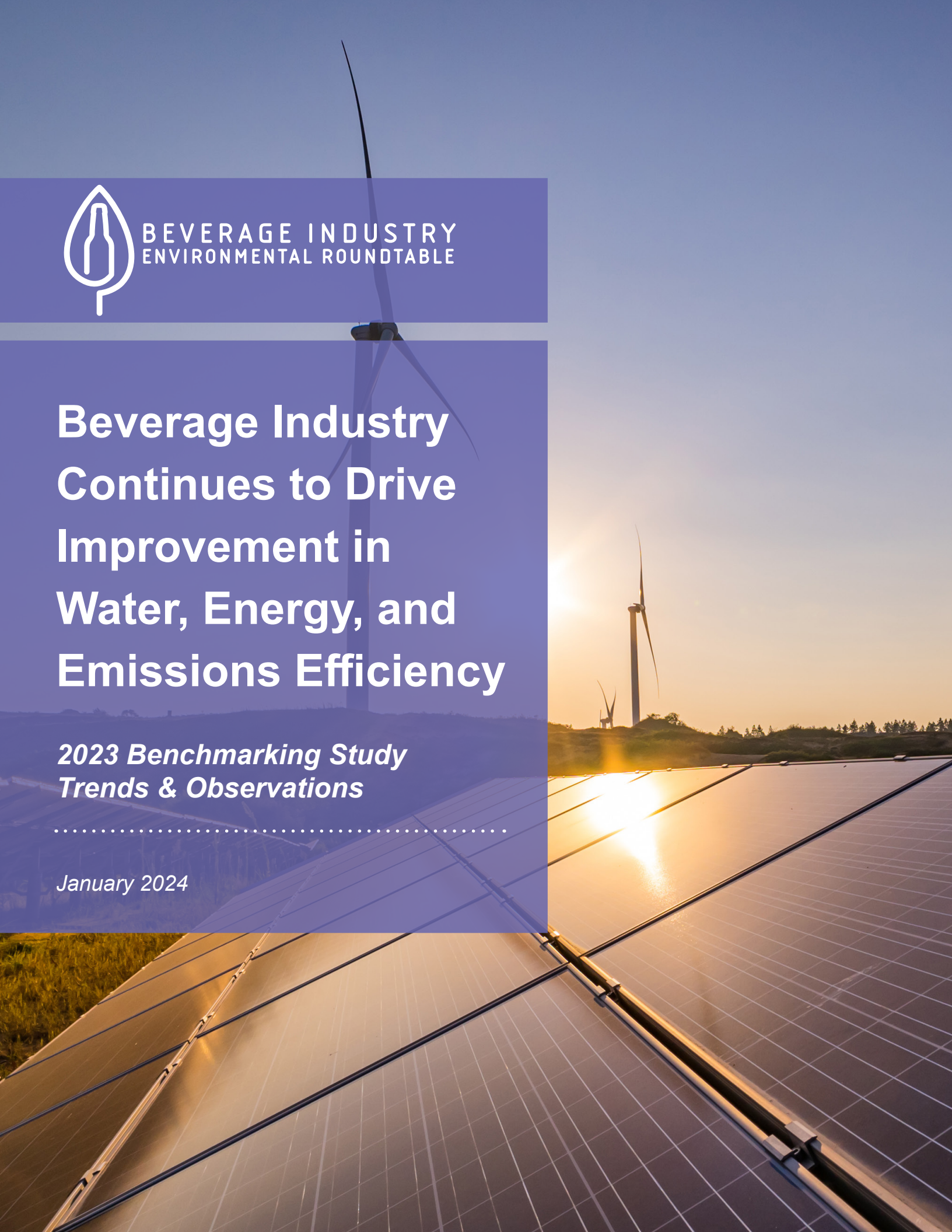


BEVERAGE INDUSTRY
ENVIRONMENTAL ROUNDTABLE

Beverage Industry Continues to Drive Improvement in Water, Energy, and Emissions Efficiency

2023 Benchmarking Study
Trends & Observations

January 2024

Acknowledgements

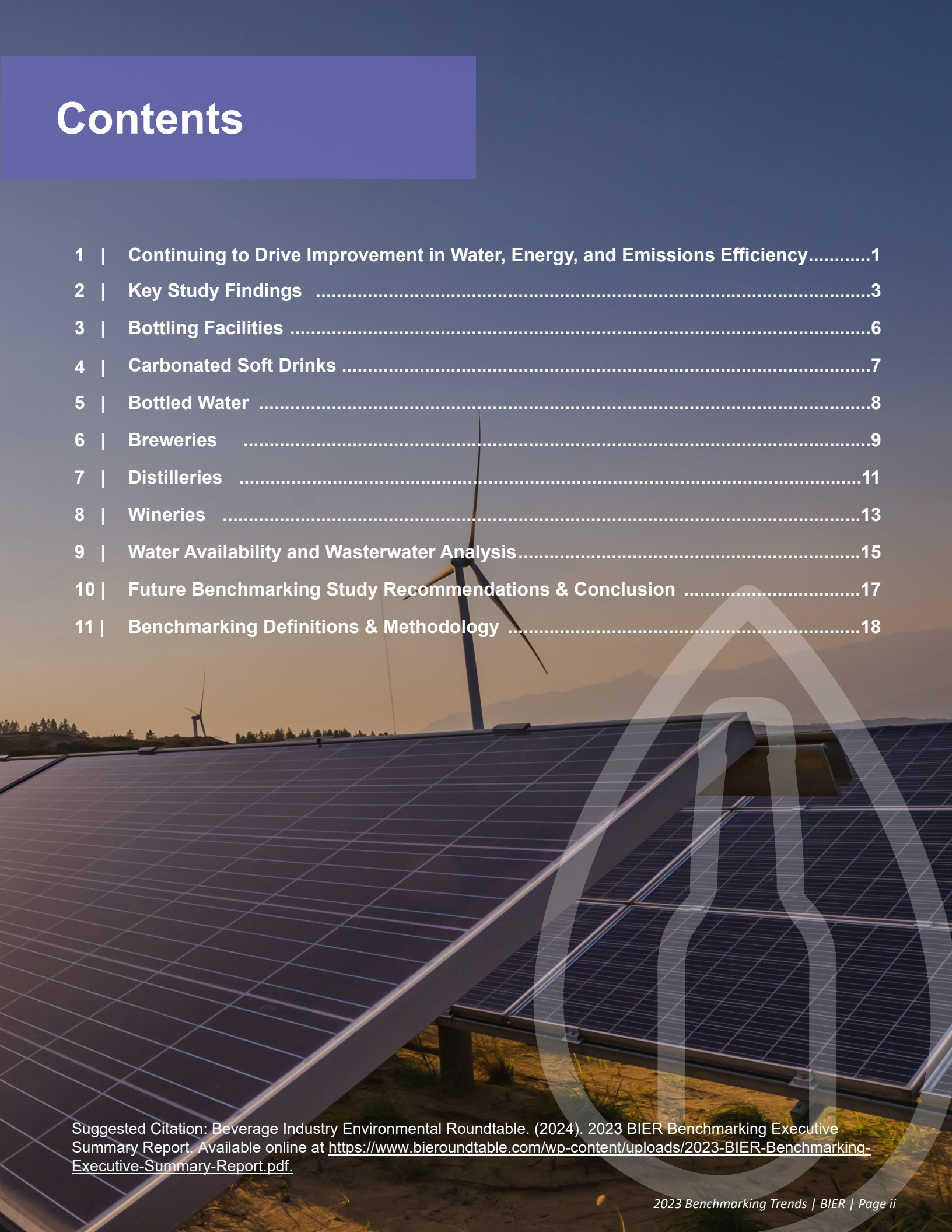
BIER would like to extend our sincerest appreciation to the individual BIER member companies for their participation and contribution, without which this report would not be possible:

BIER would also like to thank the following benchmarking partner contributors for their voluntary participation and support, all of whom provided facility data for this Benchmarking Study:

Kentucky Distillers' Association

Distilled Spirits Council of the United States

Contents



Suggested Citation: Beverage Industry Environmental Roundtable. (2024). 2023 BIER Benchmarking Executive Summary Report. Available online at https://www.bieroundtable.com/wp-content/uploads/2023-BIER-Benchmarking-Executive-Summary-Report.pdf.

Continuing to Drive Improvement in Water, Energy, and Emissions Efficiency

In December 2023, the Beverage Industry Environmental Roundtable (BIER) completed its 12th global benchmarking study – a comprehensive quantitative and qualitative analysis of water, energy, and emissions efficiency in the beverage industry. In its 12 benchmarking studies, BIER has evaluated 18 years of industry performance for nearly 2,000 facilities worldwide. Final results represent a comprehensive set of production, water, energy, and greenhouse gas (GHG) emissions metrics which are normalized, categorized, and analyzed by facility and beverage type. The 2023 benchmarking study includes facility-level data for 2017, 2020, and 2022 from 14 BIER members and two partner contributors. The study shows improvements in water, energy, and emissions intensity ratios by 8%, 11%, and 22% respectively. Continued progress is represented through a variety of facility categories, production volumes, and geographic locations – showcasing that the beverage industry continues to improve business performance while proactively reducing environmental impacts worldwide.

Resource Efficiency

The industry continues to demonstrate its dedication to stewardship and efficiency. From 2017 to 2022, water use, energy consumption, and emissions intensity decreased by 8%,11%, and 22% respectively.

Growth in Production

Reported industry production volume increased by 9% from 2017 to 2022, equivalent to an additional 25 billion liters of global beverages produced worldwide. Of facilities reporting three years of data, 62% reported an increase in production.

Renewable Sourcing

Participating companies continue to pursue renewable sourcing opportunities. From 2017 to 2022, the percentage of purchased grid electricity from renewable sources increased from 8% to 37%, representing over 10% of total energy purchases in 2022.

Data Reporting

The majority of the BIER membership has pursued external assurance of sustainability data. This is the first study that participants were encouraged to provide water reclamation information. Facilities reporting on-site water circularity had improved water intensity.

Performance at a Glance

Table 1 provides an overview of findings from the 2023 benchmarking study. Nearly all facility types demonstrate decreasing water use, energy use, and emissions intensities from 2017 to 2022, showcasing consistent efficiency improvements as industry production volume increased over the reporting period. Additional supporting metrics and findings are provided in each of the corresponding facility-type sections of this report.

Table 1: 2023 Benchmarking Study Performance Overview

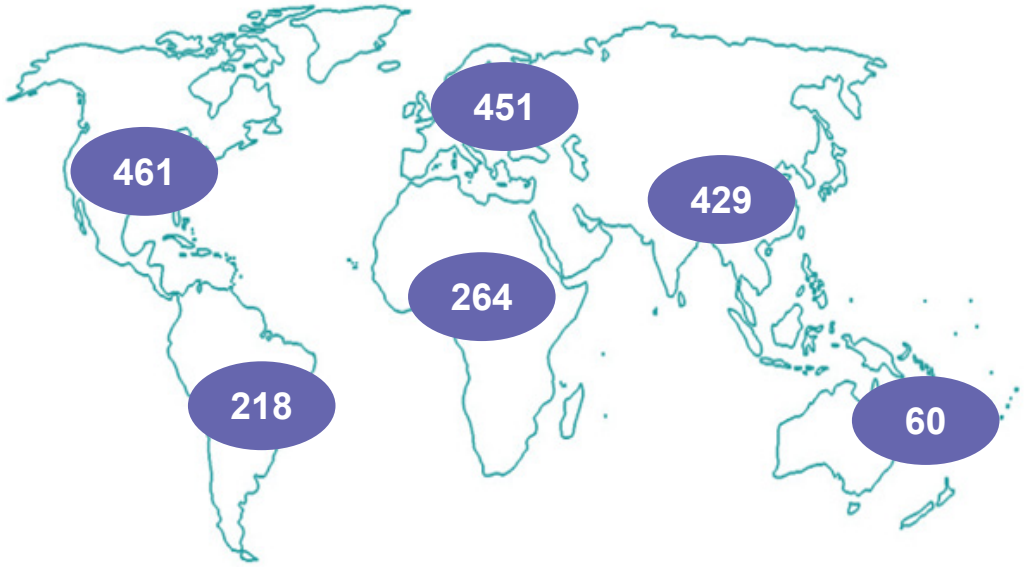
	2017	2020	2022
Total Companies Reporting	15	16	16
Total Facility Count	1,587	1,564	1,530
Total Production (Billion L)	278	282	305
Total Water Use (Billion L)	718	676	725
Total Energy Use (Billion MJ)	195	195	188
Total Emissions (MM MT CO_2e)	15.41	14.59	13.52
Water Use Ratio (WUR) (L/L)	**2.58**	**2.40**	**2.38**
Brewery	*3.32*	*3.04*	*3.11*
Distillery	*35.86*	*31.16*	*28.51*
Winery	*3.87*	*4.04*	*3.98*
Bottling (All)	*1.91*	*1.81*	*1.77*
Energy Use Ratio (EUR) (MJ/L)	**0.70**	**0.69**	**0.62**
Brewery	*1.09*	*1.05*	*0.87*
Distillery	*12.71*	*14.85*	*13.81*
Winery	*2.11*	*1.32*	*1.56*
Bottling (All)	*0.39*	*0.38*	*0.36*
Emissions Ratio (ER) (g CO_2e/L)	**57.32**	**51.73**	**44.46**
Brewery	*91.70*	*74.33*	*67.76*
Distillery	*768.73*	*731.57*	*689.57*
Winery	*89.10*	*77.31*	*97.78*
Bottling (All)	*34.51*	*33.97*	*31.67*

NOTE: Total production and facility count differs between water, energy, and emissions, as some facilities that provided water data were unable to provide energy and/or emissions data. The reported number of "Total Companies Reporting" includes 14 BIER members and two external partner contributors.

Key Study Findings

Continued Reporting Diversity: The 2023 study includes 2017, 2020, and 2022 data from 16 participating companies and partner associations, representing over 1,800 facilities worldwide. Among all reporting facilities, 1,530 facilities reported 2022 data. Facility-level data was provided by 14 BIER members as well as two external contributors. The two contributors were the Kentucky Distillers' Association and the Distilled Spirits Council of the United States. As shown in Figure 1, facilities were represented on six continents, with the majority of facilities located in North America, Europe, and Asia.

Figure 1: 2017-2022 Geographic Distribution, All Facilities



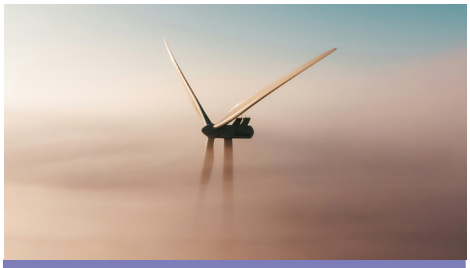
Renewable Sourcing of Purchased Electricity: The percentage of purchased grid electricity sourced from renewables increased steadily over the study period, with European facilities having the largest percentage increase. In 2022, renewable energy comprised 75% of grid electricity sourced by European facilities, representing 24% of their total energy use. From 2017 to 2022, the industry experienced a 7% increase of renewable electricity sourced from the grid in the total energy mix, signaling an industry-wide trend in pursuing renewable energy sourcing.

Growth in Industry Production: Industry production volume increased by 9% from 2017 to 2022, equivalent to an additional 25 billion liters of beverages produced worldwide. Of facilities that provided three years of data, 62% reported an increase in production volume over the study period.

Water

2022 Average Facility Water Use = 475,936 kL

68% of facilities reporting water data for all three years decreased their water use ratio from 2017 to 2022



Energy

2022 Average Facility Energy Use = 125.59 MM MJ

62% of facilities reporting energy data for all three years decreased their energy use ratio from 2017 to 2022

Emissions

2022 Average Facility Emissions = 8,958 MT CO_2e

64% of facilities reporting emissions data for all three years decreased their emissions ratio from 2017 to 2022

Correlation of Efficiency and Production Size: Beverage facilities may recognize economies of scale when producing significant quantities of beverages. Facilities with a higher production volume typically show improved efficiency due to mass production. Water use, energy use, and emissions ratios were lowest for facilities within the 200,000–500,000 kiloliters production range (Table 2). Although larger production facilities may have more continuous processes, there is an apparent apex regarding the efficiency and resources required to operate the largest facilities within the dataset (annual production >500,000 kiloliters), as they tend to report ratios slightly higher than those within the 200,000–500,000 kiloliters range. Distilleries and wineries usually have the smallest production volumes and largest resource consumption, also contributing to higher ratios within the lower production ranges.

Table 2: 2022 Efficiency Ratios by Production Range

Production Range	Water Use Ratio (L/L)	Energy Use Ratio (MJ/L)	Emissions Ratio (g CO_2e/L)
<50,000 kL	7.40	2.61	177.22
50-200,000 kL	2.56	0.73	56.59
200-500,000 kL	2.09	0.48	37.26
>500,000 kL	2.28	0.55	37.39

Improvement in Water, Energy, and Emissions Efficiency: Industry water use increased by 1% from 2017 to 2022. The corresponding increased production volume over the same timeframe led to an 8% decrease in the industry-wide water use ratio (i.e., the amount of water used to produce one liter of product), with 68% of facilities reporting a decrease in their water use ratio from 2017 to 2022. Total energy consumption decreased by nearly 7 billion megajoules, representing a 4% reduction from 2017 to 2022. Energy use ratio, defined as the amount of energy used to make one liter of beverage, decreased from 0.70 MJ/L to 0.62 MJ/L, equivalent to an 11% reduction over the study period. Of facilities that provided energy data for all three reporting years, about 62% reported a decreased energy use ratio from 2017 to 2022. Total emissions (Scope 1 and Scope 2 emissions) decreased over the study period by over 12%. Alongside a decrease in

reported emissions, the industry's production volume increased, driving a 22% decrease in the emissions ratio. Of facilities that were able to provide three years of emissions data, 64% reported a decrease in their emissions ratio between 2017 and 2022. Figures 2-4 present the industry benchmarking trends for water, energy, and emissions efficiency over the reporting period.

Figure 2: Industry Production, Water Use, and Water Efficiency, 2017-2022

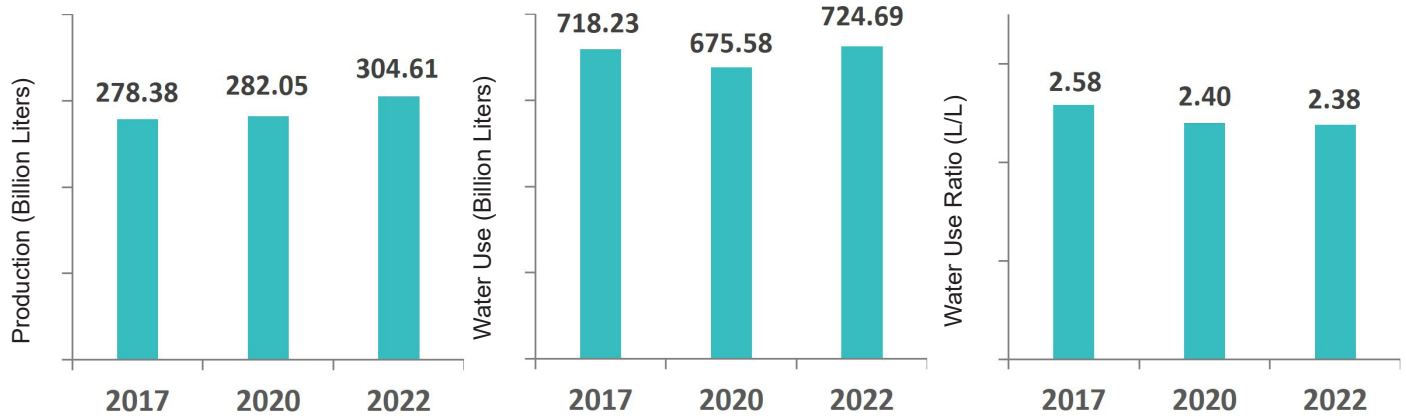


Figure 3: Industry Production, Energy Use, and Energy Efficiency, 2017-2022

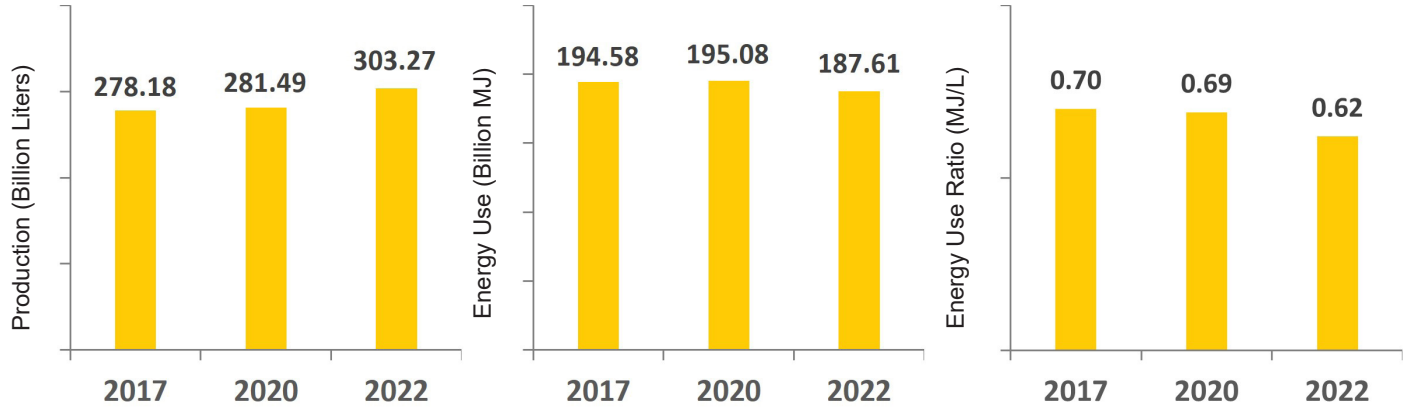
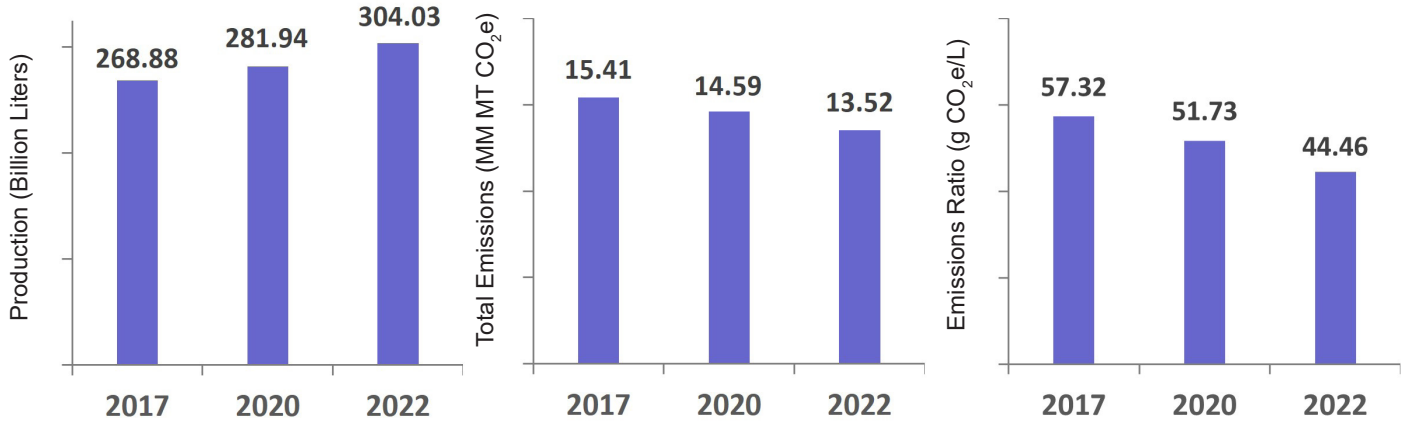


Figure 4: Industry Production, Emissions, and Emissions Efficiency, 2017-2022



Additional benchmarking analyses were completed for each of the four main facility types (i.e., breweries, distilleries, wineries, and bottling facilities) to identify beverage-specific trends in water and energy efficiency and emissions intensity. Facility types, general process definitions, and associated performance trends are presented in the following sections.

Bottling Facilities

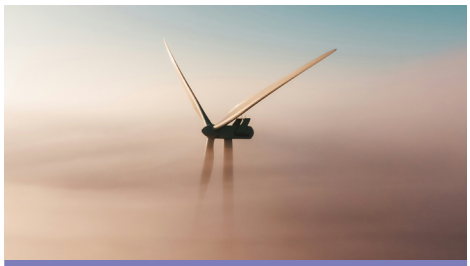
Bottling facilities are defined as locations where concentrate, syrup, flavors/infusions, and/or bulk alcohol are blended with water and packaged into various container types. Bottling facilities also encompass facilities which receive finished bulk products (such as completely brewed beer or matured whiskey). No fermenting or distilling processes are conducted at bottling facilities.

The largest dataset of the 2023 benchmarking study was bottling facilities, which accounted for 65% of 2022 production volume and 60% of total facility count. Bottling facilities have historically reported the lowest water and energy ratios due to less water- and energy-intensive processes. Other facility types that involve more resource-intensive processes (e.g., cooking, fermenting, and distilling) have reported higher ratios. Bottling facilities continued to process and package a wide variety of beverage types, with over 40% of facilities producing more than one type of beverage in 2022. For the purposes of this report, the focus was on the two largest sub-categories within the bottling dataset: Carbonated Soft Drinks and Bottled Water.

Water

2022 Average Facility Water Use = 379,540 kL

66% of facilities reporting water data for all three years decreased their water use ratio from 2017 to 2022



Energy

2022 Average Facility Energy Use = 80.49 MM MJ

61% of facilities reporting energy data for all three years decreased their energy use ratio from 2017 to 2022

Emissions

2022 Average Facility Emissions = 6,850 MT CO_2e

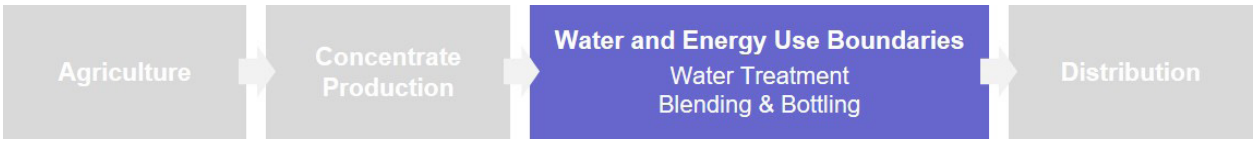
63% of facilities reporting emissions data for all three years decreased their emissions ratio from 2017 to 2022

Carbonated Soft Drinks

Carbonated Soft Drinks are defined as non-alcoholic, flavored carbonated beverages. This category includes colas, ginger ales, and seltzers, but excludes non-carbonated beverages such as ready-to-drink teas, coffees, fitness and energy drinks, and juices.

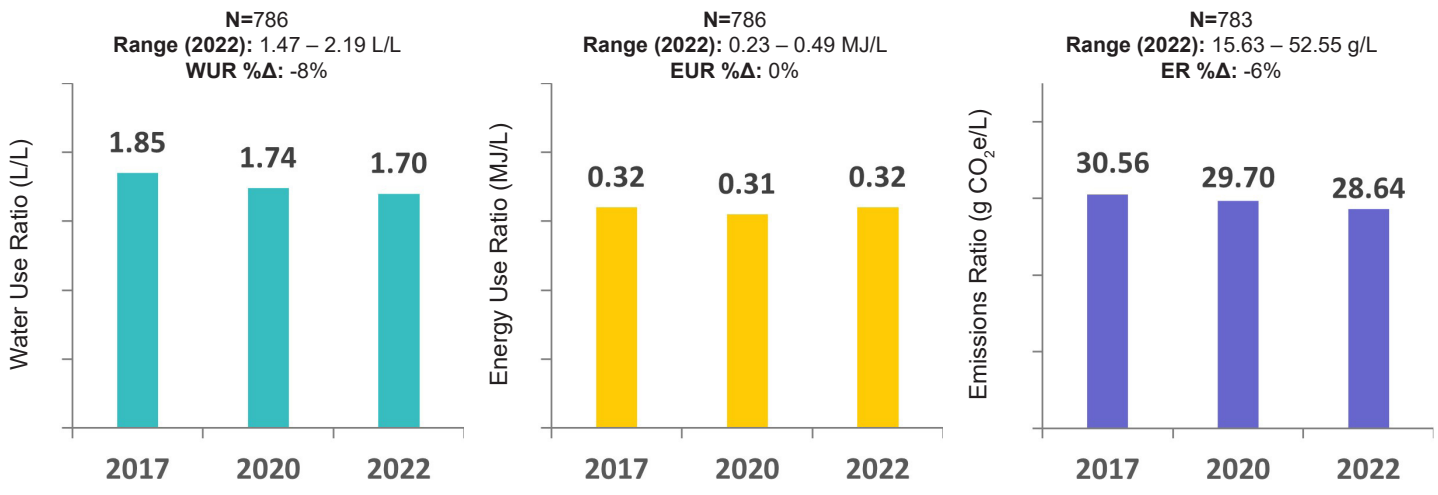
Carbonated Soft Drink facilities were the largest beverage type reported in the 2023 benchmarking study, which accounted for 65% of total bottling facilities. Facilities included in this sub-group reported a beverage production mix (i.e., percentage of each type of beverage produced at the facility) of at least 50 percent Carbonated Soft Drinks. Figure 5 demonstrates the boundaries of the operations where water and energy use were included in the benchmarking report.

Figure 5: Process Map, Carbonated Soft Drinks



As shown in Figure 6, Carbonated Soft Drink facilities continued to demonstrate improvements in water and emissions efficiency throughout the reporting period. Water use ratio decreased by 8% from 2017 to 2022, with 2023 marking the third benchmarking study where Carbonated Soft Drink bottlers achieved a water use ratio below 2.0 L/L for three consecutive years. Energy use ratio remained unchanged due to a 1% increase in energy consumption and a 3% increase in production volume. Total emissions decreased by 3%, leading to a 6% decrease in the total emissions ratio.

Figure 6: CSD Water, Energy, and Emissions Efficiency, 2017-2022

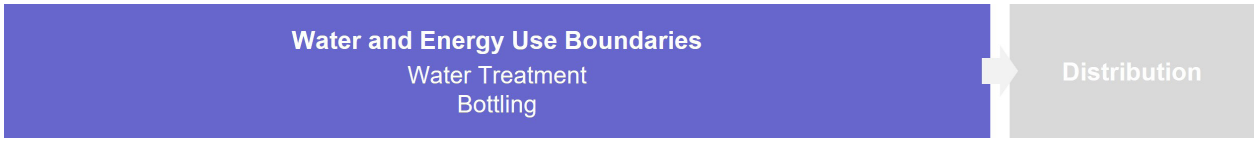


Bottled Water

Bottled Water is defined as all unflavored bottled waters including spring water, purified water (produced by distillation, deionization, reverse osmosis or other processes), mineral water, sparkling bottled water, or well water.

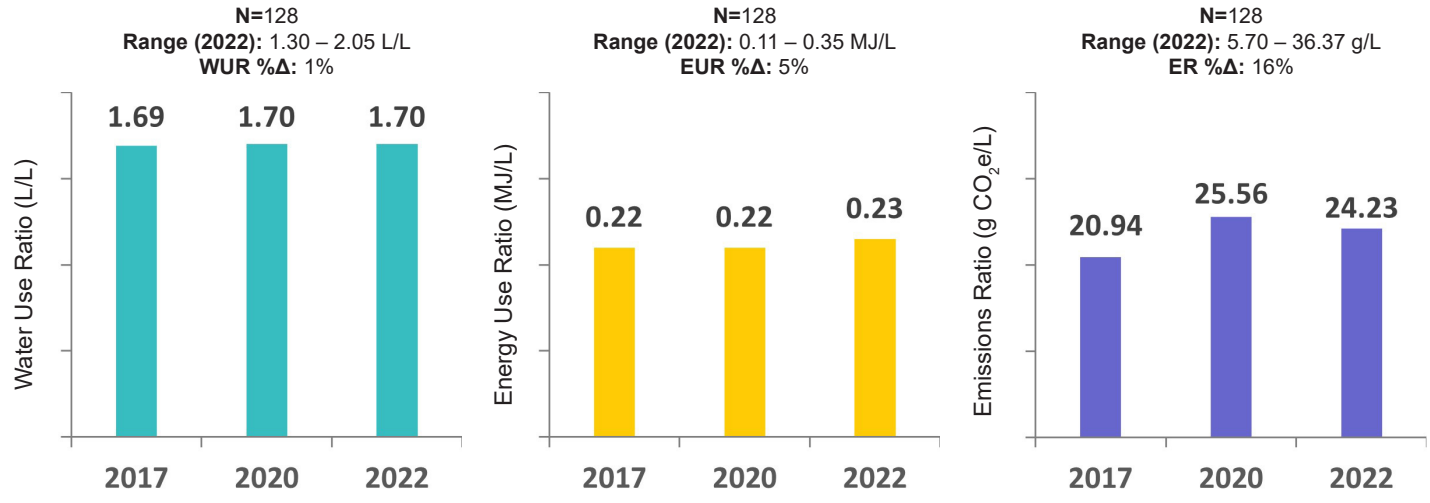
Facilities included in this sub-group reported a beverage production mix of at least 50 percent for Natural Water, Spring Water, and/or Mineral Water. Of all bottled water facilities that reported in the 2023 benchmarking study, 90% were bottled Natural Water; 5% were bottled Spring Water; and 5% were bottled Mineral Water facilities. As shown in Figure 7, water and energy use benchmarking boundaries included water treatment (as applicable) and bottling processes.

Figure 7: Process Map, Bottled Water



As demonstrated in Figure 8, bottled water facilities reported higher water use, energy use, and emissions ratios over the study period, likely due to a variation in the number of participating facilities for the reporting years and a higher production volume. Of all bottled water facilities, 27% reported decreased water use, energy use, or emissions ratios from 2017 to 2022.

Figure 8: Bottled Water Facilities Water, Energy, and Emissions Efficiency, 2017-2022



Breweries

Breweries are defined as facilities conducting all processes after the malting process to produce beer (mashing/lautering, boiling, fermenting, aging, and packaging).

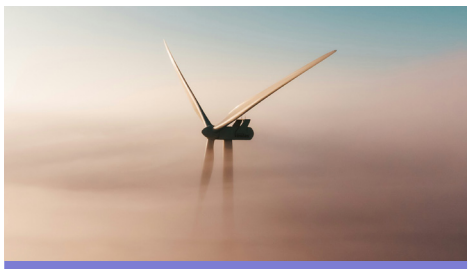
Breweries were the second largest facility type reported in the 2023 benchmarking study, accounting for 34% of industry production volume and 29% of total facility count for 2022. Of the breweries that reported 2022 data, over 80% solely produced beer, whereas the other 20% produced a variety of products including beer, bottled water, and carbonated soft drinks. As seen in Figure 9, this study accounted for all brewing processes except for upstream agricultural growth, malting, and distribution of finished products.

Figure 9: Process Map, Brewery

Water

2022 Average Facility Water Use = 733,739 kL

75% of facilities reporting water data for all three years decreased their water use ratio from 2017 to 2022



Energy

2022 Average Facility Energy Use = 206.16 MM MJ

77% of facilities reporting energy data for all three years decreased their energy use ratio from 2017 to 2022

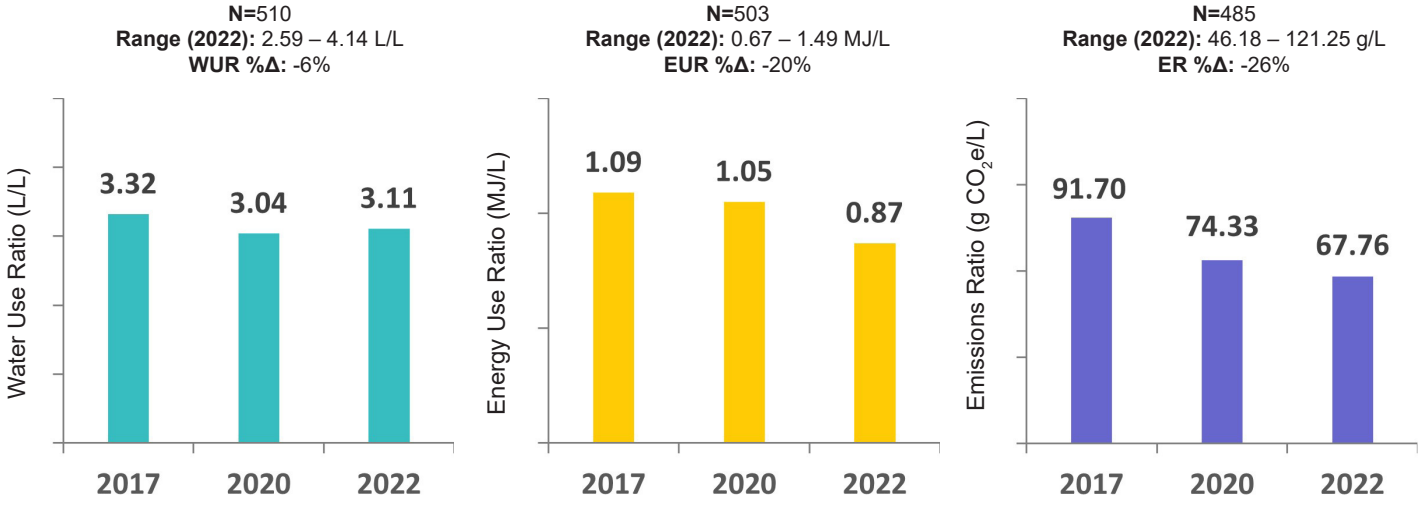
Emissions

2022 Average Facility Emissions = 13,644 MT CO_2e

75% of facilities reporting emissions data for all three years decreased their emissions ratio from 2017 to 2022

Water, energy, and emissions efficiency at breweries continued to improve throughout the reporting period, as shown in Figure 10. Total water use decreased by 6% over the study period. Energy and emissions efficiency also continued to show improvements, including a 20% decrease in the energy use ratio and a 26% decrease in the emissions ratio.

Figure 10: Brewery Water, Energy, and Emissions Efficiency, 2017-2022



Water, energy, and emissions ratios for breweries that only produced beer were slightly higher compared to all breweries (Table 3). Depending on the complementary beverage production types, plants with mixed production tended to be less water and energy intensive.

Table 3: Brewery Water, Energy, and Emissions Efficiency, 2017-2022

	All Breweries				Breweries - Beer Only			
Beverage Type	**2017**	**2020**	**2022**	**%Δ**	**2017**	**2020**	**2022**	**%Δ**
Water Use Ratio (L/L)	3.32	3.04	3.11	-6%	3.38	3.08	3.13	-7%
Energy Use Ratio (MJ/L)	1.09	1.05	0.87	-20%	1.11	1.06	0.89	-20%
Emissions Ratio (g CO_2e/L)	91.70	74.33	67.76	-26%	92.25	79.45	69.63	-25%

Distilleries

Distilleries are defined as facilities that receive agricultural inputs (grains, agave, molasses, etc.) and conduct processes (cooking, fermenting, distilling and storage/maturation) to produce bulk alcohol.

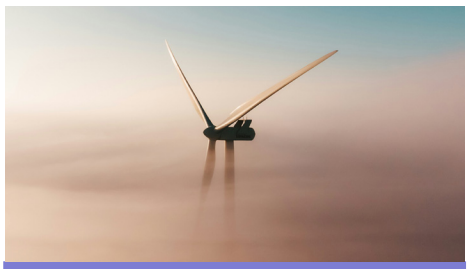
Distilleries accounted for less than 0.5% of industry production volume in the 2023 Study. Of all distilleries that reported data in this study, 75% were able to provide data for all three reporting years. Distilleries tend to be one of the most complex datasets captured within the study due to the wide variety of distilling processes and spirit types. As shown in Figure 11 below, benchmarking included all process steps except upstream agricultural growth and distribution of finished products.

Figure 11: Process Map, Distillery

Water

2022 Average Facility Water Use = 380,997 kL

60% of facilities reporting water data for all three years decreased their water use ratio from 2017 to 2022



Energy

2022 Average Facility Energy Use = 188.86 MM MJ

47% of facilities reporting energy data for all three years decreased their energy use ratio from 2017 to 2022

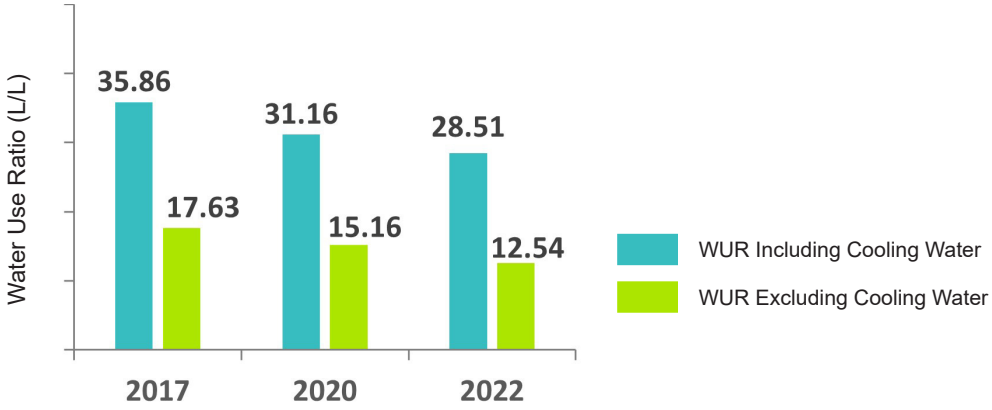
Emissions

2022 Average Facility Emissions = 9,577 MT CO_2e

61% of facilities reporting emissions data for all three years decreased their emissions ratio from 2017 to 2022

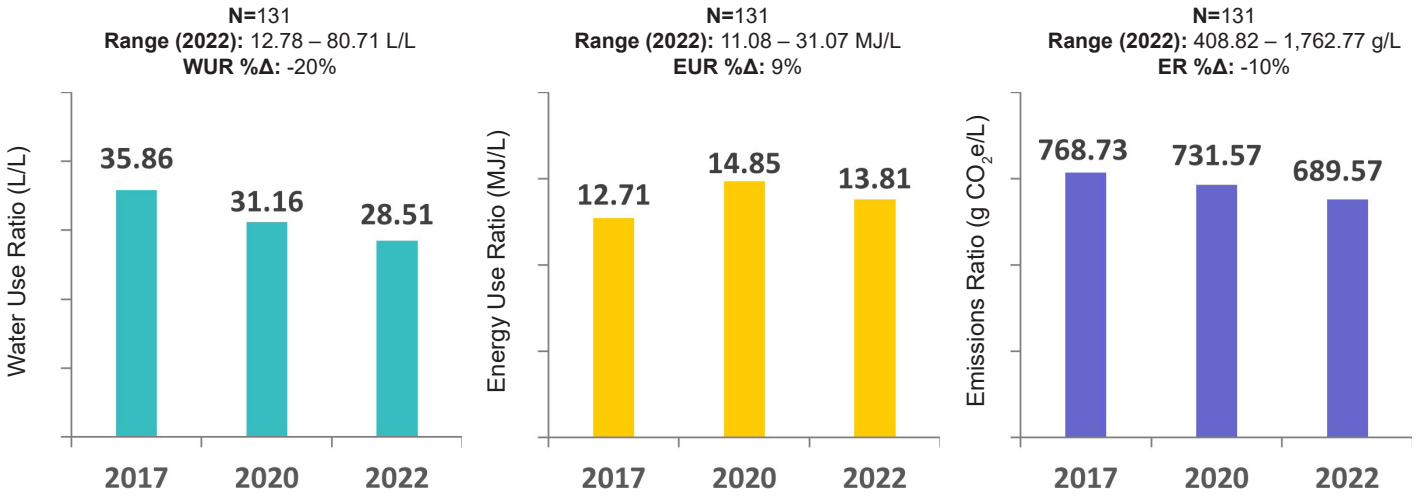
Cooling water remains the most prominent component of a distillery's water use profile, historically driving the higher water use ratios reported for this facility type. As shown in Figure 12, distilleries' water use ratios excluding cooling water were over 50% less than the water use ratios including cooling water. Of facilities reporting the type of cooling water system, over 40% reported the use of a once-through system, with the remaining 60% of sites reporting open-loop/ evaporative, closed-loop/compressive or multiple types of cooling water systems.

Figure 12: Effect of Cooling Water on Water Efficiency, 2017-2022



Distilleries, which tended to have more water, energy, and emissions-intensive processes, continued to report improved efficiency throughout the reporting period. As shown in Figure 13, the water use ratio decreased by 20%. Energy use ratio increased by 9%, corresponding with an over 20% increase in production. The emissions ratio of all distilleries decreased by 10% from 2017 to 2022, likely attributed to an increase in the consumption of biogas and natural gas and a decrease in the use of coal.

Figure 13: Distillery Water, Energy, and Emissions Efficiency, 2017-2022

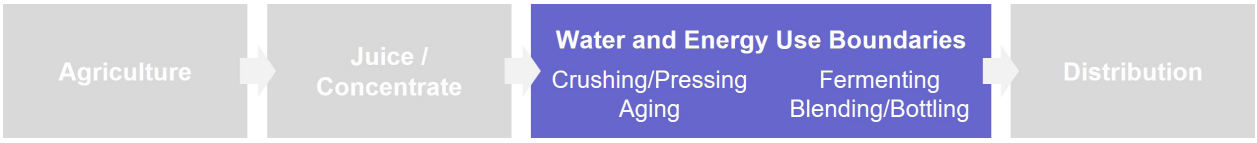


Wineries

Wineries are defined as facilities where the scope of processes include the crushing and pressing of grapes, fermentation, storage/aging, and bottling of product.

Wineries continue to be the smallest dataset within the benchmarking study by both volume and facility count. Total wine production for 2022 accounted for less than 0.12% of the industry total, with wineries comprising 3% of total beverage facilities reported. The benchmarking study accounted for all process steps with the exception of upstream agricultural growth, juice/concentrate, and distribution of finished products, as seen in Figure 14.

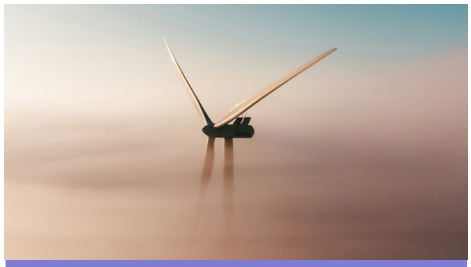
Figure 14: Process Map, Winery



Water

2022 Average Facility Water Use = 45,523 kL

61% of facilities reporting water data for all three years decreased their water use ratio from 2017 to 2022



Energy

2022 Average Facility Energy Use = 27.29 MM MJ

51% of facilities reporting energy data for all three years decreased their energy use ratio from 2017 to 2022

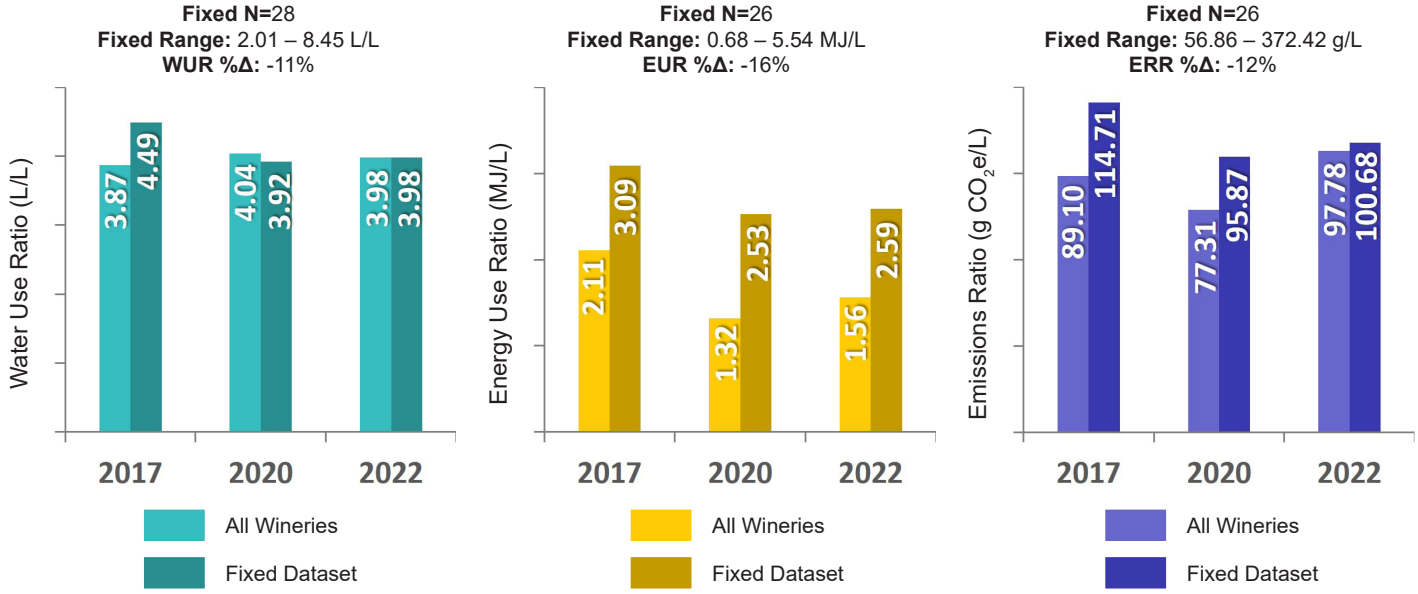
Emissions

2022 Average Facility Emissions = 1,202 MT CO_2e

50% of facilities reporting emissions data for all three years decreased their emissions ratio from 2017 to 2022

Wineries experienced the most reporting complexity compared to other facility types within this study due to weather-related impacts on production volume, resulting in the variation of year-over-year normalized trends for water, energy, and emissions. Figure 15 summarizes water intensity, energy efficiency, and emissions ratios of all wineries and wineries providing data for all three reporting years (fixed dataset) from 2017 to 2022. In the fixed dataset, production decreased by 13% and water use decreased by 23%, leading to an 11% reduction in the water use ratio for facilities reporting three years of data. The energy use ratio decreased by 16%, consistent with the decreasing trend in the reported production volume and energy use. The emissions ratio decreased by 12% in the fixed dataset, with approximately 50% of wineries in the fixed dataset reporting decreasing emissions intensity.

Figure 15: Winery Water, Energy, and Emissions Efficiency, 2017-2022



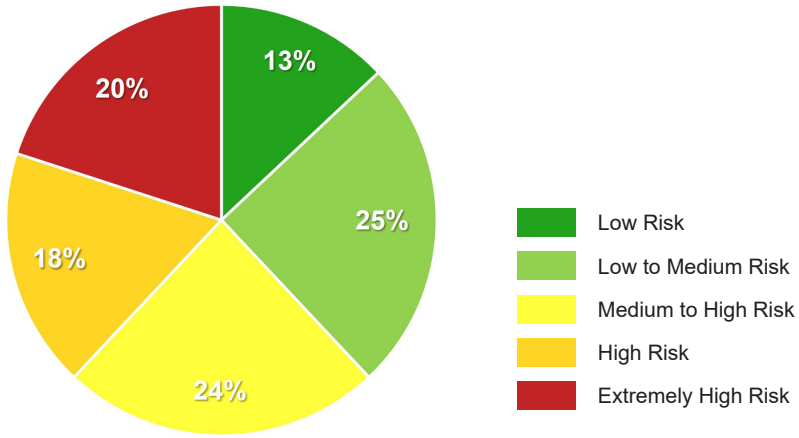
Water Availability Analysis

Global water availability is one of the most threatening and pervasive sustainability concerns of the modern era. Freshwater resources have become increasingly vulnerable to climate change, overuse, and pollution. BIER members are particularly sensitive to resource depletion, as water tends to be the largest component of beverage production for the majority of members. In recent years, BIER members have increased their focus on water risks through source water vulnerability assessments and Water Working Group initiatives to evaluate risks, collaborate on solutions, and promote efficient and sustainable water use within the beverage industry.

The 2023 benchmarking study includes a comprehensive water scarcity analysis of all member facilities that reported both water use and production volume for 2022. The WRI Aqueduct Water Risk Atlas tool was used to map and analyze water risk data for 1,347 facilities, representing 88% of BIER benchmarking sites.

As shown in Figure 16, more than 60% of facilities currently operate in areas that have at least a medium overall water risk. Overall water risk accounts for physical risks, including water quality and quantity, as well as regulatory and reputational risks.

Figure 16: Current Overall Water Risk



To further evaluate future water stress, facilities were analyzed for their projected water stress in the year 2030. At least 51% of facilities with WRI Aqueduct data available are expected to operate under medium to extremely high water stress in 2030 (Table 4). More than 60% of facilities in these areas reported decreasing water use ratios between 2017 and

2022, indicating that the industry continues to drive efficiency improvements in areas with a projected medium to extremely high water risk in the future.

Table 4: Projected Water Stress Risk, 2030

Project Water Stress, Business as Usual 2030	% of All Facilities	% Reporting WUR Improvement, 2017-2022
Minimal Risk	1%	53%
Low Risk	36%	59%
Low to Medium Risk	12%	68%
Medium to High Risk	15%	49%
High Risk	13%	56%
Extremely High Risk	23%	64%

Please note that at the time of this study, WRI had updated its Aqueduct Water Risk Atlas tool and methodology. Analyses are conducted based on indicators and metadata provided via Aqueduct 4.0, which is the latest version since the update in 2023.

Future Benchmarking Study Recommendations & Conclusion

BIER is constantly seeking to improve and refine the benchmarking study to ensure that results continue to be insightful and valuable to our members. Opportunities for improvement in 2024 and beyond include:

- **Biennial Reporting:** BIER will use the same biennial benchmarking structure in 2024 and beyond but will seek to obtain relevant insights and suggestions from members between studies. Following this schedule, the next water, energy, and emissions benchmarking study is scheduled to occur in 2025, including data for 2020, 2022, and 2024.

- **Best-in-Class Sustainability Strategy Reporting:** It is recommended that BIER members further aggregate and report information concerning sustainability strategies to develop a better understanding of efficiency improvement tactics at beverage production facilities. Sustainability strategy related information will not only help identify production procedures and operations with the highest efficiency improvement potential, but also assist with the validation of data trends reported by high-performing facilities.

Conclusion

BIER is committed to the continuous improvement and mitigation of environmental impacts associated with global beverage production processes. This commitment is demonstrated first-hand through the benchmarking study which drives industry-wide collaboration, accountability, and performance improvement from each of the BIER participating members.

Industry water use, energy use, and emissions ratios decreased by 8%, 11%, and 22% respectively over the study period, with most of all four facility types (i.e., breweries, distilleries, wineries, and bottling facilities) reporting improvements in performance ratios compared to 2017. The final dataset included representation from 16 leading beverage companies and partners and their over 1,800 production facilities worldwide.

The study showcases continued progress across a variety of facility types, production volumes, and geographic locations. BIER looks forward to continued engagement amongst our members, stakeholders, and various working groups to ensure that benchmarking insights are meaningful, accurate, and conducive to our primary goal: to enhance collaboration and advance sustainability within the beverage sector.

Benchmarking Definitions & Methodology

To establish the benchmarking dataset, each company submitted three years (2017, 2020, 2022) of facility-specific data as described below:

- **Total Water Withdrawal:** All water used by the plant (including Bottling and Industrial Water) from all sources used for activities including but not limited to: beverage production, cleaning/sanitizing processes, cooling waters, sanitation, landscaping, etc. Total Water Withdrawal includes storm water/rainwater captured for activities defined above. The scope of this study does not include water used to grow ingredients or at warehousing or office facilities. This definition is generally aligned with GRI Standard 303-3 (2018). Total Water Withdrawal excludes Return Water.

- **Total Energy Consumption:** All energy consumed on-site from all sources used for activities including but not limited to: facility operation, beverage production, cleaning/sanitizing processes, bottling processes, pasteurization, cooling, sanitation, etc. This definition is generally aligned with GRI Standard 302-1 (2016).

- **Scope 1 Emissions:** Direct GHG emissions from owned or controlled sources (e.g., generation of electricity, heating, cooling and steam from fuel combustion). This definition is generally aligned with GRI Standard 305-1 (2016). Please note: for the purposes of the 2023 BIER benchmarking study, Scope 1 does not include owned transportation fleets.

- **Scope 2 Emissions:** Indirect GHG emissions from the consumption of purchased or acquired electricity, heat or steam. This definition is generally aligned with GRI Standard 305-2 (2016).

- **Total Greenhouse Gas (GHG) Emissions:** The sum of absolute Scope 1 and Scope 2 emissions. Scope 3 emissions were not quantified for the 2023 BIER benchmarking study.

- **Total Beverage Production:** The volume of finished product generated at a facility or by a company. For facilities that produce alcoholic beverages, total beverage production should represent the actual volume of product (e.g., wine gallons) and should not be scaled to a specific alcohol content.

- **Water Use Ratio (L/L):** Calculated as the ratio of Total Water Withdrawal to Total Beverage Production and is an indicator of the efficient use of water by a company or facility.

- **Energy Use Ratio:** A measure of efficiency defined on a Facility Specific or Company-Wide basis as Total Energy Consumption / Total Beverage Production. This definition is generally aligned with GRI Standard 302-3 (2016).

- **Emissions Ratio:** A measure of efficiency defined on a Facility Specific or Company-Wide basis as Total GHG Emissions / Total Beverage Production. This definition is generally aligned with GRI Standard 305-4 (2016).

- **Beverage Facility Types:** Four facility types were identified for the data collection process: Bottling Facility, Brewery, Distillery, and Winery. This study did not include warehouses, corporate offices, food products, glass shops, or malting operations.

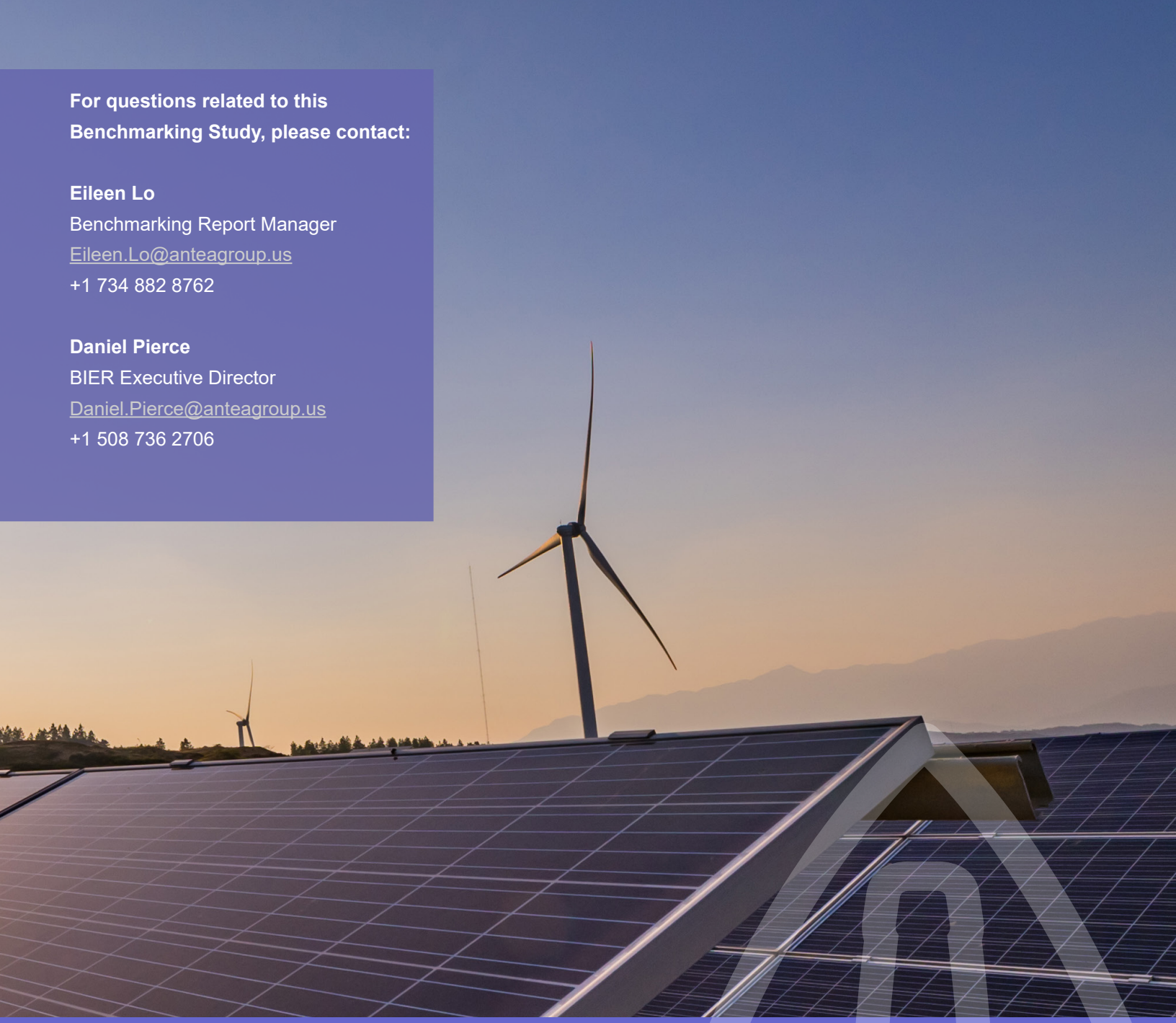
- **Beverage Product Mix:** A description of all Beverage Production Shares across a company or individual facility. The sum of Beverage Production Shares across an entity should equal 100 percent. For purposes of this study, ten beverage types were identified: beer, bottled water, carbonated soft drinks, distilled spirits (high-proof), distilled spirits (low proof), juice – not from concentrate, juice from concentrate, non-carbonated beverages, wine and other.

It is important to note that the benchmark represents an amended dataset – facilities were permitted to submit revisions for 2017 and 2020 data and were added or removed based on acquisitions and divestitures within the individual participant companies. Participants also submitted supplemental process information for their facilities (e.g., package type, cooling water use, pasteurization type, etc.) to evaluate trends observed during data analysis.

The bases for the analyses are the water use ratio, energy use ratio, and emissions ratio, which are broad indicators of how efficiently a facility uses water and energy for beverage production. The annual study, including data collection, analysis, verification, and reporting, has been managed by Antea Group, a third-party consultant, since the study's inception.

For the purposes of this study, four types of beverage production facilities were identified: bottling facilities, breweries, distilleries and wineries. The study includes all water use, energy use, and total emissions at these facility types (including withdrawals/consumption for employee services, on-site landscaping, etc.). Non-manufacturing facilities, such as office buildings and warehouses, were excluded from the reporting boundary.

Facility type was determined by the primary process conducted at each facility. Data for bottling facilities is further analyzed into additional sub-categories based on product mix, to account for the various product types processed at bottling facilities. All facilities reported a beverage product mix, or a percent breakdown of the different beverage types produced at each facility.



For questions related to this Benchmarking Study, please contact:

Eileen Lo
Benchmarking Report Manager
Eileen.Lo@anteagroup.us
+1 734 882 8762

Daniel Pierce
BIER Executive Director
Daniel.Pierce@anteagroup.us
+1 508 736 2706

About the Beverage Industry Environmental Roundtable (BIER)

The core mission of Beverage Industry Environmental Roundtable (BIER) is to advance the sector's environmental sustainability by developing industry-specific methods and data. In other words, we seek to create tools and methodologies that accelerate sustainability and its journey from analysis to action.

BIER is a technical coalition of leading global beverage companies working together to advance environmental sustainability within the beverage sector. Formed in 2006, BIER aims to accelerate sector change and create meaningful impact on environmental sustainability matters. Through development and sharing of industry-specific analytical methods, best practice sharing, and direct stakeholder engagement, BIER accelerates the process of analysis to sustainable solution development.

BIER is facilitated by Antea Group (https://us.anteagroup.com)