Energy Action Plan

2024 – 2030

UNIVERSITY of TASMANIA

Version	Date	Author	Revision
0.1	May 2024	Campus Services	Initial draft
0.2	September 2024	Campus Services	Draft
0.3	May 2025	Campus Services	Final draft

Table of Contents

Table of Contents **ii**

Glossary **1**

Introduction **2**

Objectives 2

Scope 2

Development 3

Actions **10**

Energy Reduction 10

Emissions Reduction 13

Energy Security 15

Appendix **17**

Background 17

Benchmarking 19

Forecast 28

Energy management initiatives to date 29

Glossary

Carbon	In this document, carbon refers to all greenhouse gases included in the Kyoto Protocol.
Climate Active	Climate Active is the only government accredited carbon neutral certification scheme in Australia. Climate Active and Climate Active Carbon Neutral Standard support and guide businesses as they account for and reduce carbon emissions.
CO_2-e	Carbon dioxide equivalent. A measure that allows comparison of the emissions of other GHGs relative to one unit of CO_2, that is, their global warming potential (GWP) over 100-year period.
EEF	Energy Efficiency Framework
EFTSL	Equivalent full time student load
ERSP	Emissions Reduction Strategic Plan
GHG	Greenhouse gas (e.g., methane, carbon dioxide, nitrous oxide)
KPI	Key performance indicator
Scope 1 emissions	Direct emissions from sources within an organisation's boundary and due to that organisation's activities.
Scope 2 emissions	Indirect emissions associated with a purchased energy product (e.g., electricity).
Scope 3 emissions	Indirect emissions generated in the wider economy because of an organisation's activities but physically produced by the activities of another organisation.
UTAS	University of Tasmania

Introduction

Energy markets are volatile and trend irrevocably higher in cost due to market conditions, underlying production cost, or both. Barriers that constrained demand for alternative fuels and energy sources have reduced, though are often subject to the same volatility. Due to this and environmental reasons, businesses and individuals are more actively managing their energy through technological solutions such as batteries, behind the meter solar, EV vehicles and control systems linked to electricity demand which are becoming less cost prohibitive.

The Energy Action Plan aligns with the University's longer term holistic sustainability goals that seek to deliver the best outcomes while balancing the economic, social and environmental impacts of choices made with respect to energy supply and use. This plan presents the need to consider climate adaptation, resiliency and work for a climate positive future when choosing options that provide a secure long-term energy supply to the University.

Objectives

The Energy Action Plan's objectives are to:

1. enable the various environmental and financial sustainability strategies and goals of the University
2. reduce energy consumption
3. reduce carbon emissions and
4. increase energy security

Scope

The scope of the Energy Action Plan is to secure long-term energy supply that enables the University to meet its mission. This includes analysis of the University's supply and demand requirements, cost and consumption for the University's building infrastructure, including the energy-related aspects of carbon emission and reduction activities. It excludes non-electric transport energy which is included in the University's Sustainable Transport Strategy 2022-2032. Energy-related greenhouse gas emissions are also covered in the Emissions Reduction Strategic Plan 2022-2030.

Buildings currently closed and planned to be closed have been excluded.

Development

This plan builds on previous work undertaken within the Environmental Management Plan (EMP) 2009 – 2011 and Energy Strategic Plan 2018 – 202-2023 both of which focused on energy consumption and greenhouse gas emissions, including measurement and performance indicators.

The development of the Energy Action Plan also includes commitments made in the University Emissions Reduction Strategic Plan 2022-2030 (Table 1). This plan also responds to priorities included within external tools such as the Times Higher Education Impact Rankings and the Sustainability Tracking, Assessment and Rating System (STARS) (Table 2).

Cost

The total capital value of the plan is estimated to be approximately $22m over the five years excluding actions subject to return on investment. Most of the capital cost relates to the replacement of natural gas use with electricity-based systems with approximately $8.6m required for Sandy Bay campus buildings likely to be refurbished under the larger redevelopment plan.

The operational cost of the plan, excluding actions satisfied with existing resources, is predominately the nominal value of securing certified renewable electricity worth $5m over the five years.

Implementation

Elements of this Energy Action Plan are already underway or about to start, while others require routine monitoring of the required conditions to enable both initiation and progress.

Given this and the changing nature of the University operating environment (property and revenue) the delivery of actions will be determined annually through a combination of budgeting process and prioritisation by relevant governing roles and bodies. For this plan in particular activity will be reported

to and governed by the University Executive Team Sustainability Working Group with support from the Sustainability Committee. Decisions made that might reflect initiative timeframes or focus areas will be reflected in updated versions of this plan.

Table 1. *Targets and relevant actions from the University Emissions Reduction Strategic Plan 2022-2030.*

Plan	Category	Targets	Relevant actions
Emission Reduction Strategic Plan 2022 - 2030	Electricity	Reduce gross emissions by at 5-10% by 2025 from a 2015 baseline year	Deliver power purchase agreement (PPA) agreements through renewable sources where feasible, to contribute to minimising grid-based carbon emissions
			Install behind the meter on-site renewable energy systems, where practicable
		Reduce gross emissions by at 45-55% by 2030 from a 2015 baseline year	Upgrade existing non-base building electric elements to maximise efficiency
			Ensure new builds and major refurbishments achieve a 10% or better reduction in energy intensity
	Natural gas and non-transport fuels	Reduce gross emissions by at 20-25% by 2025 from a 2015 baseline year	Conversion of existing equipment using natural gas to electric, while all new equipment is electric
			Replace fossil-fuel powered generators with non-fossil fuel powered systems
		Reduce gross emissions by at 85-95% by 2030 from a 2015 baseline year	Replace unregistered fossil fuel vehicles and equipment (e.g., forklifts, farm equipment)
			Replace LPG cooking equipment with electric, including cafes and outdoors BBQs

Table 2. *Performance and relevant criteria based on external ranking systems.*

Ranking / Rating system	2024 Performance	Category	Relevant criteria
Times Higher Education Impact Rankings	Overall: 2nd (Score: 98.5/100) SDG 13: Climate Action: 1st (Score: 92.7/100) SDG 7: Affordable and Clean Energy: 87th (Score: 70.5/100)	SDG 7: Affordable and Clean Energy	Have a policy in place for ensuring all renovations or new builds are following energy efficiency standards
			Have plans to upgrade existing buildings to higher energy efficiency
			Have a process for carbon management and reducing carbon dioxide emissions
			Have an energy efficiency plan in place to reduce overall energy consumption
			Undergo energy reviews to identify areas where energy waste is highest
			Have a policy on divesting investments from carbon-intensive energy industries notably coal and oil
			Total energy used per floor space of university buildings
			Proportion of energy from low-carbon sources (new from the 2025 rankings)

			Provide programmes for local community to learn about importance of energy efficiency and clean energy
			Promote a public pledge toward 100% renewable energy beyond the university
			Provide direct services to local industry aimed at improving energy efficiency and clean energy (energy efficiency assessments, workshops, research renewable energy options)
			Inform and support governments in clean energy and energy-efficient technology policy development
			Provide assistance for start-ups that foster and support a low-carbon economy or technology
		SDG 13: Climate Action	Measure the amount of low carbon energy used across the university
			Proportion of energy from low-carbon sources
Sustainability Tracking, Assessment & Rating System 3.0	Current: Gold (Score: 73.80/100) Target: Platinum (Score:85/100)	OP 2: Building Operations and Maintenance	100 percent of its existing buildings are A) managed under a green cleaning program, *B) individually assessed for energy performance*, C) individually assessed for indoor environmental quality (IEQ) performance, D) managed or individually assessed for water performance, and E) third party certified to a green building standard

OP 5: Energy Use	Annual energy consumption per gross square meter of floor area is less than or equal to a benchmark for its peer group
	Annual energy consumption per full-time equivalent of students and employees is less than or equal to a benchmark for its peer group
	100 percent of its annual energy consumption is from renewable sources
	100 percent of electricity from on-site or certified renewable sources
OP 6: Greenhouse Gas Emissions	Completed one or more inventories within the previous three years to quantify its emissions from at least nine of the sources listed
	Achieved zero scope 1 and 2 GHG emissions per square metre
	Achieved zero scope 1 and 2 GHG emissions per person
	Achieved zero adjusted net scope 1 and 2 GHG emissions
OP13: Vehicle Fleet	Number of cars, vans, trucks, and buses in the institution's fleet that are zero emission vehicles (ZEVs) (required). Include battery electric vehicles (BEVs) and hydrogen fuel cell electric vehicles (FCEVs)

		Number of cars, vans, trucks, and buses in the institution's fleet that are plug-in hybrid electric vehicles (PHEVs)

Furthermore, actions are also informed by the University's Energy Efficiency Framework (EEF)[1] which measures the University's energy performance. A high-level assessment of organisational performance based on the EEF's 'M1 Assessment Tool' shows that the University has a performance score of "Good" and highlights opportunities for improvement (Table 3). Further information on the University's performance score and the EEF can be found in the Appendix.

Table 3. *Organisational performance assessment results.*

Level	Average	Score	Percentage	Ranking
Energy management	2.75 / 5	16 .5/ 30	55%	GOOD
Financial management	3.17 / 5	19 / 30	63%	BETTER
Awareness and information	2.92 / 5	17.5 / 30	58.3%	GOOD
Technical	2.83 / 5	17 / 30	57%	GOOD
Maintenance, monitoring & targeting	2.57 / 5	18 / 35	51.4%	GOOD
Overall performance	**2.84 / 5**	**88 / 155**	**56.8%**	**GOOD**

[1] Energy Efficiency Framework V5.pdf

Actions

Actions within this plan are categorised into energy reduction, emissions reduction, and energy security.

Energy Reduction

The primary energy source used by the University is electricity and therefore is a significant focus area for improved efficiency of use to minimise costs and reduce carbon emissions. Electricity is used for HVAC (heating, ventilation, and cooling), fire detection, vertical transportation, artificial lighting, domestic hot water and power for various appliances and equipment for teaching, research, and administrative activities. Electricity is also being increasingly used in place of fossil fuels for electric fleet vehicles and electric equipment for grounds maintenance.

Delivering 'electrification' of the University's buildings (i.e., transitioning from natural gas and other fossil fuels, including for fleet vehicles) will result in greater demand for electricity, but will decrease the University's demand for energy due to greater efficiency. The University has increased its total building footprint with the development of the Inveresk precinct, and this will increase further once the Forestry development and the Taroona development conclude. The University has a Building Consolidation project underway. To date 30,000 SQM of gross floor area has been closed at Newnham and Sandy Bay and another 17,000 SQM of gross floor area is planned in the next 12-18 months. Within the Hobart city several leaseholds will be concluded in 2025/26.

Enablers

The following enablers are critical in facilitating actions to be progressed or initiated:

- Building design scopes and guides to clarify energy efficiency requirements
- Reduction of building floor space through consolidation (closures, sales, optimised scheduling) and exiting low utilised leasehold properties
- Behaviour change initiatives to reduce use (e.g., turn down thermostats, lights off, IT/AV equipment)
- Effective data collection and maintenance

- Available technology (e.g., sensors, building management systems)
- Opportunity matching financial means

Actions

#	Action	KPIs / Targets	End By	Cost Level	Responsibility	Notes
1.1	Improve energy information and accessibility for staff and students for behavioural / process change	Engagement measured by sustainability survey	Ongoing	Nil	Sustainability and Campus Services	• Existing Green impact program • Sustainability Survey results • Building energy use / efficiency / cost reporting
1.2	Advanced forecasting of energy usage		Ongoing	Nil	Campus Services	• Use of data analytics
1.3	Automated energy usage monitoring		Ongoing	Nil	Campus Services	• Automatic detection of anomalies, or irregular and unconventional usage
1.4	Engage the contracted services market for identification, financing (if required) and delivery of energy reduction measures for buildings.	100% of applicable m^2 evaluated/covered	2030	$m	Campus Services	• Applied to pre 2010 constructed buildings only • ERSP action item: refurbishment / replacement of artificial lighting

#	Action	KPIs / Targets	End By	Cost Level	Responsibility	Notes
1.5	Ensure new builds and major refurbishments achieve a 10% or better reduction in energy intensity compared to reference designs		Ongoing	Nil	Campus Services	• ERSP action item • Cost (if any) captured project scoping
1.6	Update and Continue measurement of University performance against the energy efficiency framework		Ongoing	Nil	Campus Services	• This will be done annually
1.7	Replace all natural gas fired heating with refrigerant based electric	No heating using natural gas	2030	$20m capex	Campus Services	• ERSP action item: conversion of existing equipment using natural gas to electric, while all new equipment is electric
1.8	Replace gas fired cooking equipment with electric	No fixed cooking equipment using gas	2030	$250k capex	Campus Services	• ERSP action item: replace LPG cooking equipment with electric, including cafes and fixed outdoors BBQs

Emissions Reduction

While reduction in energy use will deliver an emissions reduction, actions in this section are specifically for the purpose of emissions reduction and associated benefits including financial sustainability.

Enablers

The following enablers are critical in facilitating actions to be progressed or initiated:

- Opportunity matching financial means
- Onsite electricity generation feasibility
- Effective data collection and maintenance

Actions

#	Action	KPIs / Targets	End by	Cost Level	Responsibility	Notes
2.1	Procure green rights (i.e., LGCs) to acquit electricity carbon emissions under the Climate Active program (and other ratings/rankings)	Grid electricity has zero carbon emissions	2030	$1m opex	Finance and Campus Services	• ERSP action item • A bundled PPA is likely to yield best cost opportunity and may or may not be favourable to market pricing and affordability but can deliver real and intangible renewable grid supply • Entirely dependent on financial means
2.2	Install behind the meter on-site renewable energy systems, where financially beneficial and practicable		2030	$2m capex	Campus Services	• Financial return of half asset life required to achieve financial sustainability • Cost level excludes roof renewal and other enabling building backlog works

#	Action	KPIs / Targets	End by	Cost Level	Responsibility	Notes
2.3	Install behind the meter electricity storage to maximise on-site renewable generation, where practicable	Less than 5% of electricity generated exported to the grid	2030	$200k	Campus Services	• Current financial sustainability of batteries is low but is improving and viable in right use case • Use cases limited currently • Retention and use of on-site renewable generation displaces grid/PPA supplied
2.4	Install EV charging infrastructure	As per ERSP / transport strategy	2030	$165k capex	Campus Services	• Main campuses completed already • Public fast chargers to support intercampus travel and fleet emergency • Slower return-to-base off peak charging for fleet

Energy Security

Energy supply is critical to the operation of the University. While disruptions are very rare, they can and will occur and actions are required to ensure continuity of supply for the most critical of operations.

Enablers

The following enablers are critical in facilitating actions to be progressed or initiated:

- Alternative fuels with same or better characteristics
- Currency and testing of business continuity planning
- Effective data collection and maintenance
- Opportunity matching financial means

#	Action	KPIs / Targets	End by	Cost Level	Responsibility	Notes
3.1	Establish systems for continuity of supply for critical operations as identified in business continuity planning	100% of critical supplies have immediate continuity or suitable plans	2025	$k	Campus Services	• Significant majority covered already • Systems may be generators, batteries, UPS or means of connecting generator • Cost level per project basis and capex bid
3.2	Ensure suitable maintenance programs are in place for emergency power and critical energy distribution and protection assets	No asset failures	Ongoing	Nil	Campus Services	• Generators, UPS, transformers, distribution boards, protection devices, surge diverters, etc.

#	Action	KPIs / Targets	End by	Cost Level	Responsibility	Notes
3.3	Automated power quality monitoring	No out of tolerance events	Ongoing	Nil	Campus Services	• Applies to sites with high voltage distribution • Noise or adverse electricity will damage equipment and cause disruption
3.4	Evaluate and monitor viability of electricity storage to respond to the electricity market and manage peak demands		2030	$m capex (if undertaken)	Campus Services	• Financial basis only for undertaking • Cost efficiency with scale (i.e., few large) • Behind meter at large sites (NH & SB) or offsite, ideally co-located with utility scale renewable generator

Appendix

Background

The University's energy context is comparatively unique compared to its counterparts nationally and internationally. It is the only tertiary education institution for the whole state and possesses multiple, geographically separate campuses. Its main source of energy is hydro-generated electricity. Peers, nationally and internationally, often have energy supplies that have much higher environmental impacts as they have an increased reliance on generation sourced from fossil fuels.

The University consumed 213,103 GJ of non-transport energy in 2024, which primarily consisted of electricity (80.7%), followed by natural gas (18.9%) and non-transport fuels (0.4%). Approximately 0.6% of the electricity consumed was self-generated through photovoltaic systems on the University's facilities. Photovoltaic systems currently installed at the University are listed in Table A1.

Table A1. *Photovoltaic systems installed at University facilities and total generation in* ***2024****.*

Installation	Size (kW)	Year Installed	2024 Generation (kWh)
Bisdee Tier^	5.9	2011	6,300
Source Wholefoods^	1.9	2012	2,300
Bike Hub, Sandy Bay^	2.5	2013	3,000
Social Sciences, Sandy* **Bay**	20	2013	24,751
Building V, Newnham*	31.2	2014	40,561
Bike Hub, Inveresk	2.5	2014	-
Inveresk Apartments	40.3	2015	29,796
Inveresk Architecture*#	20.7	2019	-
IMAS Taroona	81.7	2023	100,019
Philip Smith Centre	6.6	2024	6,240
Rotary Dairy	29.2	2024	30,042

Installation	Size (kW)	Year Installed	2024 Generation (kWh)
NW Rural Clinical School	29.9	2024	14,443
Atrium Apartments	36.9	2024	41,201
TOTAL	**309.3**		**298,651**

^ Estimated (unmetered)

* Tasmanian University Student Association re-power

Based on 31,766 tCO_2-e of greenhouse gas emissions (all scopes) produced by the University in 2024, 27.4% was attributed to energy use. 1 shows the University's carbon footprint (all scopes) associated with energy use as reported to Climate Active for carbon neutral certification since 2015.

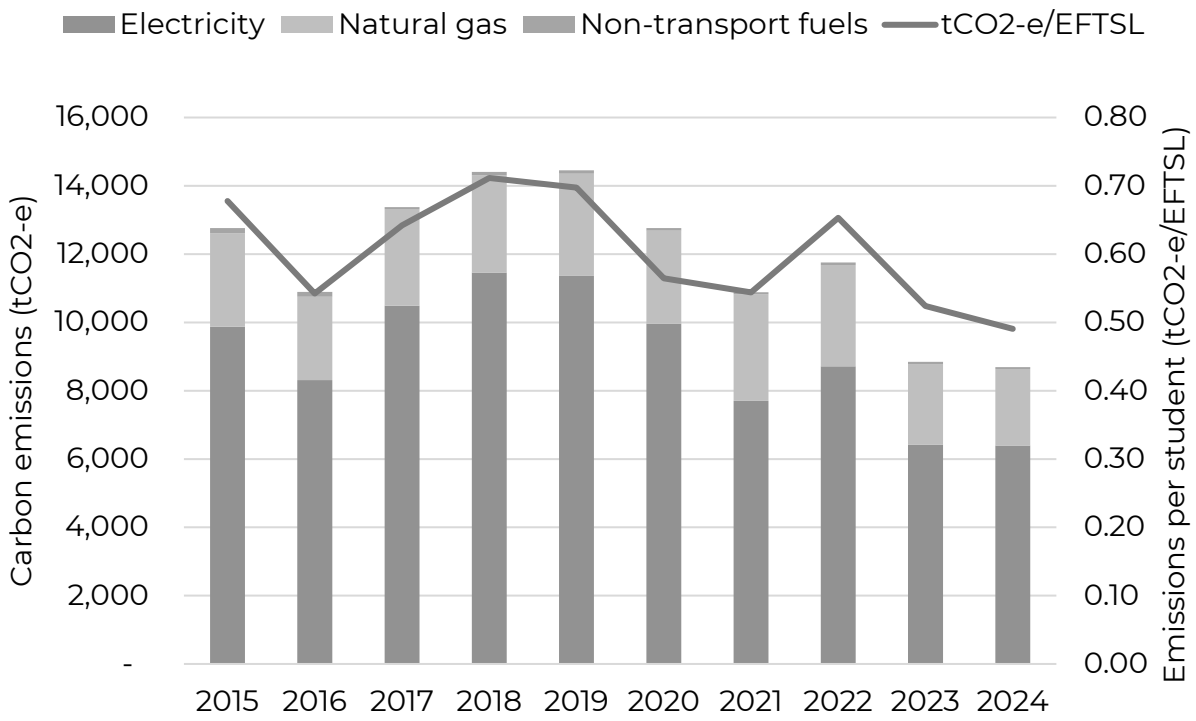


Figure A1. *Historical GHG emissions (all scopes) and per EFTSL (Australian-based students only) for energy use as reported to Climate Active.*

Benchmarking

The Tertiary Education Facilities Management Association (TEFMA) annual survey of energy use and carbon emissions is used to assess and benchmark the University's energy performance against the baseline year and its peers. The scope of the TEFMA survey covers energy used by the University's built environment and excludes spaces used primarily for student accommodation.

The University was reported to consume 189,027 GJ of energy in 2023, 10.5% lower than the baseline year. However, as numerous external factors influence the University's energy use, it needs to be rationalized by the number of students and floor area of facilities to evaluate its performance more accurately.

Table A2 and Figure A2 respectively show the University's historical and current energy, carbon emissions (Scope 1 and Scope 2) and energy cost benchmarks as reported in the TEFMA surveys.

Table A2. *Energy benchmark performance from the 2015 and 2023 TEFMA survey.*

Benchmark	2015 (Baseline)	2023 (Current)	Change
Energy (GJ/GFA m2)	0.68	0.63	-7.35%
Energy (GJ/EFTSL)	11.22	11.34	1.07%
Emissions (tCO2-e/EFTSL)	0.66	0.43	-35.12%
Cost ($/EFTSL)	308.50	358.00	16.05%

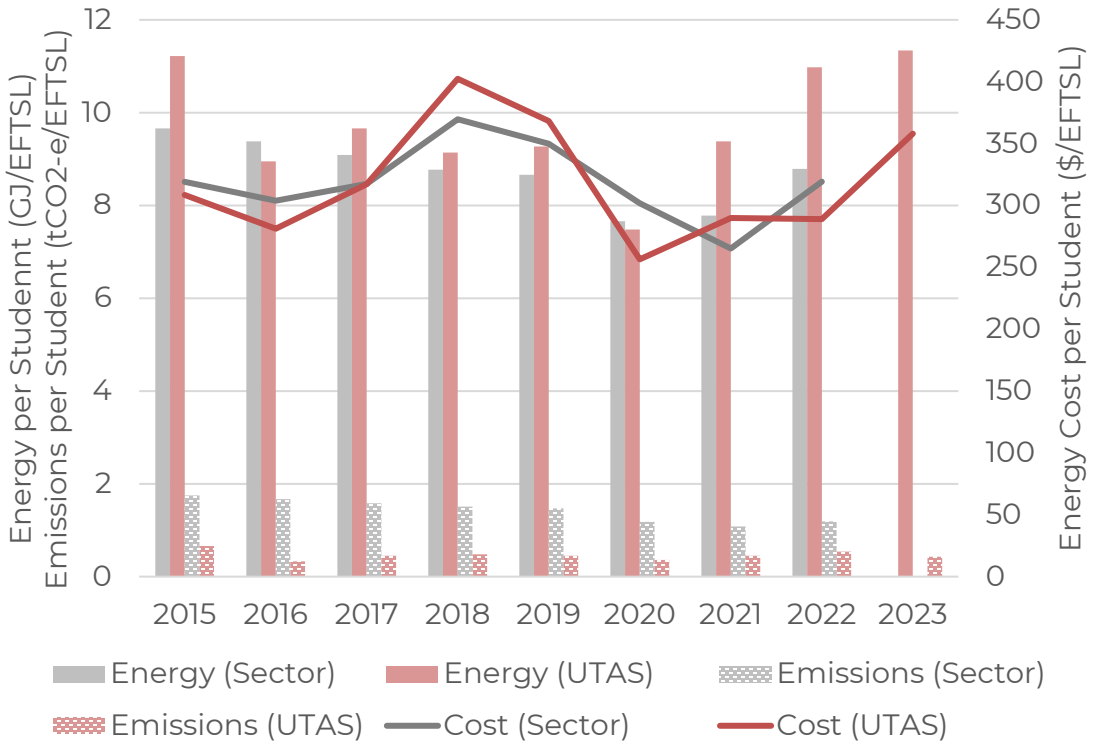


Figure A2. *Historical energy benchmark performance from the TEFMA survey. Sector data for 2023 have not been released.*

Several key factors are to be considered in assessing the University's performance:

- A high degree of volatility in student enrolment has been observed in recent years, with a high in 2020 and a sharp decline in 2023. The COVID-19 pandemic, rising costs of living and changing student desires are some of the factors impacting on student enrolments in higher education, particularly in regional areas.
- Emission factors used for different energy sources are updated and released by the Australian Government annually. Tasmania's electricity emission factor is lower than other states due to the greater proportion of renewables in Tasmania's generation mix. The latest Tasmanian emission factors for electricity and natural gas in 2023 are 36.11 and 55.53 kgCO2-e/GJ respectively.
- Several influencing factors impact on energy prices which include, but not limited to, the closure of mainland coal fired power stations, gas pipeline costs and increased gas exports. Figure A3 illustrates the fluctuation in the cost rates for electricity and natural gas incurred by the University since 2016.

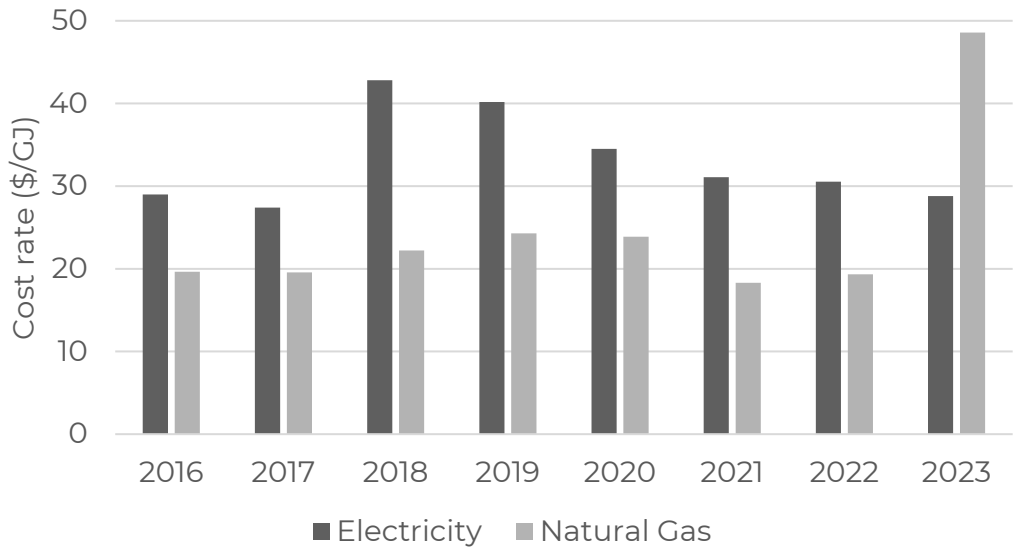


Figure A3. *Energy cost rates for electricity and natural gas.*

The University's Energy Efficiency Framework (EEF) is used to measure and assess the maturity status of the organisation around energy efficiency. The measures included in the framework allows opportunities to enhance organisational energy efficiency to be identified. The proportion of the score achieved against the score possible for each measurement criteria provide current performance level and were ranked as in Table A3.

Table A3. *Ranking of performance scores.*

Performance Ranking	%
Needs improvement	0 - 45
Good	45 - 60
Better	60 - 85
Best	85 - 100

Assessment against key criteria of energy management including financial, awareness and information, and technical aspects identified that the University achieved a performance score of "Good". Assessment areas of note for improvement include:

- Policy, clear management structure, communication & marketing channels
- Information systems, reporting of energy use and efficiency to staff and students, energy efficiency awareness

- Existing plant & equipment selection & condition, ongoing training
- System accuracy, data sources, maintenance & monitoring

The scores achieved against each measurement criteria are indicated in the tables below by shading.

Table A4. *Performance scores for Energy Management criteria.*

Score	Energy policy	Organising	Motivation	Information Systems	Marketing	Investment
5	Energy policy, action plan and regular review have commitment of top management as part of an environmental strategy	Energy management fully integrated into management structure. Clear delegation of responsibility for energy consumption. Energy committee established	Formal and informal channels of communication regularly exploited by energy manager and energy staff at all levels	Comprehensive systems set targets, monitor consumption, identify faults, quantify savings and provide budget tracking	Marketing the value of energy efficiency and the performance of energy management both within the organisation and outside it.	Positive discrimination in favour of 'green' schemes with detailed investment appraisal of all new-build and refurbishment opportunities
4	Formal energy policy, but no active commitment from top management	Energy manager accountable to energy committee representing all users. Clear line management and authority	Energy committee used as main channel together with direct contact with major users	Metering & tracking reports for individual premises based on submetering. Achieved performance against targets reported.	Programme of staff awareness and regular publicity campaigns	Same payback criteria employed as for all other investment
3	Unadopted energy policy set by energy manager or senior departmental manager	Energy manager in post, line management and authority are clear, no energy committee	Contact with major users through ad hoc committee chaired by senior departmental manager	Monitoring and targeting reports based on supply meter data. Energy unit has ad hoc involvement in budget setting	Some ad hoc staff awareness and training	Investment using short-term payback criteria only
2	An unwritten or uncoordinated set of guidelines	Energy management is the part-time responsibility of someone with limited authority or influence	Informal contacts between engineer / technical staff and a few users	Cost reporting based on invoice detail. Engineer compiles reports for internal use within technical department	Informal contacts used to promote energy efficiency	Only low-cost measures taken
1	No explicit policy	No energy management or any formal delegation of responsibility for energy consumption	No contact with users	No information system. No accounting for energy consumption	No promotion of energy efficiency	No investment in increasing energy efficiency in premises

Table A5. *Performance scores for Financial Management criteria.*

Score	Identifying opportunities	Exploiting opportunities	Management information	Appraisal methods	Human resources	Project funding
5	Detailed energy surveys are regularly updated. Lists of high- and low-cost opportunities already costed and ready to proceed immediately	Formal requirement to identify the most energy-efficient option in all new-build, refurbishment and plant replacement projects. Decisions made based on life cycle costs	Full management information system enabling identification of past savings and further opportunities for investment meeting organisations financial parameters	Full discounting methods using internal rate of return and ranking priority projects as part of an ongoing investment strategy	Board takes a proactive approach to a long-term investment programme as part of a detailed environmental strategy in full support of the energy management team	Projects compete equally for funding with other core business investment opportunities. Full account taken of benefits which do not have direct cost benefit, e.g. marketing opportunities, environmental factors
4	Energy surveys conducted by experienced staff or consultants for buildings likely to yield largest savings	Energy staff are required to comment on all new-build, refurbishment and plant replacement projects. Energy efficiency options often approved but no account is taken of life cycle costs	Promising proposals are presented to decision-makers but insufficient information (e.g. sensitivity or risk analysis) results in delays or rejections	Discounting methods using the organisations specified discount rates	Energy manager working well with accounts/ finance department to present well-argued cases to decision makers	Projects compete for capital funding along with other business opportunities, but have to meet more stringent requirements for return on investment
3	Regular energy monitoring / analysis identifies possible areas for saving	Energy staff are notified of all project proposals with obvious energy implications. Proposals for energy savings are vulnerable when capital costs are reduced	Adequate management information available, but not in the correct format or easily accessed in support of energy-saving proposals	Undiscounted appraisal methods – e.g. gross return on capital	Occasional proposals to decision makers by energy manager with limited success and only marginal interest from decision makers	Energy projects not formally considered for funding from capital budget, except when very short-term returns are evident
2	Informal ad hoc energy walkabouts conducted by staff with checklists to identify energy-saving measures	Energy staff use informal contacts to identify projects where energy efficiency can be improved at marginal cost	Insufficient information to demonstrate whether previous investment in energy efficiency has been worthwhile	Simple payback criteria are applied. No account taken of lifetime of the investment	Responsibility unclear and those involved lack time, expertise and resources to identify projects and prepare proposals	Funding only available from revenue on low-risk projects with paybacks of less than one year
1	No mechanism or resources to identify opportunities	Energy efficiency not considered in new-build, refurbishment or plant replacement decisions	Little or no information available to develop a case for funding	No method used irrespective of the attractiveness of a project	No-one in organisation promoting investment in energy efficiency	No funding available for energy projects. No funding in the past

Table A6. *Performance scores for Awareness and Information criteria.*

Score	Energy management responsibilities	Energy efficiency awareness	Reporting procedures	Review of energy performance	Ongoing training	Market awareness
5	Lists of responsibilities and assignment are comprehensive and regularly reviewed. All staff have responsibilities	Energy efficiency performance regularly presented to staff. Full use of available channels for promoting new measures for saving energy	Comprehensive reporting of status compared with best practice, regular and geared at a variety of audiences, including public statements	Energy efficiency regularly reviewed. Performance compared against int. and ext. references or benchmarks. Ideas actively sought.	Continuous professional development resourced for technical and premises staff. Active technical library. Ready access to domestic and non-domestic energy efficiency information	Keep abreast of technological developments by ongoing monitoring of trade journals, literature and other sources on energy efficiency issues.
4	Lists of responsibilities and their assignment exist for key energy staff and all departments.	Energy efficiency status presented to all staff at least annually. Occasional but wide use of publicity to promote energy-saving measures	Status reports issued annually to shareholders and staff. Impartial reporting of performance to staff and departments on a regular basis	Frequent energy efficiency reviews using monitored consumption and cost data. Analysis is regular, wide-ranging but ritualistic	Continuous professional development for technical and premises staff. All staff are aware of and have access to an energy efficiency library	Regular studies carried out on trade journals, literature and other sources to assess current developments impacting on energy efficiency.
3	Some staff and departments have written responsibilities	Energy performance presented to staff on a regular basis. Occasional use of publicity for promoting energy-saving measures	Occasional issue of energy efficiency status reports. Concentrates on good news.	Occasional technical energy efficiency reviews. Regular cost checks with exception reporting. Analysis of limited scope.	Technical and premises staff development mainly via professional and technical journals. Occasional initiatives to train staff in energy efficiency.	Trade journals, literature and other sources scanned on an ad hoc basis for information on the latest developments relating to energy efficiency
2	Unwritten set of responsibility assignments	Energy performance occasionally reported and known to very few staff. Energy-saving measures rarely promoted	Reports only issued if prompted by a business need. Most reports will contain only good news	Energy review activity based on revenue costs. Limited exception reporting only.	Energy efficiency awareness generally low. A few staff have knowledge of energy efficiency techniques and facts. Little, if any, training in energy efficiency for staff.	Trade journals, literature and other sources studied for energy implications when a purchase is imminent.
1	No evidence of assignment of energy efficiency tasks and duties	No communication of energy performance	No reporting.	No monitoring activity to underpin review processes.	Little knowledge of energy efficiency amongst staff. No attempt made to inform staff of techniques and benefits of energy efficiency.	Energy efficiency not a consideration when keeping up to date on products or technology.

Table A7. *Performance scores for Technical criteria.*

Score	Existing plant and equipment	Plant and equipment replacement	Plant and equipment condition	Operational knowledge	Documentation & record keeping	Operational methods
5	Majority of existing equipment (fixed plant and portable) incorporates best practice energy-efficient features, is correctly commissioned for energy efficiency and well maintained.	Equipment selected to be the most appropriate to the application. Life cycle costs and energy efficiency are considered. Energy savings major consideration.	Maintenance is based on needs, with formal condition appraisal methods being performed for all equipment and fabric elements affecting energy efficiency. Results acted upon where necessary	All staff understand how their roles impact on energy efficiency and take positive steps to minimise energy use. Staff receive targeted training in energy efficiency.	Fully detailed descriptions of system concepts, plant control & operation. Detailed schedules of all plant, instrumentation & controls.	Operation methods and settings for energy efficiency defined & implemented. Full utilisation of feedback from monitoring.
4	Equipment and plant are appropriately selected, energy efficient, commissioned for low energy consumption and well maintained.	Equipment selected to be appropriate to the application energy saving features considered. Life cycle costs and energy efficiency are evaluated.	Condition surveys carried out regularly on equipment and fabric elements affecting energy efficiency. Action undertaken for most defects identified.	Staff aware of how they affect energy use and take good housekeeping measures to save energy. Further training received regularly.	Detailed descriptions of plant control and operation, and outline system concepts. Reasonably detailed schedules of all plant instrumentation and controls.	Delivered conditions and operating methods for energy efficiency defined and implemented. Informal use of information from monitoring.
3	Most equipment is not specifically energy efficient, but either was commissioned or is being regularly maintained for low energy consumption	Equipment selected to be fit for purpose, bearing in mind likely life cycle costs and energy efficiency factors	Condition surveys carried out regularly on all equipment and fabric elements affecting energy efficiency. Remedial work constrained by budgets.	Most good housekeeping practices are adhered to reduce energy usage. Occasional energy efficiency training received	Basic descriptions of plant control and operation. Basic plant instrumentation and control schedules for most control systems.	Targets set against realistic budgets and maintained through financial procedures.
2	Equipment not energy efficient but commissioned for economy and periodic maintenance.	Power efficiency data on products obtained as part of selection process	Condition surveys and occasional activity, often prompted by plant failure or safety considerations. Remedial work only carried out on major defects	Energy saving techniques are only adopted by concerned staff, where easily accommodated	Minimal, or poor plant control and operation. Plant instrumentation and control schedules for only some of the plant and control systems	Targets set by default through budget setting procedures
1	Energy performance not considered during whole life cycle.	No consideration of energy efficiency in product selection	No regular surveys or maintenance carried out	No consideration is given to energy efficiency during working operations	None available	No targets set

Table A8. *Performance scores for Maintenance, Monitoring and Targeting criteria.*

Score	Operation of BMS	System accuracy	Response to alarms	Data sources	Analysis & Reporting	Maintenance & Monitoring	External audit
5	BMS installed correctly & checked regularly to ensure efficient operation, considers changes in conditions, occupancy & workload. BMS logs fan hours, & AHU filter pressures.	Sensors regularly checked & calibrated in occupied & unoccupied areas. All externally owned meters verified. Controls, settings & system balance checked yearly. Pump control & operation recorded.	Alarms flagged instantly for sensors which affect energy efficiency. Maintenance status report generated regularly to reflect needs.	Meter readings, temperature & other sensor records taken planned, or automatically. Validated against bills. Property, occupancy, climate data kept up to date.	Reports prepared to show deviation from optimum in technical & financial terms, worst performance highlighted. Accuracy of energy targeting & normalisation assessed. Define uncertainties.	Analytics for fault detection & diagnostics. Design intent, control settings, procedures & records of results documented. Pressure sensors on system & VSD to ensure appropriate running of pumps, fans, & filters maintenance.	Instrumentation calibration & database checked yearly. Market energy prices checked. Reports analysed for significant trends & anomalies
4	BMS installed correctly & always operated efficiently (i.e. desired temperature profiles are maintained) to take into account variations in ambient conditions, & occupancy.	All sensors regularly checked & carefully calibrated. Portable monitors & records used on a seasonal basis in both occupied & unoccupied areas.	Operation critically reviewed on a regular basis. Maintenance status report generated regularly	Meter readings, temperature & other sensor records taken regularly. Records kept of usage based on bills to validate data. Property, occupancy, climate data routinely obtained.	Energy usage analysed with respect to costs & other parameters regularly. Reports prepared to show deviation from optimum in technical & financial terms, & comparisons with previous period.	Full checking of controls function, controls settings, & system balance carried out once per year. Documented procedures exist for each check. Some results on record.	Instrumentation & database checked annually for accuracy. Instrumentation calibration verified. Market energy prices checked
3	BMS operated in the most effective & efficient manner at all times to take into account variations in ambient conditions. Periodic review of temperature profiles	All sensors checked seasonally & calibrated annually. Ad hoc use of thermometers & monitoring equipment in both occupied & unoccupied areas	Occasional review of operation. Maintenance status report generated occasionally	Meter readings, temperature & other sensors taken frequently. Records kept of usage based on bills to support data collation. Property, occupancy, & climate data is obtained occasionally.	Summary report of BMS data for management reports, with overarching financial detail	Informal checking of controls function & system balance carried out once per year. Schedule of checks exists but no proof of occupancy.	Database checked less than annually for accuracy. Ad hoc cursory check on reports & comparison with previous year
2	Temperature controlled by local space thermostats. Heating is turned off at weekends & in the summer	Ad hoc checking of sensors. Ad hoc hand checking of radiator temperatures	Ad hoc checks on space temperatures undertaken	Records kept of consumption based on bills from suppliers. Occasional meter readings to support data collation.	Report by maintenance department of daily space temperatures & performance when requested	Annual functional checks carried out although these are not well documented	Ad hoc checks on database. Ad hoc cursory check on reports & comparison with previous year
1	No BMS. Temperature controlled using integral plant controls. Heating allowed to remain on for 7 days/week	No procedure for sensor checking, setting or calibration.	No ability to measure or check operating efficiency	No measurements taken & no records kept.	No management reports prepared	Maintenance is on breakdown basis & controls are checked only when things go wrong	No auditing function

Forecast

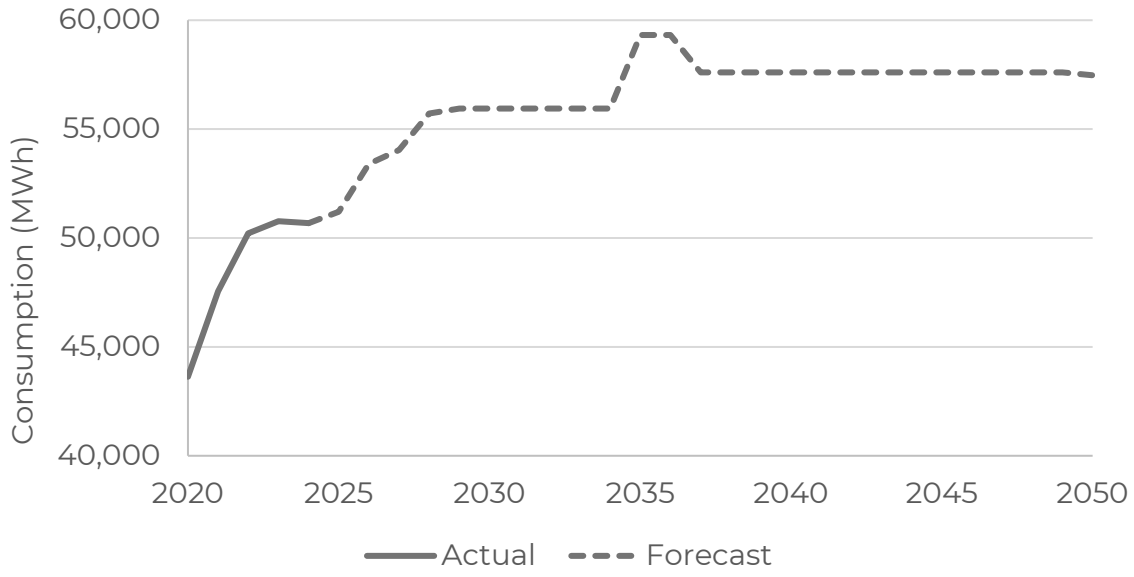
Looking into the future, the University's energy profile is expected to fluctuate significantly in the coming years due to several factors.

The University is undertaking major transformation projects across its campuses. This includes relocation of campuses, development of new facilities and increase in renovation activity. Coupled with significant shifts to the Australian higher education policy landscape and impacts of migration policies on student recruitment, these changes will influence the building portfolio and energy demand of facilities.

The 'electrification' of the University (i.e., transitioning from natural gas and other fossil fuels, including for fleet vehicles) will result in increased electricity use and demand. The University used approximately 7,955 GJ of fuels for its land-based fleet vehicles and UniHopper service in 2023. While this translates to approximately 2,200 MWh equivalent of electricity use annually, the actual increase in demand is expected to be lower due to the greater energy efficiency of electric vehicles. Similarly for natural gas, total electrification is expected to yield an increase of 5,000 MWh in electricity use due to greater efficiency than the 13,055MWh otherwise used.

These changes constitute an overall increase of annual electricity use from 51,000 MWh in 2024 to approximately 58,000 MWh in 2050. Figure A4 shows the long-term projection of annual electricity usage, noting the high uncertainty associated with possible future scenarios as mentioned above.

Figure A4. **Trend of actual and forecasted annual electricity use.**



Energy management initiatives to date

To date, many actions to reduce energy consumption and emissions have already been undertaken. Examples of energy efficiency and reduction efforts since 2006 include:

- Electrode boiler, diesel, and LPG fuel source replacement with natural gas at various facilities, as well as energy performance contracts, building management and control systems upgrades. This action reduced the University's greenhouse gas emissions by a total of 2,540 t CO_2-e between 2006 and 2015.
- Commitment of funds to roll out rooftop solar systems across multiple sites between 2023 and 2025, and ensuring new builds are solar power ready. Installation of photovoltaic generation on University facilities avoided the emission of 105 t CO_2-e between 2012 and 2019.
- Installation of motion sensor-activated lighting and design of new builds to maximize natural light to reduce unnecessary consumption.
- Installation of smart metering to enable greater capture of data for reporting and monitoring purposes.
- Annual reporting of energy use at various levels for the University's reporting requirements and greater accessibility of energy information for staff and students.
- Promotion of energy efficiency and energy saving campaigns, as well as continued involvement of students in energy-related activities through the Sustainability Integration Program for Students (SIPS) program.

The development of an updated Energy Action Plan ensures the continued commitment by the University to improve energy security and reduce energy consumption, energy cost and energy-related carbon emissions.