

# The water-energy nexus

What **Chart Industries'** acquisition of **BlueInGreen** tells us about the future of the industrial gas, energy and water treatment markets

By **Tyler Elm**, Chief Marketing and Sustainability Officer at **BlueInGreen**

September 2020, water joined precious metals, oil and other commodity futures traded on Wall Street amid fears of scarcity. In October, Chart Industries, Inc., a global manufacturer of engineered equipment for the industrial gas and energy industries, announced its acquisition of the water cleantech company BlueInGreen, LLC., which Chart's CEO and President, Jill Evanko, described as a 'natural fit'.

What is the common context connecting these events and industries? What does the acquisition of Fayetteville, Arkansas-based BlueInGreen tell us about Chart's strategy and view of the industrial gas, clean energy, and water treatment markets?

Perhaps the most obvious place to start is BlueInGreen itself – its technology and market positioning.

## The acquisition of BlueInGreen

BlueInGreen are gas-dissolution experts that provide engineered equipment for water treatment and industrial process applications. The company's patented technology provides the most efficient method of dissolving gases into liquids, leading the industry-wide trend of replacing chemicals, polymers, and ambient air with oxygen, carbon dioxide (CO<sub>2</sub>), and ozone. So, there's that – the obvious connection with industrial gas. In fact,

Chart Industries has been a supplier to BlueInGreen and their customers for more than a decade, combining Chart's gas storage and vaporization equipment with BlueInGreen's gas-dissolution technology.

As such, the acquisition of

BlueInGreen by a multinational manufacturer of engineered equipment for the industrial gas sector is certainly a 'natural fit'. It strengthens the connection between the industrial gas and water markets and sets the stage for accelerating the increasingly global trend of using

© BlueInGreen | In combination with Chart's gas storage and vaporizing equipment, BlueInGreen's CO<sub>2</sub> gas-dissolution systems are used by desalination plants to enable the remineralization process – optimizing the mineral balance of water by simultaneously adding lime and lowering pH by dissolving carbon dioxide into water.



industrial gases in water treatment – growing the applications for industrial gas use and thus, the market for Chart’s existing products and services.

The acquisition of BlueInGreen is a clear example of vertical integration – positioning Chart closer to the end-user – as well as providing manufacturing, process, distribution, sales, and other synergies and opportunities associated with the convergence of the industrial gas and water treatment markets. What makes this union even more intriguing is the intimate link between clean energy and clean water, coupled with the compounding effects of global environmental and social forces, and the common intersect of these forces with the corporate and competitive strategies of both Chart and BlueInGreen – strategies that are increasingly focused on providing sustainable solutions.

For example, BlueInGreen positions its solutions as ‘one of the many building blocks of sustainable development... making water treatment processes more efficient, more effective, safer, and more environmentally sound’ (VIC Technology Spotlight, October 2020). For instance, BlueInGreen’s Supersaturated Dissolved Oxygen (SDOX®) technology reduces energy use and greenhouse gas (GHG) emissions associated with wastewater treatment by at least 50% compared to traditional, ambient air technologies – providing more precise treatment while having the smallest energy, carbon, and physical footprint.

### Sustainable solutions

In case you haven’t noticed, Chart is increasingly invested in and focused on being at the forefront of society’s transition to a low-carbon economy – indeed, it appears to be the company’s

“BlueInGreen’s SDOX® technology reduces energy use and GHG emissions associated with wastewater treatment by at least 50%”

emerging and pragmatic social purpose – ‘enabling society’s transition to a low-carbon economy’ – messaged frequently by Evanko. Fortunately for investors, this messaging reflects Chart’s rationale of what businesses to be in, invest in, and continue to grow, rather than a superficial ‘green’ marketing initiative. Consider the company’s core growth platforms.

Chart’s vacuum-insulated fuel tanks for liquefied natural gas (LNG) are used by the trucking industry, enabling the use of LNG as an alternative fuel to diesel for heavy-duty vehicles. Chart also signaled recently that liquid hydrogen tanks for the trucking industry are in development. Both enable the use of lower- or even zero-carbon fuels, reducing the GHG emissions of ground transportation – an estimated \$750m growth opportunity for Chart.

Furthermore, Chart’s cold boxes, heat exchangers, air coolers, storage tanks, transport carriers and vacuum-insulated pipe are all used in the capture, use, and storage of CO<sub>2</sub> from flue gas and direct-air processes. In December 2020, Chart strengthened its position in the carbon capture market with the acquisition of Sustainable Energy Solutions (SES) and its Cryogenic Carbon Capture™ (CCC) technology. Coupling SES’s CCC technology with Chart’s specialty heat exchangers, process

technology and cryogenic storage and transport equipment creates a one-stop integrated technology and equipment solution.

Chart has also firmly established itself in the hydrogen economy, with over 50 years of experience in manufacturing hydrogen equipment. Additionally, Chart has recently taken minority ownership interests in HTEC, a Canadian hydrogen fuel production, distribution, and dispensing company, and McPhy, a European electrolyzer company that produces hydrogen from water using grid-based or on-site, purpose-built renewable sources of electricity. These investments come with commercial MOUs that bring Chart equipment to new regions, new customers, and new applications.

Part of the Chart’s specialty markets group, these four market segments – water, over-the-road trucking, carbon capture, and hydrogen – represent material growth opportunities with a three-year, cumulative total addressable market estimated at \$3.15bn for Chart content.

### Macro-economic, social and environmental drivers

Both Chart and BlueInGreen publicly acknowledge the role of environmental and social context when choosing what businesses to be in and how to compete. Both companies provide solutions that combine science, engineering, and strategic insight derived from a robust understanding of the economic, social, and environmental context of their businesses and core markets. Sustainability is viewed in terms of the nexus of macro-economic, social, and environmental forces and trends – how they might affect society, the built environment, and customer operations.

Current and likely outcomes influence the market segments and ▶

► applications the Companies target and guide their efforts to bring solutions to market that will create value for their customers and communities.

The influence of macro-economic, social, and environmental forces on the importance and adoption of sustainable solutions – many of which are similar for LNG, liquid hydrogen, water, and carbon capture technologies – cannot be understated. These macro-forces – the unprecedented rate and scale of urbanization and population growth, the interplay of climate change with the increasing demands for energy, water, and food resources – are further buoyed by the aggressive climate goals of industry and governments and the increasing financial stimuli for cleantech, all of which are contributing to the double-digit growth realized by Chart’s sustainable solutions.

BlueInGreen and the water treatment industry provide an

“You can’t ignore the energy-water nexus if a core element of your growth platform is enabling society’s transition to a low-carbon economy”

excellent example. The water treatment industry is notoriously conservative, risk-averse, and compliance-focused. The industry has a history of long adoption cycles, typically measured in decades (Lux Research Inc., 2008; Water Cultivation: The Path to Profit in Meeting Water Needs). Despite this, BlueInGreen has had remarkable success since its incorporation in 2004. In August

2020, BlueInGreen surpassed its 100<sup>th</sup> installation and was listed as one of the fastest growing private companies in the US, with a three-year, cumulative annual growth rate in excess of 40%, more than doubling its revenue during that period.

Typically, the adoption curve for water treatment innovations resembles an elongated hockey stick – slow adoption rates before reaching exponential growth, often fueled by numerous, strategic drivers, and frequently sparked by previously unassuming catalysts or triggers (Lux Research Inc., 2008). The difference between what is typical and what BlueInGreen has achieved is a combination of the company’s value proposition – treating more flow with higher treatment loads using a fraction of the energy – and global, catalysts of change – the same forces influencing the market segments and solutions targeted by Chart.

“Our success is the culmination of years of hard work, dedication and determination,” notes BlueInGreen CEO Chris Milligan, P.E.

“But it certainly helps that we’re in the right place at the right time with the right stuff.”

When we speak with people about the acquisition, the discussion typically starts with the obvious aspect of industrial gas and the customer benefits of being able to offer the end-to-end solution with single-point responsibility. But one shouldn’t overlook the importance of energy and sustainability in the equation of strategic fit, and the many burning platforms at the nexus of the energy and water treatment markets.

We (as a society) use an awful lot of energy to make freshwater and a lot of freshwater to make energy. You can’t ignore the energy-water nexus if a core element of your growth platform is enabling society’s transition to ►



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# GROWING YOUR BUSINESS IS OUR BUSINESS.

CHART EQUIPMENT + BLUEINGREEN TECHNOLOGY: LEADING THE WATER INDUSTRY'S USE OF INDUSTRIAL GASES IN PLACE OF CHEMICALS, POLYMERS + AMBIENT AIR

## OXYGEN REPLACING AMBIENT AIR



### BIOLOGICAL TREATMENT OF WASTEWATER

BlueInGreen's SDOX® technology and oxygen replaced surface aerators, blowers and jet aeration equipment used in the biological treatment and nutrient removal of wastewater at the meat processing plant, **reducing the customer's energy use and greenhouse gas emissions by ~75%, saving approximately \$645,000 in annual energy costs** while increasing the facility's treatment capacity.

#### BENEFITS TO INDUSTRIAL GAS PARTNER: GROWTH OF AN EXISTING ACCOUNT

- Increased the scope of products sold, adding oxygen for use in wastewater treatment to the existing contract for carbon dioxide used to freeze product.
- Facility now leases bulk gas storage equipment from their local industrial gas supplier.
- Increased annual account revenue associated with the consumption of 5,475 tons of oxygen annually.

## OXYGEN REPLACING HYDROGEN PEROXIDE + CATALYSTS



### ODOR CONTROL OF WASTEWATER

BlueInGreen's SDOX® technology and oxygen replaced in-pipe dosing of hydrogen peroxide and a catalyst, **saving approximately \$3.6 million in annual chemical costs while mitigating hydrogen sulfide production and odor** from the facility's wastewater and the formation of sulphuric acid that was corroding the city's sewers.

#### BENEFITS TO INDUSTRIAL GAS PARTNER: NEW ACCOUNT

- Facility now leases bulk gas storage equipment from their local industrial gas supplier.
- New account consuming 915 tons of oxygen annually.

## CARBON DIOXIDE REPLACING SULPHURIC ACID



### pH CONTROL OF WASTEWATER

BlueInGreen's CDOX® technology and carbon dioxide replaced treatments of sulphuric acid to manage the pH of wastewater in the buffering reactor tank prior to entering the dissolved air flotation (DAF) system for solids and oil removal, **providing more precise dosing while reducing treatment costs by approximately 70% and eliminating an unnecessary health and safety risk** requiring significant safety protocols.

#### BENEFITS TO INDUSTRIAL GAS PARTNER: NEW ACCOUNT

- Facility now leases bulk gas storage equipment from their local industrial gas supplier.
- New account consuming 825 tons of carbon dioxide annually.



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**THE WATER-ENERGY NEXUS**

▶ a low-carbon economy. After all, the cheapest source of zero-carbon energy is efficiency, and BlueInGreen solutions deliver that in spades.

The relationship between the two is strong and closely entwined. Second only to agriculture, the energy industry accounts for approximately 22% of all freshwater withdrawals globally and the sector's consumption of water is forecasted to increase significantly over the coming decades (International Energy Agency 2017; Global Water Forum, 2012, Water Outlook 2050). Similarly, it requires a tremendous amount of energy to treat and distribute fresh water. For example, the energy costs of water and wastewater treatment is often one of the largest operating costs of a municipality, second only to labor. Water and wastewater treatment facilities in the US collectively use more than 56 billion kilowatt-hours of electricity annually, costing more than \$4bn.

A companion to the global trend in demand, water scarcity is also a mounting, global issue. By 2040, most of the world will not have enough water to meet demand year-round, including much of the US. Major cities are facing a 'zero water day' – the day a community's water utility is unable to source and distribute freshwater. São Paulo, Rio de Janeiro, Cape Town, and Barcelona have already had to turn off the taps for part of the day or import water to meet demand.

Today, 14 of the world's mega-cities are experiencing water scarcity or drought conditions. Within the next few decades, it is anticipated that Barcelona, Bangalore, Beijing, Cape Town, Istanbul, Jakarta, London, Melbourne, São Paulo, and Tokyo will be unable to supply their citizens with freshwater (Global Water Forum, 2012, Water Outlook 2050; *National Geographic* 2018; The World's Water



© Chart | Chart's vacuum-insulated fuel tanks for LNG are used by the trucking industry. LNG as an alternative fuel to diesel reduces the GHG emissions of ground transportation – an estimated \$750m growth opportunity for Chart Industries

“BlueInGreen’s oxygenation systems are being used to clean the polluted rivers in situ. It’s the highest-profile water project in the country”

Crises, Explained).

Water scarcity is certainly a driver of the market adopting BlueInGreen solutions. Sometimes scarcity is a product of climate change combined with population and economic growth, as we see in the western US and the Middle East. Sometimes it's driven by rising sea levels, as we're witnessing in Florida. And sometimes it's a product of both climate change, demand, and other factors, such as pollution. With increased scarcity we see the increased use of desalination plants, which drives demands for BlueInGreen's CO<sub>2</sub>

systems to enable the remineralization process. Of course, it's often a combination of these factors. BlueInGreen recently won a project in Brazil in which the pollution of rivers, lakes and reservoirs was the primary driver. BlueInGreen's oxygenation systems are being used to clean the polluted rivers in situ. It's the highest-profile water project in the country, potentially revolutionary. And, it's a clear example of environmental crises propelling the adoption of a proven technology in new markets and applications.

Thus, the 'natural fit' of BlueInGreen and Chart is more than common customers and being a single source for gas storage, vaporization, and dissolution technologies, and it represents more than the intrinsic synergies offered by a global manufacturer. The 'fit' extends to the business strategies and focus on sustainable solutions and the promise of sustainably-driven innovation and the value of non-traditional players disrupting the status quo. [gw](#)