Department of
Primary Industries and
Regional Development

GOVERNMENT OF
WESTERN AUSTRALIA

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Energy Snapshot Study:

Beer Manufacturing

Contents

About this report

The *Beer Manufacturing Snapshot* forms part of the Department of Primary Industries and Regional Development's (DPIRD) broader *Food and Beverage Manufacturing Energy Snapshot Study* (Study), undertaken in partnership with RSM Australia.

Beer manufacturers accounted for 19 of the study's 124 responses (15% of participants). Participants were located in metropolitan and regional Western Australia, including the South West, Peel, Great Southern, Mid West and Gascoyne regions. Businesses reflected a range of operating models, including production breweries, taprooms, brewpubs and packaged beer producers.

This Subsector Snapshot explores energy use, operational emissions, actions already underway, barriers to further investment and opportunities to improve energy performance. This report uses the term *breweries* when referring to the broader business, including production, hospitality, tourism and venue operations, and *beer manufacturing* when referring specifically to brewing, packaging and other production-related activities that drive operational energy use and emissions.

Results are indicative of participating businesses and should be read alongside the Energy Snapshot report for the full methodology, emissions boundaries and sector-wide findings.

Energy efficiency is key to sector resilience

WA's beer manufacturing subsector is a visible and valued part of the State's food and beverage manufacturing industry. It connects local agriculture, manufacturing, hospitality, tourism, retail, packaging and distribution, and plays an important role in regional visitor economies.

The subsector includes a diverse mix of larger packaged beer producers, craft breweries, microbreweries, brewpubs and regional destination breweries. Energy use and emissions profiles vary significantly across the subsector. For example, a brewery producing packaged beer for wholesale and retail markets will generally have a different operating profile to a venue-led brewpub or regional tourism brewery.

For this reason, the energy and emissions picture for beer manufacturing is not one-size-fits-all. It depends on the balance between production, packaging, refrigeration, cold storage, hospitality, events and tourism activity.


HOPS

A homegrown industry with statewide reach

WA is regarded as the birthplace of Australia's craft beer industry, with several now-iconic breweries established in Perth during the 1980s and 1990s. Today, the State has more than 120 breweries, representing around 20 per cent of the national industry, despite WA being home to around 11 per cent of Australia's population.[1]

Beer manufacturing is estimated to contribute approximately $648 million to the WA economy, directly supporting around 967 full-time jobs and indirectly supporting more than 4,000 jobs across the State.[2] Beyond manufacturing, this contribution supports a wide range of industries, including hospitality, tourism, retail, packaging, freight, local events and agricultural supply chains, particularly barley, malt, and hops production. WA breweries operate across metropolitan and regional locations. Many regional breweries are destination venues, attracting visitors through taprooms, tasting paddles, tours, food offerings, and events. This makes beer manufacturing part of the State's broader "paddock to pint" story, linking local agricultural inputs, manufacturing capability, tourism and premium food and beverage experiences.[3]

The subsector's main products include draught beer for on-site consumption and hospitality venues, and packaged beer sold in cans, bottles, cartons and mixed packs. Product portfolios often include core ranges, seasonal releases, limited-edition beers and specialty styles. Some manufacturers are also responding to changing consumer preferences through lower-alcohol, no-alcohol and more diverse beverage offerings.

68%

of breweries surveyed are currently using renewable energy

1 Department of Primary Industries and Regional Development, Independent Brewers Association, Western Australian Brewers Association and South West Brewers Alliance (2024), *Western Australian Craft Beer Strategy Overview 2024–34*; Australian Bureau of Statistics (2022), 'Snapshot of Western Australia', https://www.abs.gov.au/articles/snapshot-wa-2021

2 Government of Western Australia (2024), 'Bold plan to boost WA's craft beer industry', 2 August 2024, https://www.wa.gov.au/government/media-statements/Cook-Labor-Government/Bold-plan-to-boost-WA%27s-craft-beer-industry-20240802

3 Department of Primary Industries and Regional Development et al., *Western Australian Craft Beer Strategy Overview 2024–34*.

> **Energy efficiency has become a financial necessity for us. With high competition across the market and rising energy costs, there are times where brewing can become uneconomical if we do not actively manage our energy use. Reducing energy consumption is not just about sustainability — it is about keeping the business viable — WA Brewer**

The subsector is operating in a challenging commercial environment. Beer manufacturers are managing rising packaging, freight, energy, labour and ingredient costs, while competing with larger brewers, private-label products and an expanding range of alcoholic and non-alcoholic beverage categories. Access to retail shelf space, tap contracts and distribution channels can be difficult for smaller producers.[4]

In this context, energy use is not just an environmental issue. It is a cost, efficiency and business resilience issue.

4 Independent Brewers Association (2025), *Save Australian-Owned Brewing Businesses*, February 2025, https://independentbrewers.org.au/wp-content/uploads/2025/02/SAVE-AUSTRALIAN-OWNED-BREWING-BUSINESSES-Feb-2025.pdf

Where energy is used

Brewing is an energy-intensive manufacturing process that requires repeated heating, cooling, pumping, cleaning and storage. In addition, these facilities are often linked to large venues operating restaurants and other tourism amenities.

While the energy profile of each brewery varies according to factors such as scale, beer style, equipment configuration, packaging mix, venue footprint and operating hours, the primary energy hotspots are broadly consistent across the subsector.[5]

Energy hotspot	Operational area
Process heat	Used for mashing, wort boiling, hot liquor generation, cleaning-in-place, keg washing, bottle washing, washdown and venue kitchens. Commonly supplied by natural gas, LPG or electric systems.
Refrigeration and cooling	Required for wort cooling, fermentation temperature control, conditioning, maturation, cold storage, glycol systems, packaged product quality and beer dispense. Often a major electricity load.
Packaging	Canning, bottling, labelling, conveyors, compressed air systems and cold storage can materially increase electricity demand, particularly for production-led breweries.
Cleaning and sanitation	Cleaning-in-place systems, tank cleaning, keg washing and rinse cycles require hot water, chemical dosing, pumps and controls.
Compressed air	Used in packaging and production systems. Leaks, pressure settings and poor shutdown procedures can create avoidable electricity demand.
Venue operations	Taprooms, restaurants, kitchens, event spaces, HVAC, lighting, cool rooms and beer reticulation can be material, particularly for brewpubs and regional destination breweries.

5 Australian Government (2026), 'Food and beverage manufacturing', energy.gov.au, https://www.energy.gov.au/business/sector-guides manufacturing/food-and-beverage; Brewers Association (2017), *Energy Usage, GHG Reduction, Efficiency and Load Management Manual*, Brewers Association; World Bank Group (2007), *Environmental, Health, and Safety Guidelines: Breweries*, World Bank Group.

Brewing process and energy use

The brewing process typically begins with raw material receival and storage, including malted grain, hops, yeast, water and other ingredients. Malted grain is milled to break open the grain and improve access to starches during mashing. During mashing, the milled grain is mixed with hot water to convert starches into fermentable sugars, producing sweet wort.

The wort is separated from the spent grain through lautering and sparging, before being boiled with hops to develop flavour, sterilise the wort and remove unwanted volatile compounds. Following boiling, the wort is clarified and rapidly cooled before transfer to fermentation tanks. During fermentation, yeast converts sugars into alcohol and carbon dioxide. The beer is then conditioned or matured, chilled, clarified or filtered as required, carbonated and transferred to bright tanks before being packaged into kegs, cans or bottles.

Energy use is distributed across this process, but heating and cooling are the dominant themes.

Mashing, lautering, sparging and wort boiling require hot water, steam or direct heat. Wort boiling is usually one of the most heat-intensive steps because the kettle must bring wort to boiling point and hold it there for a set period. Where breweries use steam systems, this thermal demand is commonly supplied by natural gas or LPG-fired boilers.

Fermentation and conditioning shift the energy profile from heating to cooling. Yeast activity produces heat that must be removed to maintain fermentation control and product quality. Consequently, refrigeration systems, glycol chillers, tank jackets, pumps and controls are central to energy use during fermentation, maturation and cold storage.

Packaging can also create material electricity demand, especially for breweries with canning or bottling lines. Electricity is used for conveyors, fillers, seamers, labellers, motors, compressed air systems and controls. Hot water or steam may also be required for keg washing, bottle washing or pasteurisation.[6]

For smaller breweries, packaging runs can create short but significant demand peaks, particularly where compressors and packaging equipment operate at the same time as refrigeration and venue loads.

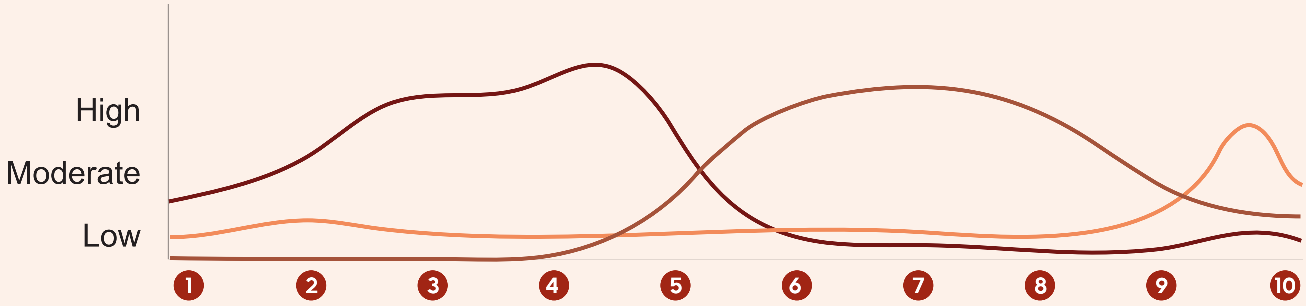
58%

of breweries surveyed have made operational process changes to reduce energy usage

6 D'Ascenzo, F., Vinci, G., Maddaloni, L., Ruggeri, M. and Savastano, M. (2024), 'Application of Life Cycle Assessment in Beer Production: Systematic Review', *Beverages*, vol. 10, no. 3, article 86; Galitsky, C., Martin, N., Worrell, E. and Lehman, B. (2003), *Energy Efficiency Improvement and Cost Saving Opportunities for Breweries: An ENERGY STAR Guide for Energy and Plant Managers*, Lawrence Berkeley National Laboratory; World Bank Group, *Environmental, Health, and Safety Guidelines: Breweries*.

Energy use changes across the brewing lifecycle. Heating dominates the early hot-side steps, then demand shifts to cooling during fermentation and conditioning, and finally to electricity for packaging.

1. Raw material receival and storage
2. Milling
3. Mashing
4. Lautering and sparging
5. Wort boiling
6. Clarification and rapid cooling
7. Fermentation
8. Conditioning / maturation
9. Bright tank and carbonation
10. Packaging



Thermal energy (hot water, steam, direct heat) - heat dominates the hot-side process

Cooling / refrigeration energy - energy demand shifts from heating to cooling

Electricity / mechanical energy - packaging can create short, significant electricity peaks

Figure 1: Brewing process and shifting energy demand

Venue and hospitality energy use

In addition to manufacturing activities, many WA craft breweries operate hospitality venues such as taprooms, cellar doors and event spaces. These areas can be significant energy users, driven by lighting, HVAC, kitchen equipment, refrigeration, beer reticulation systems, hot water, audio-visual systems and venue amenities. In smaller breweries, venue energy use may be material compared with production energy use, particularly where hospitality areas operate outside brewing hours or during periods when production equipment is idle.

79%

of breweries upgraded site infrastructure to improve energy efficiency

Separating venue and production energy data is important because the energy profile of each part of the business is likely to be materially different. Production energy is generally linked to process heat, refrigeration, motors, pumps, cleaning and packaging, while venue energy is more likely to be driven by HVAC, lighting, kitchens, cool rooms, customer-facing operations and operating hours. As a result, energy-efficiency interventions need to be targeted differently across the production and venue parts of the business, rather than treating brewery energy use as a single, uniform source of demand.

What the carbon data tells us

The Study estimates that the WA brewing subsector generates approximately **12,000 tonnes of Scope 1 and Scope 2 emissions each year**.[7] This represents around 3% of the estimated 455,000 tCO2-e for the WA food and beverage manufacturing sector.

Although breweries are not among the industry's largest emissions sources, their collective footprint remains material. Importantly, brewery emissions are closely linked to energy systems that businesses can directly influence. Better energy visibility, improved controls, preventative maintenance and operational efficiency can reduce emissions in the near term, while equipment upgrades, renewable electricity and the electrification of process heat provide longer-term opportunities.

Scope 1 and 2 emissions from brewery and venue operations

Scope 1

Direct emissions from sources controlled by the business

- Natural gas or LPG used for process heat, steam, hot water, cleaning and kitchen operations
- Diesel or petrol used in company-controlled vehicles, forklifts, generators or equipment
- Refrigerant losses from cooling and refrigeration systems

Scope 2

Indirect emissions from purchased electricity

- Refrigeration, glycol systems
- Pumps, motors, production equipment
- Packaging lines, compressed air
- Lighting, HVAC, controls
- Cold rooms, packaged product storage
- Taprooms, kitchens, venue operations

For many breweries, operational emissions are closely linked to energy systems that are within the direct influence of the business. This creates a practical opportunity for emissions reduction through better energy visibility, improved controls, equipment maintenance and operational efficiencies.[8]

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7 *Unless otherwise stated, emissions figures relate to operational Scope 1 and Scope 2 emissions and are expressed as tonnes of carbon dioxide equivalent (tCO2-e). Industry and subsector totals are indicative estimates rather than formal greenhouse gas inventories and are subject to uncertainty arising from data availability, sample coverage, scaling assumptions, emission factors and differences between businesses. Figures have been rounded and should be interpreted as estimates of scale rather than precise totals. Scope 3 emissions are excluded.*

8 Brewers Association, *Energy Usage, GHG Reduction, Efficiency and Load Management Manual*.

Main sources of Scope 1 emissions

The main sources of Scope 1 emissions in beer manufacturing typically include fuel combustion for process heating, refrigerant leakage from cooling systems, and fuel used in company-controlled vehicles or equipment.

Natural gas or LPG may be used for wort boiling, mashing, hot water generation, cleaning-in-place, keg washing and venue kitchens. Process heat can therefore be a key emissions hotspot if breweries rely on gas or LPG.

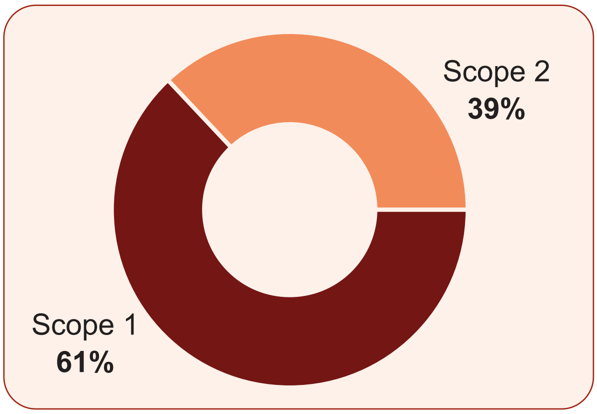

Figure 2: Scope 1 and Scope 2 split for beer manufacturers

Compared with some other food and beverage subsectors, beer manufacturers are less likely to have major biological methane or nitrous oxide emissions from production. Their Scope 1 profile is more closely linked to controllable energy systems, particularly boilers, burners, hot water systems, refrigeration equipment and mobile fuel use.

Main sources of Scope 2 emissions

Scope 2 emissions are associated with electricity use. For breweries, the most material electricity loads typically include:

- refrigeration
- glycol systems
- pumps
- packaging lines
- compressed air
- lighting
- HVAC
- cold rooms
- venue operations.

Refrigeration is important because breweries require controlled cooling across wort cooling, fermentation, conditioning, maturation, cold storage and beer dispense. Poor controls, overcooling, fouled condensers, refrigerant issues, inadequate insulation and mismatched chiller capacity can increase electricity use without improving production outcomes.[9]

Among beer manufacturing participants, Scope 1 emissions accounted for approximately 61% of operational emissions, while Scope 2 emissions represented 39%. This indicates that direct emissions—particularly from fuels used for process heat—were the larger contributor, although purchased electricity for refrigeration, cooling, pumps and packaging remained significant.

The beer manufacturing emissions split was similar to the overall food and beverage manufacturing sample, which comprised 65% Scope 1 and 35% Scope 2 emissions.

9 Australian Government, 'Food and beverage manufacturing'; Brewers Association, *Energy Usage, GHG Reduction, Efficiency and Load Management Manual.*

Different ways of brewing, different energy demands

The emissions profile of a brewery depends heavily on its operating model.

Packaged production breweries are likely to have higher operational emissions due to larger production volumes, packaging lines, compressed air systems, cold storage and materials handling. Emissions profiles are generally more manufacturing-led, with key hotspots across brewhouse heat, fermentation cooling, packaging and storage.

While venue-led breweries have lower packaging-related energy needs, hospitality activities often account for a larger share of emissions, particularly those associated with kitchens, customer areas, air conditioning, lighting, cold rooms and tap systems.

For this reason, emissions intensity comparisons should distinguish between production-led and venue-led breweries. A simple emissions-per-litre metric may not fairly reflect differences in business models where hospitality, tourism and events are significant parts of the operation.

What breweries are already doing

Study data indicates that WA beer manufacturers are taking practical steps to improve energy performance. These actions are being driven by cost management, equipment reliability, operational efficiency, product quality and sustainability considerations.

The most common action reported by brewery participants was **site infrastructure upgrades**, selected by **79% of brewery respondents**, in line with the broader food and beverage sector average. This may include measures such as:

- lighting upgrades
- insulation improvements
- building works
- refrigeration improvements
- solar readiness or other site-level changes that support energy efficiency.

Breweries were also more likely than the broader study sample to report **operational or process changes**, selected by **58% of brewery respondents** compared with **52% of all food and beverage manufacturing respondents**. This significant result suggests many breweries are considering their production routines, cleaning cycles, refrigeration settings, hot water use, packaging runs and shutdown practices and how these can be adjusted to reduce avoidable energy use.

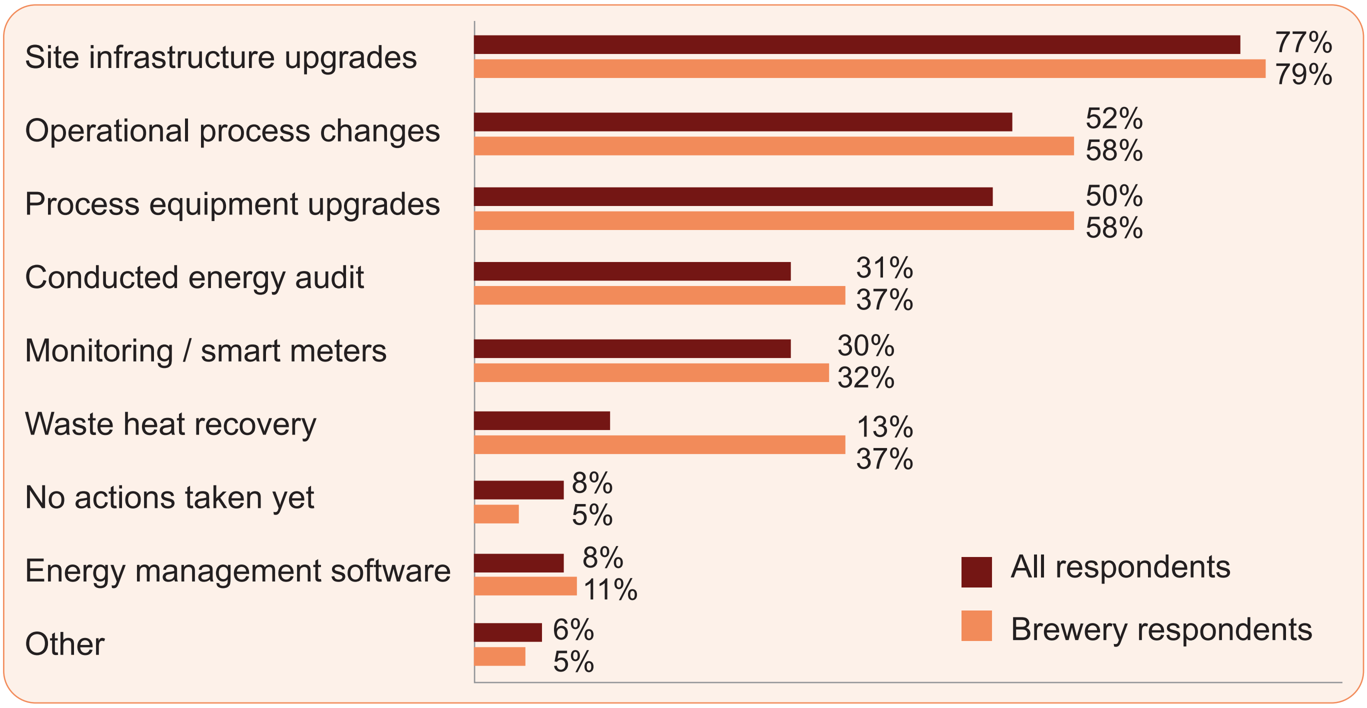

Figure 3: Energy efficiency actions of WA breweries

Equipment upgrades are already common

58% of brewery respondents reported process equipment upgrades, compared with 50% across the broader sample. This indicates that breweries are investing in or considering improvements to equipment such as:

- refrigeration systems
- glycol systems
- pumps
- motors
- boilers
- packaging lines
- controls
- compressed air systems.

58%

of brewery respondents reported process equipment upgrades

Breweries are leading in waste heat recovery

A useful finding from the Study is that 37% of brewery participants reported implementing waste heat recovery, compared with 13% across the broader food and beverage sector. This difference may reflect the strong suitability of brewing processes for heat recovery, rather than indicating a higher level of energy-efficiency activity within breweries. Breweries often have repeated and co-located heating and cooling demands, including wort boiling, wort cooling, hot water generation, cleaning, refrigeration and fermentation temperature control. This creates practical opportunities to capture and reuse heat on-site. For example, by recovering heat from wort cooling, refrigeration systems or hot water processes and redirecting it to pre-heating, cleaning or other thermal requirements.[10]

WA breweries are already acting on energy efficiency, but many are still early in their emissions measurement journey. The next opportunity is to turn utility, fuel and refrigerant data into a simple baseline that improves decision-making.

10 Australian Alliance for Energy Productivity (2023), 'More beer, less energy: Melbourne brewery leads the way in sustainable brewing with a heat pump and PV', https://www.a2ep.org.au/post/more-beer-less-energy-with-heat-pumps-for-sustainable-beer-brewing; Brewers Association, *Energy Usage, GHG Reduction, Efficiency and Load Management Manual*.

Better monitoring is improving energy visibility

Around one third of brewery respondents also reported undertaking energy audits and using monitoring, smart meters or automated controls. This indicates that some breweries are beginning to move beyond one-off efficiency actions towards better energy visibility and more structured energy management. However, the use of dedicated energy management software remains relatively low, at 11% of brewery respondents, suggesting a further opportunity to improve ongoing monitoring and decision-making.

From individual actions to structured energy management

Overall, the findings suggest that WA breweries have already established a foundation for improved energy performance, with many participants reporting site upgrades, process changes, and equipment improvements. The next opportunity is to transition from individual initiatives to a more coordinated and proactive approach to energy and emissions management. Importantly, this does not necessarily require large-scale capital projects, with many opportunities available through improving visibility of energy use. Understanding which equipment and processes are driving demand, and translating existing electricity, gas, LPG, fuel and refrigerant data into a simple Scope 1 and 2 baseline can help identify quick wins, prioritise investment and build stronger business cases for future upgrades.

Renewable energy

Renewable energy is increasingly relevant for beer manufacturers, particularly rooftop solar PV. Breweries often have daytime production, refrigeration and venue loads that may align with solar generation, making solar a practical first-step renewable energy option for some sites.

The Study findings revealed **68% of brewery participants use renewable energy** as part of a mixed energy supply, while a further group reported that while they were not yet using renewable energy, they were considering it. Across the broader food and beverage study sample, on-site solar was the dominant renewable energy option.

Renewable electricity procurement, battery storage, heat pumps, electric boilers, thermal storage and integrated heat recovery may also become relevant over time, depending on the scale of the brewery, site configuration, equipment replacement cycles, electrical capacity and business case.[11]

68%

of breweries surveyed are currently using renewable energy

90%

of respondents identified high upfront costs as the main barrier to improving energy efficiency

11 Australian Government, 'Food and beverage manufacturing'; Australian Alliance for Energy Productivity, 'More beer, less energy'.

What is driving breweries to act

Energy efficiency and emissions reduction are increasingly linked to business resilience. For breweries, the drivers are practical and commercial as much as environmental.

Lower operating costs and reduced power bills are the strongest driver, selected by **100% of brewery participants**, compared with **96% of all food and beverage participants**. This confirms that energy and emissions reduction is first and foremost a cost management issue for the subsector, particularly where refrigeration, process heat, packaging, cold storage and venue operations contribute to operating costs.

Breweries also placed strong emphasis on **business values and ethics**, identified by **84% of participants**, compared with **76% across the broader sample**. This suggests that action is not only influenced by cost savings, but also by responsible business practice, brand identity and community expectations.

84%

said business values / ethics are drivers for emissions reduction

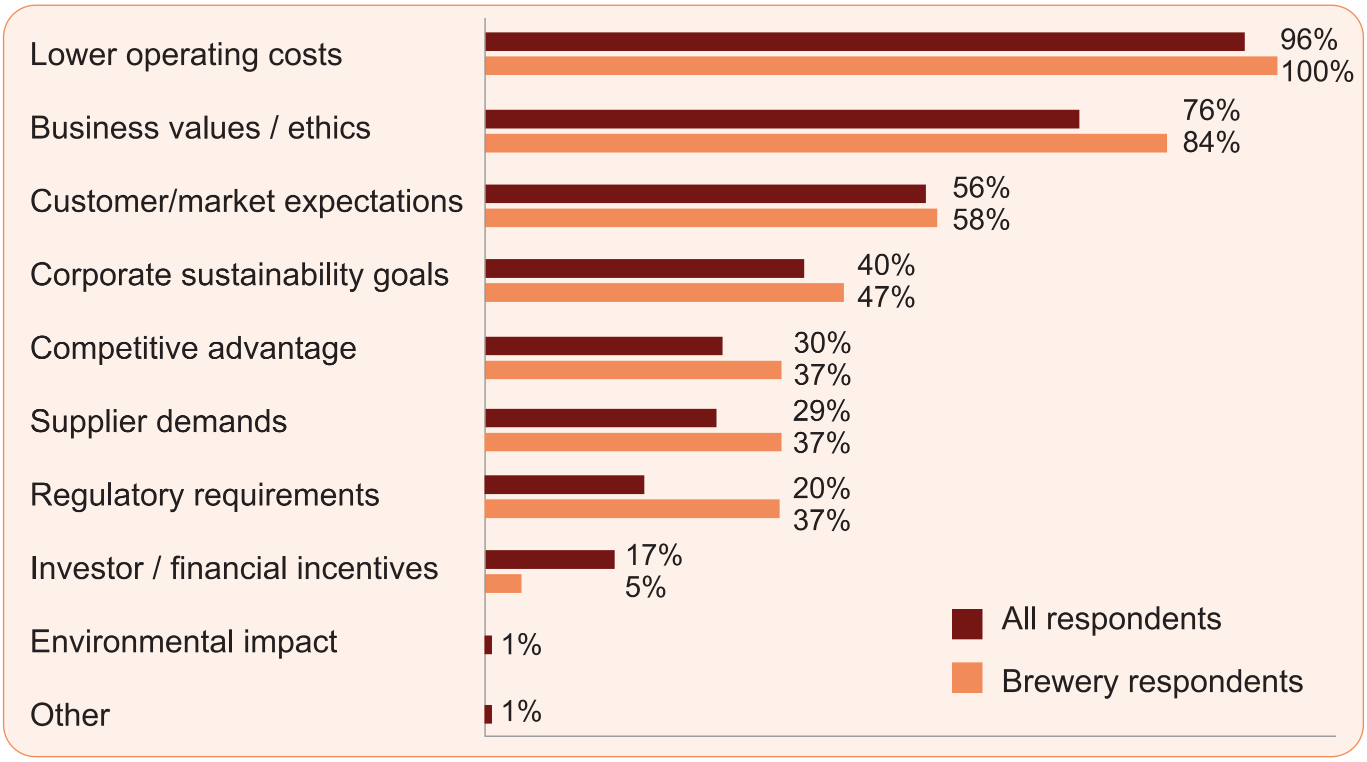

Figure 4: Emissions reduction drivers for WA breweries

Customer and market expectations were broadly consistent with the full sample, at **58%** compared with **56% overall**. Breweries were also more likely to identify **competitive advantage** and **regulatory requirements** as drivers, suggesting that some businesses are viewing energy and emissions reduction as part of future positioning and preparedness.

Energy efficiency can also support product quality and operational consistency. Better refrigeration control, improved hot water systems, preventative maintenance and optimised cleaning processes can reduce energy use, improve reliability and reduce avoidable downtime.

Overall, the results show that breweries have a broader motivation profile than cost alone.

What is holding breweries back

The main barriers to energy efficiency and emissions reduction are practical and commercial. These barriers are particularly relevant for small and medium independent breweries operating in a competitive market with rising input, packaging, freight, labour and energy costs.

These barriers reinforce the need for staged, fit-for-purpose support that helps breweries identify what is practical now, what requires further assessment, and what may be viable in the future.

Barrier	Consideration
Capital cost	Larger upgrades can be difficult to fund, even where the investment is expected to deliver long-term savings.
Limited energy data	Without sub-metering or monitoring, it may not be clear which parts of the site are driving energy use.
Operational disruption	Equipment upgrades can require downtime, which may be difficult to schedule around brewing, packaging or venue operations.
Technical uncertainty	Businesses may be unsure which technologies are suitable or whether the business case is strong enough.
Site constraints	Roof space, tenancy arrangements, electrical capacity, grid connection costs and regional contractor availability can limit options.
Competing priorities	Businesses are managing cost pressures across labour, packaging, freight, ingredients, insurance, energy and market competition.
Internal capability	Smaller operators may not have dedicated sustainability, engineering or energy management resources.

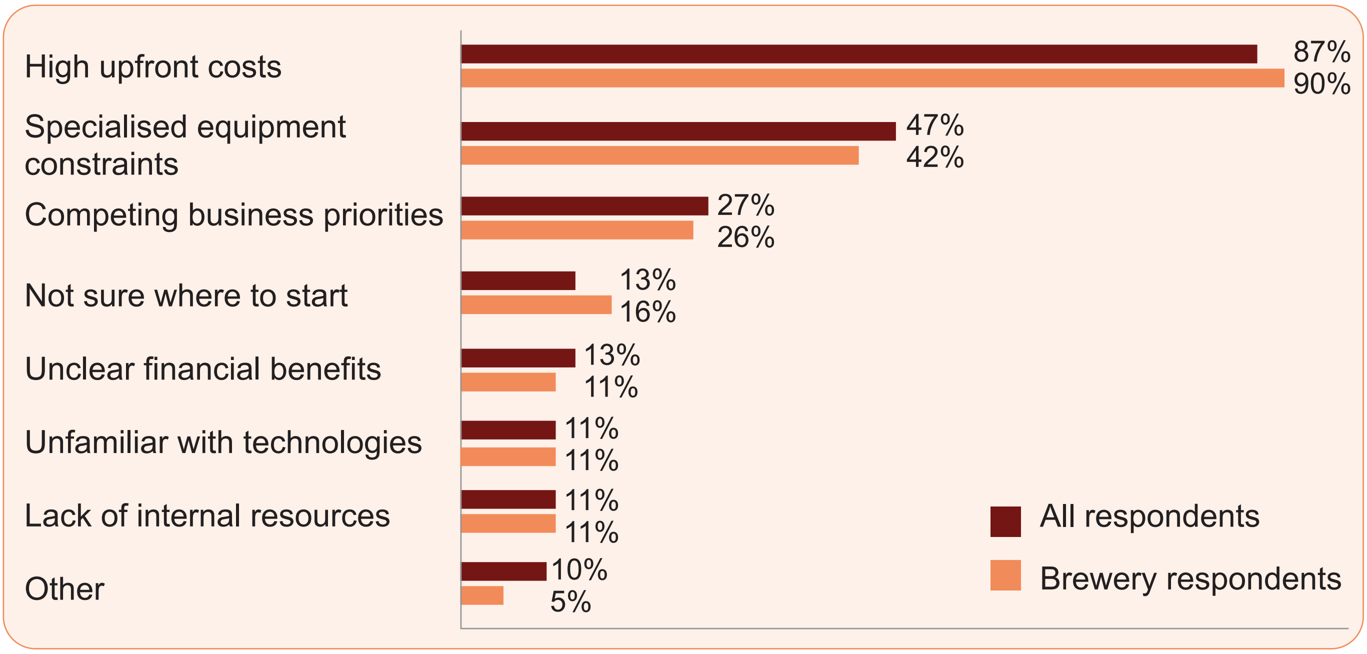

Figure 5: Barriers to energy efficiency for WA breweries

The barrier is not intent — it is capital and equipment reality.

High upfront costs is the dominant barrier and sits slightly above the broader food and beverage sector average (selected by 90% of brewery participants, compared with 87% overall). This confirms that affordability is the primary constraint for breweries. Specialised equipment constraints were identified by 42% of breweries, suggesting that while equipment complexity remains a consideration, the greater challenge is often the cost and timing of upgrades.

Competing business priorities were identified as a barrier by 26% of brewery respondents, broadly in line with 27% across the overall food and beverage Study sample. This suggests that, while breweries may recognise the value of energy efficiency, production capacity, venue upgrades, packaging changes, staffing, maintenance, marketing and broader cost pressures can still take priority.

The future: efficient, resilient and lower-emissions brewing

For WA breweries, energy and emissions reduction is both a sustainability and business resilience opportunity.

Lower-emissions brewing needs to be practical and aligned to each operator's production model, venue operations, site constraints and investment planning.

Using the report's **Measure → Optimise → Upgrade → Decarbonise** framework, the pathway for breweries can be staged according to each business's current energy maturity, site configuration and investment capacity.

This staged approach allows breweries to reduce energy use and emissions while managing capital constraints, technical risk and operational disruption.

The first step is to **measure** energy use and emissions by establishing a simple Scope 1 and Scope 2 baseline, supported by production and activity data. This gives businesses better visibility of where energy is being used and how emissions intensity changes over time. Sub-metering can separate brewhouse equipment, refrigeration, packaging lines, cold rooms, venue operations and solar generation.

The next step is to **optimise** existing systems through lower-cost operational improvements, including:

- **Refrigeration and cooling:** review temperature set points, reduce overcooling, check glycol temperatures, maintain chillers and condensers, and repair cool room seals.
- **Heat and hot water systems:** improve insulation, tune boilers and burners, review hot water set points, and schedule hot water generation more efficiently.
- **Cleaning processes and compressed air systems:** reduce excessive cleaning cycles, optimise cleaning-in-place systems, and check compressed air systems for leaks.
- **Operational controls:** shut down idle equipment and introduce start-up and shutdown checklists.

Breweries can then make targeted investment to upgrade equipment and controls where there is a clear business case. Opportunities include:

- **Equipment and controls:** install high-efficiency refrigeration systems, improved glycol system controls, lower-impact refrigerants, variable speed drives, efficient motors and pumps, and packaging line controls.
- **Heat and utility systems:** upgrade boilers or burners, boiler economisers, condensate recovery, and improved insulation.
- **Digital and on-site energy:** energy management software, solar PV, efficient hot water systems, and automated controls.
- For **production-focused breweries**, the greatest opportunities are often found in process heat, refrigeration, packaging, compressed air and cold storage systems.
- **Venue-based** breweries may benefit from improvements to HVAC systems, kitchens, lighting, cool rooms, beer reticulation systems and operating practices.

Over time, businesses can **decarbonise** by assessing longer-term opportunities such as renewable electricity procurement, battery storage, heat pumps, electric boilers, integrated heat recovery, CO_2 recovery from fermentation, and biogas recovery from high-strength wastewater where technically and commercially viable.[12]

12 Australian Government, 'Food and beverage manufacturing'; Australian Alliance for Energy Productivity, 'More beer, less energy'; Brewers Association, *Energy Usage, GHG Reduction, Efficiency and Load Management Manual*.

Cold beer, hot process: 4 Pines closes the energy loop

4 Pines Brewing Company is taking an integrated approach to electrifying its Brookvale brewery. With up to $1.77 million in funding from the Australian Renewable Energy Agency (ARENA), the business will replace its gas-fired boilers with high-temperature heat pumps that capture waste heat from refrigeration and reuse it for brewing. Refrigeration systems will also be upgraded and a small electric boiler installed for processes that still require steam.

The project is designed to remove natural gas from brewing operations, reducing Scope 1 emissions by approximately 280 tCO_2-e annually and eliminating fossil-fuel consumption for process operations. Scheduled for completion in November 2028, the project demonstrates how breweries can treat heating and cooling as an interconnected system—turning heat that would otherwise be wasted into a useful energy source. If successful, the model could provide a replicable pathway for electrifying process heat across breweries and other food and beverage manufacturers.[13]

The Study findings demonstrate that WA breweries are already taking meaningful steps to improve energy performance. However, emissions tracking remains at an earlier stage of development, with larger-scale projects constrained by capital cost, limited energy data, site requirements and competing business priorities. Continued progress is likely to be influenced by access to practical support, including grants, energy audits, equipment advice, technical expertise, renewable energy advice, feasibility studies, business case support and peer case studies demonstrating outcomes achieved from comparable breweries.

The opportunity for WA breweries is to improve energy productivity, reduce avoidable energy use, manage cost exposure and strengthen the sustainability credentials of the State's brewing industry. The future of lower-emissions brewing will depend on the cumulative impact of better energy and emissions data, improved process control, staged investment, and practical support measures. Importantly, these approaches must be designed to align with the operational and commercial realities of brewing, packaging, hospitality, regional tourism and commercial viability. [14]

13 Australian Renewable Energy Agency (ARENA) (2026), Industrial decarbonisation gets $13 million boost, media release, 20 March 2026.
14 Australian Renewable Energy Agency (ARENA) (2026), 4 Pines Brewery Electrification, Australian Government.

Beer Manufacturing

A practical pathway to efficient, resilient and lower-emissions beer manufacturing

Step 1: measure

Establish simple and repeatable baseline data

- **Capture energy and emissions:** electricity, natural gas, LPG, diesel, petrol, refrigerants
- **Capture activity:** litres of beer produced, packaged volumes, keg volumes, venue operating hours, kitchen or hospitality activity, refrigeration loads
- **Track:** both absolute emissions and emissions intensity over time
- **Tools:** sub-metering, energy management software

Step 2: optimise

Prioritise low-cost operational improvements first

- **Refrigeration and cooling**
- **Heat and hot water**
- **Cleaning and compressed air**
- **Operational controls**

Fast, low-cost, low disruption improvements to boost reliability and reduce energy waste

Step 3: upgrade

Make targeted investments in equipment and controls

- **Equipment and controls**
- **Heat and utility systems**
- **Digital and on-site energy**

Opportunities: production-led breweries
Process heat, refrigeration, packaging, compressed air and cold storage

Opportunities: venue-led breweries
HVAC, kitchens, lighting, cool rooms, beer reticulation and operating hours

Develop a strong business case to support payback periods, production downtime, and/or site constraints

Step 4: decarbonise

Plan for longer-term decarbonisation opportunities

- **Renewable electricity procurement**
- **Battery storage**
- **Heat pumps**
- **Electric boilers**
- **Integrated heat recovery**
- **Electrification infrastructure**
- **CO_2 recovery from fermentation**
- **Biogas recovery from high-strength wastewater**

Site-specific options are best suited to larger operators with stable production or planned equipment upgrades

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Important disclaimer

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