IWA WATER LOSS SPECIALIST GROUP
the international water association

Leakage Emissions Initiative
www.leigroup.org
Improving our air by preserving our water

The Standard Carbon Balance – Finally Making the Tie From Leakage to Carbon Emissions

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Relevant Roles:
Chair, AWWA Water Loss Outreach Subcommittee
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Chair, Leakage Emissions Initiative, IWA Water Loss Specialists Group
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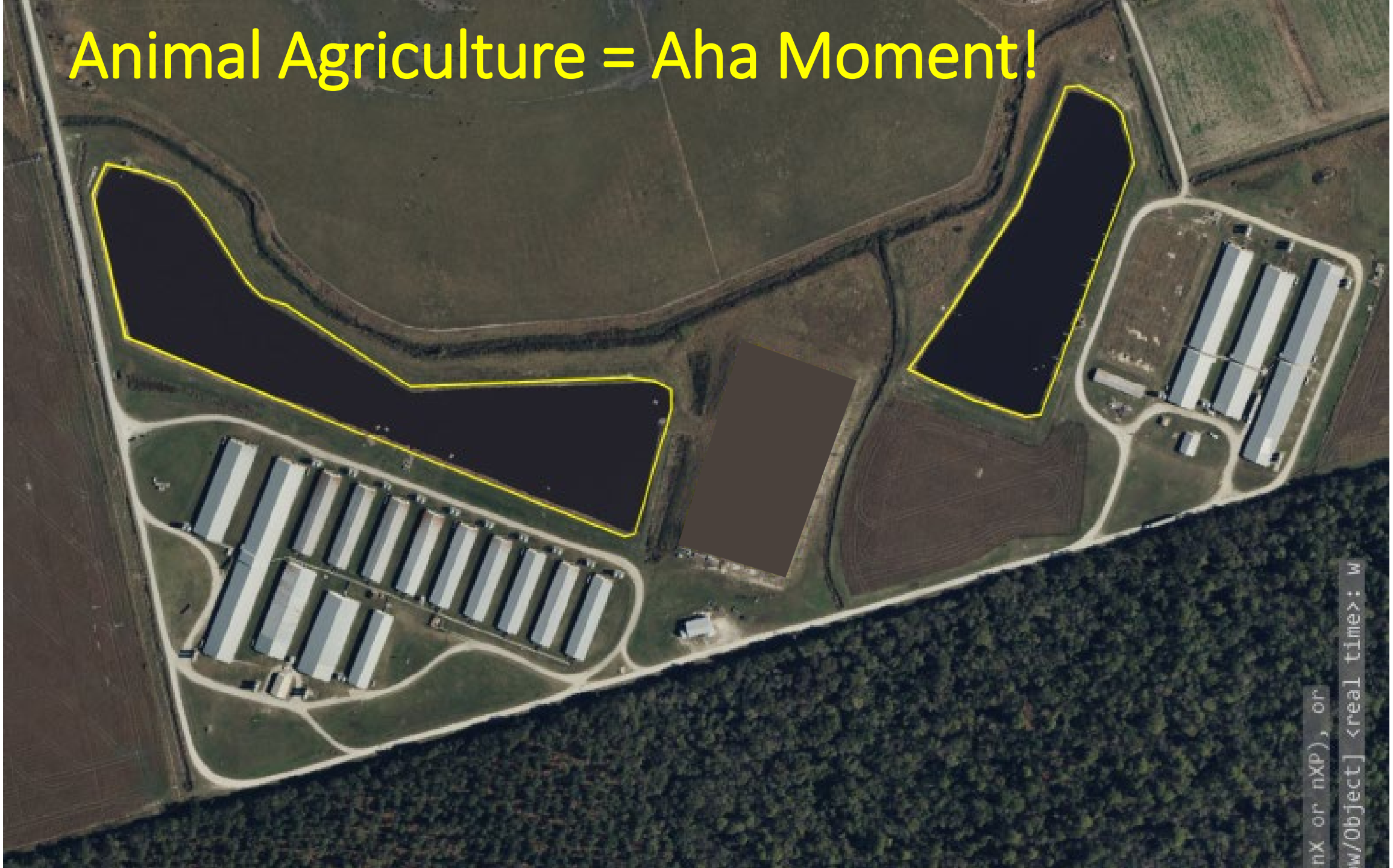
Leakage Emissions Initiative

- Following Water Loss 2022 in Prague, The IWA WLSG proposed an initiative that seeks to quantify the impact unchecked leakage has concerning avoidable carbon emissions.

- The goal was to update the water balance to include an accounting on the carbon emissions for each balance component with a specific initial focus on Leakage.

Animal Agriculture = Aha Moment!




nX or nXP), or
w/Object] <real time>: w

Real Loss and Carbon

- Significant amount of electricity and fuel is used by a water utility
- Leakage Emissions are the greenhouse gasses associated with the extraction, treatment, pumping, and desalination of water that is ultimately lost to leakage.
- Leakage Emissions are traceable and measurable.

JUNE 9, 2023 Climate Change Society Water Supply

IWA Water Loss Specialist Group White Paper: Leakage Emissions Initiative

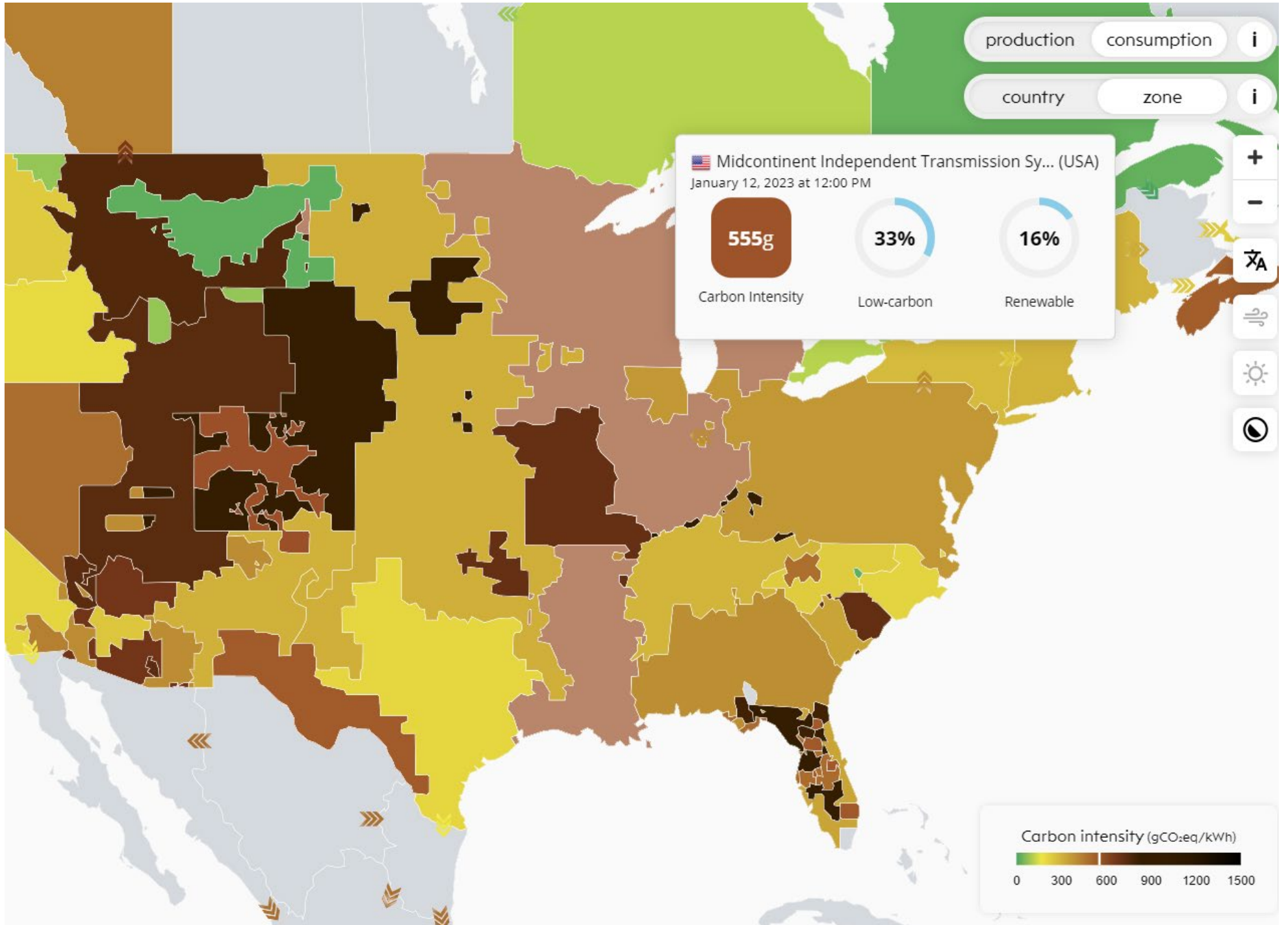
The Water Loss Specialist Group (WLSG) is a group of the International Water Association that promotes best practice in the management of water loss and non-revenue water across the world.

Keep it Simple!

How “Dirty” is the Energy Source?
Grams CO_2/kWh

How much Energy does the Utility use?
kWh/M^3

Generates Utility Specific Carbon Intensity
Grams CO_2 /M^3


production
consumption
country
zone
Midcontinent Independent Transmission Sy... (USA)
January 12, 2023 at 12:00 PM
555g
Carbon Intensity
33%
Low-carbon
16%
Renewable
Carbon intensity (gCO2eq/kWh)
0
300
600
900
1200
1500

AWWA Free Water Audit Software

Water Balance

FWAS v6.0

Water Audit Report for: "Traditional" Water/Energy Source

Audit Year: 2021 Jan 01 2021 - Dec 31 2021

Data Validity Tier: Tier IV (71-90)

Volume from Own Sources (VOS) (corrected for known errors) 46,119.270	System Input Volume 46,483.696	Water Exported (WE) (corrected for known errors) 719.673	Billed Water Exported			Revenue Water (Exported) 719.673
		Water Supplied 45,764.023	Authorized Consumption 37,295.862	Billed Authorized Consumption 37,147.825	Billed Metered Consumption (BMAC) (water exported is removed) 37,147.825	Revenue Water 37,147.825
					Billed Unmetered Consumption (BUAC) 0.000	
				Unbilled Authorized Consumption 148.037	Unbilled Metered Consumption (UMAC) 55.167	Non-Revenue Water (NRW) 8,616.198
					Unbilled Unmetered Consumption (UUAC) 92.870	
			Water Losses 8,468.161	Apparent Losses 2,004.136	Systematic Data Handling Errors (SDHE) 92.870	
					Customer Metering Inaccuracies (CMI) 1,818.397	
					Unauthorized Consumption (UC) 92.870	
Water Imported (WI) (corrected for known errors) 364.426				Real Losses 6,464.025	Leakage on Transmission and/or Distribution Mains Not broken down	
					Leakage and Overflows at Utility's Storage Tanks Not broken down	
					Leakage on Service Connections Not broken down	

Water Balance Real Loss	6,464
Reported Leakage Through Repairs	500
Background Leakage	2,219
Estimate of Unreported Real Loss	3,745 (Recoverable)

2,219 3,745 500

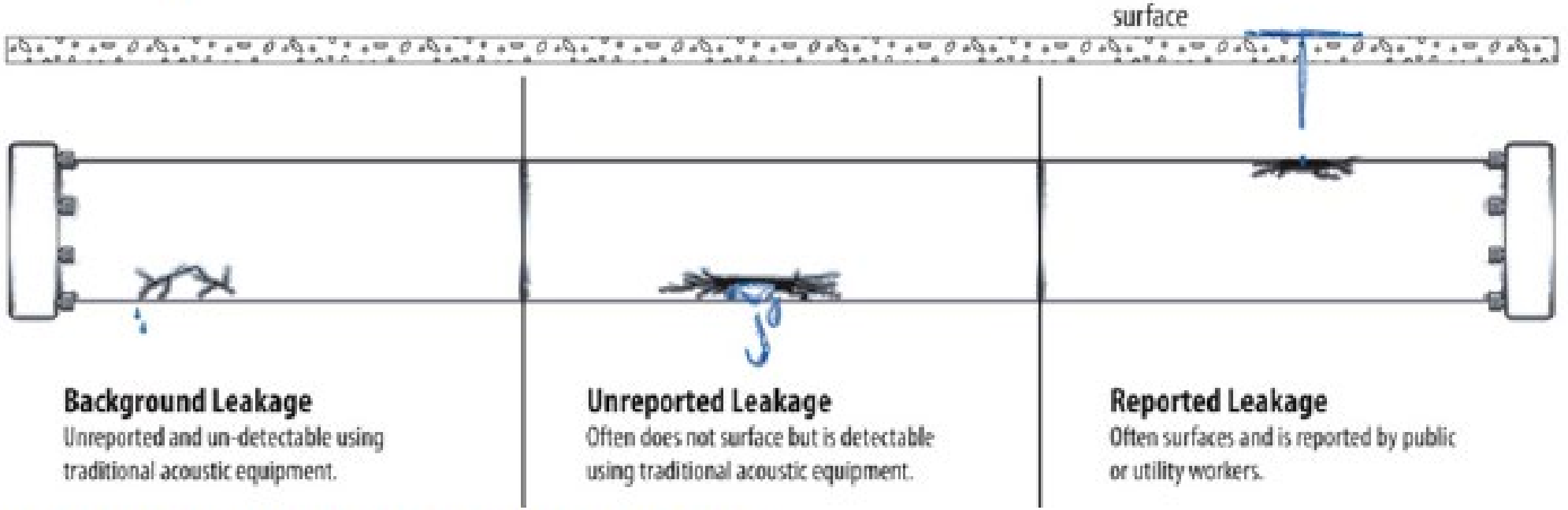


Figure 1: Sub-Components of Real Loss (graphic credit WRF)

AWWA Free Water Audit Software

Water Balance

= Metric Tons of CO2/Yr.

Water Audit Report for: "Traditional" Water/Energy Source

Audit Year: 2021 Jan 01 2021 - Dec 31 2021

Data Validity Tier: Tier IV (71-90)

FWAS v6.0

Volume from Own Sources (VOS)
(corrected for known errors)
175,783,167
47,552

Water Imported (WI)
(corrected for known errors)
1,379,502
368

System Input Volume
183,530,754
48,933

Water Exported (WE)
(corrected for known errors)
2,724,259
726

Water Supplied
173,235,672
46,188

Billed Water Exported
2,724,259
726

Authorized Consumption
141,180,195
37,641

Billed Authorized Consumption
140,619,814
37,492

Billed Metered Consumption (BMAC)
(water exported is removed)
37,492 *140,619,814*

Billed Unmetered Consumption (BUAC)
0 *0.000*

Unbilled Authorized Consumption
560,381
149

Unbilled Metered Consumption (UMAC)
56 *208,830*

Unbilled Unmetered Consumption (UUAC)
94 *351,551*

Water Losses
32,055,476
8,547

Apparent Losses
7,586,480
2,023

Systematic Data Handling Errors (SDHE)
94 *351,551*

Customer Metering Inaccuracies (CMI)
1,835 *6,883,381*

Unauthorized Consumption (UC)
94 *351,551*

Real Losses
24,468,996
6,525

Leakage on Transmission and/or Distribution Mains
Not broken down

Leakage and Overflows at Utility's Storage Tanks
Not broken down

Leakage on Service Connections
Not broken down

Revenue Water (Exported)
2,724,259
726

Revenue Water
140,619,814
37,492

Non-Revenue Water (NRW)
32,615,857
8,696

Water Balance Real Loss	24,468,996 m^3	(6,464 Mgal)
Reported Leakage Through Repairs	1,892,706 m^3	(500 Mgal)
Background Leakage	8,399,829 m^3	(2,219 Mgal)
Estimate of Unreported Real Loss	14,176,461 m^3 (Recoverable)	(3,745 Mgal)

(2,219) 8,399,829 2,240

(3,745) 14,176,461 3,780

(500) 1,892,706 505

6,525 Total

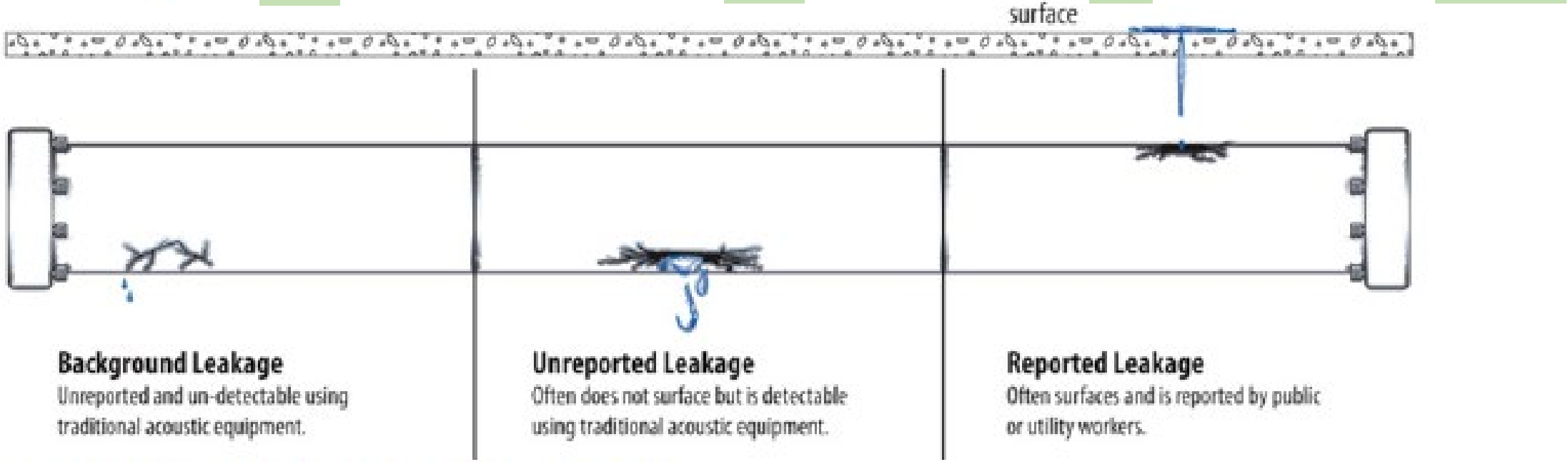


Figure 1: Sub-Components of Real Loss (graphic credit WRF)

= Metric Tons of CO2/Yr.

Example Calculation

Leakage Carbon Reductions Calculator (Actual data from a Midwestern U.S. utility – See Figure 1)

Term	SI Units Example	Units	Calculation Notes	
Volume of Water Supplied	175,783,167	m^3/Yr	From Standard Water Balance	(46,437 Mgal/Yr)
Reference Carbon Intensity	555	g/kWh	From utility's energy source(s) https://app.electricitymaps.com/map?aggregated=false	
Utility Energy Usage	84,444,444	kWh/yr	From utility's energy bill*, excluding overhead energy usage not required for water production and distribution	
Utility Energy Intensity	0.48	kWh/m^3	*Utility Energy Usage* (kWh/yr) divided by *Volume of Water Supplied* (m^3/Yr)	(1,817 kWh/Mgal)
Utility Carbon Intensity	266.62	g/m^3	Multiply *Reference Carbon Intensity* (g/kWh) by *Utility Energy Intensity* (kWh/m^3)	(1.01 mT/Mgal)
Target Leakage Reduction	**14,176,367**	m^3/Yr	Manual input to calculate	(3,745 Mgal/Yr)
Target Carbon Emissions Reduction	**3,779,651,284**	g/Yr	Multiply *Utility Target Leakage Reduction* (m^3/Yr) by *Utility Carbon Intensity* (g/m^3)	
Target Carbon Emissions Reduction	**3,780**	mt/Yr	Convert to Metric Tons per year (divide grams by 1,000,000)	(3,780 mT/Yr)

* *Energy Cost* ($/Yr) divided by *Utility Energy Cost Rate (avg)* ($/kWh) (only if actual power usage not available). See *Figure 3* below.

Carbon Leakage Credits (CLCs), Maybe?

- The Leakage Emissions Initiative may lead to a system where a utility can generate Carbon Leakage Credits when they reduce their Leakage Emissions by reducing their Real Loss.
- CLCs may represent a measurable decrease in emissions and wasted water
- CLCs may then be sold to corporations who have sustainability goals related to a reduction in GHG emissions and water conservation
- The revenue generated from CLCs can bolster funding for:
  - Finding and Fixing Leaks
  - Pressure Management Programs
  - Asset Rehabilitation

Leakage Emissions Horizon

- Methodology Endorsed by Verification Body – example: Gold Standard
- Case Studies from recent and ongoing Leakage Reduction Projects
- Education to Global Financial Institutions

Considerations and Discussion

- Time horizon to “count” avoided CO2 – 10, 15 years?
- What about new leakage after a reduction project
- Addressing “Leakage Lagging Mindset/Misconception” (LLM)
  “Utilities should have already reduced their leakage”

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