U.S. DOE Measuring Life-Cycle Greenhouse Gas Emissions from Water Resource Recovery Facilities Workshop

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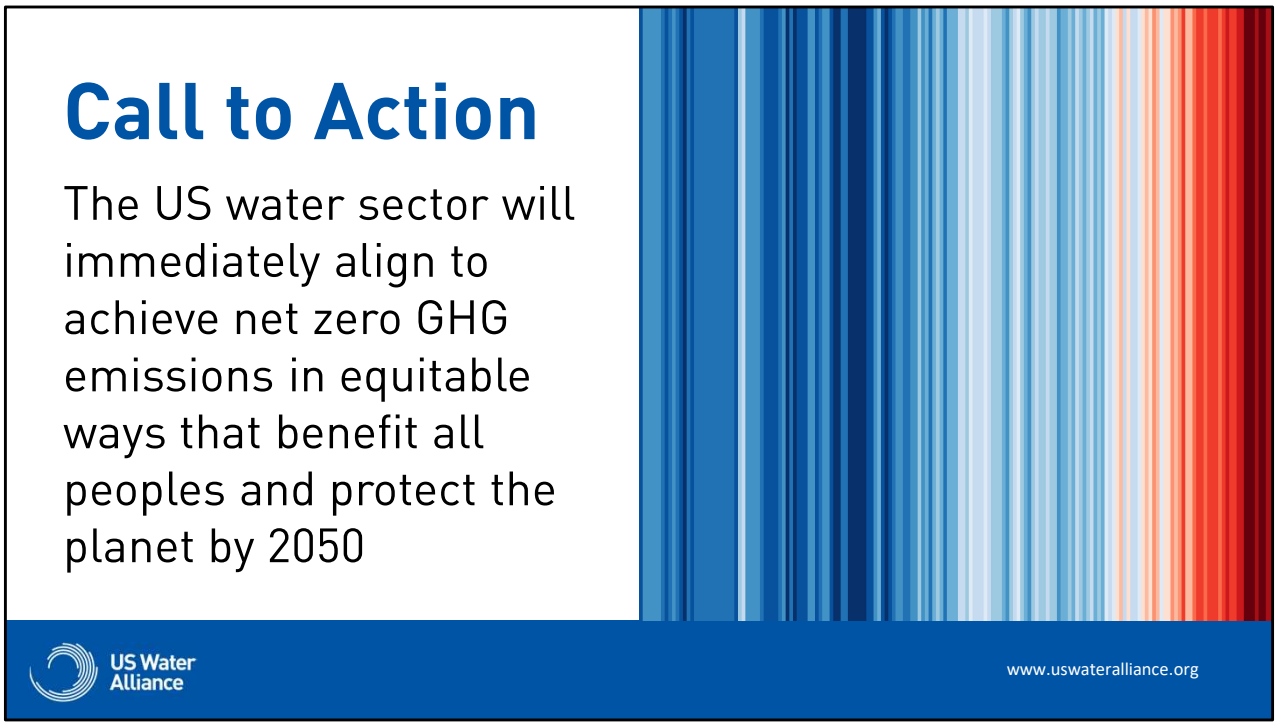
Hello. My name is David Ponder. I am the Director of Climate Action at the US Water Alliance. I am also the current chair of the Water Environment Federation Greenhouse Gas Focus Group.

I am honored to be here and would like to thank the staff and leadership at the US DOE for organizing this workshop and inviting me participate.

The prospect of a potential partnership between US DOE, other federal and state agencies, water utilities and other water sector partners and allies to better understand the life cycle emissions from water resource recovery facilities is a welcome development.



Before I turn to more specifically to discuss the water sector's GHG emissions and the GHG accounting practices that underpin those estimates, I first want to speak to the bigger picture.

Water utilities are at the forefront of the climate crisis. More intense storms, rising sea levels, and more frequent droughts strain water supplies, damage infrastructure, and jeopardize the delivery of clean water, sanitation, and stormwater management.

The science is unequivocal: we must accelerate our efforts, actions, and investments for a swift transition to a net-zero economy. Failing to hasten reductions in GHGs emissions will worsen climate impacts and require more complex and costly responses by water utilities. Investments many will have difficulty paying for.

Avoiding these prospects, requires us all to root out every opportunity to reduce GHG emissions– and to lift up solutions that remove and store carbon dioxide from the atmosphere.

The good news is the water sector is uniquely positioned to do both.

We can and must step up to address the direct and indirect emissions from our facilities and operations. But we also should be embracing One Water approaches such as nature-based solutions, energy recovery, and resource circularity to reach the ambitious climate goals across our communities.

This is- in a nutshell – what the US Water Alliance called for in our Net Zero Plus call to action –

A call signed onto by many of the organization in this conversation.

Some may greet this call to action with skepticism – utilities are after all facing a myriad of pressures, constraints and challenges. To you and them I would point out that the path to realizing this vision and the pursuit of mitigation strategies is paved with co-benefits in the form cost-savings, additional revenues, and operational efficiencies. Most of what we needs to be done to reduce GHGs also is just good for the 'business" – energy management saves money and reduces O&M costs, process optimization to minimize nitrous oxide supports biological processes and consistent nutrient removals, managing fugitive methane reduces health and safety risks and recoups lost revenue. Investing in upstream water quality improvements can avoid both the cost and emissions from new infrastructure.

WWRF GHGs in context

The water sector, and wastewater treatment in particular, is a non-trivial contributor to global GHGs.

Current best estimates suggest that wastewater treatment account for at least 1.6% of total global GHGs. This may not sound significant, but it is on the same order of magnitude other higher profile sectors like global shipping and aviation.

While these best estimates demonstrate the magnitude of the water sector's contribution it is important to note that they are highly likely an underrepresentation of the sector's actual contributions. For example, one recent study (who's co-author I am sure will address momentarily) found that U.S. wastewater methane emissions are nearly 2 times greater than reported in EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks.

It not just that our current estimates are potentially understated, they are simply incomplete.

These estimates do not include several significant emission sources including:

- Methane emissions from sewer and collection systems

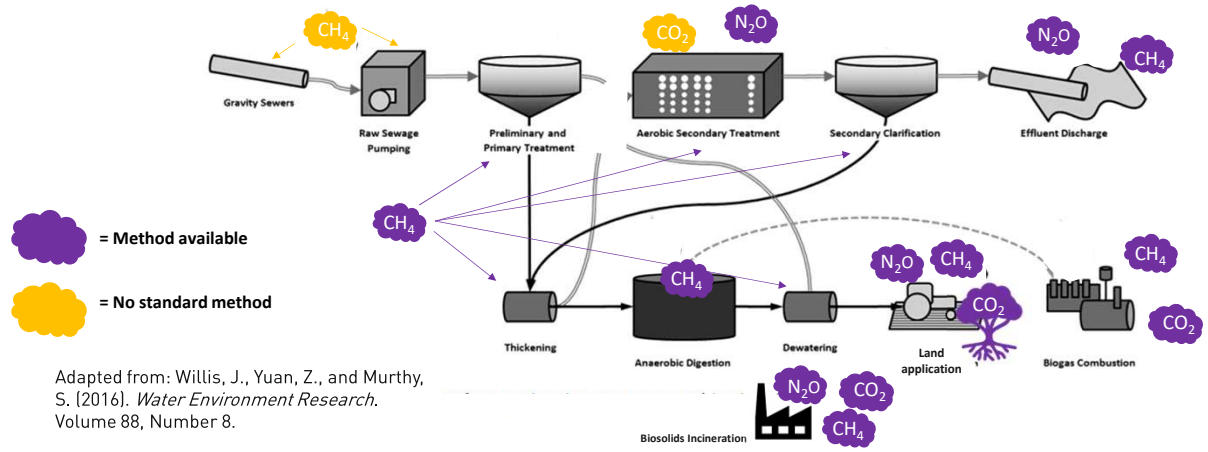
- Emissions associated with the sector's energy intensive processes (which is upwards of 4% of total US energy consumption)
- Biosolids use and disposal
- Embodied emissions from purchased good and services

And in case it is not obvious,

- A complete, transparent accounting of an organization's GHGs is the foundational step towards effective mitigation.
- It is the basis for identifying major emission sources and the prioritization of mitigation strategies
- It is also how organizations set goals and track and report progress

For the water sector to make meaningful strides in climate action, it is imperative to have a comprehensive understanding of its GHG emissions.

Sources of WWRF GHGs



Adapted from: Willis, J., Yuan, Z., and Murthy, S. (2016). *Water Environment Research*. Volume 88, Number 8.

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I will not belabor this slide as most people in this room are versed in the unit processes that give rise to GHG emissions in wastewater collection, treatment and effluent discharge.

I do though want to point a couple of things:

- This does not show every potential emissions pathway or plant configuration (notably absent are sidestream nitrogen removal, fossil carbon additions, biogas cleanup and pipeline injection, composting

and landfilling).

- Default methods frequently lump multiple elements together (e.g. centralized treatment CH4 is plant-level)

- Even a process level emissions factor may exist (e.g. anaerobic digestors) – the factor is not specific to the sector (land application) or ignores potentially important distinctions in configuration (e.g. fixed versus floating covers, boilers versus engines versus flares)

- The largest potential source – sewers – does not have a method. John Willis will enlighten us on this.

- It is widely assumed that all of the carbon received in the plant is of biological origin and therefore treated as biogenic and thus ignored. This is likely untrue, esp at plants with significant industrial loadings

Perhaps though the greatest flaw is that the default factors can not be used to show progress toward net zero.

Default wastewater methods

$$CO_2\ equivelant = AD \times EF \times GWP$$

Where:
AD = Activity Data
EF = Emission Factor
GWP = Global Warming Potential

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The way we calculate GHGs essentials follow this formula.

Activity data is a variable quantity typically tied back to plant loadings and nutrient discharges.

While the EF and GWP terms are fixed.

So the only way a facility can show progress on climate is to reduce the AD term

While this framework may make sense when thinking about energy consumption – where you can reduce GHGs either through energy efficiency/conservation or by sourcing a lower carbon intensive energy source.

But in the context of WWTPs it makes little sense.

I do though want to be clear that I don't think we should toss the baby out with the bathwater. This fundamental framework does have some advantages:

- It is straightforward, easy to understand, and does not require complex

computational methods

- Aggregating the data to perform even these basic calculations is not trivial. It requires real time and effort.
- And not all utilities have the resources or expertise to carry it out
- Even as we seek to improve our understanding and the precision of process emissions estimates we need to keep our ultimate audience in mind
- What ever comes out of this needs to be translatable, particle and user friendly
- Yes, better emissions factors would be great, but even better would be a standard, user-friendly guidance on empirical methods
- If we really think that direct measurement is what is required, we need to think about how to make that as streamlined and straightforward for end users.

I want to conclude my remarks by reemphasizing the urgency of climate action.

Emphatically yes, we need to improve and refine how we estimate WWRF GHGs. Yes, a national monitoring campaign would be a good thing (maybe less for improving on national Efs developed elsewhere, but because we are so parochial).

But, we can not wait to act.

There are things we can and should be doing today to

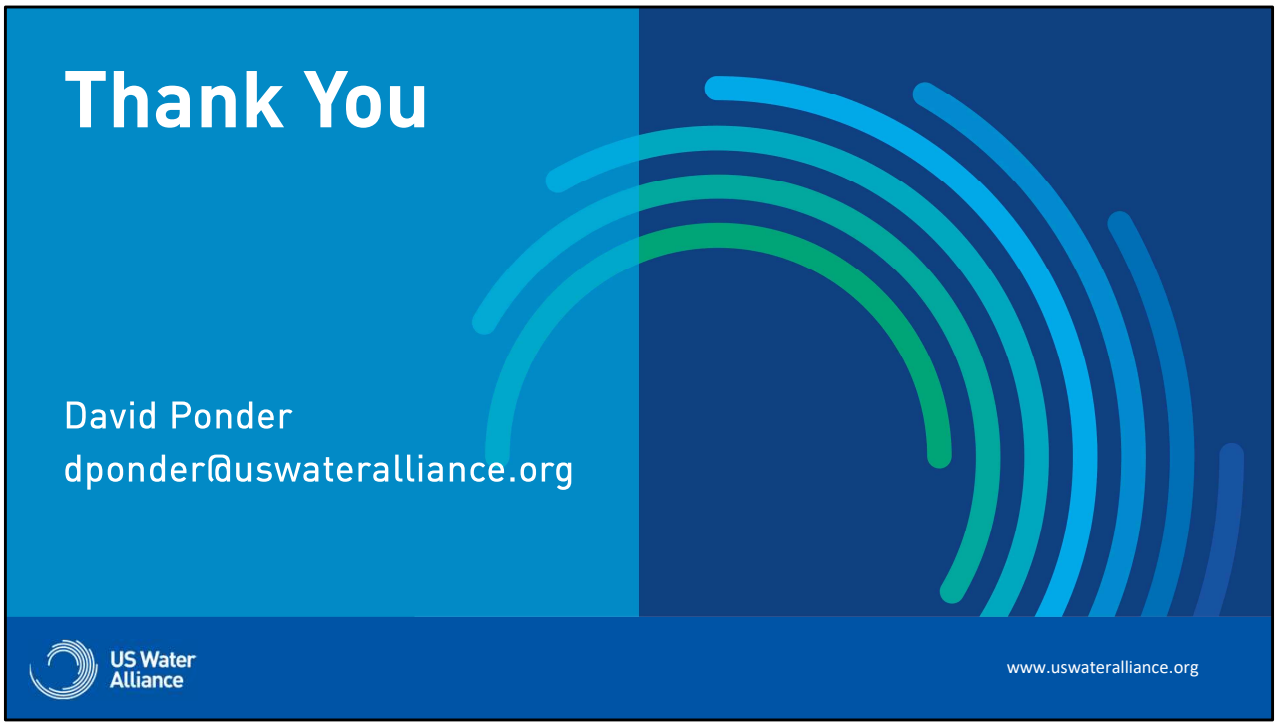
reduce both direct process and fugitive emission and indirect emissions.

To name just a handful:
We can and should be proactively seeking out and repairing methane leaks.
We can and should be squeezing out every KWH and therm of energy savings.
We can and should be controlling processes based on performance (not

We can and should be keeping biosolids out of landfills.

This is just good facility maintenance.

Moreover, there are things we can and should be doing now to reduce process and fugitive emissions that don’t need to wait



Thanks again for your time.

Cheers
David