



**November 29, 2022**

# Agenda

- Topic 1: US Management Team
- Topic 2: Market Overview and Opportunity
- Topic 3: Kentucky JV Opportunity
- Topic 4: R&D Capability and New Products
- Topic 5: Q&A

# US Technical Team

**Dr. Regina Rodriguez** has a Ph.D. from the University of Florida, where she received the prestigious National Science Foundation Graduate Student Fellowship.

- Dr. Rodriguez currently sits as the Chairperson of the Activated Carbon Standards Committee for the American Water Works Association.
- Dr. Rodriguez holds 9 patents. Her leadership has resulted in one-of-a-kind sorbents and systems for power stations and water treatment.



**Dr. Regina Rodriguez**

**Dr. David Mazyck** founded Engineering Performance Solutions, owned and operated Acticarb (now Donau Carbons US). He has supervised more than \$20M in research. Previously technology lead for a NASA commercialization center, and appointment by the World Coal Association to the United Nations to assist with a Global Treaty on Mercury,

- Dr. David Mazyck is past Chairman of the American Water Works Association Activated Carbon Standards Committee. He is recognized as a world leader in activated carbon technologies and an American Water Works Association Water Sciences Division Trustee.
- Dr. David Mazyck has more than 15 patents many of which have been commercialized.



**Dr. David W. Mazyck**

# Topic 2:

## Market overview

# Addressable Market & Opportunity

| Product                   | Est Market Size | Carbonxt Current |
|---------------------------|-----------------|------------------|
| Powdered AC               | US\$250m        | ✓                |
| AC Pellets – Air Phase    | US\$40m         | ✓                |
| AC Pellets – Liquid Phase | US\$30m         | ✗                |
| Granular AC               | US\$500m        | ✗                |

## Product

**Powdered AC**

**AC Pellets – Air Phase**

**AC Pellets – Liquid Phase**

**Granular AC**

## Carbonxt Future

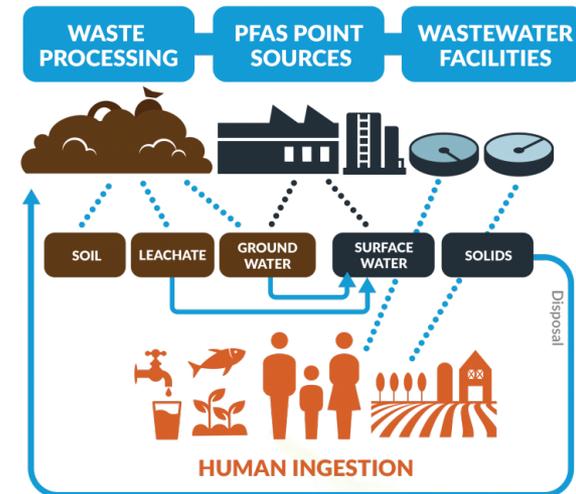


# Liquid Phase: Why now?

## Per- and Polyfluoroalkyl Substances (PFAS)

PFAS are widely used, long lasting chemicals, components of which break down very slowly over time. PFAS are found in soil, water, air, fish, and humans across the globe. Scientific studies have shown that exposure to some PFAS in the environment may be linked to harmful health effects in humans and animals.

The US EPA recently published updated lifetime health advisories for four PFAS, which include PFOA, PFOS, GenX and PFBS. These limits are well below the previous levels as well as the Minimum Reporting Levels currently in place (4 ppt).



| PFAS | Previous LHA (ppt)                     | New LHA (ppt) |
|------|--|---------------|
| PFOA | 70 (alone or in combination with PFOS) | 0.004         |
| PFOS | 70 (alone or in combination with PFOA) | 0.002         |
| GenX | No previous LHA                        | 10            |
| PFBS | No previous LHA                        | 2,000         |

# PFAS – Forever Chemicals

❖ The EPA is set to establish National Primary Drinking Water Regulations for these compounds to be finalized by Autumn 2023. Enforcement is scheduled to begin 2024-2028.

❖ The EPA's Fifth Unregulated Contaminant Monitoring Rule (UCMR 5) was finalized in Fall 2021 and includes 29 PFAS. Public water systems serving over 3,300 people are required to collect samples during a 12-month period from January 2023 through December 2025.

❖ Utilities that did not observe PFOA or PFOS through previous testing measures may now find PFAS due to the expanded contaminant list and significantly improved analytical capabilities.

❖ The Effluent Limitation Guidelines Program will target landfills and establish guidelines by the end of 2022. The EPA expects to complete rulemaking by the end of 2022. If landfill leachate is found to contribute to PFAS concentrations that exceed established ELGs in surface waters or treatment systems, the landfill may be responsible for pretreatment.

## COMMON ITEMS



Water Resistant Clothing



Cleaning Supplies



Nonstick Cookware



Stain Resistant carpet or fabrics



Paints, varnishes, and sealants



Personal care products (shampoo, dental floss) and cosmetics (nail polish, eye makeup)



Some fast food containers or wrappers, microwave popcorn bags, pizza boxes, & candy wrappers



# Topic 3: Kentucky JV Opportunity

# Carbonxt - Kentucky JV

- Existing facilities are unable to support the anticipated growth of Granular Activated Carbon (“GAC”) and Activated Carbon Pellets for PFAS treatment.
- In assessing a solution, management has pursued JV opportunity alongside innovative Waste to Energy provider Inez Power LLC.
- The Kentucky JV delivers three key outcomes:
  1. *Increased production capacity..*
  2. *Control over input costs.*
  3. *High quality raw materials, facilitating entry into liquid-phase market AC's (water treatment).*



# Liquid Phase – Seizing the Opportunity

## Water treatment plants need solutions to meet the coming EPA PFAS regulations

- Granular Activated Carbon (“GAC”) is the best-known technology for addressing “forever chemicals” (PFAS). Existing addressable market is greater than 150,000 tons per year.
- Driven by regulatory change, GAC demand is expected to increase far beyond normal growth rates.
- AC Pellets offer benefits relative to GAC. They are well placed to win share for liquid-phase solutions.
- Carbonxt has been approached by multiple entities (governments and water treatment facilities) for AC Pellet samples, pilots and/or testing in preparation for the coming requirements.
- The US currently has no domestic pellet manufacturing capacity.



## Topic 4: R&D capability and insights into new products

1. Hydrestor
2. SO<sub>x</sub>/NO<sub>x</sub> Removal Pellets
3. Batteries
4. Application of Pelletized AC in Steel Manufacturing

# Phosphorus Reduction in the Community as Prevention of Eutrophication and Harmful Algal Blooms

## Introduction

Phosphorus and nitrogen are critical components of natural growth. These nutrients move through the environment and can accumulate in water bodies. Anthropogenic releases of nutrients include wastewater treatment discharges, fertilizer runoff, and industrial discharge.

Once the water bodies accumulate excess nutrients, algal blooms begin to grow and can either cause the water body to turn eutrophic (killing other flora and fauna).

## Problem Statement and Motivation

In the USA, roughly 34 billion gallons of water per day are processed as wastewater. That water is either directly discharged into surrounding waterbodies or reused for beneficial practices.

Reused water can be beneficially used to irrigate urban landscaping or agriculture, recharge watersheds, and/or non-potable industrial processes. Much of this water, is treated to moderate levels, but some still contain elevated nutrient concentrations and can lead to eutrophication and algal blooms in surface water.

**HydRestor®** is intended to be a technology deployed by wastewater facilities and municipalities with elevated phosphorus concentrations to reuse their reclaim water.

## Wastewater and Water Reuse Statistics

34 billion gallons of water per day are processed at US wastewater treatment facilities – *US EPA 22*

34% of “major” US WWFs have Nitrogen or Phosphorous regulations.

10% of “non-major” US WWFs have Nitrogen or Phosphorous regulations.

*Data based on 2016 US EPA Reporting*

5 billion gallons of water per day are beneficially reused for urban irrigation, environmental recharge, or other industrial purposes. – *Water Reuse Association 2022*

32 states have regulations for urban reuse, 17 states have regulations for environmental recharge. – *2012 EPS Report*

60% of Florida impaired waterbodies are related to nutrients or dissolved oxygen issues. – *2022 FDEP Report*

## HydRestor® – Phosphate Recovery Technology

- The HydRestor™ technology is a pelletized activated carbon media, specifically created to reduce nutrient loading in water and reduce phosphorus concentrations.
- The ready-to-use filter media is loaded into beds and water is then passed through with necessary residence times needed for phosphorus adsorption. The technology is formulated to target the removal of phosphorus from a variety of water sources, including wastewater, stormwater, and industrial processes.
- The HydRestor™ was selected for an extensive research program funded through the state of Florida and local municipalities. The award funds \$400,000 of testing and will treat over 8 million gallons of water.

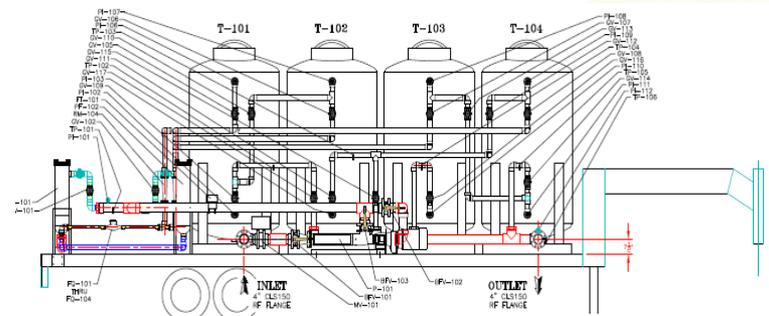
### Example Case Studies

HydRestor® pellets were used in a large-scale system that treated nutrients through a 1 million gallon per day flow stream.



### Future Work and Implications

A pilot trailer is being manufactured in order to take HydRestor® mobile. Simple plug-and-play configuration leads to more availability of pilot testing and continuation of demonstrated performance.



**ESD Waste2Water, Inc.**  
Partnership for a Cleaner Tomorrow

# Carbonxt – R&D

- Carbon materials for batteries
- Pellets for more ReACT systems
- Decarbonization (CO<sub>2</sub>) reduction in steel manufacturing.



# Topic 5: Questions?



**THANK YOU!**

**David Mazyck  
Regina Rodriguez**