Kuraray Co., Ltd.

Management Briefing

Growth Opportunity in Activated Carbon Business

Presenter:

Hitoshi Kawahara	President and Representative Director
Nobuhiko Takai	Director and Managing Executive Officer, President, Functional Materials Company
Stevan R. Schott	Executive Officer, General Manager of Environmental Solutions Division, Calgon Carbon Corporation President
Jenalle Brewer	Senior Vice President - U.S. Drinking Water & Global Business Development, Calgon Carbon Corporation

June 21, 2024



Kawahara: I'm Kawahara, the President of the Company. Thank you very much for attending Kuraray's management briefing taking time out of your very busy schedule. As just mentioned by the moderator, as we have already distributed the handout, today, we will present the growth opportunity of the activated carbon business, mainly focusing on the applications to remove organofluorine compounds or so-called PFAS. In April this year, the U.S. EPA has finalized the regulation, which contains three years of monitoring period and two years of grace period. After five years, the regulations will be implemented. Although there is two years of the grace period, the regulation is totally in line with what we have been assuming as overall.

These are the regulations of the drinking water in the United States. However, on top of the PFAS, there can be the regulations on other substances contained in the drinking water, and there already is the consideration being given to regulate the industrial-use PFAS. Also, it is expected that there will be more stringent regulations in many other countries of the world, which includes Europe and Japan. Also, we expect that the new regulations shall be introduced in Asia as well. We at Kuraray conduct the activated carbon business. Therefore, we believe that the environment is becoming positive for our company.

Now, as the world's leading manufacturer of the activated carbon business, we have to catch up to this increasing demand so that we will be able to further expand our business. However, in doing that, we do understand that we are faced with a lot of challenges. For one thing, we have to make the necessary capital expenditure so that we will be able to enhance our capacity to continue to supply. There are also some challenges in the manufacturing processes and of the activated carbon because the emissions of greenhouse gas are always a challenge. We will be leveraging on the technology that we have on the corporate as well as to utilize CCUS, among other technologies, to work on the reduction of the greenhouse gas emissions. I hope that the Company shall have some other occasions to address about these topics as well.

Let us get started with the presentations. Based on the material that has been distributed already, let me introduce two speakers from the United States. First of all, we have Mr. Stevan Schott, the Executive Officer. He is the General Manager of the Environmental Solutions Division, which is conducting the activated carbon business of Kuraray Group and also concurrently serving as the President of the Calgon Carbon Corporation subsidiaries in the United States.

We also have Jenalle Brewer, who also belongs to the Environmental Solutions Division serving us as well as serving as the Senior Vice President of Calgon Carbon Corporation. She is in charge of the drinking water business in the United States, which is the main topic that we will cover in today's management briefing.

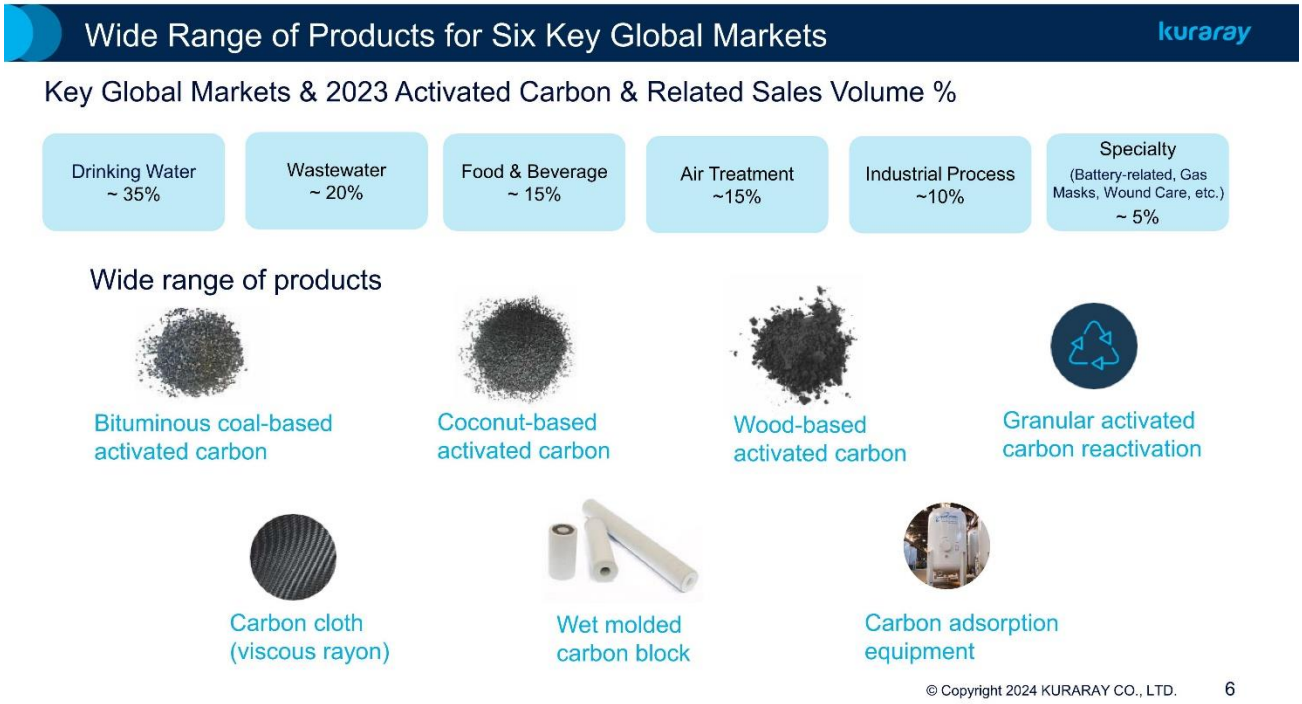
Without further ado, I would like to invite Mr. Schott as well as Ms. Brewer to make the presentation.



Schott: Thank you. I'd like to briefly describe activated carbon and its societal benefits. Activated carbon can be made from many raw materials, including coconut, bituminous coal, wood, and lignite. Each raw material provides different qualities in the finished activated carbon product due to its physical characteristics, including pore structure, hardness, and density.

For example, activated carbons made from wood have very large pores, making them particularly suited for decolorization. Coconut carbons provide tremendous microporosity and are generally harder and have fewer impurities compared to coal-based carbons, making them effective in applications such as batteries and home water filters. However, we have found that bituminous coal-based carbons are the most versatile, offering effective treatment in hundreds of different applications.

The coal-based carbons we expertly manufacture are developed to have varied numerous large and small pores and have an expansive surface area to attract and retain a large amount of varied organic material. These carbons are also particularly good at being able to withstand an indefinite amount of recycling or reactivation cycles. These qualities make our coal-based activated carbons particularly good for removing PFAS from drinking water and facilitating PFAS destruction through our reactivation process.



Turning to slide 6, I'd first like to highlight our six key markets. You can see that our largest market is global drinking water, which represents 35% of our volumes sold. We manufacture and offer many different coal-based activated carbons within our Filtrasorb brand to serve this market and are ready to meet the rapidly growing demands that are coming from the urgent need to remove PFAS from our drinking water.

Of course, other markets served, including wastewater, food and beverage, air treatment, industrial process, and specialty are all important to our success, providing varied outlets for hundreds of differing activated carbon products that are used in over 700 different applications. Our versatility can be attributed to different raw materials we use to produce our carbons and best-in-industry manufacturing expertise to optimize the performance of our products for varied and complex market applications.

We are the only activated carbon company that manufactures carbons from coal, wood, and coconut. In the United States, we also manufacture large equipment vessels of varying sizes and types to allow for ease of activated carbon usage by our customers. These vessels also help facilitate the recycling of the activated carbons and will be particularly needed by drinking water providers, especially those treating groundwater.



Turning to slide 7, you can see how the products we manufacture and sell improve the living environment. In addition to helping provide clean and safe drinking water, our carbons are used extensively to treat waste water. We helped to solve air emission challenges in many applications, and our products are used to enhance critical stages of chemical manufacturing and in many environmental remediation projects to clean contaminated soil and water. In addition, many of the food and beverage products you enjoy on a daily basis have been purified with activated carbon.

Next, I'll highlight that our carbons are used by battery manufacturers to improve their performance. We expect this area to be another source of future growth. Finally, our products are used in respirators and other filters to protect industrial workers, first responders, and others.

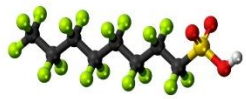
Brewer: Good morning. I'm excited to talk about the great opportunity ahead for the drinking water business in the United States resulting from the newly established enforceable limits for PFAS. As I will detail in the coming slides, our company has and will continue to be the preferred solution to ensuring that forever chemicals are forever no more. Kuraray is well positioned to realize significant and profitable growth from PFAS treatment.

What is PFAS and PFAS effects

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What is PFAS

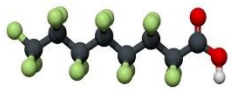
- Poly- and perfluoroalkyl substances – PFAS
- Characterized by carbon bonded with multiple fluorine atoms
- Class of synthetic fluorinated compounds originating in the ‘40s
- Commonly referred to as “forever chemicals”



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

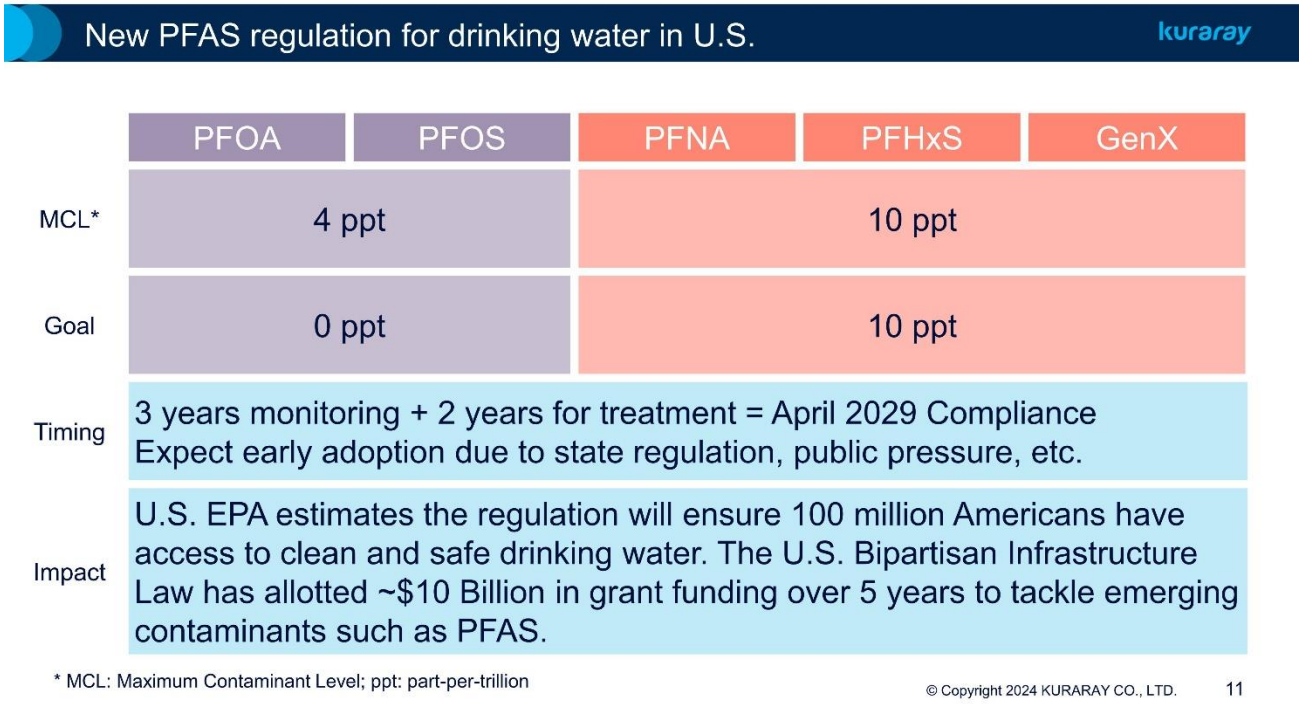
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Moving to slide 9, PFAS are a class of thousands of man-made chemicals. The strong carbon–fluorine bond that characterizes these chemicals provides important properties that makes these compounds persistent and pervasive. These compounds will not break down in nature and will bioaccumulate in the human body when ingested. Toxicological studies have shown that a subset of these chemicals can cause negative health effects, including, but not limited to, multiple cancers and birth defects.



As illustrated on slide 10, PFAS are used in many different applications. Examples include waterproofing, food packaging, fire suppression and firefighting foams, and nonstick properties in cookware and food packaging, to name a few. The broad use of these chemicals over many decades has resulted in widespread contamination.

While the current regulation is focused on US drinking water, we expect additional regulation and consumer awareness to drive the need for PFAS treatment, which will result in growth in industrial markets and other geographies, and will be discussed later in the presentation.



Slide 11 summarizes the final regulation announced by the US Environmental Protection Agency, or EPA, in April. The maximum contaminant levels, or MCLs, are the amount of PFAS permissible in drinking water. These enforceable limits will require utilities to treat on a national scale and are extremely low. To give a perspective, one part per trillion or PPT is equivalent to one drop of water in 20 Olympic-sized swimming pools.

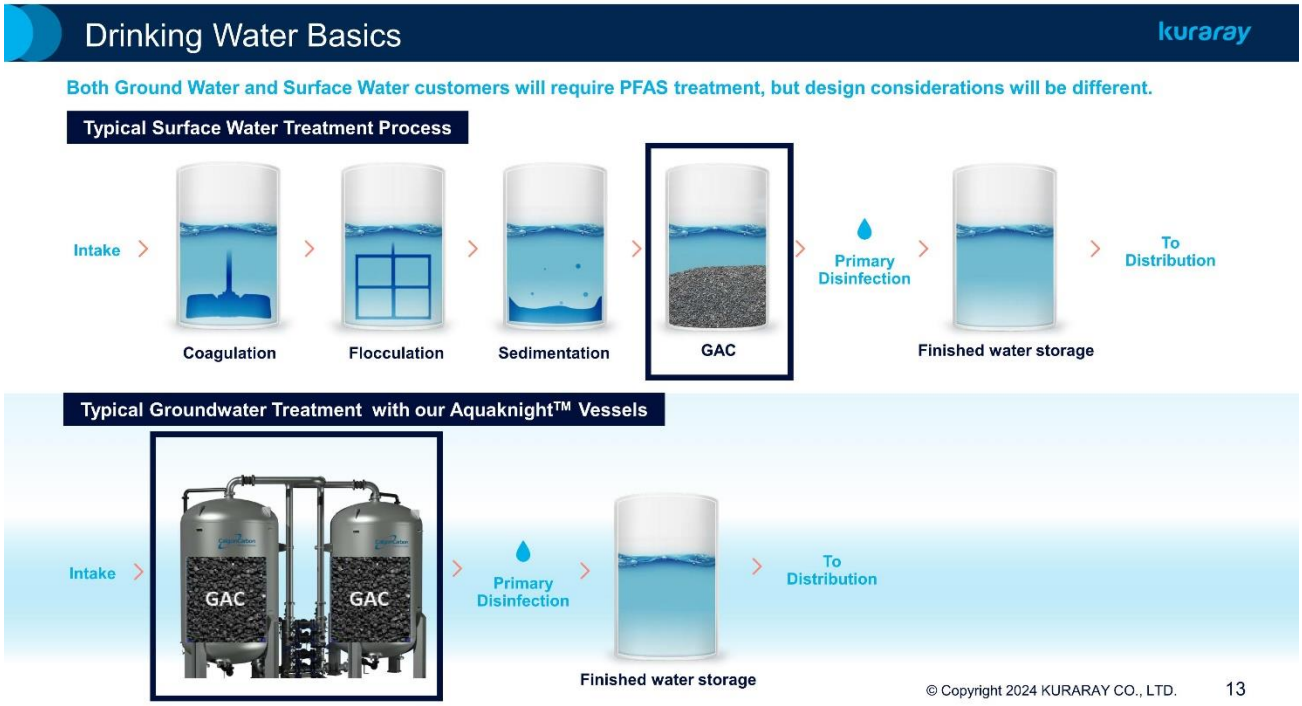
Drinking water utilities across the US will be required to be compliant with the limits by early 2029. We expect early adopters. Many municipalities will achieve compliance well in advance of this due date due to state regulations, public pressure, or supply chain concerns. Most importantly, the US EPA estimates that 100 million people or 30% of the US population will be impacted by the regulation and has allocated USD10 billion to ensure that Americans have access to clean and safe drinking water. Comparatively, a study published by the US Geological Survey estimates that at least 45% of US tapwater is contaminated with PFAS.

Expected Demand Growth

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Moving to slide 12, estimates on market sizes vary, so I would like to take some time to detail our view of growth expectations as a result of the regulations. Today, a fraction of drinking water utilities have reported results on PFAS contamination, and as more utilities report, the precision of our market estimates will improve.

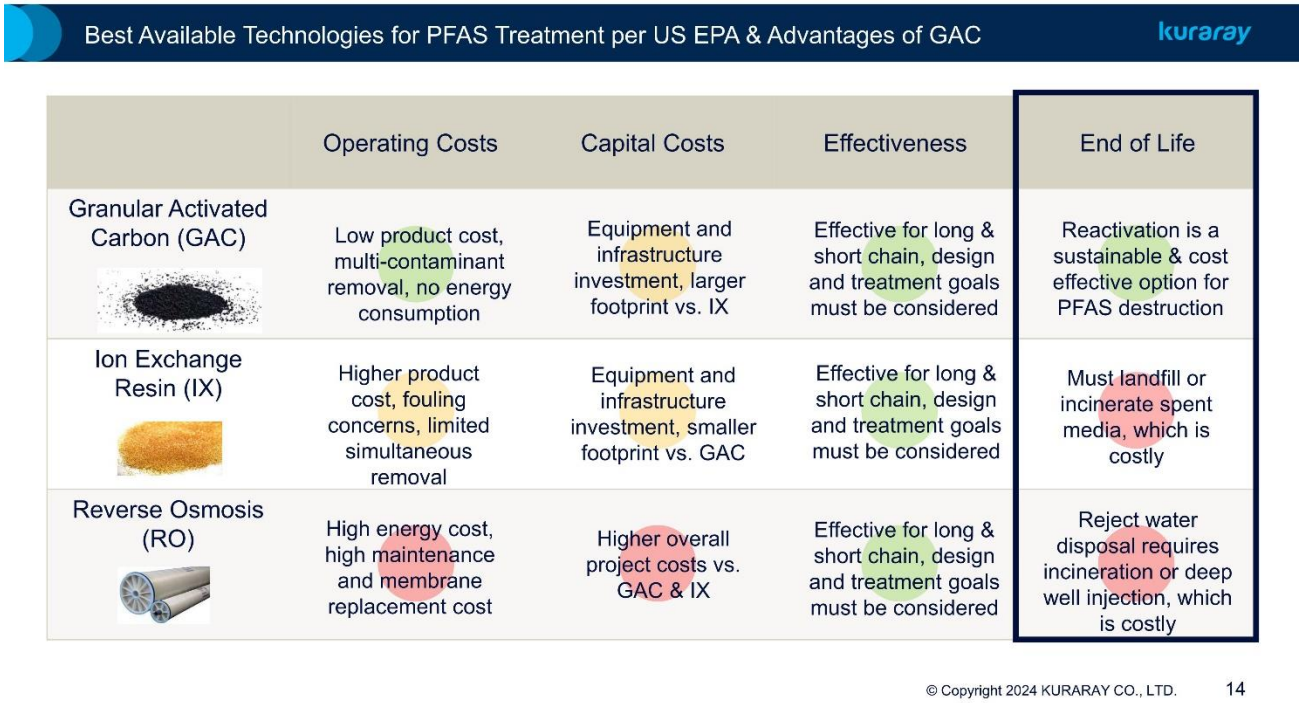
In the next few slides, I will detail our view of the growth and the assumptions used based on our study of the approximate 15% of large drinking water utilities across the US that have reported PFAS testing results, our understanding of the technical requirements for compliance, and our knowledge of who are already testing or evaluating treatment for other contaminants as well as PFAS.



Slide 13 provides some basics on drinking water, which are important considerations in our assumptions regarding market size. A majority of drinking water comes from two sources: surface water and groundwater. Surface water comes from rivers and lakes, and because of the organic and other material in the water, must go through multiple treatment steps as shown in the diagram on the top part of the slide. Flow rates are typically very high.

Groundwater comes from aquifers or wells, and because of natural filtration, generally contains less solids and organic matter compared with surface water. As shown on the bottom part of the slide, groundwater uses fewer treatment steps.

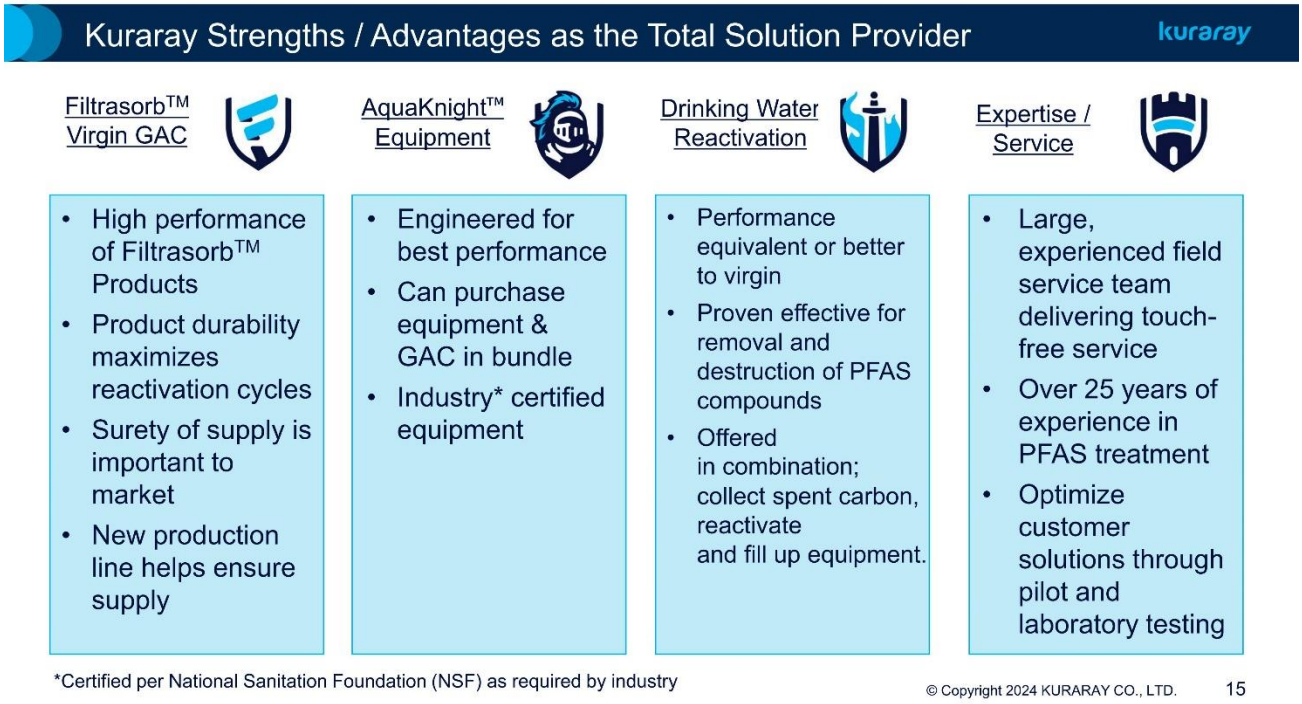
Both surface water and groundwater will require PFAS treatment, but technical and economical considerations will be very different. As an example, groundwater will use tanks or vessels, as shown on this slide, where surface water facilities will use fewer vessels and more gravity filters, which are similar to swimming pools filled with filtration media, including granular activated carbon.



Slide 14 provides a comparison of the three best available technologies cited by the US EPA for PFAS treatment: granular activated carbon or GAC, ion exchange, and reverse osmosis. The table considers operating costs, capital costs, ease of use, and end-of-life considerations. In each category, you will see a colored circle. Green represents very good for this category. Yellow is average, and red is comparatively poor. Comparing the technologies, all three are effective, but what separates granular activated carbon from other technologies is its low operating cost, the simplicity of use, and the ability to destroy the PFAS contaminants while recycling the carbon at end of life through reactivation.

Considering the information on the last slide, the importance of operating costs, ease of use, and end-of-life considerations will be different between surface water and groundwater. Because surface water facilities process higher volumes of water with comparatively more organic compounds, reverse osmosis and ion exchange is likely to generate high volumes of PFAS-laden waste to dispose, and filing from organics and other matter will be very costly based on media cost.

We expect that a good majority of surface water customers will select granular activated carbon coupled with reactivation as the most cost-effective and sustainable approach to treatment. For groundwater sites, we still expect approximately half of the total process groundwater to be treated with granular activated carbon for the reasons shown on this slide.



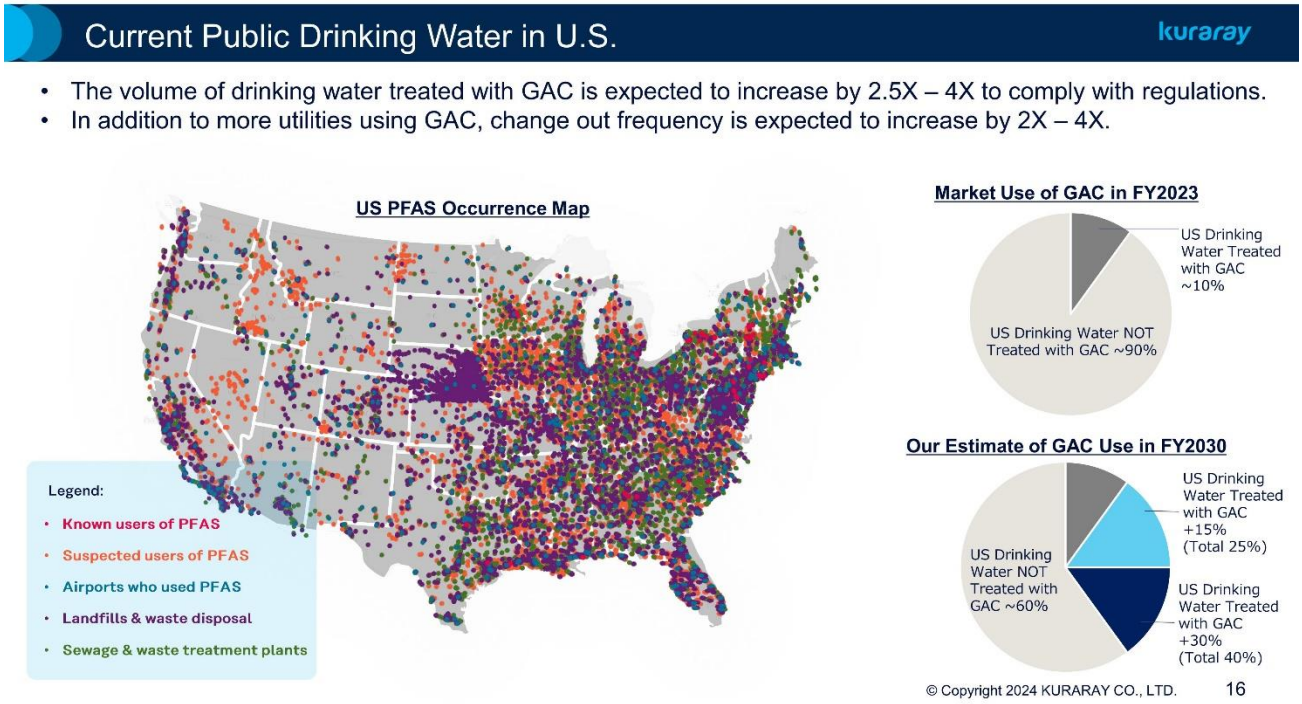
Slide 15 provides an overview of our advantages for PFAS treatment. Key to Kuraray's success in this area is a full solution. Municipalities want a solution provider, not just in activated carbon media, and we are the only activated carbon company that currently has the capability to offer all four aspects of what is required.

First, our Filtrasorb Virgin Granular Activated Carbon has consistently demonstrated superior performance in removing short- and long-chain PFAS compared to other carbons. Our US presence, surety of supply, and expertise provide advantages that are greatly valued by our customers.

Second, our newly rebranded AquaKnight Equipment, which uses an enhanced design to ensure that no water escapes without treatment while ensuring the activated carbon can be completely removed during exchanges.

Third, our drinking water reactivation services where we are the only company to have published the effectiveness of reactivating spent carbon with PFAS and a peer-reviewed journal. The US EPA cites our work.

The final pillar is our unparalleled expertise, which includes the industry's largest research and development organization, the most capable field service team, a strong logistics group, and our leading brand name and reputation. We have been the preferred solution for PFAS treatment to the industry for over 25 years. We do what no one else does, and these four pillars distinguish us from the competition.



Slide 16 provides a good image of the scope of PFAS occurrence in the US. The key takeaway from this slide is that although PFAS occurrence is concentrated on the eastern half of the United States, PFAS is everywhere and comes from a variety of sources, including PFAS manufacturers, PFAS users, airports, landfills, and many more.

The pervasiveness of the contamination will drive treatment, and we believe it will lead to extensive adoption of granular activated carbon coupled with reactivation as the preferred treatment method. As we look at the US market today, approximately 10% of drinking water is treated with granular activated carbon, as shown by the dark gray part of the pie chart. This means that the remaining 90% of drinking water is not yet treated with granular activated carbon, as shown on the light gray piece of the pie.

Shifting to the future, in 2030, we estimate that an additional 15% to 30% of drinking water will need to be treated with granular activated carbon. In the case of 15%, which will be referred to as the low end of the range, 25% of drinking water will use granular activated carbon in the future. This is represented by the light blue piece on the bottom pie chart.

If 30% of drinking water requires PFAS, a total of 40% of drinking water will require GAC treatment in the future, which will be referred to as the high end of the range. The incremental impact between the high end and low end of the range is illustrated by the dark blue piece on the bottom pie chart.

In addition to greater adoption of granular activated carbon, this carbon will need to be changed out much more frequently, resulting in an increase in volumes or usage. To quantify, the frequency of change outs for groundwater treatment is expected to double on average, and the frequency of surface water treatment will quadruple on average as compared to more traditional drinking water applications.

Expected Demand Growth for Drinking Water in U.S.

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- 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%):



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Moving to slide 17, which takes the information from the last few slides and provides a perspective on what this means for activated carbon sales growth, we estimate the total market value for PFAS treatment for US drinking water to be between USD1 billion to USD2 billion in 2030. This includes all technologies: GAC, resin, and reverse osmosis, and the associated equipment required to meet treatment objectives. This does not include one-time infrastructure costs such as site development, buildings, and other costs.

We estimate that 75% of this total market value will be for granular activated carbon-related costs, including product, equipment, reactivation, and services. The high adoption of granular activated carbon is driven by surface water treatment, which we believe will predominantly favor granular activated carbon. For Kuraray, this means our revenues for PFAS treatment for drinking water could increase by 600% on the low end of the range to over 1,200% on the high end of the range by 2032.

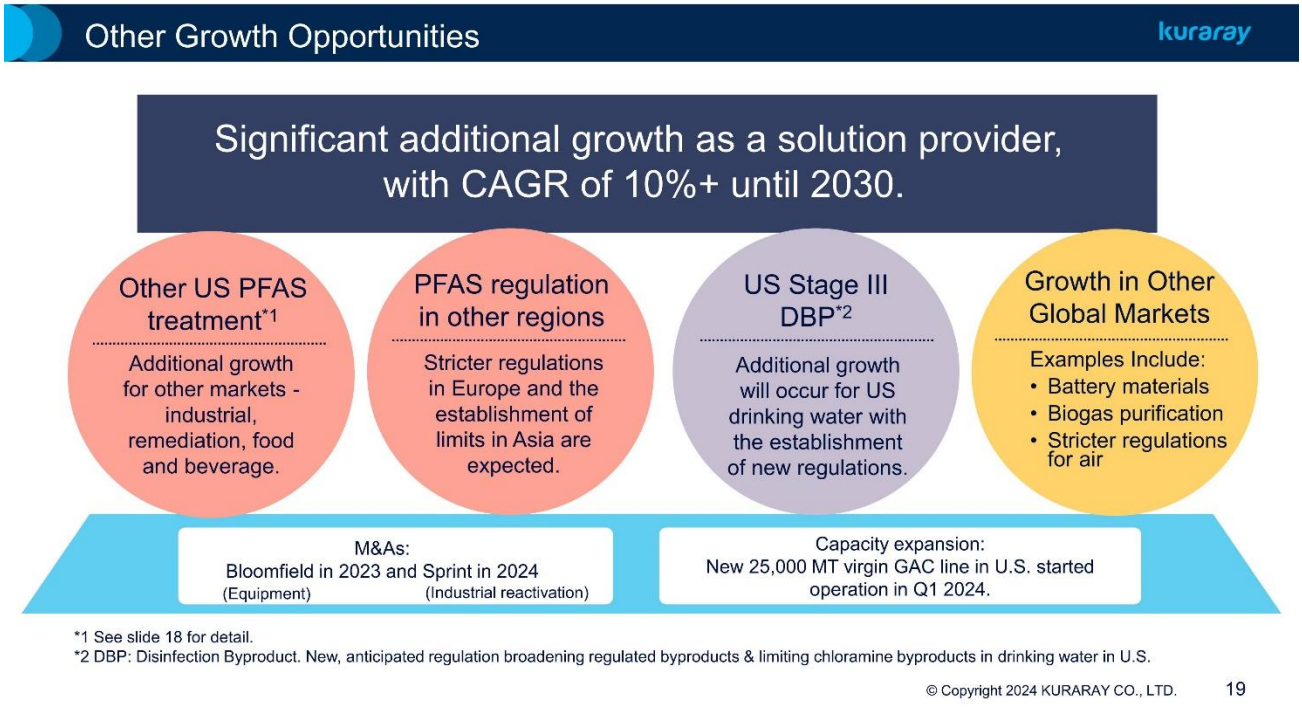


As shown on slide 18, because PFAS is ubiquitous and regulation beyond US drinking water is being developed, the opportunity for Kuraray will not be limited to only drinking water. Growth will come from treatment of many different applications, which are highlighted on this slide.

For example, the US Food and Drug Administration is in the process of evaluating appropriate standards for bottled water which may require bottlers to install PFAS treatment. Under the EPA's Effluent Guidelines Program Plan 15, discharge limits are expected to be established at a specific industry level.

For example, individual discharge limits are being developed for landfills, producers of organic chemicals, plastics, and synthetic fibers and facilities that add metal finishing. Proposed regulations are expected to be released in 2024 for several of these industries.

Unfortunately, until we have an understanding of the regulatory limits, it is difficult to quantify the market opportunity. However, we know the growth is great for PFAS treatment and will extend beyond US municipal drinking water and beyond the United States.



Slide 19 explains the broad opportunities for Kuraray beyond PFAS treatment for US drinking water and how our approach as a total solutions provider positions us to maintain our leadership position in the marketplace.

First, we will see growth in PFAS treatment for other applications owing to regulation and consumer awareness. Next, we expect growth in Europe, Asia, and other regions owing to the establishment and tightening of PFAS regulation. As an example, Germany, Sweden, and Canada have proposed specific PFAS regulations, and many other countries have health advisories in place as they consider enforceable limits for drinking water and industrial discharge.

Beyond PFAS regulations, we expect to see an expansion of the disinfection byproduct regulation for drinking water within the US today. Regulation exists to prevent the formation of some harmful byproducts in drinking water, which form when chlorine, the disinfectant, reacts with organics in the water.

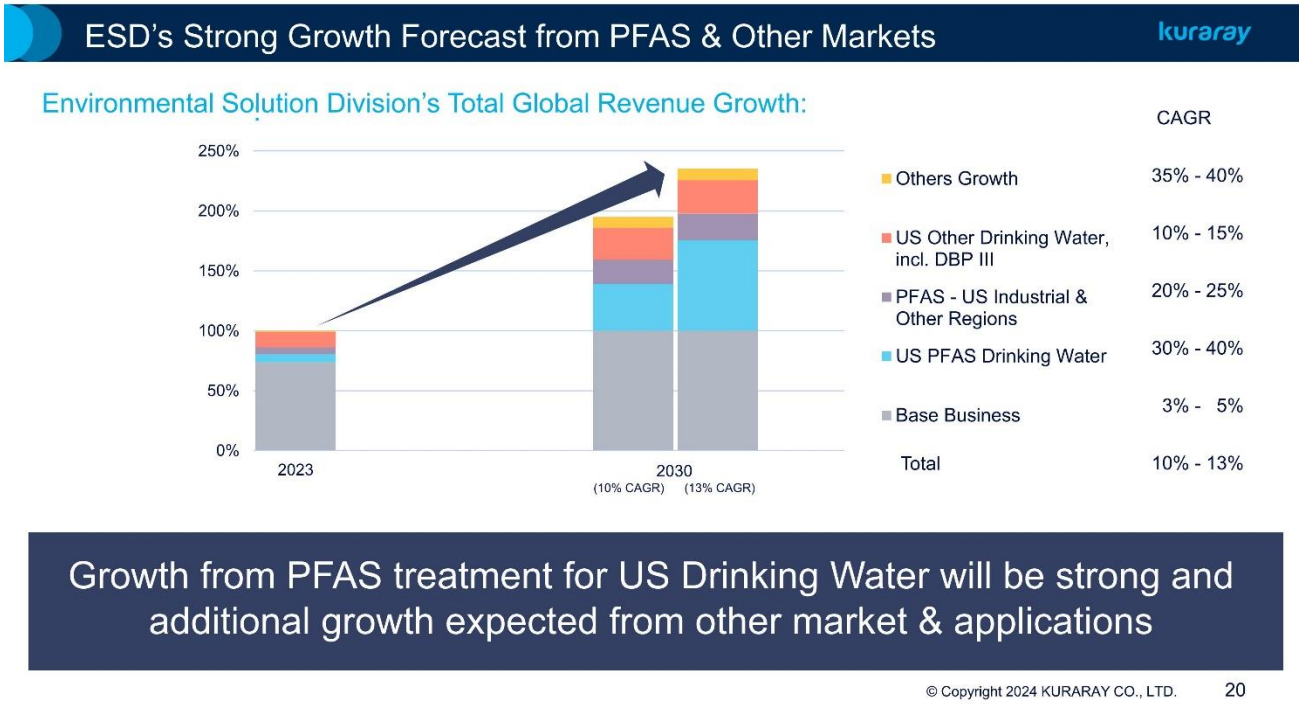
To comply with this, drinking water utilities use either granular activated carbon or powdered activated carbon to remove organics prior to disinfection, so byproducts can't be formed. Other utilities use chloramine as a disinfectant to avoid the need to invest in treatment to prevent regulated byproduct formation. In the future, we expect additional regulation of byproducts to drive the further use of granular activated carbon.

Beyond water treatment, the use of activated carbon will grow owing to demand for other markets such as additives for batteries, to improve and support electrification, biogas treatment as society moves to cleaner energy sources, and stricter regulations for air treatment, to name a few.

To support our growth, we have taken important steps to increase capacity, including the construction of our new virgin production line in the US, which added 25,000 metric tons of capacity, and started commercial operation in Q1, and our recent M&A activity, which included the acquisition of Bloomfield, a tank fabricator on the West Coast in the US, and the pending acquisition of Sprint, an industrial reactivation company in the Gulf region.

As we look to future growth, we are carefully studying further capacity increases and hope to announce plans in the future. In the meantime, we are actively working with customers to secure contracts and have already

identified USD1.8 billion in sales opportunities for the US drinking water business alone, only which half relate to PFAS treatment.



Moving to slide 20, while the estimated growth for the environmental solutions division depends on many factors, our view is that the current growth drivers discussed today could increase our topline revenue by a compound annual growth rate of between 10% and 13% through 2030. Thank you.