiatives, such as water conservation, leak reduction, nature based solutions and water quality. Not all regions are water scarce, so initiatives do not need to be one size fits all. These frameworks can be approached with an opportunity mindset, seeking beneficial investments that address varying local issues in exchange for credits managed through a centralised scheme.

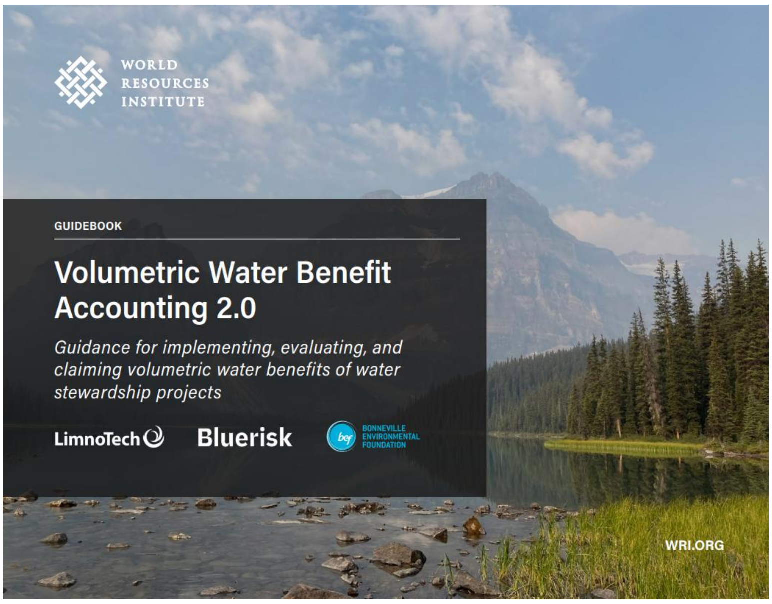
[61] Techtarget, 2025 – locations not specified.
[62] Techtarget, 2025

Measuring benefits

Measuring benefits of such initiatives will be key to investors, communities and stakeholders – all want robust and credible outcomes. Volumetric Water Benefit Accounting (VWBA)[63] was developed to give companies a consistent, credible way to quantify the actual water outcomes of stewardship projects, responding to the need for transparent accounting behind "replenishment" and similar targets. First released in 2019 and updated as VWBA 2.0 in 2025, the guidance sets out a structured six-step approach to identify eligible projects, calculate volumetric water benefits (e.g. megalitres per year), and track and report results in line with catchment conditions and risks.

In practice, organisations use VWBA to screen activities, estimate benefits, avoid double counting, and substantiate public claims against corporate or site-level water goals. It covers a broad range of interventions that can measurably change hydrology or reduce demand – irrigation efficiency upgrades, leak reduction, wetland and riparian restoration, managed aquifer recharge, stormwater capture, and process-water reuse. Volumetric metrics are paired with complementary indicators where needed. It is designed to make water benefits comparable, auditable, and tied to local basin context.

Figure 15: Guidebook on Volumetric Water Benefit Accounting, September 2025



[63] World Resources Institute

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Offsetting examples

The below examples illustrate the range of activities being pursued globally through offsetting frameworks:

- **Replenishment, groundwater recharge or water recycling** – typically reported in terms of volume replenished or 'water positive' commitments. Some global data centre organisations are funding projects in watersheds near operations (pond recharge, aquifer modelling, credits)[64]. For example in Sydney, the Great Eastern Ranges is partnering with Amazon Web Services to restore nature in bushfire-impacted parts of the Wollondilly Shire (Sydney), to improve water yield and quality, boost biodiversity and enhance resilience to climate change (estimated 32 million litres/year on completion).
- **Agricultural water-use efficiency, demand reduction, leakage reduction** – such as drip irrigation, scheduling, on-farm efficiency initiatives. For example in Penrith, Sydney Water facilitated a project with Swan Systems and Microsoft for more efficient irrigation practices in local parks.
- **Nature-based treatment, wetland restoration and habitat repair** – including nature-based wastewater or stormwater treatment to improve water quality, water availability or provide ecosystem benefits (habitat, flood attenuation, erosion). For example in the US, Meta has partnered with the National Forest Foundation on the Comanche Creek Restoration in New Mexico.
- **Water quality** – may include scientific research on treatment or remediation methods. For example, in Taiwan, Google is funding a gravel contact oxidation process in the heavily polluted Xipuzi drainage area.

Circular economy opportunities

Some advanced data centres recirculate water for reuse in their own facility. There are global examples where the heat energy from the used water is reused: in Devon, UK, a data centre reuses heat generated by submerged servers to warm the Exmouth pool, saving energy . The Old Oak and Park Royal development in London uses data centre waste heat to serve 10,000 homes and commercial space .

There may be opportunities for siting a data centre close to a business that can use high salinity water, or hot water (e.g. pools, glasshouses/protected cropping, enclosed gardens, food production). A direct offtake could be established prior to recycling the cooled water at the data centre where feasible. Capacity for some discharges to sewer may still be required.

[64] Industry publication, webpage, webpage, circular economy article

3.8 Existing frameworks in Australia to incentivise efficiency

1. Australia has two existing frameworks relevant to data centres.
2. NABERS has energy tools but not water tools. Expanding the NABERS Data Centres framework to include water will help support efficient water use.

NABERS (National Australian Built Environment Rating System) Energy Tools

Australia's NABERS government-backed rating framework certifies the operational performance of buildings on a 1 – 6 star scale. For data centres, NABERS Energy offers two pathways: Infrastructure, and Whole Facility – so operators, tenants and owner-operators can be rated appropriately.

Ratings are based on 12 months of measured consumption, normalised for factors like IT load and climate, and are carried out by NABERS Accredited Assessors under published rules. For data centres specifically, the methodology aligns with PUE-based benchmarking to provide a market-recognised indicator of efficiency and to support procurement, disclosure and improvement programs.

There are no water tools to go with the NABERS energy tools for data centres yet. These would be a good starting point for Australia.

Water Stewardship Asia Pacific

Water Stewardship Asia Pacific (WSAP) is a not-for-profit that leads uptake of the International Water Stewardship (IWS) Standard across Australia and the Asia Pacific region. It supports governments, businesses and communities to strengthen water governance, build local capacity, and drive collective action for sustainable water use.

Working at both site- and catchment-scale they help organisations realise the benefits of water use that is environmentally sustainable, economically beneficial, and culturally and socially equitable, meeting the organisations' ESG ambitions. Using the International Water Stewardship Framework, WSAP provides training, strategic advice, Water RoadMap tool and Verification Program to provide a pathway to credible water stewardship.

3.9 Global regulatory trends

1. Many global jurisdictions are adopting policy frameworks that channel digital investment towards leading, sustainable outcomes eg Singapore, Malaysia, Ireland and Spain.
2. Recycled water is being used in some places, with different providers.
3. Australia can learn from other places and develop leading frameworks.

Around the world, governments are shaping data-centre growth through clear reporting requirements, performance standards, and gateway-style approvals that reward efficient, low-impact designs. These approaches provide valuable lessons for Australia to build a policy framework that supports both digital investment and sustainable water management.

Europe

Spain is introducing one of the most advanced models, requiring annual disclosure of energy, water and sustainability indicators. New or expanding data centres must demonstrate they are within the top 15% of national performance before gaining grid access – directly encouraging best-practice proposals.

The European Union already collects WUE and energy KPIs in a central database and plans to propose minimum performance standards by 2026.

Germany has mandated tight PUE limits and required heat reuse for new centres, while Ireland prioritises grid connections for centres in suitable locations with flexibility and system-support capability – operating as a gateway to channel investment to efficient projects.

United Kingdom

The UK is strengthening planning and reporting expectations, with recommendations for mandatory water use reporting, integration of water planning into digital infrastructure approvals, and incentives for advanced cooling. London's system of favouring projects that export waste heat provides a positive example of targeted, performance-oriented approvals.

Asia

Singapore has developed one of the world's most complete frameworks, combining mandatory reporting, efficiency standards, high-temperature operating guidelines and capacity allocation only to best-in-class operators. Its long-standing leadership in recycled water (NEWater) and detailed efficiency benchmarks provide a model for transparent, proactive stewardship. Excess NEWater purified recycled water is added to drinking water supplies.

Johor, Malaysia demonstrates how strong sustainability criteria can guide rapid growth. Raised tariffs, sustainability guidelines and a structured vetting process – which has rejected about 30% of applications – ensure new projects contribute positively to water and energy goals. Recycled and reclaimed water are central to approvals, supported by clear WUE expectations.

United States

U.S. states are adopting varied but increasingly purposeful approaches. Las Vegas (Nevada) has prohibited evaporative cooling in new developments, redirecting investment towards low-water cooling technologies.

Texas highlights the need for modern safeguards, with legacy laws allowing unrestricted groundwater extraction – showing the risks of not updating frameworks as data centre development accelerates. There is a lasting reputational legacy for these data centres.

Minnesota, California, Colorado and Virginia use tools such as mandatory disclosures, large-user reviews, recycled-water networks and impact-based permitting to manage demand and support efficient proposals.

Overall insight

Globally, data-centre growth is being guided away from permissive planning, towards policies that promote efficiency, transparency and responsible resource use. This points to a concise set of policy levers that Australia can adapt, including:

- Mandatory public reporting of WUE and cooling technologies
- Performance standards for PUE, WUE and potentially heat recovery
- Gateway-style approvals that prioritise efficient, low-water applications
- Proactive protection of community water sources through recycled water strategies, pricing tools and location based planning

These examples show that good regulation can support both sustainable water management and a thriving digital economy. Australia is well positioned to build on these insights and develop a world-leading framework.

Section 6: Appendix: Global examples: recycling, WUE regulation and targets Global examples describes these and other global examples in more detail.

3.10 Extent of recycled water use

1. Recycled water use is becoming more common, but the global extent is unclear.
2. Australia has the opportunity to lead on recycled water for data centres.
3. Recycled water is a valuable resource and should be used to best benefit communities.

It is not easy to gauge how much data centre water use is recycled wastewater. In some places its use is growing (for example Singapore, Malaysia and the US, as outlined in Section 3.9 and Section 6), but there is little detailed reporting. It is also unclear because:

- WUE reporting does not always distinguish clearly between water sources
- definitions can cause confusion (e.g. water can be reused internally in evaporative cooling systems, but if that water was not drawn from municipal recycled water supplies (which reuse treated wastewater), it is not generally considered as using recycled water
- simple lack of reporting - Uptime Institute reports that globally, 'Fewer than half of data center owners and operators are tracking the metrics needed to assess their sustainability and, in some cases, to meet pending regulatory requirements'
- many data centre organisations (particularly cloud providers) do not disclose location and water sources of their centres for security reasons[65].

The American Water Works Association paper 'Cooling the Cloud: Water Utilities in a Data-Driven World'[66] notes that 'By some accounts, up to 57% of water consumed by data centers for cooling has been sourced from potable water, with the rest coming from various other sources such groundwater, surface water, or various forms of reuse or reclaimed water.'

One large global provider reports using recycled water for direct evaporative cooling in Virginia and Oregon. Some data centre organisations state the use of non-potable or recycled water at a number of data centres, particularly in the US, though it is not always stated what percentage of total water demand this makes up. One provider claims to use recycled water at 25% of its sites[67].

Singapore is a good case study. PUB invested in the central NEWater scheme to provide recycled water from wastewater for industry some twenty years ago, with excess used to top up drinking water supplies. Johor, Malaysia is also driving recycled water for data centres. Some data centre organisations report harvesting and using rainwater[68] onsite, though there is little detail about the quantities of this or whether it is used for landscaping only. One data centre organisation has indicated that it is used in cooling processes.

Recycled water for industry is an appealing concept, but there are practical considerations to be aware of:

- Recycled water is not always cheaper than drinking water – particularly at smaller scale. Pricing may often be bespoke, reflecting costs, risk allocation and service standards. Higher purity recycled water requires high cost advance treatment. Data centres will need to allow for the risk and long term commitment of this source of water. Large, centralised purified recycled water for drinking schemes can achieve economies of scale;

[65] Industry discussions

[66] Cites U.S. Department of Homeland Security. Cybersecurity & Infrastructure Security Agency. Recent U.S. Efforts on AI Policy. Washington, DC., n.d. https://www.cisa.gov/ai/recent-efforts

[67] Industry article, Data Center Dynamics article

[68] Industry article and discussions

whereas smaller, stand-alone recycled water schemes may face higher unit costs (Section 2.2).

- Data centres using recycled water for cooling may also still need a drinking water top up to achieve the level of service sought, with attendant costs and charges. This is particularly relevant for smaller scale facilities with limited redundancies. They will also still need a drinking water connection for staff and hygiene uses.
- In some places, recycled water may be committed to existing uses or customers – such as industrial or irrigation sites, or receiving waters.
- Often, recycled water will need new treatment systems and distribution pipelines – with attendant costs, space needs, approvals, timelines and administrative coordination. Where such pipelines already exist, flows may be available for new customers. Where they do not, the public utility, a private utility, or another entity such as a data centre organisation can set up the treatment and distribution infrastructure. This can happen at a larger centralised plant (for example an existing wastewater treatment plant); or through sewer mining, building a local, decentralised plant to treat the water onsite. The Australian Guidelines For Water Recycling will govern quality and risk requirements.
- If higher purity water is desired to maximise the cycles of concentration, advanced treatment systems such as reverse osmosis may be needed to reduce dissolved solids, nutrients and organics; and for wastewater disposal, as cumulative liquid waste streams could impact other system users. This can cost more than conventional drinking water.
- With the shift towards very low water use technologies in new data centre builds, there may be less imperative for recycling, as the small amount of water used may not justify the cost for creating, treating and distributing a new, separate recycled water supply.
- Recycled water systems are not always engineered to offer the same level of reliability as drinking water systems. They can have varying flow levels, a single treatment source (less redundancy), less in-network storage, fewer repair crews and spare parts for breakdowns, longer rectification times. There are also specific considerations for managing Legionella risk with recycled water. Equally, recycled water systems can be configured for high reliability, continuity and quality, on par with potable systems. These attributes can be designed in through early engagement and planning, and/or redundancy may be available through backup connection to drinking water supplies.

Australia's opportunity: Recycling offers safe, reliable water for the whole community

Recycling presents a major opportunity for Australia to lead in supplying secure, climate-resilient water for both communities and growing sectors such as data centres. Purified recycled water is already a safe, cost-effective drinking water source in over 35 cities worldwide, and similar approaches can help strengthen water security here. As Australian jurisdictions consider new recycling schemes, a core guiding principle is that community and environmental needs for affordable, reliable drinking water remain the first priority. Within that framework, a mix of approaches – from large, centralised purified recycled water schemes through to fit-for-purpose industrial supplies, sewer mining and other local solutions – is likely to offer the best way forward across different regions and contexts, enabling data centres to benefit from recycled water without compromising drinking water security or network resilience.

4. Data centre water use in Australia

This section is aimed at the water sector, policy-makers and stakeholders. It explains how water use varies with different WUE levels, and that whatever the actual water use, efficiency levels have a substantial impact on overall productivity.

The modelling is not a forecast of future water use. It represents a theoretical maximum average water use under full load, which is rarely the operational reality. The purpose is to show the critical importance of water efficiency in design, not to predict a specific outcome for Australian water supplies in any jurisdiction.

4.1 Single data centres versus other customers

1. A single centre's water use can vary widely with its size, scale, and WUE level.
2. A large data centre can still use less water than the largest existing customers of water utilities if it adopts water efficient cooling (low WUE).
3. An efficient but very large facility could use more than large existing customers.

How much water a single data centre uses varies based on its computing capacity and water efficiency level, measured by the WUE metric. To illustrate the relativities, WSAA modelled three hypothetical individual data centres, with increasing computing capacity:

- A cloud data centre: 25 MW
- A smaller hyperscale: 100 MW
- A larger hyperscale: 250 MW[69] (NB: Australia recently approved two above 500 MW)

WSAA has modelled water use for each centre at three levels of WUE. These levels span a range – from the voluntary efficiency targets under the Climate Neutral Data Centre Pact (CNCDP) to lower efficiency, to illustrate some potential high and low water demand scenarios. This analysis calculates quantities of water regardless of source – it could be a mix of recycled water, drinking water, desalinated water, storm or rainwater.

This modelling is not a forecast of actual water use levels or timing; it illustrates relativities. It represents a theoretical maximum for average design capacity water use. Actual operational use varies and is typically lower, due to variable IT loads and climatic conditions. The purpose is to show how different WUE levels influence potential water use, and how design efficiency choices have a profound impact.

Table 5: WUE levels for three hypothetical data centres (illustrative only)

WUE (L/kWh)	Efficiency level	Rationale for choosing this modelling point
0.4	Higher	The lowest WUE in the CNCDP for drinking water in water-stressed regions. Generally considered efficient, though some Australian market entrants are achieving lower WUE than this (see Section 3.5)
1.32	Medium	The highest WUE set in the CNCDP for drinking water in water-stressed regions. Industry source Aquaray posits 1 – 2 as "Average to Inefficient".
2.5	Lower	Due to limited reporting of WUE, it is difficult to define low water efficiency with precision. However, Equinix notes that facilities relying solely on evaporative cooling may report a WUE as high as 2.5. Some applications to Australian water utilities state a higher WUE than this.

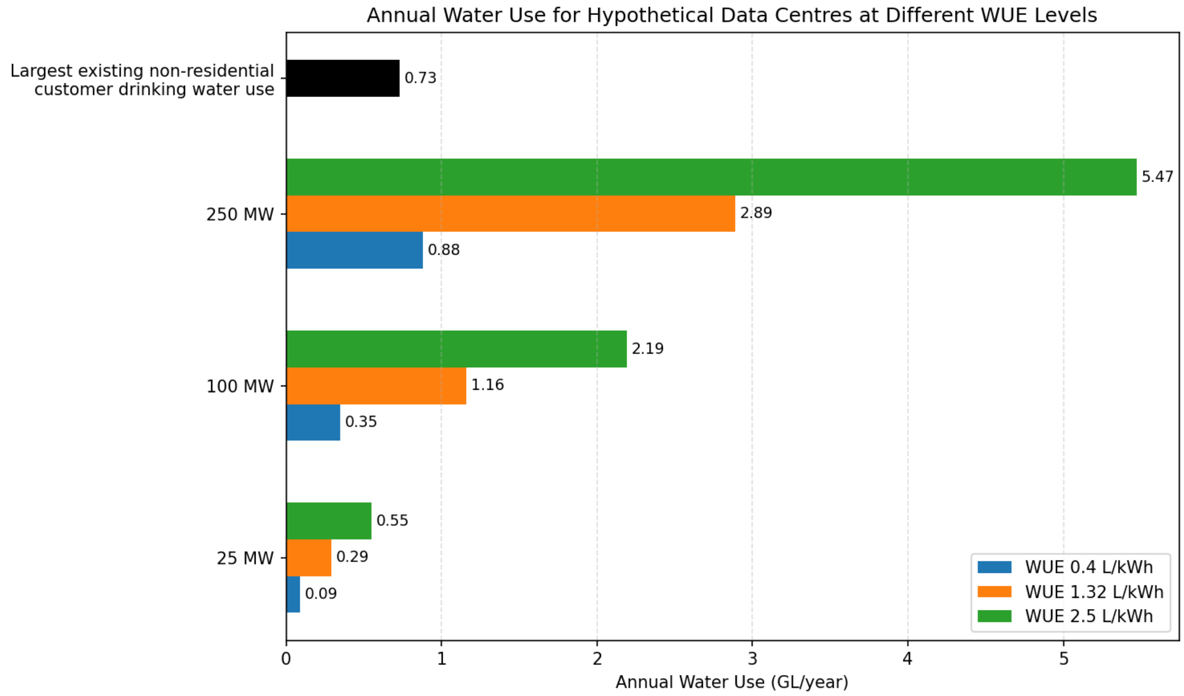
Figure 16 shows the three hypothetical single centres and their water use at the three WUE levels. Higher WUE means more water is used for the same output. For reference, their

[69] There are larger hyperscale data centres than this existing and/or planned in Australia.

hypothetical water use is plotted against the existing largest drinking water customers of major city water utilities (typically below 1 billion litres per year (GL/Y).[70]

This analysis is based on a new data centre operating at its full, designed IT load. In practice, facilities ramp up to this over several years, so their actual water use in their initial operating years will be lower than these figures suggest. The aim is not to predict actual use or timing, but to show the difference WUE levels make to water use.

Figure 16: Upper bound average water use of model data centres at WUE levels (GL/Y)



While this is not the actual water use, it is evident that a single large data centre could use substantially more water than existing large customers. However, with a low WUE, that data centre can use less water than other large customers. This figure is also source agnostic – the water could be drinking water, recycled water, seawater or some combination.

Sydney Water is receiving applications and enquiries for single data centres of up to 40 million litres per day (average day demand, equivalent to over 14 billion litres per year (GL/Y)). This is equivalent to 70,000 to 80,000 homes, or 16 Olympic swimming pools per day. It is twenty times the use of the largest existing drinking water customer. Melbourne water utilities are also receiving very large water use applications.

Whatever the water source, the relativities are clear – a lower WUE uses water more productively as it takes less water to create the same output. Integrated planning that can assess the potential for water efficiency, energy efficiency and carbon impacts for data centres in different locations, will ensure the best long term sustainability outcomes.

[70] There are occasional outliers slightly higher, using a combination of drinking and recycled water.

4.2 Cumulative water use in Australia – digital bang for the water buck

1. Data centres have the potential to use a substantial proportion of urban water supplies. Sydney applications (15 - 20% of total water use) are a good example.
2. The level of water efficiency (WUE) has a profound impact on how much 'bang' we get for the quantity of water used.
3. There is a strong case for driving Australia's data centre fleet to be water-efficient, and use recycled water where feasible, following the lead of global jurisdictions.

Data centres are acutely concentrated in cities. Even within cities, they often 'cluster' together in key suburbs. The emergence of Australia as a global data centre hotspot can lead to positive outcomes for Australian communities. This will need careful planning for the cumulative water impact of many data centres in already populous areas.

Water utilities are in the unique position of having wide visibility of the market, through applications and enquiries for new data centres. For example, Sydney Water has received applications for scores of new centres, including large hyperscalers. Melbourne is slightly behind, and other cities less again. The market spans established technology operators deploying bespoke, highly efficient cooling systems purpose-built for data centres, including next-generation designs tailored to high-density AI loads. It also includes traditional developers favouring more conventional approaches such as evaporative cooling. These different segments can have very different impacts on water and energy supply balances.

Even allowing for some centres to not proceed, data centres could represent the largest step change in industrial water demand in some time. In NSW, the independent pricing regulator IPART cited in its final Report for Sydney Water's pricing 2025-2030, Sydney Water's estimate that annual average water demand for the Sydney data centre fleet of:

- Around 90[71] gigalitres a year by 2035
- This represents around 15 – 20% additional demand, compared with current demand and forecast 2035 demand without data centres
- Data centres could represent over 35% of non-residential drinking water demand in 2035[72]
- However, this water could come from a range of sources including recycled water, which would mean a lower proportion of the drinking water demand.

Demand figures for data centres in Melbourne are not provided at this time. Water use varies significantly by operator design, technology choice, and site conditions, reducing the reliability of any generalised number. The sector is working closely with the Victorian Government and broader industry to develop robust, evidence-based demand forecasting and supports WSAA along with key stakeholders in establishing a consistent national framework for future guidance.

These numbers can generate community interest, given the importance of water security for

[71] Calculated on average day demand projections, not peak demand projections

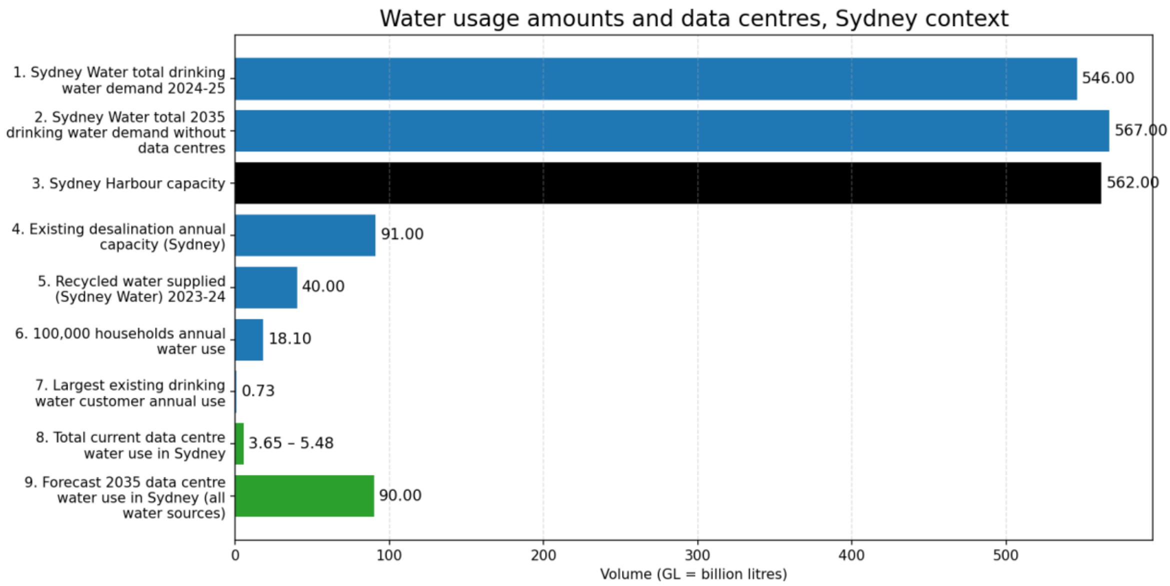
[72] In Sydney, residential use typically represents around 30% of total water use (e.g. Bureau of Meteorology, National Performance Report for urban water utilities, Part B, Sydney Water volume supplied to non-residential customers in 2023-24, 29%)

households, businesses and the environment. Meeting this new demand sustainably is a core part of the water sector's strategy. A significant portion of this supply will likely come from climate independent sources, primarily recycled water. Data centre growth represents a significant circular economy opportunity, and a way to integrate digital growth with sustainability leadership, through sophisticated and proactive planning.

Water utilities are developing smart staging approaches that combine speed to market with long term sustainability. This can enable large water use customers to establish quickly by using drinking water as an interim measure, while building recycling infrastructure in funding partnerships with data centre providers, incorporating additional allowance for growth and community needs. This is happening in other countries and Australia can take a leading role.

To give a sense of urban water use scale, Figure 17 takes the example of Sydney and shows current and future water demand along with some reference points and equivalent community demands. On average, residential customers account for about 70% of urban water use, the rest is from business and industry:

Figure 17: Water usage amounts and data centres, Sydney context (GL per year[73])



The relative 'bang for buck' of water supplies

Communities are likely to take an interest in the water efficiency of new data centres – how much digital 'bang' can be gained for the amount of water used. Figure 18 illustrates, in indicative terms, how much hypothetical data centre capacity could be supported at the three

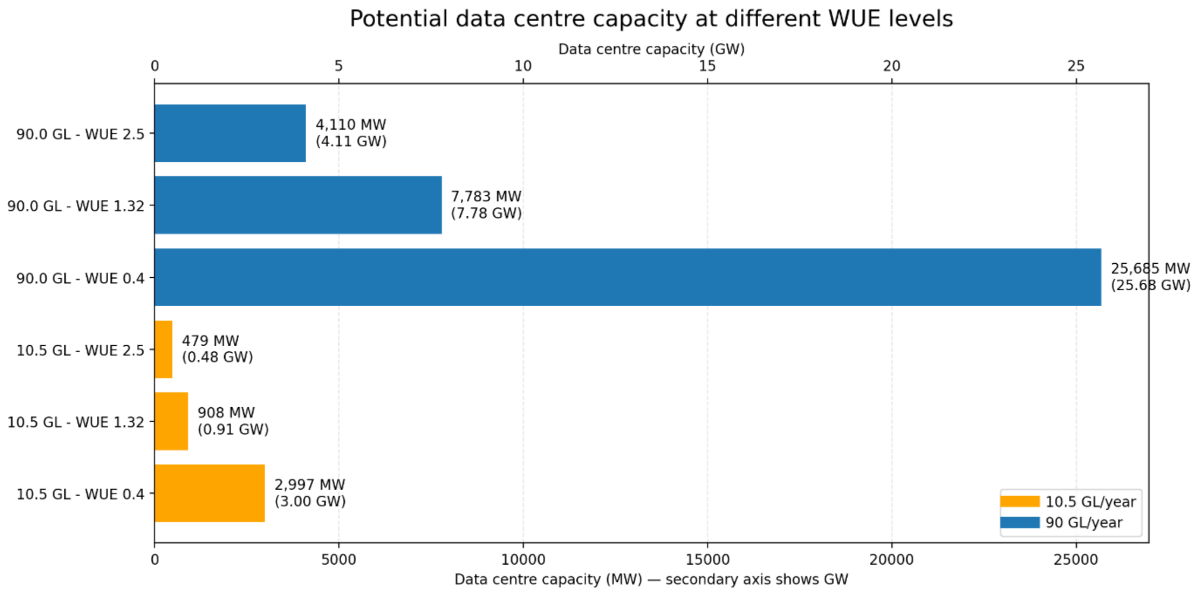
[73] Figures are approximate. Sources, notes: 1. Sydney Water Price Proposal to IPART review of Sydney Water prices 2025-2030, p237. 2. Sydney Water estimate (December 2025). 3. (Reference point only, not annual. List of non-coherent units of measure (Wikipedia). 4. Sydney Desalination Plant website. 5. Bureau of Meteorology, National Performance Report for urban water utilities, Part B. 6. Average volume supplied per residential property (Sydney Water, 2023-24, 181 kilolitres). 7,8. Sydney Water figures, December 2025. 9. Sydney Water estimates, December 2025, based on data centre proponent enquiries for servicing with a degree of certainty to proceed (based on average day demand projections, not peak demand projections).

WUE levels modelled earlier. The values shown are theoretical rather than forecasts.

Using Sydney as an example, the figure includes both Sydney Water's estimated 2035 demand and the 'Data Centres As Enabling Infrastructure' 2030 estimate. The intention is not to suggest which, if either, is more likely. Actual outcomes will depend on a range of factors, including the evolution of the data centre market, other resource constraints such as energy supply, planning approvals, supply chains and finance, as well as reported trends towards lower water cooling technologies. Future supplies will likely also comprise a mix of sources including recycled water. Also, the estimates are for different timeframes.

Rather, the figure is intended to highlight the relativities: different WUE levels can lead to large differences in digital capacity for any given amount of water. Given that data centres typically operate continuously once constructed, it is important to establish optimal systems from the outset, as retrofitting lower water use cooling systems later can be challenging.

Figure 18: Theoretical potential data centre capacity at different WUE levels, operating at full design capacity (MW, GW, illustrative only)



Though this is not actual data, the relativities are clear – for any given amount of water, more data centre capacity can be achieved with water efficient cooling systems. Australia has the opportunity to learn from the many global examples of different approaches, and develop an optimal framework that will drive sustainable investment.

Separate industry modelling has shown that differing levels of water efficiency could have the following impact on water supplies (not the actual levels, the relativities are the key):

- advanced water efficiency – 1% increase in non-residential water demand
- medium water efficiency – 5% increase in non- residential water demand
- low water efficiency – 10+% increase in non- residential water demand

Policy-makers can factor these potentialities and the all-important relativities, into their integrated planning efforts for sustainable digital planning.

5. Checklist of application data for data centres seeking water services

Please prepare this detailed information for your water servicing application to enable faster responses. Delays can arise from missing information. Water utilities can enter into non-disclosure agreements as needed to protect confidentiality.

This information is general in nature and will vary for individual utilities. In case of doubt, please enquire directly and/or provide as much detail as possible to avoid misinterpretation.

How to apply for water and wastewater connections?	Data centres looking to operate as public water utility customers will need to come in via developer servicing channels; especially when new water and wastewater connections are required, in greenfield areas, where the water and trade waste demands are high, and where there is limited existing infrastructure capacity.
Response times from water sector	Water utilities have regulated requirements to respond to servicing requests within certain timeframes. These differ with jurisdiction and individual utility customer service agreements or legislation.
Know your water usage	Have a clear idea of how much water you think you'll need, including: - Maximum daily demand (or requested flow) (MDD) – both instantaneous (L/s) and cumulative (KL/d). - (Terminology note: water utilities interpret this as the 5-10 days of highest water use per year.) - How many days a year you expect to use the MDD - Peak demand and how often you would expect this. Is it the hottest day on record, or in a decade or two, when you are at full load capacity? (For water utilities, this might mean a 1 in a 10,000 or 100,000 day event). - Max hour demand - Average daily demand (ADD) (L/sec or kL/day) - Average annual demand ML/y - Predicted seasonal variations in daily water demand and used water discharge - Daily diurnal usage (typical variation in demand throughout each day), from the utility's mains and internally - Noting that water supply can fluctuate with drought and season, what % of the time do you expect to be operating? - How will your demand change over time (if you plan to scale your operations, list usage through to full build-out) as well as your initial flows – year by year, average daily demand (L/sec or kL/day) for each year over the next 10 years The difference between average and max day matters for infrastructure sizing. Utilities may provide average day supply but not maximum.
What quality water?	What quality of incoming water can you accommodate? Be specific. For example if you are interested in recycled water, specify what level of quality you need for each process.

	Please tell us how it will be used (manufacturing, cooling, internal plumbing, landscaping, fire suppression, other) and the volumes for each activity. This influences the design of the internal water system if non-potable water (e.g. recycled water) is used for cooling (a separate internal water network will be required to supply potable water, for drinking, hygiene for onsite personnel).
What if recycled water is not available?	Capital city utilities will likely seek to provide recycled water as the preferred supply for data centres. However, where this is not available or not at sufficient quantities, potable water may be supplied. In recycled water areas, some degree of potable top-up may occur for supply reliability.
Business continuity and onsite backup	What capacity of onsite storage can you accommodate, for both feed water and used water discharge? - Most places will require at least 24 hours of maximum-day storage to meet their backup/reliability accreditation under design standards. - Data centres building onsite storage capacity will reduce the costs for both parties of providing infrastructure to cater for peak instantaneous demands. - In the same way that data centres may include generator/s for backup energy supply, they should consider their maximum storage tank capacity to provide business continuity. Many water utilities may require data centres to hold such contingency storage themselves and not provide allowance for abnormal operating conditions in reservoirs. There may be scope to negotiate with the water utility to provide more of the backup supply (e.g. above average day demands), but this will need to be explicitly sought and discussed during the servicing application. - Utilities may install flow regulation valves and devices to prevent draw off beyond agreed limits and protect against poor system pressure for other customers. They may also require centrally controlled telemetry systems and valves to monitor compliance, close off supply when needed, and measure usage over time.
Know your wastewater discharge	Considering your water flow demands, detail how much you expect to discharge as liquid trade waste, with the same metrics as for water supply
Your timeframes, project certainty + potential for duplication	- At what stage are you at in the planning cycle? - Please provide proof of secured project funding, land acquisition, planning approvals, energy agreements, anchor tenants. - Are other bidders also submitting applications to construct this data centre? (To optimise resource planning) - When would you expect to construct the data centre? - What is your realistic timeline for any future ramp-up in capacity? - Have you considered working with other data centre companies to determine the likelihood of clusters, with aggregate volume requirements? - Note that you may be required to submit a project status update at intervals.
Life cycle	- How long do you expect your facility to operate – what are the expected asset lives?

	- If technological advances change your operations, how likely are you to want to shift your water use patterns? - Have you considered that you may need to enter into a take or pay contractual arrangement to ensure water service providers do not create assets that are later stranded?
Water efficiency	What water efficiency steps, if any, do you propose to take to minimise your overall water footprint (both onsite, and as part of your supply chain)? To what extent is your proposed water use: - consumptive (used once only then discharged) - used repeatedly i.e. pass through system - collected and recycled) - What is your targeted number of Cycles of Concentration (i.e. how many times do you reuse the water) - What is the limiting factor on your Cycles of Concentration rate (e.g. water quality coming into the facility, equipment capability, or wastewater discharge limits) - What is your PUE to enable WUE calculations Have you analysed how your proposal aligns with any water sustainability frameworks e.g. Water Stewardship Asia Pacific or NABERS energy tools?
Precinct-scale and circular economy approaches	There may be opportunities for co-designed infrastructure, or precinct scale water planning, potentially alongside energy and connectivity planning. For this, engage with both the local water utility and the Planning department in the relevant state or territory government.

6 Appendix: Global examples – recycling, WUE regulation, reporting requirements and targets

A range of case studies around the world can help Australia develop its policy framework. They include alternative source water, regulatory approaches, voluntary offsetting commitments, pricing regulation and more. Globally, there is a growing trend towards requiring public reporting of WUE, 'gateway' type approaches that reward low WUE with faster application processing, and local permitting controls on data centre water use.

Spain

The Spanish Ministry for Ecological Transition and the Demographic Challenge (MITECO) has launched a draft royal decree to require data centres to publish information on their energy and water consumption, and other key sustainability indicators[74]. Large data centres above 100MW will also be asked to accredit "the best practices of the sector" and be within the 15% of facilities with the best performance for energy, water use, and sustainable practices.

Spain has developed[75] a draft national rule 'intended to guide the roll-out of data centres towards projects that maximise positive territorial impacts while minimising associated negative externalities', by setting performance thresholds and reporting requirements on energy and water for grid access. Under a draft Royal Decree, data centre proponents must make annual disclosures including energy and water use, and new or expanded facilities must show that they are within the top 15% of performance on electricity and water consumption indicators, as a condition of grid connection.

Excerpts (truncated) outline that 'reporting is required on energy and sustainability indicators covering the footprint occupied by the data centre, energy consumption and its sources (including renewables), the contribution to electricity-system resilience, water consumption (in aggregate and potable), the type of refrigerants used, and the efficient use of various resources. It also requires reporting of the projects' socio-economic impacts, including jobs created and contribution to the local and national economy.'

The rule states that 'Member States must ensure that data centres use waste heat or other waste-heat recovery applications where technically and economically feasible. Thus, heat produced by data centres could feed district-heating networks to provide climate control for neighbourhoods or municipalities near data centres, or supply heat to nearby industrial or other activities.' 'Lastly, it is consistent with the principle of efficiency, since this regulation does not impose unnecessary or accessory administrative burdens.'

The rule will be on public consultation until September 2025[76].

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[74] DataCenterdynamics article
[75] Ministry of Ecological Transition and Demographic Challenge – WSAA AI-generated translation
[76] Inside Energy and Environment article

European Union

Data centres must[77] report against KPIs to a European Union database. The European Commission then calculates and publishes indicators including WUE in aggregate form. Further minimum performance standards may be proposed after assessment. The EU reportedly[78] intends to propose minimum performance standards by the end of 2026.

The European Commission has developed voluntary best practice guidelines on energy: the 2025 Best Practice Guidelines for the EU Code of Conduct on Data Centre Energy Efficiency outlines the identified best practices for energy efficiency. Similar water guidance, from any jurisdiction would be a good future step.

Netherlands

Data Centre Dynamics quotes PWN, the water supply company for North Holland, stating that “We are investigating alternatives to industrial water together with our customers and large commercial consumers in the water chain… Our starting point is that we will not supply water of drinking water quality in the future if it is not necessary for use.”

Belgium

Saint-Ghislain in Belgium is a positive case study[79] for evaporative cooling, with industrial canal water in use as an effective alternative to drinking water. The centre, built in 2007, draws grey water from a nearby industrial canal for its cooling towers, and does not use high-energy chillers, achieving a PUE of around 1.1. The canal water is treated on-site before use, and reused multiple times. For example, CO_2 is injected to control pH which allows reuse of the cooling water up to four cycles instead of just two before discharge.

Germany

New data centres must meet tight PUE targets[80] and waste-heat reuse obligations; non-compliant designs will struggle to obtain approvals/tenancy. This functions as an implicit gateway. Germany’s Energy Efficiency Act sets explicit PUE thresholds[81]:

- Existing data centres: PUE ≤ 1.5 from 1 July 2027, and ≤ 1.3 from 1 July 2030
- New data centres (commissioned on/after 1 July 2026): PUE ≤ 1.2 and mandatory waste-heat utilisation

Ireland

In the face of energy supply security issues, Ireland’s regulator proposes that new data centre connections are prioritised[82] by criteria such as location (grid-ready areas), on-site generation/flexibility, and system-support capabilities.

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77 March 2024, Commission adopts EU-wide scheme for rating sustainability of data centres
78 John Ainger, ‘EU will work on setting water use caps for thirsty data centers’, Bloomberg, May 15, 2025, reported in American Water Works Association Cooling the Cloud: Water utilities in a Data-Driven World
79 References include Aquatech Trade, Copenhagen Economics and industry articles
80 Mayer-Brown article
81 Bitkom – AI-generated translation
82 Decision paper by Commission for Regulation of Utilities and Matheson article

Projects meeting these criteria can progress; others face delay or refusal - effectively forming a potential gateway for efficient, grid-supportive designs. New centres connecting to the electricity network will be required[83] to provide generation and/or storage capacity to match the requested data centre demand capacity, onsite or in local proximity. Energy use and emissions must be reported annually.

United Kingdom

Policy focus is on evidence and planning; recent work with the Environment Agency surveyed water use but did not set numeric limits. However the Government Digital Sustainability Alliance recently recommended[84] strengthening regulatory frameworks through mandatory location-based reporting of water use from all sources, integrating water planning into AI infrastructure development, incentivising the adoption of advanced, water efficient technologies and enhancing transparency.

London uses the planning system and targeted funding to favour schemes that export data-centre heat into new networks (e.g., Old Oak, Park Royal). This is not a blanket moratorium, but funding and planning engagement act as a gateway for heat-reuse-enabled designs[85].

TechUK reports that 51% of the 73 UK data centres considered in an article use waterless cooling systems.

Stockholm, Sweden

Boosting energy efficiency

Published in September 2023

Heat recovery from data centres

Stockholm, Sweden

IN A NUTSHELL

Stockholm's initiative to attract data centres to the city and capture their excess heat in the city's district heating network has allowed it to boost its IT industry while reducing the system's emissions by 50g of CO2 per kilowatt hour.

New tech for an old network

Stockholm has positioned itself at the forefront of climate action, striving for climate positivity by 2040. This goal necessitates innovation, and repurposing excess heat plays into this by promoting energy efficiency and reduced waste. The strategic redirection of excess heat from data centres into district heating is an important step along this road.

With a robust district heating network that began in the 1950s and now spans 3,000 km, and a district cooling system covering 300 km, Stockholm's infrastructure capacity for heat recovery is significant. By 2030, Stockholm Exergi aims for its district heating to be generated entirely from renewable and recovered sources. Open District Heating, introduced in 2014, assists in this by facilitating industries that produce excess heat to feed that heat into the network, rather than wasting it.

© Fractice image data centres

STOCKHOLM

The city, utility and grid operator assembled plug-and-play land, power and fibre expressly for operators that commit to recovering waste heat into the district-heating network. This packaged offer and facilitation amounts to preferential access for "heat-reusing" (i.e., high-efficiency, circular) projects[86]. Data centres are in effect available for heating city apartments.

Hamina, Finland

A data centre in Hamina, Finland, uses cold sea water for cooling since 2011[87]. The site uses existing infrastructure from an old paper mill. It takes in fresh seawater from the Gulf of Finland, pumps it through cooling modules, and mixes the cool water with used seawater so that the water returned to the Gulf is at a similar temperature[88]. It is a dependable source as the Gulf freezes each year. A lot of research was required about historic seawater temperatures, and fibreglass reinforced piping plus titanium plates were used to avoid the corrosiveness of the seawater.

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[83] Commission for Regulation of Utilities statement
[84] Government Digital Sustainability Alliance, UK, Rich Kenny, Report: Water Use in AI and Data Centres
[85] UK Government statement, Old Oak and Park Royal Decision, Envirotec article
[86] Stockholm Data Parks webpage, European Mayors statement
[87] Detailed in Nature Partner Journals 2021 article, Wired article
[88] DataCentreDynamics article

Singapore

Singapore established itself as a world leader on water stewardship including recycling since the early 2000s, when it pioneered high quality purified recycled water with its NEWater recycling program. Today, after holding a moratorium[89] on data centre development from 2019-22, its framework for managing data centres combines efficiency, reporting, a gateway style process, benchmarks and recycling[90].

In 2024 Singapore released a **Green Data Centre Roadmap**[91] 'to chart green growth pathways for data centres', noting that 'the ability to expand data centre capacity in a sustainable manner will depend on the ability to make data centres green. Singapore, applying its advantage as a regional data centre hub and a dynamic international business hub, is taking the lead in crafting innovative strategies for the long term sustainable growth of data centres through the Roadmap.'

Singapore's Deputy Prime Minister outlined that the Roadmap creates a gateway type system by 'advanc[ing] the work of the Digital Connectivity Blueprint launched in June 2023 that sets out Singapore's ambition for a future-ready and world class digital infrastructure. The Roadmap outlines Infocomm Media Development Authority's plans to partner the industry to innovate and accelerate data centres' sustainability…[t]o encourage adoption of the Roadmap, Infocomm Media Development Authority and Economic Development Board will allocate new data centre capacity to operators which prioritise both sustainability and economic value. Over the next 10 years, IMDA aims for all DCs in Singapore to achieve Power Usage Effectiveness of less than or equal to 1.3 at 100% IT load.'

'A key strength is that our industry and government have worked closely over many years, to consistently push the boundaries for data centres' energy efficiency. Our Tropical Data Centres standard – a world-first – enables data centres to save energy by running safely at higher temperatures and humidity levels. These complement and build on earlier standards such as the **Singapore Green Data Centre Standard (SS 564)** and the Building and Construction Authority-IMDA's **Green Mark for Data Centres Scheme**. Efforts also include our pilot Data Centre Call for Application, which piloted the ability to bring in new data centres that raised the bar for energy efficiency, while contributing strategic and economic

[89] Water and Wastewater Asia article
[90] PUB webpage, Bird & Bird article
[91] Rajah and Tann Asia article

value. These collectively support data centres to adopt best practices, on a continued path towards enhanced sustainability.'

Key elements of the Singapore framework:

- **Singapore Green Data Centre Standard (SS 564)** includes water performance, usage and efficiency metrics, plus energy and environmental impacts
- **Sustainability Standard for Data Centres Operating in Tropical Climates** (2023) - outlines a pathway to safely increase operating temperatures to 26° degrees or higher, aiming to optimise energy efficiency but also by implication water usage, because cooling in Singapore's tropical climate demands more energy and water.
- An aspiration to bring data centres to a WUE of 2.0 within the next ten years: through optimising cooling tower water consumption[92], including recycling blowdown water and increasing Cycles of Concentration through using electrolysis to clean cooling water and reduce freshwater use.
- Customers using over 60 megalitres a year must submit annual volumes supplied
- submit a Water Efficiency Management Plan to PUB
- install private water meters at key water usage areas
- appoint at least one Water Efficiency Manager
- Gateway style: the Economic Development Board announced a certain capacity would be awarded to the proponents that demonstrated 'best in class' energy efficient performance[93] along with other economic and technical benefits for Singapore
- Ensure trade effluent is below 45° Celsius, has pH between 6 and 9, have caustic alkalinity not exceeding 2,000 milligrams of calcium carbonate per litre; and be low in substances such as bide, petroleum spirit or other inflammable substance
- Operators of data centre businesses may benefit from PUB's Water Efficiency Fund which incentivises organisations to develop efficient and innovative ways to manage their water consumption.
- With the data collected, PUB develops sectoral water efficiency benchmarks for office buildings, retail operations, hotels, data centres, laundries, wafer fabrication and semiconductor plants, electronics plants, and biomedical manufacturing facilities. The Sectoral Water Efficiency Benchmark for data centres is 2.2 L/kWh[94].

NEWater purified recycled water is used by various data centres in Singapore[95], and the residual supply is used to supplement the city's drinking water supplies[96].

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[92] TechInsights states that cooling towers account for 97% of a data centre's water consumption
[93] Economic Development Board media release
[94] The Green Data Centre Roadmap notes that in 2021, the median WUE of DCs in Singapore that were large water users over 60,000 m3 in the previous year) was 2.2 m3/MWh (which equals 2.2L/kWh)
[95] Industry webpage, industry webpage, industry webpage
[96] WSAA global potable reuse maps

Seoul, Korea

At Jungnang Wastewater Recovery Facility, an innovative partnering approach enabled mututally beneficial outcomes. Tomorrow Water installed Proteus Primary biofilters, to replace conventional primary clarifiers. This meant treatment could occur in a much smaller footprint at the facility, reclaiming footprint and enabling data centres to be built in a co-location with the facility, described as a 'Co-Flow Campus'[97].

Johor, Malaysia

Johor is enabling rapid data centre growth with a strong sustainability focus. Water and Wastewater Asia outlines that rising costs, stricter regulations and resource constraints due to competition are prompting data centres in Johor to seek alternative water sources. One data centre organisation will take and treat raw river water from the Tebrau River. Authorities have introduced measures to prevent industrial competition from affecting household supply, such as raising the non-domestic tariff, and introducing guidelines in 2024 to encourage sustainable use of water and energy. Six months later, officials reported rejecting almost 30% of applications due to insufficient sustainable practices. In August 2025 Johor has become the first state to adopt 'Tier 4 Data Centre technology' integrating advanced air cooling and wastewater recycling systems[98].

Malay Mail details that the Johor government set up a special committee to vet data centres' impact on demand. The Data Centre Development Coordination Committee also advises developers to adopt modern cooling systems and new water-saving techniques like recycled water, river water, off-river and closed cooling systems.

Charles Santiago, former chairman of Malaysia's National Water Services Commission, said: "Any effort that uses alternative water must be welcomed. It signals that there is strong public and private commitment." He added that the industry should also consider rainwater harvesting and desalination. He urged local councils to mandate alternative water supply plans for new data centres and stated that local councils must make sure to state to investors and respective parties, the existence of rainwater harvesting, including clean water. He urged water suppliers to establish usage limits for data centres and assess their contingency plans for potential disruptions and droughts[99].

One data centre is collaborating with Johor Special Water to develop a recycled water scheme[100] for its hyperscale campuses, sourcing unused local wastewater, treating and supplying it for its operational needs. It has developed as a public private partnership with a focus on jobs, economic benefits and energy efficiency – one site will target a PUE of 1.25.

Another data centre proponent is self-funding and building a separate water reclamation plant to treat effluent from a nearby municipal plant, treating it with membrane bioreactor and reverse osmosis to create high purity water[101].

97 Tomorrow Water website, courtesy Sydney Water
98 The Edge article
99 Malay Mail article
100 DataCentreDynamics article, Techwire Asia article, industry article
101 Asian Water article

Various regulatory guidances for Malaysia are available such as the 2024 Guideline for Sustainable Data Centres (here), which target design PUE <1.4, design WUE <2.2 for hyperscalers; Johor's 2024 State Data Centre Development Planning Guidelines.

Loudoun County, Virginia, USA

Northern Virginia houses a heavily concentrated zone called 'Data Center Alley' with more than 3,400 technology companies. Loudoun Water[102] has 20 miles of recycled water pipeline that serves these customers. Loudoun's recycled water fee is less than half the cost of drinking water per gallon. One company received approval to use treated wastewater for direct evaporative cooling in a partnership with Loudoun Water.

Plans for data centres can change rapidly. In 2020, Loudoun County forecasted that data centre expansion would slow after 2021, leading to an additional 17 million square feet of development from 2021-30. Actual increases were roughly 20 million square feet in just four years, so the overall forecast tripled to nearly 43 million square feet. This case study[103] notes the importance of having dedicated staff in place to plan for data centres.

AP News reports that also in Virginia, the most heavily developed data centre zone in the U.S., Gov. Glenn Youngkin vetoed a bill that would have forced more disclosures from data centre developers about their site's noise pollution and water use.

California, USA

The City of Santa Clara manages a 33 mile recycled water pipeline network supplied by South Bay Water Recycling. This delivers recycled water to 350 customers including 41 industrial users. Three of these are data centres[104]. The water is a mix of purified water from Silicon Valley Advanced Water Purification Centre (using microfiltration, reverse osmosis, ultraviolet light disinfection) and tertiary recycled water produced at a regional wastewater facility[105]. Valley Water is also evaluating opportunities to expand existing recycled water and purified water reuse to boost drinking water supplies[106].

Overall the city has 31 data centres using recycled water[107] and that more are starting to use water efficient cooling systems. Council member Karen Hardy said improvements to the city's electrical grid have been made possible because of the city's data centres and technology industry, and that data centres are becoming more efficient with their energy, water and space… "There's so many positives to the residents that they don't realize because of that redundancy built into the system that data centers need."

Also in California, E&E News reports that draft bill AP93, would require data centre operators to estimate their water usage when applying for new permits or renewing their business licenses, under penalty of perjury. In amendments last week, Papan (D) struck a provision that would have required companies to recertify their water usage after the Department of

[102] WateReuse Association AI Fact Sheet
[103] American Water Works Association, Cooling the Cloud: Water utilities in a data driven world, October 2025
[104] WateReuse Association AI Fact Sheet
[105] Santa Clara web page
[106] https://purewater4u.org/about-svawpc and WSAA maps
[107] San José Spotlight article

Water Resources develops efficiency guidelines. The bill also directs that Department and the California Energy Commission to develop guidelines and best practice for efficient resource use by 1 January 2028. The bill has drawn opposition from data centre groups that argue the easy expansion of data centres is essential for the state's thriving artificial intelligence industry to remain competitive, and more regulation will hamper construction.

Tucson, Arizona, USA: Missed opportunity for data centre investments in beneficial water stewardship initiatives

A developer proposed a data centre outside Tucson's city limits, seeking connection to the city's reclaimed (non-potable) water system via an 18-mile, 24-inch pipeline. The data centre would be provided with potable water initially, then transition to fully recycled water supply with on-site treatment (potentially reverse osmosis for high purity water). At full build-out, it would have had a demand just under 2.46 billion litres per year. In return, projects and programs under consideration at the time to 'offset' the water demand, included multi million dollar advanced metering infrastructure, large-scale leak detection, and PFAS groundwater remediation – developed and aligned with Arizona's "one water" approach in mind, of which recycled water forms part of the portfolio.

Despite these potential system benefits, there were community concerns about water and energy use of the centre, exacerbated by a perception of lack of transparency in engagement between city officials and the proponent. In the end, the city council rejected the proposal. The city subsequently introduced a Large Quantity Water User Ordinance, requiring high-use applicants to submit conservation and offset plans before operating. In this instance, the tangible benefits of the potential investment will not proceed at this time.

Douglas County, Georgia, USA

A data centre diverts 30% of wastewater from the local municipal treatment plant for recycling[108], piping it into the data centre for cooling. Increasing cycles of drought and high demand made the recycling facility essential for operating in hot summer months. In 2023 the data centre used over 90% recycled water[109].

Aurora, Colorado, USA

Aurora City has codified a *Large Water User Guide* for customers such as data centres, with criteria for volumetric water use and non-recoverable consumption thresholds (the share of water consumed onsite and not returned as wastewater for beneficial reuse. This will help evaluate environmental impacts and discourage extremely high water use applications.

Other USA state legislation examples:

The New York Senate introduced a bill[110] in 2025-26 to require data centres to disclose annual projected water use. In June 2025 Minnesota legislated[111] to require a pre-application

[108] Industry video
[109] WateReuse Association AI Fact Sheet
[110] New York State Legislature, Senate, Senate Bill S6394A, 2025-2026 Legislative Session, introduced in Senate March 13, 2025
[111] Minnesota Legislature, House, HF 16, 94th Legislature 2025

evaluation for projects proposing to use more than 100 million gallons (378 million litres) per year. Connecticut has proposed legislation[112] covering both – requiring data centres to report information on water use and establish water efficiency standards.

Las Vegas, USA

In Las Vegas, Southern Nevada Water Authority has banned[113] evaporative cooling systems in new industrial and commercial buildings as they are among the largest water users, aiming to redirect investment towards air conditioning systems with recirculating refrigerants.

The Las Vegas Sun quotes Dave Johnson, Deputy General Manager of Southern Nevada Water Authority: "In Southern Nevada, wet cooling has been utilized primarily because the price of water has been less than the price of power, and these systems have been pervasively installed,". "Air conditioning requires "a little bit more electricity" than evaporative cooling, but Southern Nevada can make up that difference through solar power generation, Johnson said. Locals say it is too early to tell if this will have any impact on business growth. Other locations have similar bans[114]. At the same time there have been some local efforts to stop these bans[115].

The southern Nevada ban is also driving recycling: a 16 mile pipeline is being built near Reno to access wastewater[116].

Ohio, USA

Columbus[117] Ohio is water rich, but still focuses on sustainable water provision to data centres. Recycled water is seen as central to balancing the water needs of communities and data centres. Kristen Atha, Director of Public Utilities, City of Columbus, notes there is pressure on utilities to find 'non-traditional' solutions and reuse is seen as one of the few scalable options. While industrial users like data centres can be the first to take recycled water, it requires careful infrastructure planning to seek outcomes that benefit the broader community as well.

Atha notes that pricing structures often don't reflect the true cost of supplying water, and it risks being under-valued, leading to misaligned incentives for conservation and reuse. "The rate that we use with the data centers is a separate [higher] rate that's different from our regular user rate."

Transparent, cost-reflective long term pricing would help both utilities and data centres make better long term investment decisions. "We've had numerous conversations with all the

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[112] State of Connecticut General Assembly, Senate, An Act Concerning Energy and Water Efficiency Requirements for Artificial Intelligence Data Centers, Raised Bill No. 1292, January Session, 2025, introduced in Senate April 7, 2025. 67 State of Connecticut General Assembly, House, An Act Concerning Energy and Water Efficiency Requirements for Artificial Intelligence Data Centers, Proposed Bill No. 5076, January Session, 2025, introduced in House January 10, 2025
[113] See Great Basin Water article, Southern Nevada Water Authority Conservation Plan and Ordinance, and Review Journal
[114] Review Journal article
[115] Great Basin Water article
[116] Review Journal article
[117] The Exec Exchange by Piers Clark, Episode 26 – Data Centres and Water Demand – with, Ohio. 15 April 2025

different data centers about public-private partnership and how can they invest money to help us build a water reuse facility that could help supply some of their needs?"

Clark closes the interview by noting, "I think the answer has to be that data centers need to find ways of getting cooling without using copious amounts of water."

Texas, USA

Texas is an early case study highlighting the value of sound regulation, noting that Australia's regulatory framework enables much better management of water. A 1904 'rule of capture' law entitles landholders above aquifers to draw unlimited amounts of water from that aquifer. Other legislation gives limited scope to change this, and the legal context is litigious.

Data centres were permitted to develop without limits on groundwater use, allowing them to use large amounts of water while residents face visible drought restrictions such as lawn watering limits. One centre is expected to be 60 hectares larger than New York City's Central Park. This contrasts with energy, as Texas passed legislation to manage energy demands from data centres during grid emergencies by giving energy providers the authority to cut off power for data centres and other customers using over 75 megawatts and redirect that energy during emergencies and periods of high demand. Community negativity has arisen due to lack of transparency and beneficial offsets being far from affected communities[118].

Oregon, USA

Prineville, Oregon, has the world's first data centre to achieve certification by the Alliance for Water Stewardship (AWS) North America to meet its standard. Located in the high desert of Central Oregon, Apple's Prineville data centre made efforts to share water resources across five areas of water governance, including water balance, water quality, Water-Related Areas, and safe water, sanitation and hygiene.

Oregon notes an example of a farm that uses wastewater from a data centre to farm irrigation. On the pricing front, AP News reports that 'lawmakers in Oregon are advancing legislation to order utility regulators to ensure data centres pay the cost of power plants and power lines necessary to serve them'. Oregon's legislature has passed[119] a bill, the Oregon POWER Act, to 'clear the way for the Oregon Public Utility Commission to ensure charges for grid expansion and infrastructure needed to power data centers are not passed onto residential and commercial customers by creating a separate customer class for data centers. Those centers are the fastest-growing energy users in the state.'

Australia has a great opportunity to combine investment with a focus on sustainability, and lead the world in integrating data centres sustainably into our servicing environment. While some difficult global examples can leave a legacy of reputational impacts, Australia can benefit from the learnings of other places and create positive frameworks that maximise community benefit.

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[118] Legislation text, Texas Tribune, Newstarget article, Newsweek, Austin Chronicle, Water Online
[119] State of Oregon Governor's Office news item, Oregon Capital Chronicle article

7. Acknowledgements and references

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- Members of overseas governments
- Members of community organisations

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