Department of
Primary Industries and
Regional Development

GOVERNMENT OF
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Energy Snapshot Study:

Wine Manufacturing

Contents

About this report

The *Wine Manufacturing Snapshot* forms part of DPIRD's broader *Food and Beverage Manufacturing Energy Snapshot Study* (Study), undertaken in partnership with RSM Australia. Wineries contributed 25 of the study's 124 responses, representing 20% of participants. Most were regional micro, small or medium-sized businesses, with strong representation from the South West and Great Southern.

This Subsector Snapshot explores energy use, operational emissions, actions already underway, barriers to further investment and opportunities to improve energy performance across participating wine manufacturers. This report uses the term *wineries* when referring to the broader business, including vineyard, cellar door and hospitality activities, and *wine manufacturing* when referring specifically to production-related energy use and emissions.

The findings should be read alongside the Food and Beverage Energy Snapshot Study, which provides the study methodology, emissions boundary and whole-of-industry findings. Results are indicative of participating businesses and are not intended to represent an engineering assessment or statistically representative industry benchmark.

For WA wineries, lower-emissions production starts with better energy visibility, smarter cooling and practical investment decisions that support cost control, resilience and premium market positioning.

Western Australia's wine subsector is an important part of the State's food and beverage manufacturing industry. It contributes to regional economies, tourism, hospitality, exports, and local employment across grape growing, wine production, packaging, distribution and cellar door sales.

The subsector includes a diverse mix of small family-owned wineries, medium-sized producers, contract winemaking operations, vertically-integrated vineyard and winery businesses, cellar doors, hospitality venues and export-oriented producers. This diversity means that energy use and emissions profiles vary significantly between businesses.

For wineries, energy use is concentrated in a number of recurring activities: refrigeration and cooling, crushing and pressing, fermentation control, stabilisation, storage, bottling, packaging, pumping, cleaning and wastewater management. For vineyard-integrated businesses, additional energy and emissions sources may include irrigation, tractors, pumps, fertiliser, fuel and vineyard operations.

The key opportunity for WA wineries is practical: improve visibility of where energy is used, reduce avoidable energy consumption, invest in targeted upgrades and strengthen market-facing sustainability credentials.

A broader view of sustainability across the wine value chain

State and national wine sustainability work has already mapped the broader emissions picture for the grape and wine value chain. Wines of Western Australia's (WoWA) *Western Australian Wine Industry Sustainability Report 2025* provides a whole-of-industry view of the State's wine sector, including vineyards, winemaking, packaging, distribution and value-chain emissions.[1] *Wine Australia's Emissions Reduction Roadmap* provides the national pathway for reducing emissions across vineyards, wineries and the wider supply chain.[2]

The Study adds a different lens. It considers wine as a food and beverage manufacturing subsector, not as a whole agricultural and wine value chain. In the context of this report, the focus is on energy use within winery operations and the related **Scope 1 and Scope 2 emissions**.

Energy use is the amount of electricity, gas, diesel, LPG or other energy a winery consumes. Scope 1 and Scope 2 emissions are the greenhouse gas emissions associated with these and other business activities. Scope 1 includes direct operational emissions, such as on-site fuel use and refrigerants. Scope 2 includes emissions from purchased electricity. Energy efficiency can reduce emissions, but the two measures are not the same.

Together, these studies are complementary. While WoWA and Wine Australia demonstrate the broader wine industry transition task, this Study provides practical, operational opportunities within wine manufacturing.

Rather than providing a detailed wine industry carbon footprint, this report focuses on winery energy use and Scope 1 and Scope 2 operational emissions. It excludes vineyard emissions such as effluents and broader value-chain emissions. Data in this Study cannot be directly compared with other existing studies.

1 Wines of Western Australia 2025, *Western Australian Wine Industry Sustainability Report 2025*, Wines of Western Australia.
2 Wine Australia 2023, *Safeguarding the Future for Australian Wine: An Emissions Reduction Roadmap*, Wine Australia.

Why wineries are important to WA

Western Australia's wine industry is deeply rooted in its regions. From the Swan Valley to Margaret River, the Great Southern and other growing areas across the South West and southern parts of the State, wineries turn local climate, landscape, skills and agricultural production into premium beverage products. Beyond winemaking, wineries contribute to regional economies as employers, exporters, tourism destinations and hospitality venues, and are woven into the identity and character of many WA regions.

The wine industry's contribution extends well beyond wine sales, with wineries supporting activity across grape growing, contract winemaking, cellar-door operations, hospitality, events, retail, packaging, freight, professional services and regional tourism.

In many regions, visitors experience wine as part of a broader regional offering that includes cellar doors, restaurants, tastings, accommodation, events and local food experiences. As a result, wineries play an important role in supporting WA's premium food and beverage economy.

Recent Wine Australia data shows both the scale of the national industry and the pressures it is navigating. In 2024, Australia had an estimated 2,156 wineries, produced 1.04 billion litres of wine and recorded $5.7 billion in winemaker sales. The broader wine sector—including grape growing, winemaking and wine tourism—contributed an estimated $51.3 billion in direct and flow-on gross output and supported more than 203,000 jobs nationally. WA accounted for 42,000 tonnes of the 1.565 million-tonne national winegrape crush in 2025, reflecting a smaller-volume industry than the major producing states.[3] In 2026, the national crush fell to 1.27 million tonnes—the smallest since 2000 and 25 per cent below the 10-year average—as seasonal pressures and weaker demand continued to drive industry adjustment.[4] For WA wineries, this reinforces the importance of premium positioning, regional identity, visitor appeal, and efficient, resilient operations.

Nationally, the wine industry has faced a challenging commercial environment in recent years. Producers have had to manage export market disruption, oversupply, changing alcohol consumption patterns, major retailer pressure and competition from other alcoholic and non-alcoholic beverage categories. At the same time, premiumisation, regional provenance, cellar-door experiences and recovery in some export markets continue to create opportunities for higher-value producers.

In this context, energy use is not just an environmental issue for wineries. It is a key business performance factor, influencing costs, productivity and resilience across activities such as vintage operations, refrigeration, pumping, wine storage, filtration, bottling, warehousing and tourism operations. Better energy management can reduce operating costs, improve production reliability, support product quality and help wineries respond to growing market expectations around sustainability and emissions data.

3 AgEconPlus and Gillespie Economics (2025), *Economic Contribution Australian Wine Sector 2025*, report prepared for Wine Australia, 7 August 2025.

4 Wine Australia (2026), *Smallest vintage in 25 years reflects market pressures and seasonal conditions*, media release, 15 July 2026, https://www.wineaustralia.com/news/media-releases/national-vintage-report-2026.

Where and how energy is used

Wineries have a distinctive energy profile compared with many food and beverage manufacturing operations. While much of the industry relies on continuous process heat, boilers, pasteurisation or high-throughput production lines, wine manufacturers are characterised by electricity-intensive processes, seasonal vintage activity and significant cooling loads.

Refrigeration, chilling, pumping, compressed air, bottling and controlled storage are central to the winery energy profile.

The energy profile of each wine manufacturer varies depending on its business model, wine style, production scale, vintage size, storage requirements, the inclusion of on-site bottling and vineyards within the operating boundary, and the scale of cellar-door, hospitality and events activities.

A small cellar-door winery may have a very different energy and emissions profile to a larger production winery with extensive refrigeration, bulk storage and packaging operations.

Energy hotspot	Operational area
Refrigeration and cooling	Used for grape chilling, must chilling, fermentation temperature control, cold stabilisation, barrel halls, tank storage and finished wine storage. This is often the most important winery electricity load.
Pumps, motors and transfer systems	Wine production involves repeated movement of juice and wine through crushing, pressing, racking, filtration, tank transfer, bottling and cleaning.
Crushing, pressing and receival equipment	Vintage activities create short, intensive electricity demand through crushers, destemmers, presses, conveyors and grape receival systems.
Filtration, clarification and stabilisation	Processes such as filtration, flotation, cold stabilisation and clarification can require refrigeration, pumps and specialist equipment.
Bottling and packaging	Bottling lines, labelling, conveyors, compressed air and warehousing can be material for wineries that bottle on site.
Hot water, washdown and cleaning	Used for sanitation, barrel washing, tank cleaning, bottling preparation and general winery hygiene.
Compressed air	Used in some bottling, packaging and processing equipment. Leaks, high pressure settings and poor shutdown procedures can create avoidable demand.
Cellar door, hospitality and tourism operations	Lighting, HVAC, kitchens, tasting rooms, accommodation, restaurants, events and refrigeration can be material for tourism-led wineries.
Vineyard fuel and irrigation, where within boundary	Integrated vineyard production dominated businesses may also use diesel, petrol or electricity for tractors, irrigation pumps, frost fans, forklifts and other mobile equipment.

The heaviest wine manufacturing energy use generally occurs where businesses need sustained cooling, repeated pumping or concentrated activity during vintage. Refrigeration is especially important because product quality depends on temperature control. Cooling systems may operate across fermentation, cold stabilisation, barrel storage, finished goods storage and hospitality refrigeration.

Poor controls, overcooling, dirty condensers, refrigerant leaks, inadequate insulation or mismatched equipment can increase energy costs without improving product outcomes.

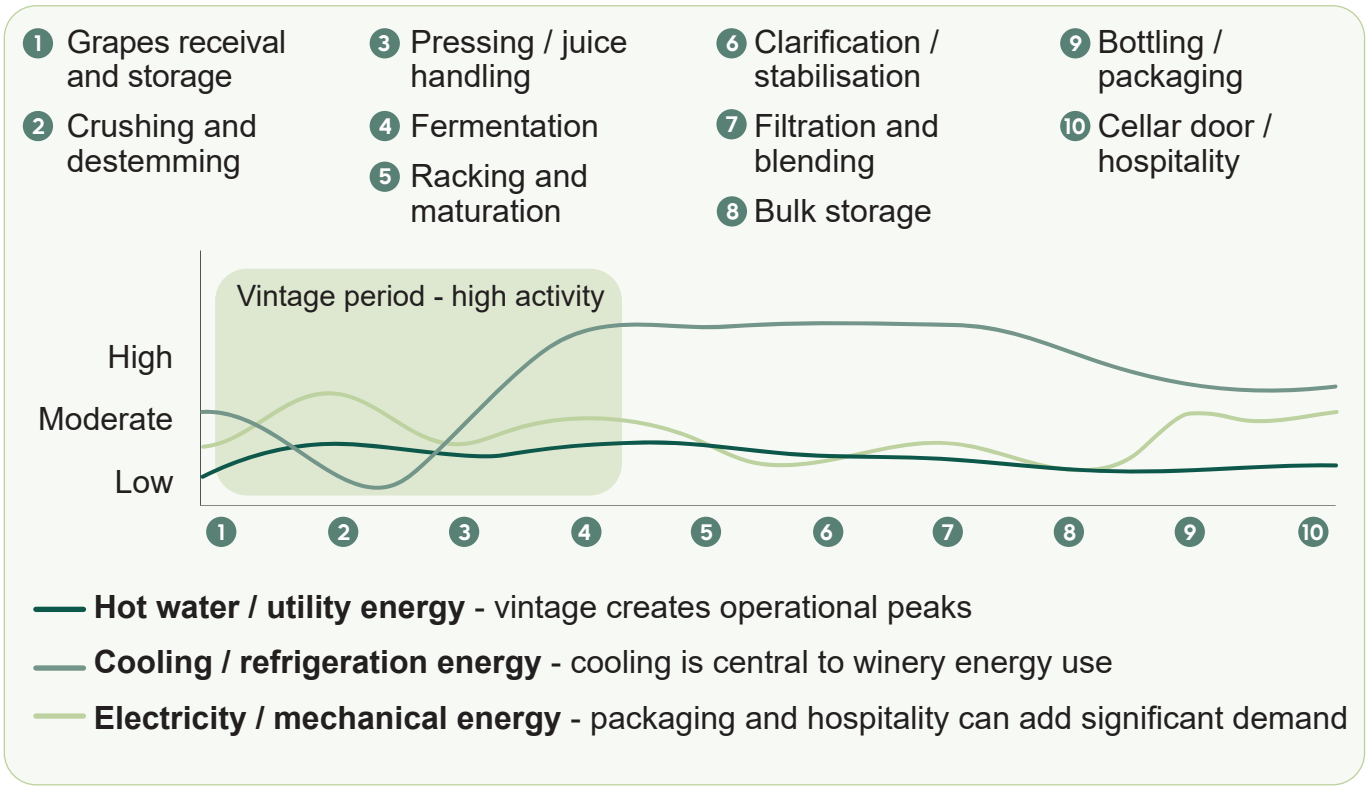

Figure 1: Wine making process and shifting energy demand

The wine manufacturing process and energy use

The wine manufacturing process typically begins with grape receival, weighing, sorting and crushing. Grapes are then destemmed and processed depending on wine style. White wine production generally involves pressing before fermentation, while red wine production usually ferments on skins before pressing.

Fermentation requires carefully controlled temperatures conditions. As yeast activity produces heat, winemakers must actively manage fermentation conditions to achieve the desired wine style and quality. As a result, refrigeration and cooling systems are a major component of winery energy use.

After fermentation, wine may be racked, matured, stabilised, filtered, blended and stored before packaging.

Cold stabilisation can be particularly energy intensive because it often requires wine to be chilled and held at low temperatures. Alternatives such as electrodialysis may reduce electricity demand for some medium and larger production sites, although suitability depends on product style, scale, equipment availability, capital cost and technical requirements.

Packaging can also be a significant operational energy load where bottling is undertaken on site. Electricity is used for bottling lines, conveyors, labellers, pumps, compressors and warehousing equipment. Where bottling is outsourced, some operational energy use shifts outside the business boundary, although packaging remains important to the broader wine subsector's value-chain emissions.

For wineries with cellar doors, restaurants or accommodation, hospitality loads can operate year-round and outside vintage. Lighting, HVAC, dishwashing, kitchen equipment, refrigeration, tasting rooms and events areas can become material, especially where production volumes are relatively small, but visitor operations are substantial.

For this reason, energy and emissions comparisons should distinguish between **vineyard production dominated, winery production dominated**, and **wine sales dominated businesses**. A production winery with on-site bottling, significant refrigeration and bulk storage will have a different energy profile to a small cellar-door winery where hospitality, lighting, HVAC and visitor facilities are more material.

Another key feature of winery energy use is seasonality. Demand often increases sharply during vintage, when grape receival, crushing, pressing, pumping, fermentation control, refrigeration and cleaning are all active. Outside of vintage, energy use may be driven more by storage conditions, refrigeration base load, bottling, cellar door operations and hospitality activities.

This means annual electricity use alone may not provide enough insight. Wineries benefit from understanding when energy is used, which activities drive demand, and how energy intensity changes with production volume, wine style, storage time and visitor operations.

Scope 1 and 2 emissions from winery, storage and visitor operations

Scope 1

Direct emissions from sources controlled by the business

- Natural gas or LPG used for hot water, boilers, cleaning, heating and process requirements where relevant
- Diesel or petrol used in company-controlled vehicles, forklifts, generators, vineyard equipment or irrigation pumps
- Refrigerants losses from cooling and refrigeration systems

Scope 2

Indirect emissions from purchased electricity

- Refrigeration and tank cooling systems
- Pumps, motors and production equipment
- Bottling lines and packaging equipment
- Lighting, HVAC and controls
- Cold rooms and wine storage
- Cellar doors, kitchens and visitor operations

WA wineries are already acting on energy efficiency. The next opportunity is to turn utility, fuel and refrigerant data into a practical Scope 1 and 2 baseline that supports better decisions.

Scope 1 and 2 carbon footprint: what matters most

This subsector report focuses on operational emissions that wineries can most directly influence: Scope 1 emissions from fuels and refrigerants used on site, and Scope 2 emissions from purchased electricity.

Scope 3 emissions, including glass bottles, packaging, purchased grapes, freight, export shipping and purchased goods and services, are outside the scope of this report. These value-chain emissions are important to the wider wine sector, but the practical focus here is on energy use and emissions within the business's operational control.

For wineries, Scope 2 electricity is often a key operational emissions source. Electricity is used for refrigeration, pumps, motors, compressors, bottling equipment, lighting, HVAC, cold rooms, cellar-door operations and site amenities. The greatest near-term opportunity is therefore to improve electricity visibility and reduce avoidable consumption, particularly from refrigeration, cooling and pumping systems.

Scope 1 emissions are more likely to come from diesel, petrol, LPG or natural gas used in hot water systems, boilers, forklifts, company-controlled vehicles, generators, vineyard equipment or irrigation pumps where those activities are within the business boundary. Leakage from refrigeration and cooling systems can also contribute to Scope 1 emissions and should be included where data is available.

Fermentation produces carbon dioxide, but this is biogenic carbon from grapes and is usually treated differently from fossil fuel emissions. For a practical Scope 1 and 2 operational baseline, wineries should prioritise electricity, fuel, refrigerants and any on-site stationary combustion. While fermentation emissions can be noted separately where relevant they are not the focus of this energy efficiency report.

These metrics should be interpreted carefully because annual production can vary due to vintage conditions, wine style, storage time, outsourcing arrangements, tourism operations and the inclusion of vineyard activities.

The Study estimates that WA's wine subsector generates approximately 12,000 tonnes of Scope 1 and Scope 2 emissions each year.[5] This represents around 3% of the estimated 455,000 tCO2-e for the WA food and beverage manufacturing sector.

5 *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.*

This estimate provides an indication of the subsector's operational footprint rather than a formal industry inventory and should be interpreted as an estimate of scale.

Among winery respondents, Scope 1 emissions accounted for approximately 63% of operational emissions, while Scope 2 emissions represented 37%. This indicates that direct emissions—particularly from fuel used in vineyard equipment, vehicles and onsite operations—were the larger contributor, although purchased electricity for refrigeration, cooling, pumping and cellar operations remained significant. Wineries had a slightly higher Scope 1 share than the overall study sample, which comprised 65% Scope 1 and 35% Scope 2 emissions.

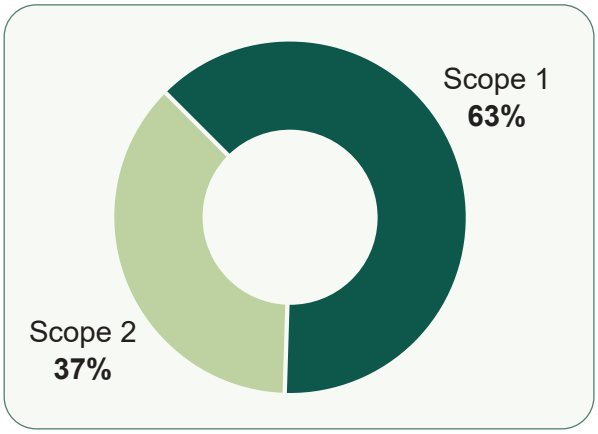

Figure 2: Scope 1 and Scope 2 emissions - wine manufacturers

What WA wineries are already doing

Study insights show a subsector that is engaged in sustainability and energy efficiency, but still has a significant opportunity to strengthen emissions tracking, energy monitoring and staged investment planning.

Among surveyed wineries, 76% reported using renewable energy as part of a mixed supply, well above the industry average of 63%. This suggests renewable energy is already an important part of the winery energy mix. On-site solar is particularly relevant for wineries because many electricity loads occur during daylight hours, including refrigeration, pumping, bottling, lighting and cellar-door operations.

However, vintage peaks and cooling loads may not always align with periods of solar generation. This means load management, tariff review, renewable electricity purchasing or battery storage may also need to be considered.

Surveyed wineries have already implemented a range of practical measures to improve energy performance:

Survey response	Finding
76% use renewable energy in some form	Renewable energy is already part of the operating model for many wineries.
48% made process equipment upgrades	Wineries are investing beyond basic infrastructure improvements.
48% made operational or process changes	Behavioural and process changes are already being used to manage energy.
48% use monitoring, smart meters or automated controls	Nearly half are improving energy visibility, but there is room to expand.

Examples provided by respondents included:

- LED lighting upgrades
- insulation added to tanks and cool rooms
- automated tank cooling controls
- upgraded chiller units
- upgraded cooling systems
- pump repairs or replacements
- solar arrays on winery roofs and pump stations
- lightweight glass bottle adoption
- energy monitoring
- reduced tractor uses in the field
- actively managing temperature and storage conditions.

This suggests many wineries have moved beyond basic awareness and are already implementing practical improvements.

However, emissions capability remains less mature. Many businesses are not yet translating electricity, fuel and refrigerant data into a structured Scope 1 and 2 baseline. This creates a clear next step for the subsector: converting existing utility, fuel and production information into simple emissions and energy intensity metrics that can support better decisions.

Renewable energy and lower-emissions power

Renewable energy is already part of the operating profile for many wineries:

- 72% reported using a mix of renewable and non-renewable energy
- Only one respondent reported using 100% renewable energy
- 24% reported that they are not currently using renewable energy but are considering it.

On-site solar was the dominant renewable energy source reported by respondents. Some respondents also identified purchased renewable electricity, power purchase arrangements, GreenPower or on-site wind generation.

This aligns strongly with the wine sector's decarbonisation priorities. Wine Australia's roadmap identifies grid decarbonisation, renewable electricity purchasing and on-site solar generation as key initiatives for reducing emissions across vineyards and wineries.[6]

The ARENA-supported Treasury Wine Estates Barossa Decarbonisation Project also highlights the practical direction of travel for large wineries: combining biogas reuse, electrification of hot water and thermal processes, hybrid solar-diesel irrigation systems, solar, battery storage and demand management.[7]

For WA wineries, renewable energy opportunities will depend on roof space, electrical capacity, production load profile, export limits, battery economics, grid constraints, tenancy arrangements and the timing of vintage and refrigeration demand.

Solar is important, but it is not the whole solution

Solar PV can reduce purchased electricity, but broader emissions reduction may also require refrigeration efficiency, better controls, cold stabilisation alternatives, heat pumps, renewable electricity procurement, battery storage and supply chain action on packaging and transport (albeit, Scope 3).

6 Wine Australia 2023, *Safeguarding the Future for Australian Wine: An Emissions Reduction Roadmap.*
7 *Australian Renewable Energy Agency, Treasury Wine Estates Barossa Decarbonisation Project.*

Willow Bridge Estate – working smarter to use less energy

Willow Bridge Estate demonstrates what operational optimisation can look like in practice. Rather than relying on a single major equipment upgrade, the business has coordinated practical changes across harvesting, refrigeration, storage, and vineyard machinery.

During vintage, grapes are harvested between approximately 2 am and 7 am, arriving at the winery at around 16°C rather than the 32°C possible during daytime harvesting. Willow Bridge builds on the benefits of cooler harvesting by carefully timing when fruit enters refrigerated storage, adjusting storage temperatures where wine quality permits, and using insulation and covered work areas to retain cooler conditions. Together, these measures reduce cooling demand without compromising wine quality.

The same optimisation mindset extends into the vineyard. By planning more efficient tractor routes, Willow Bridge has reduced travel time and machinery operating hours. The business estimates that this change alone has lowered tractor fuel use by around 10%, although longer-term monitoring is needed to confirm the result. Additionally, their sprayer has been modified to treat four vine rows in each pass rather than two. Requiring fewer passes further reduces diesel use, labour, equipment wear and maintenance.

> **It doesn't take a major investment of time to achieve meaningful energy savings. An energy audit helped us identify simple changes, such as adjusting refrigeration temperatures, that reduced costs without compromising wine quality – Willow Bridge Senior Winemaker, Kim Horton**

Willow Bridge's optimisation work is underpinned by its status as a Certified Member of Sustainable Winegrowing Australia, which provides a framework for monitoring performance, benchmarking results and identifying further opportunities for improvement.

Willow Bridge highlights what coordinated optimisation can achieve before major investment in new equipment is required. Careful timing, smarter routes and better use of existing equipment can deliver meaningful energy and cost savings.

Packaging, transport and the broader wine supply chain

For wineries, Scope 1 and Scope 2 emissions represent only part of their overall emissions profile. The broader wine sector footprint is strongly influenced by value-chain emissions, particularly packaging and transport.

Wine Australia's roadmap identifies industrial processes and supply chain emissions, transport, winery operations and vineyard operations as key parts of the Australian wine sector emissions profile. Packaging materials, particularly glass bottles, can be material because they contribute to both manufacturing emissions and transport weight.

Lightweight bottles and lower-energy glass production are therefore important sector-wide opportunities. Several WA wine subsector respondents also reported moving to lightweight glass bottles as part of their energy and emissions-related actions.

Transport is also material, particularly for wineries supplying interstate or international markets. Road transport, shipping, distribution and cold chain requirements can affect total product emissions and customer-facing sustainability credentials.

While this Study focuses on operational emissions and energy use, understanding broader supply chain emissions is increasingly important as customers, export markets, retailers and distributors seek emissions information.

Operational emissions are the starting point; packaging and transport are the next frontier.

Wineries can start by understanding emissions from electricity, fuel and refrigerants, but a more complete view of the emissions footprint will need to consider bottle weight, packaging materials, freight and distribution.

What is driving action and what is holding wineries back

Cost is the strongest driver for energy action across the food and beverage survey sample, and this is highly relevant for wineries. Electricity costs are particularly important where refrigeration, cold stabilisation, storage, pumping or bottling are material. For wineries operating cellar doors, restaurants or accommodation, customer-facing energy loads also add to operating costs.

Study insights indicate that affordability is the primary barrier for wineries. **High upfront costs were identified by around 92% of wineries**, making capital investment the clearest constraint. Compared with other subsectors, wineries were more likely to cite unclear financial benefits and limited internal resources as barriers. This suggests that investment decisions are influenced by both cost constraints and challenges in assessing options, quantifying payback, and building confidence in the business case.

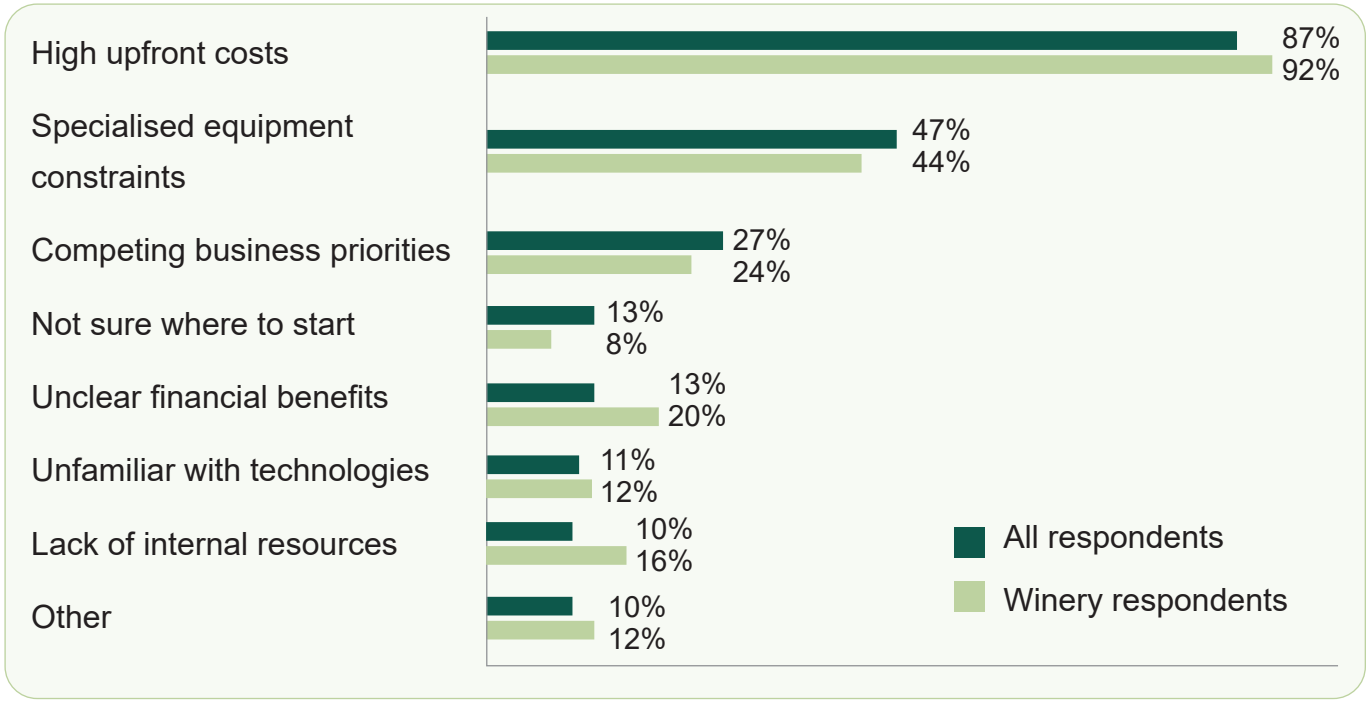

Figure 3: Barriers to energy efficiency for wineries

These barriers are understandable. Winery equipment is highly specialised and closely linked to product quality, vintage timing and production risk. Replacing refrigeration plant, bottling equipment, pumps, compressors or hot water systems can be expensive and disruptive. Many wineries are also seasonal businesses, meaning that capital decisions must be planned around vintage cycles, cash flow and equipment availability.

Capability can be as important as capital. Many wineries operate with lean teams focused on production, vintage management, sales, tourism and day-to-day operations. Even where energy-saving opportunities are identified, businesses may lack the time, technical expertise or internal resources to assess technologies, interpret energy data or prioritise investments alongside other operational demands. This suggests that practical advisory support, peer learning opportunities and access to trusted technical guidance may be just as valuable as direct financial assistance.

Wineries need both practical and commercial support to understand where energy is being used, identify the highest-value opportunities, assess payback, and plan upgrades around normal maintenance, replacement or expansion cycles.

92%

of wineries identified high upfront cost as a barrier to improving energy efficiency

Barrier	Consideration
High upfront cost	Larger upgrades such as chillers, refrigeration systems, battery storage, solar expansions or process technology can require significant capital.
Specialised equipment	Winery equipment must protect wine quality, production timing and storage requirements.
Seasonal demand	Energy use can peak during vintage, making investment decisions more complex.
Technical uncertainty	Businesses may be unsure which technologies are suitable or reliable for their site.
Grid and export constraints	Some sites may face limits on solar export, connection capacity or network constraints.
Competing priorities	Wineries are managing production, labour, tourism, marketing, stock, cash flow and export uncertainty.
Data limitations	Without sub-metering or energy management systems, it can be difficult to identify the best opportunity or prove the business case.
Capability	Smaller wineries may have insufficient sustainability or energy management expertise, making it harder to identify opportunities, assess technologies and develop investment-ready business cases.

WA wineries are already acting, but larger changes require better data, stronger business cases, credible technical advice and practical support.

The future: a practical pathway for wineries

Reducing energy use and emissions presents both a sustainability and a business resilience opportunity for WA wineries. It also supports the direction already established by the Western Australian Wine Sustainability Advancement Program (WAWSAP). Led by Wines of Western Australia with DPIRD, Wine Australia, regional associations and other partners, WAWSAP brings together environmental stewardship, climate action and industry collaboration. Energy efficiency and emissions reduction contribute to its objective of reducing emissions and building resilience, while complementing broader work on water security, biodiversity, soil health, circular economy practices and sustainability certification.[8]

The wine subsector has strong seasonal peaks, high product quality expectations and persistent cost pressure. Energy use is shaped by vintage activity, refrigeration and tank cooling, pumping, bottling, wine storage, hot water, lighting, HVAC, cellar door operations and, for some businesses, vineyard fuel use. This means lower-emissions winemaking needs to be practical, staged and aligned to each winery's production cycle, site configuration, visitor operations and investment capacity.

The Study indicates many WA wineries are already taking action through site infrastructure upgrades, equipment improvements, operational changes and renewable energy. However, emissions tracking is at an early stage for much of the subsector. Improving visibility is the next opportunity: turning electricity, fuel and refrigerant data into a simple baseline that can be linked to production activity such as tonnes of grapes crushed, litres produced, cases bottled, trading days or cellar door activity.

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

Measure: understand where energy and emissions arise

The first step is to **measure** energy use and emissions by establishing a practical Scope 1 and Scope 2 baseline. For wineries, this should go beyond whole-site electricity use where possible, as annual bills may not show whether refrigeration, bottling, pumps, cellar door operations, irrigation or hospitality activity are driving demand. Better visibility of energy use can inform stronger business cases that justify upgrades to equipment and systems. Wines of Western Australia's Carbon Smart Hub provides practical tools and guidance to help producers understand, measure and reduce emissions, while the WAWSAP Wine Forward Climate Resilience Program integrates carbon-footprint measurement with climate-risk assessment and adaptation planning.[9]

8 Wines of Western Australia, Western Australian Wine Sustainability Advancement Program projects; Wines of Western Australia n.d., Driving sustainability in WA wine.

9 Wines of Western Australia, Carbon Smart Hub; Wines of Western Australia n.d., Wine Forward Climate Resilience Program.

Optimise: improve the systems already in place

The next step is to **optimise** existing systems through lower-cost operational improvements, including optimising **refrigeration and cooling systems**, improving tank insulation and cool room management, and reviewing pumping and cold stabilisation practices. Additional savings can be achieved by improving compressed air, lighting, hot water and HVAC systems, and shutting down equipment when not in use. Optimisation is particularly important during vintage, when small improvements to cooling, pumping and operating controls can reduce avoidable energy use during peak periods. For wineries with cellar door operations, aligning lighting, refrigeration and climate control with trading hours can further moderate energy consumption. Lastly, **environmental initiatives** such as land regeneration, water stewardship, erosion control and biodiversity enhancement can strengthen sustainability outcomes and support industry certification programs.

Upgrade: invest when the business case is clear

Wineries can then **upgrade** equipment and controls where there is a clear business case. Key opportunities include installing **high-efficiency cooling and refrigeration systems**, optimising glycol controls, improving tank insulation and transitioning to lower-impact refrigerants. Additional benefits can be achieved through variable speed drives, efficient hot water systems and alternative cold stabilisation methods. **Digital tools** such as energy management software, monitoring systems and automated controls can help identify savings and improve energy management, while solar PV and battery storage can reduce reliance on grid electricity. Efficiencies may also be realised through upgraded bottling equipment, lightweight packaging and improved HVAC systems in cellar door and hospitality areas. Timing is important, as many upgrades are most practical when aligned with equipment replacement, production expansion, site works or changes to bottling, storage or cellar door operations.

Heat pumps reduce LPG use at Port Phillip Estate

Port Phillip Estate replaced a 130 kW LPG boiler with two 19 kW heat pumps supplying hot water to its bottling operations, cellar door, kitchens and accommodation. The system was integrated with existing solar hot-water infrastructure and a 99.8 kW rooftop solar system. Annual LPG consumption was expected to fall from approximately 26,000 litres to below 14,000 litres—a reduction of more than 46%—while improving hot-water reliability. Subsequent reporting estimated annual gas-bill savings of $6,000–$8,000.[10]

The project demonstrates how electrifying hot-water production can reduce direct fuel use and Scope 1 emissions.

10 Australian Alliance for Energy Productivity (2025), Video site tour of award-winning heat pump system at Port Phillip Estate and Kooyong Wines vineyard.

Decarbonise: shift remaining demand to lower-emissions energy

Over time, wineries can **decarbonise** by shifting remaining demand to lower-emissions energy and technologies where practical. This may include renewable electricity procurement, electrification, heat pumps, low-impact refrigerants, electric equipment, battery storage, lightweight packaging and lower-emissions transport options where relevant.

Connecting businesses with practical industry support

The Study shows that WA wineries are motivated to act, but that larger projects may be constrained by upfront cost, seasonal disruption, site constraints, limited staff resourcing and the need to protect wine quality and production continuity. Practical support will therefore be important, including grants, energy audits, equipment advice, renewable energy guidance, feasibility studies, business case support and case studies from comparable wineries.

Reducing energy use and emissions presents both a sustainability and a business resilience opportunity for WA wineries. It also supports the direction already established through the WAWSAP. WAWSAP is a nine-partner consortium initiative led by Wines of Western Australia, funded by the Australian Government through the Climate-Smart Agriculture Program under the Natural Heritage Trust.

WAWSAP's establishment was enabled by the Western Australian Wine Industry Partnership (WIP), an industry-led initiative supported by the WA Government through DPIRD, as a key delivery vehicle for the WIP's Sustainability Strategy. The program brings together environmental stewardship, climate action and industry collaboration. In particular, energy efficiency and emissions reduction contribute to its climate action objective of reducing emissions and building resilience, while complementing broader work on water security, biodiversity, soil health, circular economy practices and sustainability certification.[11]

The opportunity for WA wineries is to reduce avoidable energy use, manage exposure to energy costs, improve refrigeration and production efficiency, and strengthen sustainability credentials in domestic, export and tourism markets. The transition to lower-emissions wine manufacturing will depend on a combination of better data, smarter cooling, improved operational controls, staged investment, and practical support tailored to the operational and commercial realities of wine manufacturing.

11 Wines of Western Australia, Sustainability Certification Support Vouchers.

Wine Manufacturing

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

Step 1: measure

Establish simple and repeatable baseline data

- **Capture energy and emissions:** electricity, natural gas, LPG, diesel, petrol, refrigerants
- **Capture activity:** tonnes of grapes crushed, litres produced, cases bottled, trading days, cellar door activity, irrigation activity
- **Track:** 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	**Storage and process control**	**Compressed air and site services**	**Hospitality and cellar door**	**Environment conservation and biodiversity**

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

Step 3: upgrade

Make targeted investments in equipment and controls

Cooling and refrigeration	**Process and utility systems**	**Digital and on-site energy**	**Packaging and site improvements**

Opportunities: production
Cooling, pumping, bottling, storage

Opportunities: wine sales / hospitality
HVAC, lighting, kitchen, refrigeration, visitor facilities

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

Step 4: decarbonise

Plan for longer-term decarbonisation opportunities

Renewable electricity	**Solar PV and battery storage**	**Electrification**	**Heat pumps**
Lower-impact refrigerants	**Electric vineyard equipment**	**Wastewater and organic waste recovery**	**Lower-emissions packaging and transport**

Site-specific options best suit wineries with suitable load profiles, planned equipment upgrades, or strong market drivers for lower-emissions production


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