



kuraray

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Management Briefing

KURARAY CO., LTD.

Today's Theme

Growth Opportunity of Activated Carbon Business

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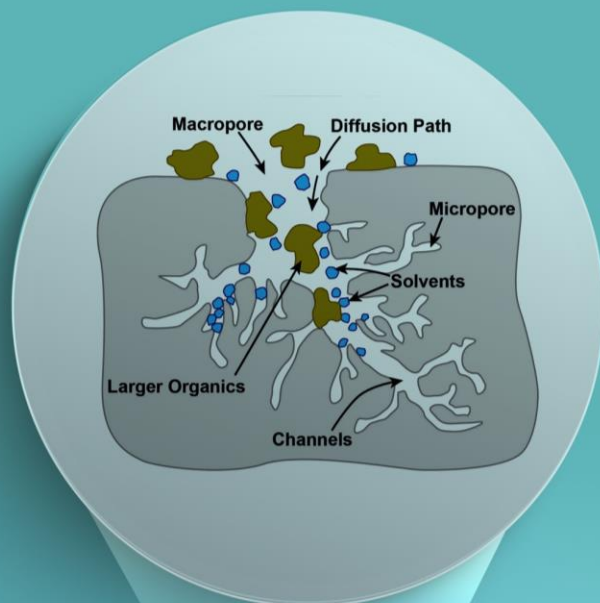
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Growth Opportunity of Activated Carbon Business



What is Activated Carbon?



- **Activated Carbon** is a porous material that removes organic compounds from water and air as well as other liquids and gases by a process known as “adsorption.”
- In adsorption, **organic molecules** contained in a liquid or gas are attracted and bound to the surface of the pores of the activated carbon as the liquid or gas is passed through.

Raw Materials Used In Activated Carbon Production:

Raw material dictates uniqueness of product



Coconut



Bituminous
Coal

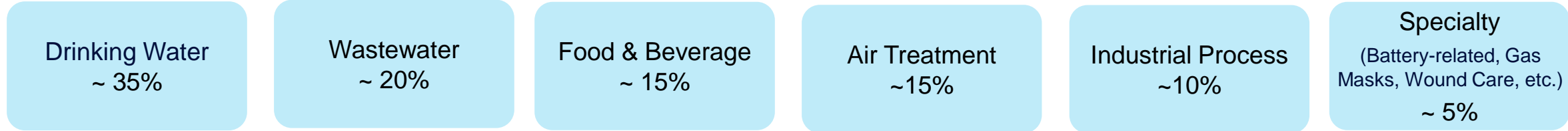


Wood



Lignite

Key Global Markets & 2023 Activated Carbon & Related Sales Volume %



Wide range of products



Bituminous coal-based activated carbon



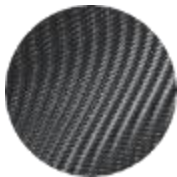
Coconut-based activated carbon



Wood-based activated carbon



Granular activated carbon reactivation



Carbon cloth (viscous rayon)



Wet molded carbon block



Carbon adsorption equipment



Provide clean, safe drinking water



Reduce environmental impact and allow wastewater reuse or disposal



Remove and recover contaminants from air emissions



Enhance critical stages in chemical manufacturing



Improve the environment through remediation projects



Purify food products



Enabling electrification and reducing emissions for automotive industry



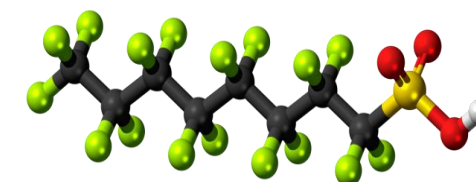
Protect your personal environment



Overview of new U.S. PFAS drinking water regulation

What is PFAS

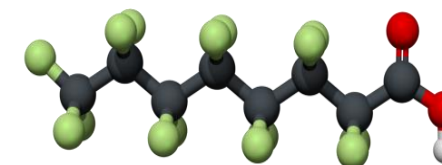
- Poly- and perfluoroalkyl substances – PFAS
- Characterized by carbon bonded with multiple fluorine atoms
- Class of synthetic fluorinated compounds originating in the '40s
- Commonly referred to as “forever chemicals”



PFOS Molecule

PFAS effects

- Highly persistent / resistant to degradation in the environment
- Ubiquitous in most water supplies
- Accumulates in the body
- Toxicological studies demonstrate adverse health effects through exposure at very low concentrations



PFOA Molecule

PFAS are EVERYWHERE.....

Cleaning Supplies



Firefighting Foams



Eye Makeup



Nail Polish



Fast Food Wrappers



Nonstick Cookware



Insect Spray



Shampoo



Microwave Popcorn Bags



Stain Resistance Products



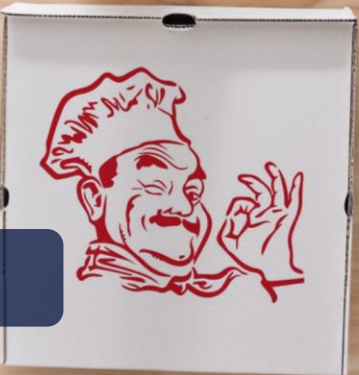
Waterproof Clothing



Dental Floss



Pizza Boxes



Candy Wrappers



	PFOA	PFOS	PFNA	PFHxS	GenX
MCL*	4 ppt		10 ppt		
Goal	0 ppt		10 ppt		
Timing	3 years monitoring + 2 years for treatment = April 2029 Compliance Expect early adoption due to state regulation, public pressure, etc.				
Impact	U.S. EPA estimates the regulation will ensure 100 million Americans have access to clean and safe drinking water. The U.S. Bipartisan Infrastructure Law has allotted ~\$10 Billion in grant funding over 5 years to tackle emerging contaminants such as PFAS.				

* MCL: Maximum Contaminant Level; ppt: part-per-trillion



Expected Demand Growth




Both Ground Water and Surface Water customers will require PFAS treatment, but design considerations will be different.

Typical Surface Water Treatment Process



Typical Groundwater Treatment with our Aquaknight™ Vessels



	Operating Costs	Capital Costs	Effectiveness	End of Life
<p>Granular Activated Carbon (GAC)</p> 	<p>Low product cost, multi-contaminant removal, no energy consumption</p>	<p>Equipment and infrastructure investment, larger footprint vs. IX</p>	<p>Effective for long & short chain, design and treatment goals must be considered</p>	<p>Reactivation is a sustainable & cost effective option for PFAS destruction</p>
<p>Ion Exchange Resin (IX)</p> 	<p>Higher product cost, fouling concerns, limited simultaneous removal</p>	<p>Equipment and infrastructure investment, smaller footprint vs. GAC</p>	<p>Effective for long & short chain, design and treatment goals must be considered</p>	<p>Must landfill or incinerate spent media, which is costly</p>
<p>Reverse Osmosis (RO)</p> 	<p>High energy cost, high maintenance and membrane replacement cost</p>	<p>Higher overall project costs vs. GAC & IX</p>	<p>Effective for long & short chain, design and treatment goals must be considered</p>	<p>Reject water disposal requires incineration or deep well injection, which is costly</p>

Filtrisorb™ Virgin GAC



- High performance of Filtrisorb™ Products
- Product durability maximizes reactivation cycles
- Surety of supply is important to market
- New production line helps ensure supply

AquaKnight™ Equipment



- Engineered for best performance
- Can purchase equipment & GAC in bundle
- Industry* certified equipment

Drinking Water Reactivation



- Performance equivalent or better to virgin
- Proven effective for removal and destruction of PFAS compounds
- Offered in combination; collect spent carbon, reactivate and fill up equipment.

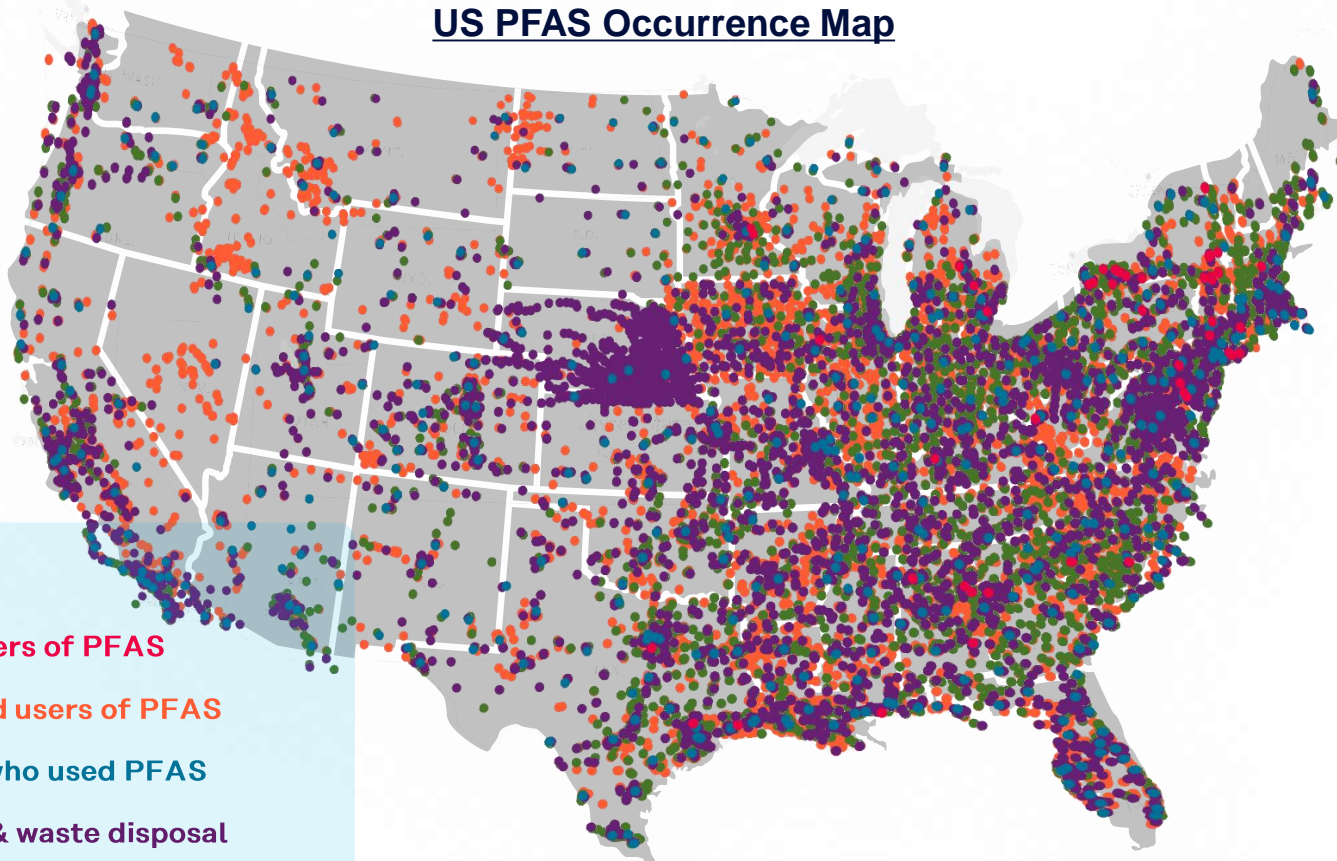
Expertise / Service



- Large, experienced field service team delivering touch-free service
- Over 25 years of experience in PFAS treatment
- Optimize customer solutions through pilot and laboratory testing

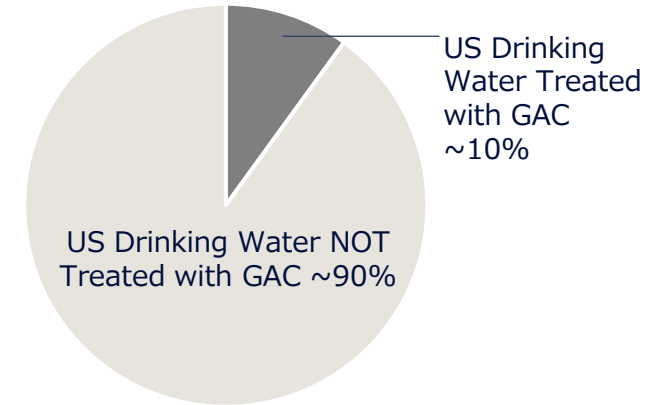
*Certified per National Sanitation Foundation (NSF) as required by industry

- The volume of drinking water treated with GAC is expected to increase by 2.5X – 4X to comply with regulations.
- In addition to more utilities using GAC, change out frequency is expected to increase by 2X – 4X.

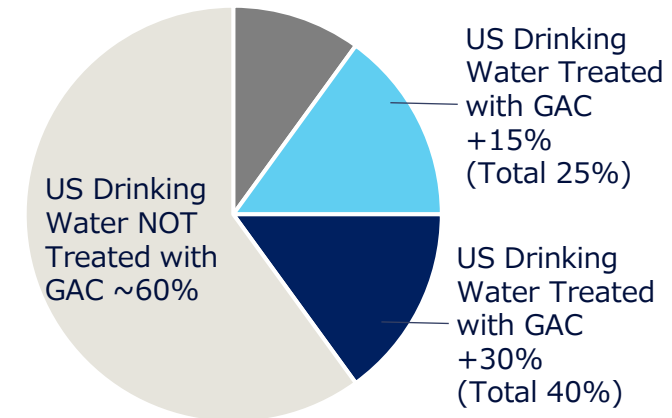


- Legend:
- **Known users of PFAS**
 - **Suspected users of PFAS**
 - **Airports who used PFAS**
 - **Landfills & waste disposal**
 - **Sewage & waste treatment plants**

Market Use of GAC in FY2023

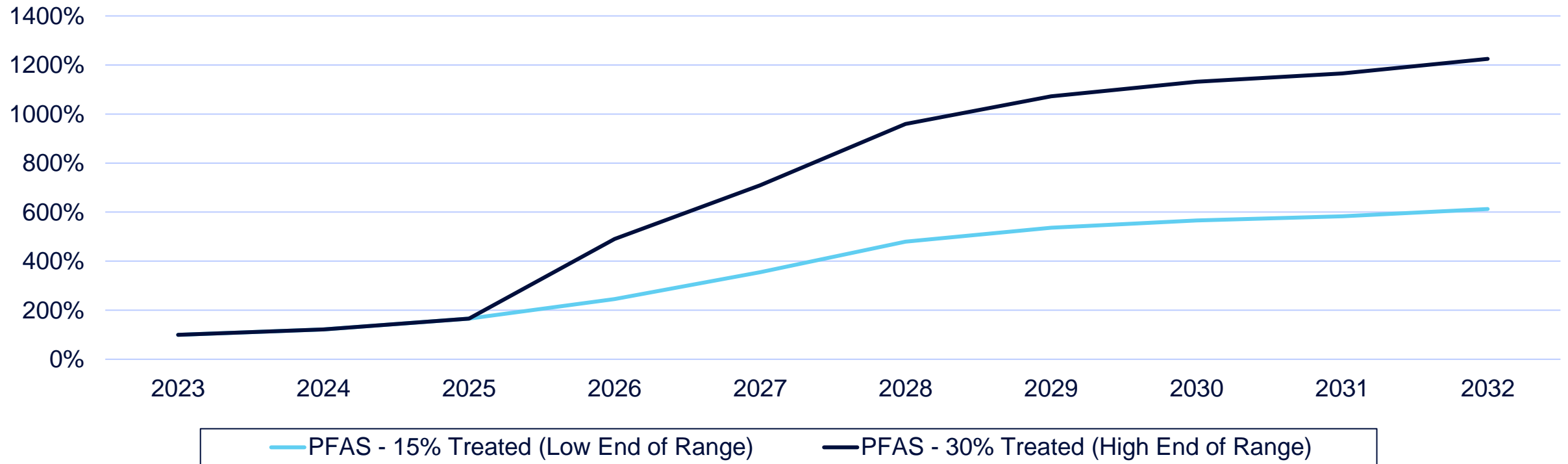


Our Estimate of GAC Use in FY2030



- Our annual estimate of the market value for PFAS treatment for U.S. drinking water is between \$1.0B to \$2.0B in 2030, depending on % of water requiring treatment.
- We believe activated carbon will represent 75% of the market and our strength as a Total Solution Provider positions us to capture more than half of the demand.

Calgon Carbon U.S. Drinking Water PFAS-Only Revenue Growth (2023 as 100%):




PFAS Treatment Opportunities Beyond Municipal Drinking Water




Agriculture

- Irrigation water




Beverage & Bottling

- PFAS in bottlers and beverage producers




Wastewater Treatment

- Wastewater
- Direct discharge to stream
- Leachate
- Municipal wastewater




Industrial Plant

- Air emissions
- Industrial wastewater
- PFAS treated materials



Firefighting Foam

- Discharge to stream and groundwater




People/Housing

- Home water filters for PFAS



Landfill

- Treatment of leachate for PFAS



Remediation

- Treatment of contaminated waterways and soils

Significant additional growth as a solution provider,
with CAGR of 10%+ until 2030.

Other US PFAS treatment*1

Additional growth for other markets - industrial, remediation, food and beverage.

PFAS regulation in other regions

Stricter regulations in Europe and the establishment of limits in Asia are expected.

US Stage III DBP*2

Additional growth will occur for US drinking water with the establishment of new regulations.

Growth in Other Global Markets

Examples Include:

- Battery materials
- Biogas purification
- Stricter regulations for air

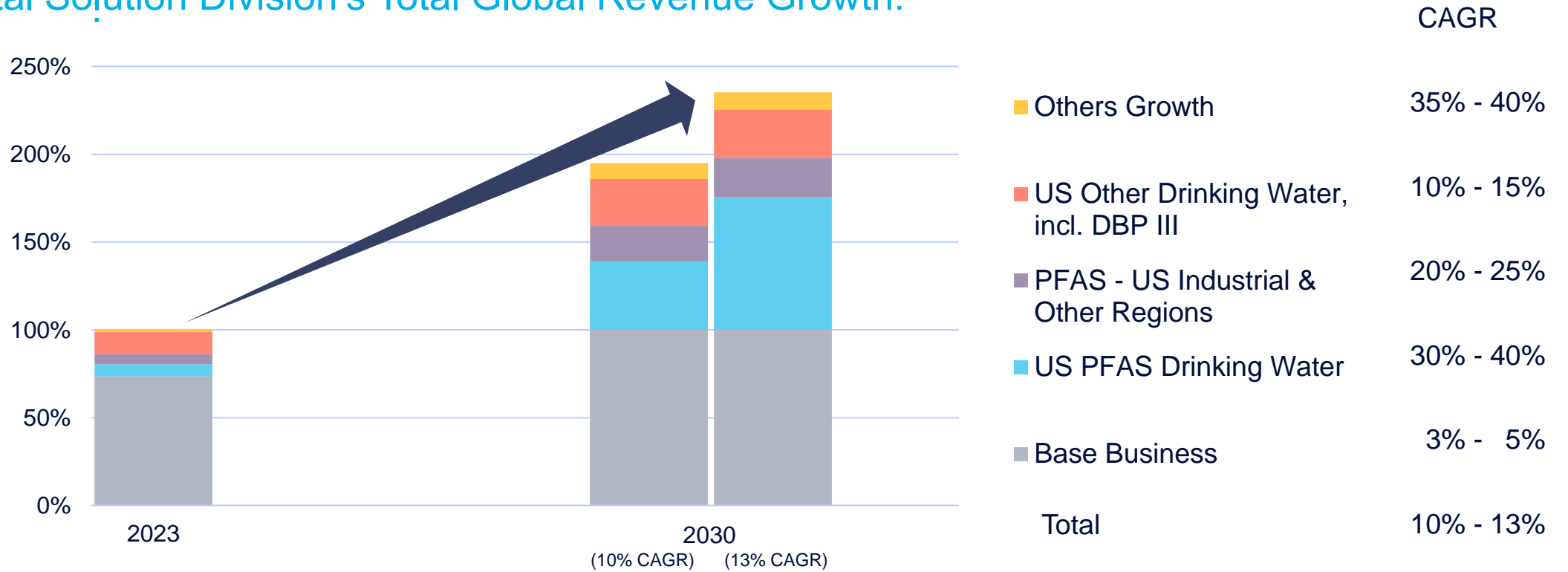
M&As:
Bloomfield in 2023 and Sprint in 2024
(Equipment) (Industrial reactivation)

Capacity expansion:
New 25,000 MT virgin GAC line in U.S. started operation in Q1 2024.

*1 See slide 18 for detail.

*2 DBP: Disinfection Byproduct. New, anticipated regulation broadening regulated byproducts & limiting chloramine byproducts in drinking water in U.S.

Environmental Solution Division's Total Global Revenue Growth:



Growth from PFAS treatment for US Drinking Water will be strong and additional growth expected from other market & applications



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