November 2023

Water Utility Decarbonization

Rising to the challenge of lower emissions

THE RACE TO ZERO IS ON

Since the **Paris Agreement** of 2016, more than **70 countries** have pledged to meet ambitious net-zero goals

Most have committed to a **45 percent cut in GHG emissions by 2030**, and net zero by 2050

Those who have made commitments account for **76 percent** of global **greenhouse gas (GHG)** emissions

Net zero means cutting greenhouse gas emissions to as close to zero as possible, with any remaining emissions re-absorbed from the atmosphere, such as by oceans and forests

EMISSION SCOPES EXPLAINED

Scope 1: Direct emissions from sources controlled or owned by an organization. This includes emissions from fuel combustion – for instance, diesel dewatering pumps. Process emissions such as N_2O also fall within Scope 1.

Scope 2: Indirect GHG emissions associated with the purchase of electricity, steam, heat, or cooling. Although scope 2 emissions happen elsewhere, they are accounted for in an organization's GHG inventory because they are a result of the organization's energy use.

Scope 3: Emissions from assets not owned or controlled by the organization, but that the organization indirectly affects through its value chain.

A CHALLENGE – AND AN OPPORTUNITY

Water systems are big GHG-emitters – but utilities have an extraordinary opportunity to optimize operations and advance the race to zero, hand in hand.

- Water infrastructure accounts for **2 percent of GHG emissions**
- A medium-sized utility offering both clean water and wastewater services can produce the equivalent of **42,000 tons of CO2 emissions annually** from energy intensity only
- That's the same as **150 commercial flights** from Paris to New York City

You can cut emissions while meeting your communities' need for **safe**, **affordable water** and **sanitation**, and complying with regulations.

THE NET ZERO OPPORTUNITY

With the right approaches and proven technologies, net zero is possible for water utilities – and it can be a powerful catalyst for network-wide optimization

- ✓ Wastewater utilities could **cut electricity-related GHG emissions in half** using existing technologies
- ✓ Around **95%** of this impact can be achieved at **zero or negative cost**
- ✓ **+80** water and wastewater utilities have already **set explicit net-zero and climate-neutrality targets**

Cuxhaven reduced aeration energy use by 1.1 million kWh annually, enough to power 275 homes for a year

Fairmont reduced excess water usage by 25 million gallons, and cut fleet-related GHG emissions through advanced metering

Thames Water created almost 140 million m^3 of green biogas – enough to replace fossil fuel use on site

WE CAN HELP YOU TO BUILD YOUR NET-ZERO ROADMAP TODAY

Moving Fast Towards Your Net-Zero Future

Set Realistic Targets

Optimize Energy and Resources

Prioritize Capital Planning

Plan For The Future

SETTING NET ZERO TARGETS

As you accelerate your journey to net zero, these six considerations for shaping emissions reduction targets can help keep you on track.

ALIGN ORGANIZATIONAL AND SUSTAINABILITY GOALS

SET YOUR BASELINE — WHAT IS MEASURED GETS MANAGED

MATCH SHORT-TERM INTERVENTIONS TO LONG-TERM THINKING

TURN ON THE LIGHTS BY EMBRACING DIGITAL AND DATA

TACKLE PROCESS EMISSIONS

BE OPEN AND TRANSPARENT

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OPTIMIZE ENERGY AND RESOURCES

There are cost-neutral ways being deployed across the water sector to reduce emissions while ensuring process stability.

To begin, you should look at the root cause of inefficiencies

INEFFICIENT LEGACY ASSETS

Low hydraulic and motor efficiencies, unsteady flow, and high levels of solid content all depress efficiency. In wastewater facilities, limited process-control can result in excessive energy use by aeration blowers and ineffective biologic processes that release N_2O.

UNDER-PERFORMING ASSETS

Applications, particularly those with rotating equipment, are often not working at high efficiency. Design oversizing can lead to energy waste and higher operating costs.

AGING INFRASTRUCTURE

In many countries, wastewater-collection assets and water-distribution networks are reaching end-of-life. Water infiltration in sewers and water losses in distribution networks result in excess pumping and treatment.

Then, streamline asset and process management for Scope 1 and 2 emissions cuts

ASSESS AND IDENTIFY SYSTEMS

- ✓ Emissions-associated assets across operations
- ✓ Users of energy and their role and use within the system
- ✓ Nutrient loading within a wastewater plant, including emissions factors

EVALUATE OPPORTUNITIES

- ✓ Current energy management practices
- ✓ Data capabilities including energy use and cost

IMPLEMENT AND MONITOR

- ✓ Stakeholder education and communications
- ✓ Evaluate assets within the system for optimization
- ✓ Identify data gaps and areas for improvement

By deploying high-efficiency technologies, you can affordably make progress towards net zero

Asset Optimization Solutions

Digital Twin Technology

Leak Detection and Condition Assessment

Sustainable Energy Production

CUXHAVEN, GERMANY

In Cuxhaven, Germany, EWE WASSER GmbH runs a large municipal wastewater-treatment plant with the capacity to treat wastewater for 400,000 people.

As it relies on energy-intensive technologies such as mechanical aerators, blowers, and diffusers, aeration accounts for more than 50 percent of energy consumption. Until recently, Cuxhaven operated its plant based on set point controls.

To improve the efficiency of aeration, Cuxhaven first had to better understand the performance of the processes involved. Virtual sensors were created to estimate incoming carbon, nitrogen and phosphorous loads. With a real-time digital twin of the entire plant, it was then possible to optimize aeration and chemical inputs at each point of the process.

Outcomes:

- ✓ Aeration energy use has been reduced by 30%, or 1.1 million kilowatt hours (kWh) annually – enough energy to power 275 homes for one year

The solution not only reduces energy consumption and saves the utility money, but it also ensures high water quality for the local community while allowing the utility to meet regulatory requirements.

PRIORITIZE CAPITAL PLANNING

Prioritizing emissions reduction **doesn't require a fundamental shift in business practice.** It doesn't mean large investments in new infrastructure.

The pragmatic path to net zero is about **finding ways to fold net-zero considerations into existing processes** and the flow of day-to-day decision making.

1 MAP GHG REDUCTION OPPORTUNITIES

By factoring net-zero objectives into **project KPIs**, you can make significant strides in cutting emissions. E.g.

- ✓ New pumping equipment must reduce associated emissions by 40%

2 TAKE A GREENER APPROACH

New **capital improvement projects** offer unique opportunities for smart upgrades that can deliver emissions reductions:

- ✓ Metrology
- ✓ Pumping
- ✓ Treatment

3 EMBRACE DIGITAL SOLUTIONS

With **digital technology**, you can 'turn on the lights' and get a real time view of your system for significantly better situational awareness – something that is vital to good decision making

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SOUTH BEND, INDIANA

Every time a storm hit, the City of South Bend's aging sewer system could not handle the excess discharge. In 2012, the city was looking at a long-term control plan for an estimated $713 million in capital improvements, plus financing costs.

Four years before, the City had installed a real-time monitoring system of more than 120 sensors, located throughout its urban watershed. The utility decided to expand the sensor network and use it as the basis for a system that directly controlled the pumping system and valve actuators to react in real time.

Now, the network adapts to sudden wet-weather events by shifting excess flows to under-utilized parts of the network. The utility avoids sewer overflows and prevents water pollution.

Outcomes:

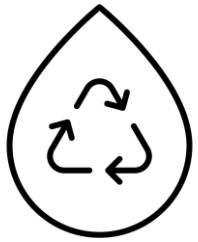
- ✓ Eliminated dry weather overflows and reduced CSO volumes by more than 80%, or roughly one billion gallons
- ✓ Achieved approximately $1.5 million in annual operating and maintenance cost savings
- ✓ E. coli concentrations in the St. Joseph River have dropped by more than 50%, improving water quality

The smart sewer system not only saved the utility money, but it prevented needless construction of new grey infrastructure which would have had a high level of embedded carbon.

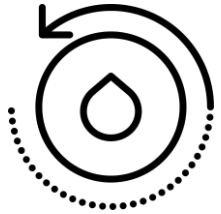
PLAN FOR THE FUTURE

Decarbonization is an opportunity to reimagine conventional approaches to water management. Making progress towards net zero requires a shift toward viewing wastewater as a resource, rather than as a by-product to be managed.

Tackle Process Emissions



Turn Waste Into Energy



Embrace Resource Recovery

Thames Water creates almost 140 million cubic meters of green biogas during the sewage treatment process, which can then be used in power stations and co-generation facilities to generate electricity and heat.

The utility produces more than enough biogas to replace fossil fuel use onsite, leaving surplus renewable power that gets injected back into the grid.

KEY TAKEAWAYS

- Ambitious net-zero goals require **bold approaches and innovative thinking.** This means breaking away from the status quo and using technology to reimagine conventional approaches.

- No one single technology will get the industry over the line in this race, but **a combination of proven technologies and smart thinking will.**

- **Utilities can reduce emissions quickly and affordably – with the right approaches and proven technologies.**

- More than that, these approaches can **optimize utility operations to deliver better sustainability and business outcomes hand in hand.**

SHAPE NET-ZERO COMMITMENTS TO OPTIMIZE SERVICES AND TACKLE CLIMATE CHANGE, TODAY

Contact: NetZero@Xylem.com **or visit:** https://www.xylem.com/en-us/campaigns/net-zero/ **for more information**