WATER UTILITIES
Moving Fast Toward A ZERO-CARBON FUTURE

xylem
Let's Solve Water

HOW WILL WATER UTILITIES CUT EMISSIONS IN HALF AND HELP DECARBONIZE THE WATER SECTOR?

Water operators have long been stewards of an essential resource, and water infrastructure is a cornerstone of every prosperous economy. But today's water systems are also major sources of global greenhouse gas (GHG) emissions.

Water utilities account for approximately 2% of GHG emissions[1] – the equivalent of the world's shipping industry.

And this figure is set to spiral as utilities work towards the UN's Sustainable Development Goal of universal access to water and sanitation by 2030.

How can water utilities quickly become part of the solution to climate change while continuing to serve their communities?

Assessments by Xylem and our partners indicate utilities could dramatically reduce electricity- and process-related GHG emissions across water and wastewater infrastructure – quickly and cost-effectively – using existing, high-efficiency technologies.

A growing number of utility operators are committing to "net-zero" emissions targets, along with detailed route-maps to achieve them.

Efficient technologies – together with changes in process, policy and practice – can drive rapid progress without adding costs to current operations.

By embracing these opportunities today, utilities can free up capital to fund water and wastewater infrastructure upgrades at the same time as they reduce their GHG emissions.

As a sector built on serving communities and protecting the environment, it is time for water to take its place in the greater climate discussions – and lead the way with action.

The water sector could become one of the fastest sectors to decarbonize, and a powerful example to others. This paper outlines some of the ways utilities can get started on their race to zero.

1 Water UK: Global water community challenged to join the Race to Zero

DECARBONIZING THE WATER SECTOR – AT NEUTRAL TO NEGATIVE COST

Xylem's initial study of wastewater infrastructure, Powering the Wastewater Renaissance, assessed 18 distinct electricity-related emissions abatement opportunities across three regions: the United States, Europe, and China. Core findings from this study, and from a follow-up analysis of the clean water sector, follow.

- **50% of energy-related emissions from the wastewater sector can be abated with existing technologies,** such as intelligent wastewater pumping systems, adaptive mixers with variable speed drives, and real-time decision support systems. **~95% of the impact is achievable at zero or negative cost.**[2]

- **Reduction of energy-related emissions in the wastewater sector is directly related to the pace of adoption of existing technologies.** It does not require new technologies or carbon pricing policies.

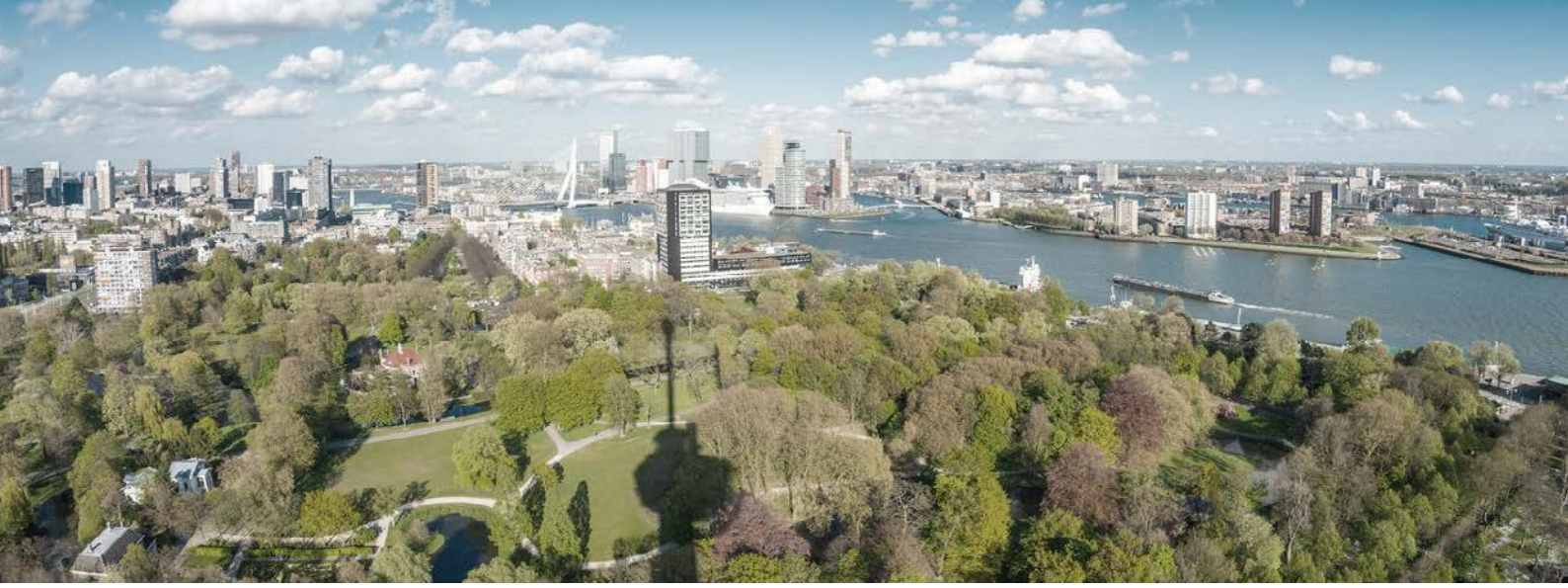
- **Existing technologies can also reduce process emissions.** For example, intelligent mixing and aeration systems enable monitoring and modeling that can reduce process-related GHG emissions by limiting production of nitrous oxide.

- **In clean water, readily deployable high-efficiency technologies also have a material impact on emissions reduction.** Technologies such as ultraviolet (UV) disinfection and advanced metering infrastructure (AMI) deliver significant emissions abatement throughout the water production plant and the water distribution network.

Infrastructure decisions made today will have consequences for decades to come.

While there is investment and research still required to advance the sector's ability to eliminate emissions, particularly in regard to process emissions, the technology and solutions exist today to make meaningful impact. In the UK alone it is estimated that utilities could save up to 10 million tons of greenhouse gas by reaching net zero in 2030.[3]

2 Xylem: Powering the Wastewater Renaissance
3 Water UK: Net Zero 2030 Routemap



LEADING UTILITIES ARE MAKING SWIFT PROGRESS TOWARD NET ZERO, TODAY

Water utilities around the world are already setting firm net-zero targets – and beginning to deliver on them. For example, water companies in the UK have almost halved operational emissions since 2011 through a combination of energy efficiency measures, renewable energy and the production of biomethane from sewage treatment processes.[4] In the US, the City of Gresham's wastewater treatment plant is the first in the Pacific Northwest to generate more electricity than it consumes each year through the use of biogas generation and recovery, saving the city about $500,000 per year.[5] These experiences demonstrate that by prioritizing emissions reduction, water operators can deliver big results quickly, affordably, and at minimal risk.

As of October 2021, Global Water Intelligence identified 65 water and wastewater utilities with net-zero, carbon, and climate neutrality targets. They include some of the largest utilities in the world, serving over 185 million people.[6] From Melbourne Water to the Metropolitan Water District of Southern California and Thames Water in the UK, utilities across geographies are increasing their accountability on the path to net zero.

Innovative approaches are fueling progress. As part of its strategy to achieve net-zero emissions by the middle of this century, PUB, Singapore's national water agency, plans to award S$6.5M (USD$4.82M) to incentivize innovative solutions that can eliminate carbon emissions from water treatment facilities. The agency is seeking carbon capture, utilization, removal, and other solutions at any technology readiness level that can be integrated with its operations and reach commercial scale within a decade or sooner.

The opportunity is clear. The components of success are available: technologies, experience, funding, collaboration and, increasingly, regulatory incentives.

Here are some of the technologies that are enabling fast progress.

4 Water UK: Global water community challenged to join the Race to Zero
5 EPA: Examples of innovation in the water sector
6 GWI: The world's water and wastewater utilities with net-zero targets

WATER UTILITIES
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WATER UTILITIES' GREENHOUSE GAS (GHG) EMISSIONS = **GLOBAL SHIPPING**

THE CARBON FOOTPRINT OF WATER UTILITIES' ENERGY USE = CO_2 **101 COAL-FIRED POWERPLANTS**

EMISSIONS ARE SET TO **MORE THAN DOUBLE** BY

2040

THE GOOD NEWS?
EXISTING TECH CAN CUT EMISSIONS AT LOW OR NO COST

GLOBAL WATER UTILITIES **COULD CUT GHG EMISSIONS BY 50%***

WE DON'T NEED TO WAIT
HIGH-EFFICIENCY TECH IS ALREADY HELPING UTILITIES CUT EMISSIONS

WASTEWATER COLLECTION
SOLUTION
Intelligent Wastewater Pumping Systems

CONTRIBUTION
Maximizes energy potential

WASTEWATER TREATMENT
SOLUTION
Real-time Decision Support Systems

CONTRIBUTION
Optimized monitoring & modeling of processes

WATER DISTRIBUTION
SOLUTION
Advanced Metering Infrastructure (AMI)

CONTRIBUTION
Demand & Leak Management

WATER MANAGEMENT & PRODUCTION
SOLUTION
UV Disinfection

CONTRIBUTION
Maximizes energy & reduces chemicals

SMART CITIES

ENVIRONMENT

Infrastructure decisions have consequences for decades.

By investing today, water utilities will reduce emissions and free up capital to fund essential infrastructure.
The race to zero is a win-win. Let's go!

Learn more at www.xylem.com/racetozero

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*Energy-related GHG emissions in the wastewater sector. Full study here.

GETTING OUT OF THE GATES FAST: HOW TO MAKE A QUICK START REDUCING EMISSIONS

The faster water utilities deploy these high-efficiency technologies, the faster emission targets are achieved, contributing to the containment of climate change. Here are some steps that can help accelerate water utilities' race to zero.

1. **Make firm commitments to reduce emissions.** Leading utilities are already joining the water sector's Race to Zero. Led by the UN's High-Level Climate Champions for Climate Action, the Race to Zero is a global initiative, rallying companies, cities, and regions to take immediate action to halve global emissions by 2030 and deliver a healthier, fairer zero-carbon world in time. You can get on the starting line here.

2. **Deploy high-efficiency technologies to make meaningful, early progress – and do so affordably.** For example, intelligent wastewater pumping systems can cut energy use by up to 70% in wastewater pumping by reducing inefficiencies and emergency call-outs associated with clogging. In clean water, leak detection technologies can eliminate real water losses, saving energy consumed in the treatment and transport or water. You can find out more about the high-efficiency technologies being applied across the water cycle here.

3. **Define the supporting processes, policies and practices to get all the way to net zero.** Water UK's Net Zero 2030 Routemap details the broad range of approaches that are required to deliver on this commitment and provides specific actions to create accountability, reduce the costs and risks of the transition to net zero, and to unlock new benefits.

By implementing high-efficiency technologies and making emissions focused changes to operational processes and practices, water utilities can win the race to zero, while delivering the essential services on which their communities' health and prosperity depend.

APPENDIX

High-efficiency technologies, including digitally-enabled solutions, are helping utilities realize dramatic emissions reductions across both clean water and wastewater activities.

WASTEWATER COLLECTION		
The Solution	How it works	How it contributes to Race to Zero
Intelligent wastewater pumping systems	Clog-free pumping systems reduce inefficiencies, eliminate emergency call-outs for sump cleaning	Maximizes energy efficiency potential ■ Cuts energy use by 70% in wastewater pumping ■ Reduces fossil fuel combustion and CO2 emissions from emergency service mileage
Real-time decision support systems	AI-based wastewater networks ensure best management of hydraulic volume, eliminate sewer overflows	Maximizes energy efficiency potential ■ Enables monitoring and modeling of process optimization ■ Reduction of CO2 emissions from unnecessary construction

WASTEWATER TREATMENT		
The Solution	How it works	How it contributes to Race to Zero
Real-time decision support systems	Treatment system optimization ensures compliance with treatment permits and reduces energy and chemical use	Enables monitoring and modeling of process optimization ■ Cuts energy use by up to 30% ■ Reduces chemical use in biological activated sludge treatment
Intelligent mixing and aeration systems	Optimally designed biological systems and adaptive mixers with integrated variable frequency drives optimize mixing and aeration of activated sludge	Maximizes energy efficiency potential ■ Cuts energy use by up to 25% compared to conventional mechanical mixers Enables monitoring and modeling of process optimization ■ Reduces process emission of GHG by limiting production of Nitrous Oxide

WATER RESOURCE MANAGEMENT AND PRODUCTION

The Solution	How it works	How it contributes to Race to Zero
UV disinfection	High-efficiency, chemical-free disinfection process for drinking water production	Maximizes energy efficiency potential and avoids onsite production and use of energy-intensive chemicals

WATER DISTRIBUTION NETWORK

The Solution	How it works	How it contributes to Race to Zero
Advanced metering infrastructure (AMI)	Two-way communication for real-time data transfer to smart water meter	Demand and leakage management ■ Reduces water use and apparent water losses, saving energy from water treatment and pumping ■ Reduces fossil fuel combustion and CO2 emissions from utility vehicles
Leak detection and condition assessment	Acoustic free-swimming sensors and data analytics detect gas pockets, water leakages, and zones at risk of failure in pipes for targeted rehabilitation	Demand and leakage management ■ Eliminating real water losses saves energy consumed in the treatment and transport of water ■ Reduction of CO2 emissions from unnecessary pipe replacement and civil construction