LESSON 8
PLAN FOR NET ZERO

Water companies are anchor organizations in our communities. They are key parts of local infrastructure and also one of the sectors most vulnerable to disruption from extreme climate change. Aligning with national Net Zero targets and having purposeful plans deliver Net Zero is essential.

Water and energy are two inherently linked resources. Water is crucial for many energy production processes; the International Energy Agency estimates that the energy sector accounts for 10% of global freshwater use. Meanwhile, as a user of energy for treating and transporting water, the contribution from the water sector to global greenhouse gas (GHG) emissions is significant, which makes addressing the industry's own carbon footprint paramount.

Water and wastewater infrastructure make up approximately 2% of global greenhouse gas (GHG) emissions.

Estimates suggest that the industry represents around 2% of global GHG emissions, of which process emissions – nitrous oxide, biomethane and carbon dioxide – from sewage treatment represent a major part. In the US alone, EPA estimates that drinking water and wastewater systems account for over 45 million tonnes of greenhouse gases annually. And, on the back of steadily growing demand, driving not least the growth in desalination, which itself is highly energy intensive, energy consumption will only rise.

While the water sector is uniquely exposed to climate change, as a generally regulated industry, it is also uniquely positioned to collaborate and lead on Net Zero. Efforts to reduce GHG emissions will bring benefits at asset, network and system levels, and in terms of water availability.

Measure emissions first to set a Net Zero target

Many water and wastewater utilities worldwide have already established their own Net Zero targets; approaching 100 utilities have now signed the UN's Race to Zero campaign. Country-wide targets are also emerging. In 2020, water companies in the UK launched the world's first sector-wide Net Zero target, with the unveiling of a routemap to achieve Net Zero for operational

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emissions by 2030. Denmark's national water sector is also targeting Net Zero by the same date.

The process for any utility is first understanding its carbon footprint baseline. From there it can set a Net Zero target.

The industry's emissions can be categorized:

- Scope 1 or direct emissions, notably methane and nitrous oxide, linked to wastewater and sewage treatment. Plus, the use of gas or other direct emissions;
- Scope 2 or indirect emissions linked to purchased electricity for water treatment process and pumping water;
- Scope 3 or indirect emissions from treatment chemicals, construction and customer use of water.

Scope 2 emissions: the quickest opportunity

Water companies have operated energy efficiency measures for decades, but there's still more to do. Efforts to safeguard supplies by targeting leakage have simultaneously resulted in emissions reductions.

As in all industries, energy use across existing assets and operations must be optimized. Digital twins and emerging high-efficiency technologies are proving invaluable in identifying and delivering efficiencies. A major focus is on optimizing water and wastewater networks in terms of energy demand for pumping – but these also need to be able to respond to peak flows caused by climate change and urbanization. Reducing the energy demand during wastewater treatment is also a priority. Ongoing energy requirements must be shifted to renewable power sources, either procured or produced on site by the utility itself. Many utilities, some of which are large landowners, are now investing in their own wind and solar operations to complement the electricity produced from biogas.

Banding together collectively to buy renewable power at advantageous rates under Power Purchase Agreements (PPAs) is an increasingly common strategy. For example, 13 water utilities across Victoria, Australia, partnered in 2019 to form Zero Emissions Water (ZEW) to bulk buy renewable energy certificates from the 200MW Kiamal Solar Farm, a new solar farm under development that came into operation in 2021. These renewable energy certificates can be surrendered by the water corporations to write-off the emissions associated with an equivalent amount of electricity they use from the grid. This approach complements their existing renewables initiatives and cuts emissions. All water corporations across Victoria have committed to being Net Zero by 2035 and to sourcing 100% of their electricity from renewable sources by 2025.

Scope 1 emissions: harness biogas to cut greenhouse gas emissions and create a renewable fuel

In contrast, tackling Scope 1 fugitive emissions associated with wastewater treatment, which account for a significant share of the industry's carbon footprint, is more challenging. Harnessing biogas from wastewater is not a new technology but it remains underused in some regions. The American Biogas Council for example estimates that only one third of US wastewater treatment plants are capturing biogas.

In warmer climates, for example Brazil, biogas is produced not just from the primary and secondary sludges, but also from the incoming sewage. Trials underway in the UK are looking to adapt tropical technology to temperate conditions, which could substantially reduce the energy demands of wastewater treatment - and produce renewable energy. Core to the challenge is the use of aerobic wastewater treatment, using technologies such as the activated sludge process, which are proving to be a potent source of nitrous oxide.
Current research is baselining these emissions and seeking to optimize process control to minimize them. Ultimately a different treatment approach may be needed; removing the nitrogen up front (to make new fertilisers or other products) could be an alternative.

WSP's partnership with Logan City Council in Australia alongside Downer and Cardno has successfully turned sewage sludge into energy and a marketable biochar at its high tech Loganholme Wastewater Treatment Plant.

Scope 3 emissions

Scope 3 emissions are those that are created through the supply chain. For water companies these especially include customer heating of supplied water, the carbon taken to produce water treatment chemicals and construction materials, and treatment of wastes.

These emissions are not usually under the direct control of water companies, so part of the solution is to form strong partnerships with suppliers and communities to have a role in reducing them.

For the supply chain, immediate actions are for water companies to use their influence to ask suppliers to set and deliver Science Based Targets themselves. And to make this a commitment of purchase. This is an approach being adopted by private and public companies across the world, and water companies can do more here, using their purchasing power and their importance to their value chain to drive fast action.

For customers, an immediate approach can be to integrate carbon savings with existing water saving initiatives. The less water used by customers in laundry, the bathroom and kitchen, the more customers save water, money, energy and carbon. Beyond immediate water saving measures, water companies can have an important role in influencing wider government policies to take fast carbon action nationally. They should also use their trusted and embedded influence across most homes in their regions to drive change and to help customers cut their own footprint. This could be by providing advice and support or potentially in the future by expanding their role to support renewable energy generation and installation of heat pumps.

For example, Melbourne Water, Severn Trent and Aarhus Vand, three water utilities based in Australia, UK and Denmark respectively, have formed a partnership to advance the future of low carbon wastewater treatment. They are collaborating on developing technologies to reduce the carbon footprint of wastewater treatment sites to net-zero, sharing existing expertise, and establishing new international standards for measuring and reporting emissions. Under the agreement, one of Severn Trent's sewage treatment facilities in the UK has been transformed into a Net Zero hub, dedicated to researching and testing the latest carbon neutral wastewater treatment technologies at an industrial scale. In another example, DANVA, the Danish Water and Wastewater Association, has collaborated with counterparts including the US Water Alliance and the International Water Association.

Such collaborations are aimed at promoting cross-cultural learnings and raising awareness of the GHG emissions sources and Net Zero solutions.

Programs for delivery

Whichever approach is adopted, key for delivery of Net Zero ambitions is to base a program on strong science, engineering and governance. Science Based Targets provide the most robust ambition for infrastructure organizations. This is ambitious and hard. But if governments are to deliver Net Zero economies by 2050, then it's essential too that water companies – a key anchor organization – in their regions also step up to lead and to play a strong role.

As well as setting targets, strong governance programs for delivery are as essential. The delivery landscape is awash with well-intentioned goals which whither on the ground when faced with other business priorities and the hard yards of implementation. Successful programs come from effective governance for delivery. This is covered more in our 'governance' section (Lesson 9).