SEQUANA

THE MOVING TARGET

Why water utilities need to rethink the pathway to Net Zero

IMAGE 1. WIND FARM, RURAL AUSTRALIA

BACKGROUND

WATER UTILITIES MUST REACH NET ZERO…

Figure 1 illustrates that water utilities across Australia are expected to transition to net zero emissions by 2050 at the latest, in line with national and state-level targets and policy frameworks.

The most stringent regulatory environment is observed in Victoria, where a Statement of Obligations has been specifically tailored to the water sector and formally issued to the state's 18 water utilities. Under these instruments, Victorian water utilities are required to achieve net zero emissions by 2035, supported by defined interim milestones and reporting obligations.

… BUT NET ZERO IS NOT A FIXED TARGET

In response to these new regulations, most water utilities have defined a Net Zero plan that should lead them to this Net Zero objective. These significant efforts from the water sector have paid off as the sector emissions have started to decrease.

However, these Net Zero plans are built on assumptions that may not hold tomorrow. Carbon accounting, emissions boundaries, regulation and offset markets continue to evolve, making Net Zero a moving target.

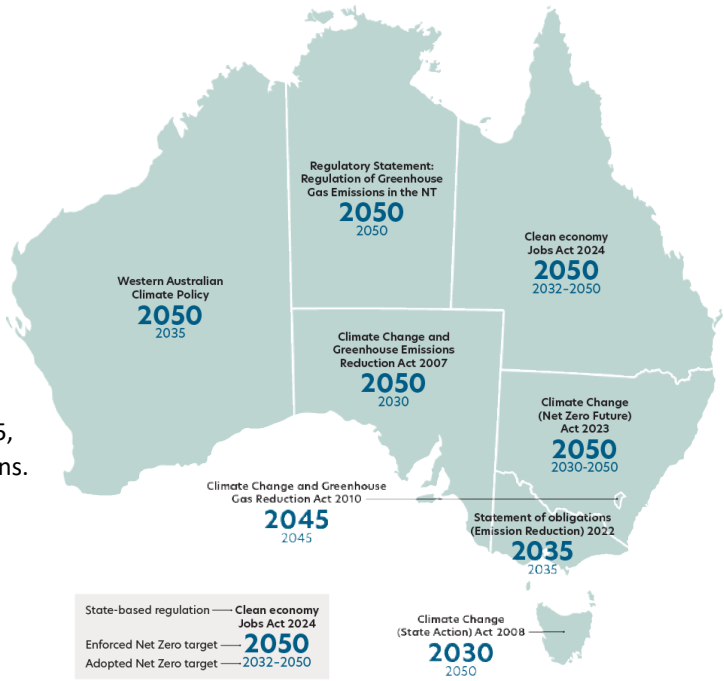

FIGURE 1. CLIMATE CHANGE STATE REGULATIONS AND NET ZERO TARGETS ACROSS AUSTRALIA

This paper introduces the "no-regret pathway": an adaptive approach that reduces emissions while improving efficiency, resilience and flexibility as conditions change.

"NET ZERO": A MOVING TARGET

MOVING CARBON ACCOUNTING METHODOLOGIES

In most states and territories, water utilities have been required to focus solely on the Scope 1 (direct) and Scope 2 (electricity-related) emissions (Figure 2). While the methodology used to calculate Scope 2 emissions is relatively straightforward and is unlikely to evolve significantly soon, the reporting standards for Scope 1 emissions are expected to evolve as research progresses and internal standards are defined.

Scope 1 emissions are currently estimated from the combustion of fuels (e.g. fleet and on-site equipment) and fugitive emissions from wastewater treatment processes. Recent advances in measurement techniques and scientific understanding suggest that current estimation methodologies may significantly underestimate direct emissions. Key examples include:

- **N_2O emissions from wastewater treatment plants:** A **study** by de Haas & Ye comparing standard estimation methods with direct measurements across eight Australian plants found that actual N_2O emissions could significantly differ from current estimates. Should these findings be incorporated into future methodologies, the reported emissions from wastewater treatment could substantially change.
- **Methane emissions from sewer networks:** Currently not accounted for in standard reporting frameworks, methane emissions from sewer systems are gaining attention. Initiatives such as the **Sewer Methane Measurement Project**, led by Brown and Caldwell in collaboration with Melbourne Water, aim to better quantify these emissions. Their inclusion in future methodologies could increase reported Scope 1 emissions.

Given these developments, utilities should plan for the possibility that reported emissions may increase as measurement and accounting methodologies evolve, even without corresponding changes in underlying operations.

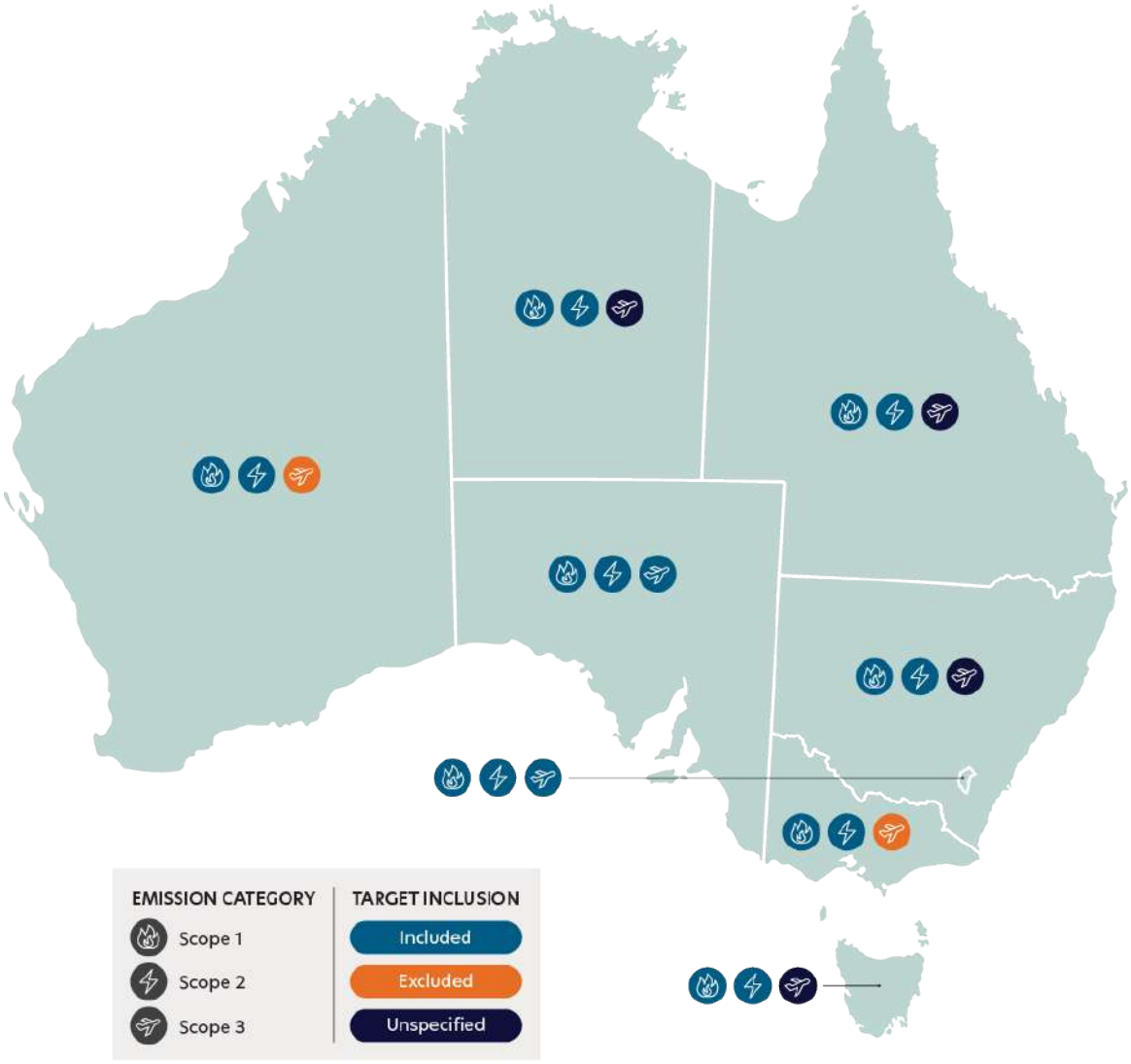

FIGURE 2: EMISSION SCOPES INCLUDED IN THE STATE CLIMATE REGULATIONS

MOVING EMISSION BOUNDARIES

Reporting Scope 3 (indirect) emissions is highly challenging as these emissions are associated with the manufacturing and transportation of products and services, employee commuting and waste generation. Because of this complexity, early legislation and reporting requirements have generally allowed Scope 3 treatment to evolve over time (Figure 2). As methodologies improve, utilities should plan for the possibility that some Scope 3 emissions may be incorporated more explicitly into future reporting and reduction obligations.

This could materially change the emissions baseline utilities need to address. Scope 3 emissions can represent a significant share of the total footprint for some water and wastewater facilities (Figure 3), making greater visibility of these emissions increasingly important for long-term planning.

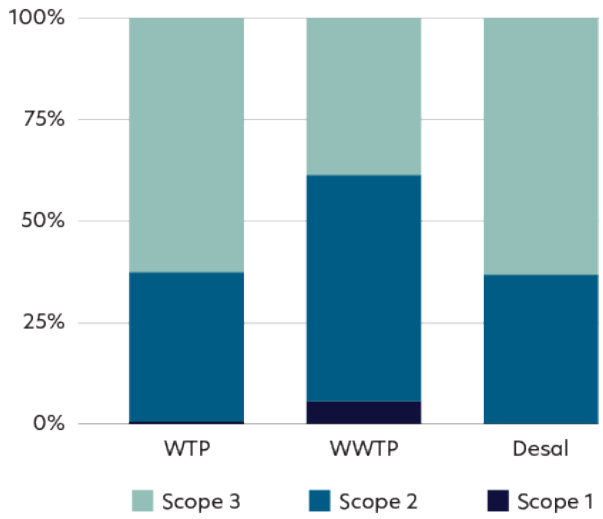

FIGURE 3: SPLIT OF SCOPE 1, SCOPE 2 AND SCOPE 3 EMISSIONS FROM DIFFERENT TREATMENT FACILITIES OPERATED BY VEOLIA IN AUSTRALIA (OZWATER 2024 PROCEEDINGS[1])

THE RISKS OF OVER-RELIANCE ON OFFSETS

External carbon offsets can provide important flexibility within a Net Zero pathway, particularly where residual emissions are difficult or uneconomic to eliminate. However, heavy reliance on externally procured offsets can also increase exposure to changing emissions baselines, market availability and price volatility. Common instruments include:

- **Australian Carbon Credit Units (ACCUs):** Used to offset residual Scope 1 (and, where applicable, Scope 3) emissions.
- **Large-Scale Generation Certificates (LGCs):** Used to address Scope 2 emissions by procuring renewable electricity externally, as developing sufficient in-house renewable capacity is often impractical.

VOLATILE ACCU COSTS

Demand for Australian Carbon Credit Units (ACCUs) extends well beyond the water sector, increasing competition for available offsets. ACCU prices have also demonstrated significant volatility, rising from approximately AUD 20 to nearly AUD 60 per unit within a single year during 2021–2022 (Figure 4).

While the offset strategy may appear relatively straightforward and cost-effective today, it exposes utilities to significant market risks. In response to this procurement challenge, the Victorian water sector established the **Zero Emissions Water Carbon Offsets** initiative in 2026, with the objective of pooling ACCU procurement across the sector to reduce costs and manage market risks more effectively.

IMAGE 2. SCIENTIST COLLECTING A SEDIMENT CORE TO ASSES CARBON SEQUESTRATION RATES IN THE SEDIMENT OF MANGROVES

1 Document can be accessed through the OzWater'24 Past Papers Webpage (Day 3 Morning session / Decarbonisation / Paper 110)

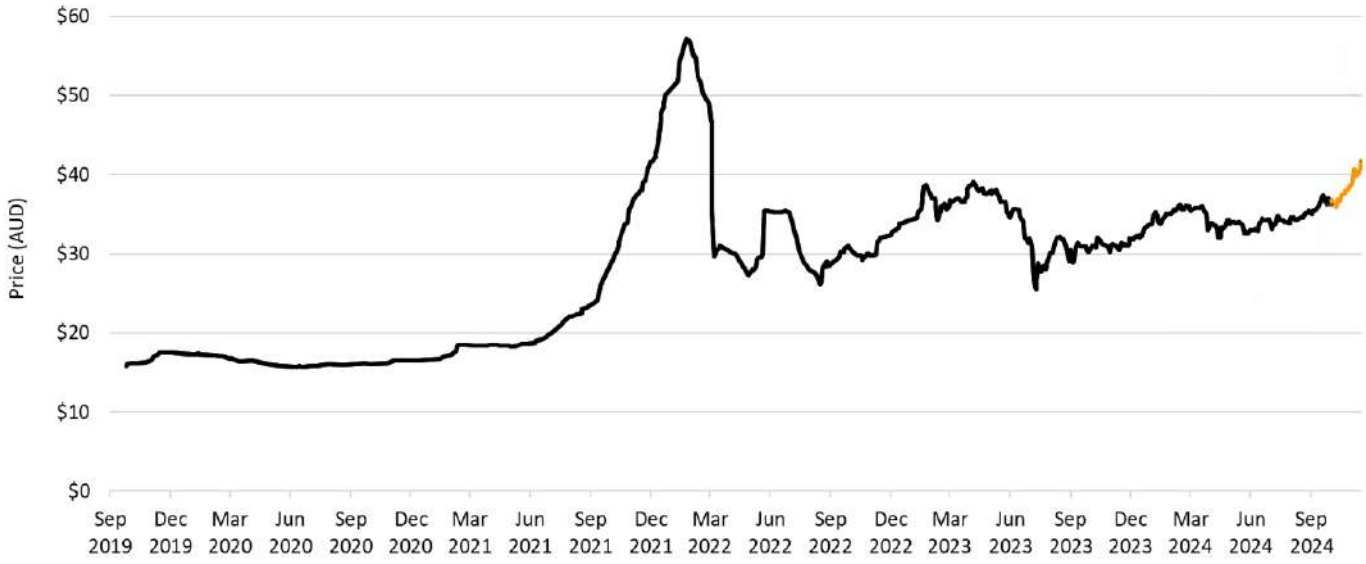

FIGURE 4: EVOLUTION OF THE ACCU PRICE BETWEEN 2019 AND 2025 (EXTRACTED FROM THE CLEAN ENERGY REGULATOR WEBSITE)

THE END OF LGCS

The combined effect of increasing emissions baselines (due to Scope 3 inclusion and improved Scope 1 methodologies) and volatile ACCU costs is likely to significantly increase the cost of achieving net zero for water utilities.

Utilities whose strategies rely heavily on external offsets are particularly exposed to these risks. Over time, this could translate into substantially higher operational costs, which are ultimately likely to be passed on to end customers.

A more structural change is emerging in the treatment of Scope 2 offsets. Under the **Renewable Electricity Guarantee of Origin (REGO) scheme**, LGCs will be phased out by 2031 and may be replaced by time-stamped certificates (REGOs).

This represents a fundamental shift. Under the current LGC framework, renewable electricity generated at any time can be used to offset consumption at another time (e.g. solar generation during the day can offset electricity consumed at night). However, with the increasing penetration of solar energy in Australia, the carbon intensity of the grid varies significantly throughout the day.

The potential introduction of time-stamped REGOs is therefore expected to enable time-based matching between electricity consumption and renewable generation. In practice, this means that electricity consumed during periods of low renewable generation (e.g. at night) may require the purchase of more expensive, time-matched certificates.

Utilities whose Net Zero pathways rely heavily on externally procured offsets, without corresponding operational and infrastructure changes, may face greater exposure to future price volatility and changes in carbon accounting frameworks. This reinforces the value of balancing offsets with practical emissions reduction and operational initiatives.

THE "NO-REGRET" PATHWAY

The moving Net Zero target, combined with uncertainty in carbon offsets and energy markets, makes long-term planning challenging. Utilities therefore need adaptable pathways rather than static plans. A "no-regret" action creates value across multiple plausible futures: reducing emissions while also improving efficiency, lowering whole-of-life costs, increasing resilience or reducing exposure to regulatory and market change.

NEW TECHNOLOGIES

Decarbonisation across various industrial sectors has accelerated the development and adoption of technologies that can also create opportunities for the water sector. The objective, however, should not be to adopt technology for its own sake. Utilities can assess potential investments across multiple future carbon-price, energy-price and accounting scenarios, prioritising options that create enduring operational and financial value. Key opportunities include:

- **On-site renewable energy generation:** The significant decrease in the cost of solar PV and battery storage over the past decade has made it increasingly viable for water utilities to self-generate a portion of their electricity demand. Emerging alternatives to lithium-ion batteries, such as sodium-ion technologies, offer the potential for further cost reduction and more sustainable energy storage solutions. This directly reduces Scope 2 emissions and limits reliance on external offsets. In addition, aligning electricity consumption with periods of high renewable generation will become increasingly valuable. Water utilities can leverage existing storage assets (e.g. clear water tanks, sewage tanks) to shift energy-intensive processes to daytime periods, reducing reliance on higher-cost night-time offsets. This "load shifting" strategy represents both a design and operational optimisation opportunity with long-term financial benefits.
- **Electrification of fleets and assets:** Advances in battery technology are enabling the transition to electric vehicles and equipment. For example, in Victoria, 13 water utilities are currently trialling or planning fleet electrification initiatives, contributing to a reduction in Scope 1 emissions. Projects such as **Barwon Water's green oxygen** initiative demonstrate how renewable electricity and recycled water can be used to produce hydrogen for fleet use, reducing Scope 1 emissions. In addition, the oxygen by-product of electrolysis can be reused in wastewater treatment processes to improve aeration efficiency and reduce electricity consumption, thereby also lowering Scope 2 emissions.
- **Biosolids use:** The anaerobic digestion of biosolids, potentially combined with external organic waste streams, enables the production of biogas for combined heat and power. Alternatively, emerging technologies such as the **Biosolids to Biochar** process (e.g. projects led by South East Water in partnership with RMIT University) offer the potential to sequester carbon and generate Australian Carbon Credit Units (ACCUs). This can contribute to reducing net Scope 1 emissions while creating a potential revenue stream.

FUNDING OPPORTUNITIES

The adoption of these new technologies can be made difficult by the level of investment they require from water utilities. In parallel with technological innovation, a range of funding mechanisms are available to support the transition.

The Australian Renewable Energy Agency (ARENA) has played a key role in supporting decarbonisation projects within the water sector. Over the past decade, ARENA has contributed more than $15 million in funding to projects involving water utilities, particularly those focused on innovative approaches to reducing energy consumption and integrating renewable energy (Table 1).

FROM A STATIC NET ZERO PLAN TO A "NO-REGRET" PATHWAY

Net Zero strategies developed today will operate in different conditions tomorrow. The objective is not to create the perfect plan for today, but a pathway capable of adapting as technology, regulation and markets evolve. Utilities that understand their exposure, test decisions against future scenarios and prioritise actions that create value beyond carbon reduction will be better prepared as the pathway to Net Zero continues to move.

PROJECT	WATER UTILITY	FUNDING AMOUNT	START DATE
Sewage Waste to Energy Feasibility study	Unity Water	$426k	2016
Logan City Biosolids Gasification Project	Logan City Council	$6.22m	2019
Malabar Biomethane injection project	Sydney Water	$5.9m	2020
Green Oxygen for wastewater treatment	Barwon Water (Vic)	$3m	2024
Logan City, food and garden organics (FOGO) feasibility study	Logan City Council	$292k	2023
Feasibility study into Energy optimisation of water network	Grampians Wimmera Mallee Water	$118k	2023

TABLE 1: PROJECTS FUNDED BY THE AUSTRALIAN RENEWABLE ENERGY AGENCY (ARENA) INVOLVING WATER UTILITIES

SEQUANA

TURNING UNCERTAINTY INTO AN ACTIONABLE PATHWAY

Sequana has a proven track record of successfully delivering high-quality solutions tailored to Australia's unique environmental and regulatory landscape. Our commitment to innovative and sustainable development has driven our expansion into decarbonisation activities to support the water sector to reach their Net Zero objectives. Our services include:

UNDERSTAND YOUR EXPOSURE

We quantify Scope 1 and Scope 2 emissions against current frameworks and assess how potential accounting changes could affect future reported emissions. We can also estimate Scope 3 emissions using international standards, helping utilities understand potential future obligations and associated financial exposure.

BUILD YOUR NO-REGRET PATHWAY

We help define or review Net Zero strategies against different market and regulatory scenarios. Through cost-benefit assessment, we evaluate technology and operational options to identify the no-regret pathway that will reduce emissions while managing whole-of-life cost and exposure to volatile offset markets.

TURN STRATEGY INTO DELIVERY

We help translate decarbonisation strategy into deliverable projects, from concept design and feasibility studies through to implementation. We can also support funding applications, including ARENA opportunities, and help water organisations manage the delivery of large-scale projects.

IMAGE 3. DRONE AERIAL PHOTOGRAPH OF LARGE IRRIGATION DAMS IN A LARGE AGRICULTURAL AREA IN THE REGIONAL TOWNSHIP OF LUDDENHAM IN NEW SOUTH WALES, AUSTRALIA