GREATER CURTIN

Curtin University Decarbonisation Plan

OPERATIONAL NET ZERO BY 2035

Curtin University

GREATER CURTIN

Acknowledgement of Country

Curtin University recognises the wisdom of First Nations Australians and their stewardship of Country for more than 60,000 years. Curtin University pays our respect to the Aboriginal and Torres Strait Islander members of our community by acknowledging the traditional owners of the country on which the Perth CBD, Technology Park, Midland and the Perth Campus in Bentley are located, the Wadjuk people of the Noongar Nation, and on our Kalgoorlie Campus, the Wongutha people of the North-Eastern Goldfields. We extend this respect to all people of all First Nations globally.

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Document Control

This summary report is version controlled by PF&D Planning.

For questions contact sustainability@curtin.edu.au

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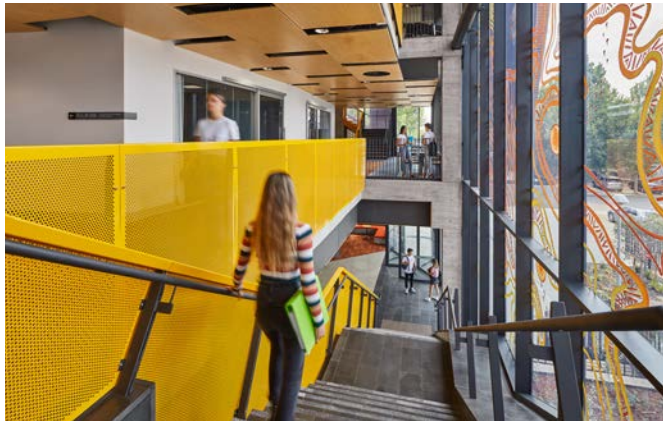


1

Executive Summary

THE PATHWAY TO ACHIEVING OPERATIONAL NET ZERO

1.1

Introduction

Curtin University, a leading institution with a strong history of skills based learning and research, is well-positioned to address the increasing global concerns around climate change. Building on its legacy of technological innovation, Curtin continues to develop strategies for progressive decarbonisation that align with global climate goals. This document outlines Curtin's strategic plan to mitigate the university's environmental impact, and establish Curtin as a living laboratory for innovative sustainability practices. By integrating initiatives including upgrading energy efficiency, green and decarbonised energy, and implementing adaptive regeneration, Curtin is committed to creating resilient and sustainable campuses.

Curtin's journey toward operational Net Zero by 2035 is driven by an ambitious yet measured program that spans six workstreams and twelve initiatives. This comprehensive approach highlights Curtin's deep commitment to sustainability, reflecting its core values of People, Planet, and Partnerships.

This document is a summary report based on detailed evaluations carried out to assess and confirm the viability of establishing this target. This summary report outlines the process that has defined the pathway to decarbonisation and maps out the next steps along this journey.

Curtin will reduce its emissions as fully as possible by prioritising energy and efficiency improvements, with carbon offsets used only as a final measure to balance any remaining emissions.

1.2

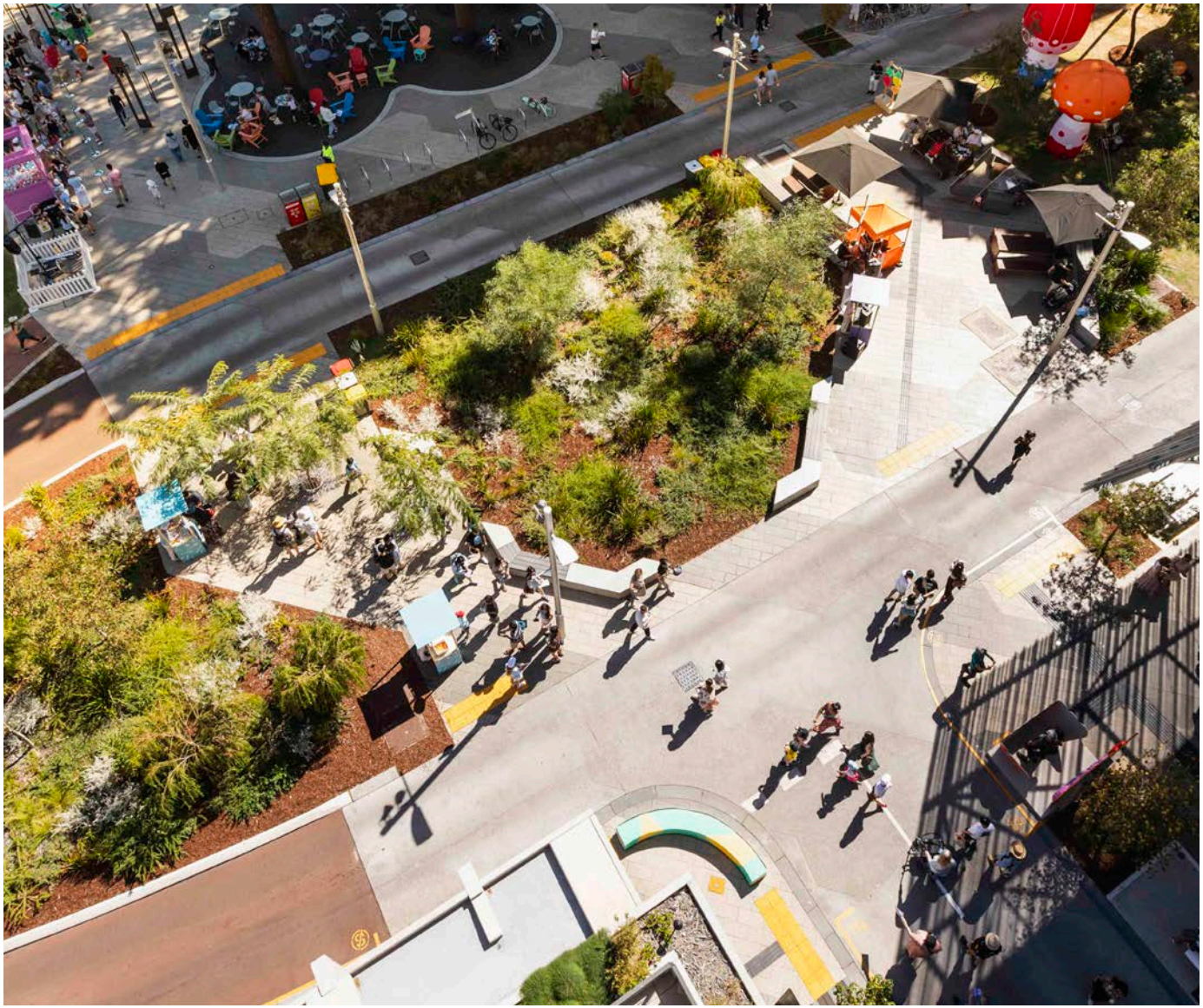
Decarbonisation Plan overview

1.2.1 Overview

Curtin University is committed to driving sustainable development through education, research, engagement, governance, and operations, all in line with the United Nations Sustainable Development Goals (SDGs). In alignment with these pillars, Curtin has developed a *Decarbonisation Plan* (referred to as 'the Plan') to reduce carbon emissions and optimise energy usage, waste generation and water consumption across its West Australian (WA) campuses. The Plan responds to Curtin's specific context as a technical and skills-based university with a strong history of research and learning through our built environments. It takes into consideration our multiple campuses, existing environmental systems and operational constraints while harnessing emerging opportunities.

The Decarbonisation Plan supports both the *Greater Curtin Master Plan* (GCMP or the Master Plan) and the *Curtin 2030 Strategic Plan*, prioritising the university's operational activities to significantly reduce its carbon footprint, waste, and water usage.

This Plan will allow Curtin to gradually reduce emissions across its WA campuses, with the longer-term goal of extending this strategy to Curtin's global campuses. It addresses *Scope 1, 2, and 3 emissions*, and outlines specific actions and milestones related to energy efficiency, waste and water management. As projects progress, the Plan will be periodically reviewed to accommodate and consider new opportunities, risks and evolving climate-related guidance. The Plan will be updated as needed to reflect changing circumstances.



1.2.2 Approach and key findings

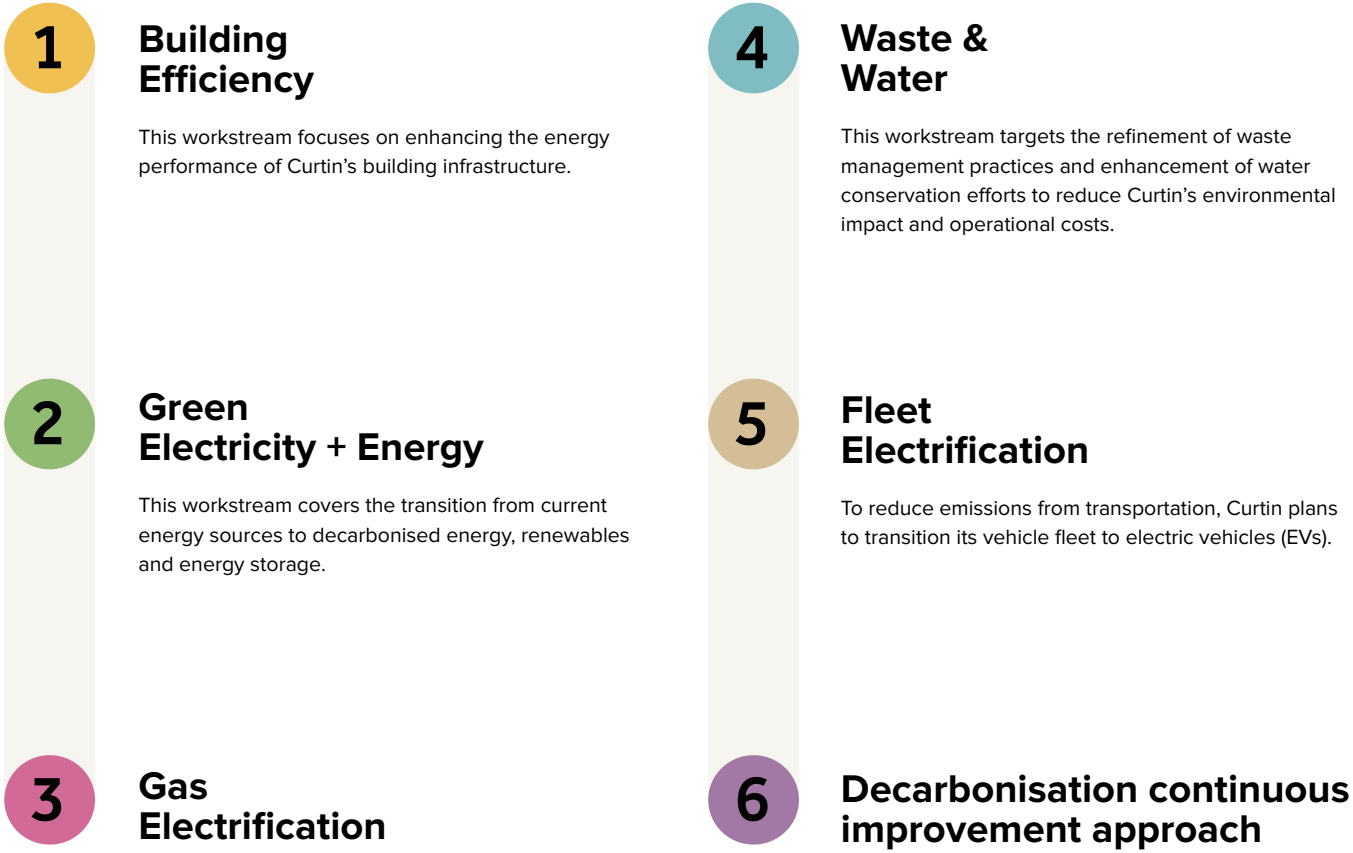
The Decarbonisation Plan is designed to help Curtin achieve ***Net Zero emissions***, beginning with operational Net Zero at its WA campuses by addressing Scope 1 and 2 carbon emissions. This is aligned with the ***Science-Based Targets initiative (SBTi)*** guidance on Scope 1 and 2 target setting, leveraging both existing and newly identified sustainability initiatives across Curtin's operations.

The most impactful and cost effective initiatives have been prioritised to meet Curtin's aim to achieve operational Net Zero for Scope 1 and 2 emissions. This will be achieved through the implementation of six workstreams, to be launched within 12 months, with reporting and Key Performance Indicators (KPIs) across all workstreams, underpinned by a governance framework that promotes continuous process improvement.

The initiatives implemented as part of the Net Zero pathways will also be utilised by the ***RACE for 2030 Pathway to Net Zero Precincts*** research project led by Curtin University, to benefit research into precinct wide decarbonisation opportunities.

The Plan was created in alignment wih the Greenhouse Gas (GHG) Protocol accounting methods, on which the National Greenhouse and Energy Reporting (NGER) Scheme is built. As such the Scope 1 and 2 emissions addressed in this Plan align with Curtin's annual NGERs report.

Figure 1 Six workstreams underpin Curtin's Decarbonisation Strategy

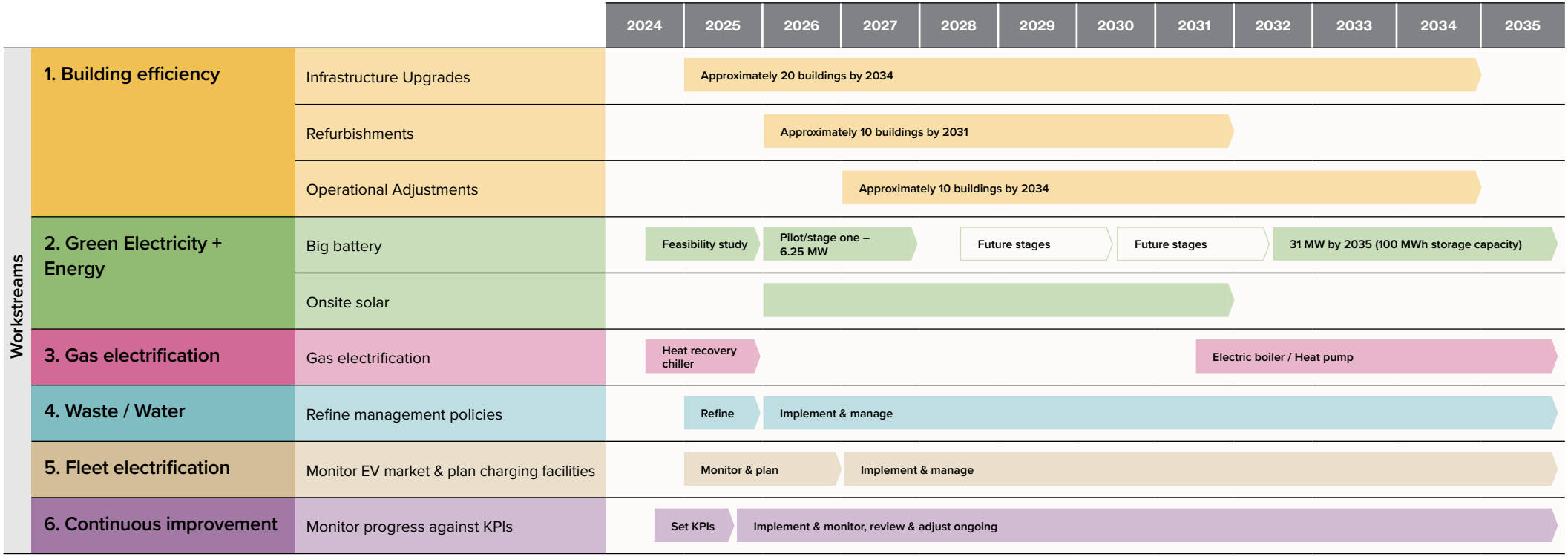


1.2.2 Approach and key findings (cont.)

Initiative implementation schedule

The implementation plan to achieve the 2035 Operational Net Zero target is structured across six distinct workstreams to be delivered as a program of works over 10 years.

Figure 2 Implementation plan to achieve the 2035 Operational Net Zero target



Impact (cumulative)												
Scope 1 emission reduction	-	-	-48%	-49%	-50%	-52%	-52%	-52%	-55%	-77%	-77%	-100%
Scope 2 emission reduction	-	-4%	-16%	-30%	-33%	-33%	-47%	-84%	-95%	**-100%**	**-100%**	**-100%**

1.2.2 Approach and key findings (cont.)

The Plan also sets out initial steps for addressing Scope 3 emissions through a broader parallel process, which will be developed over time and further defined as a future workstream. This is because Curtin must first define its Scope 3 boundaries and clarify accountabilities within the working group, ensuring that departments managing the most significant emission categories are included. Completion of this workstream will enable Curtin to achieve a full Net Zero target across all scopes of emissions.

Figure 3 The Four activities which should be undertaken to address Scope 3 emissions

1

Scope 3 working group

Establish the working group responsible for Scope 3 reporting and target setting to include representatives for all the material Scope 3 sub-categories.

2

Define reporting boundaries

Determine appropriate reporting boundaries for external Scope 3 reporting. This includes defining which emissions sources will be covered and the extent of the reporting across the value chain.

3

Develop emissions forecast

Curtin should develop a detailed Scope 3 emissions forecast based on its future operational plans, suppliers' decarbonisation targets, and expectations regarding staff and student commuting. This forecast should consider to what extent Curtin can influence its suppliers, staff, and students to support Scope 3 decarbonisation efforts.

4

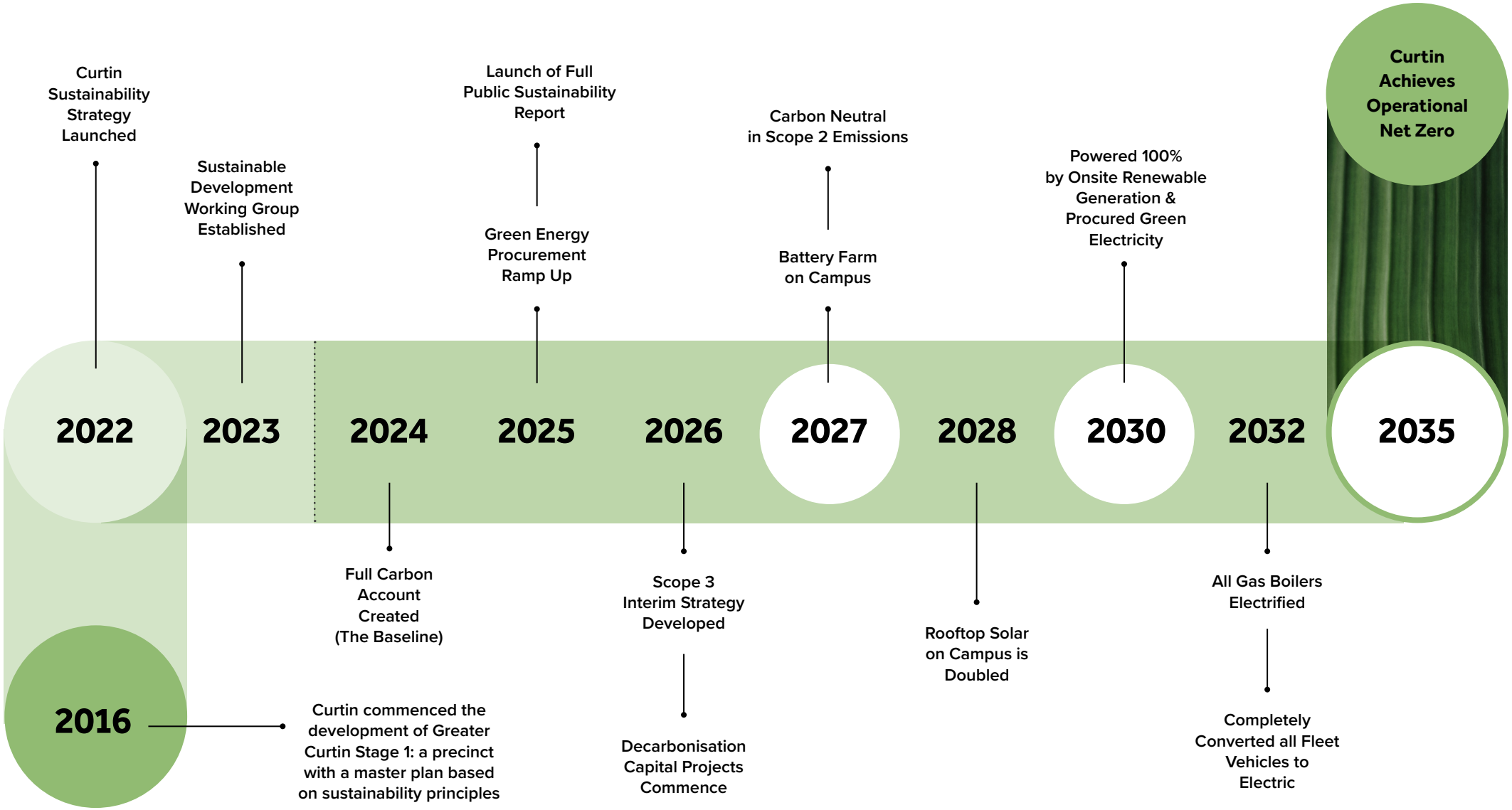
Assess financial resources

Assessing the cost of key Scope 3 emission reduction levers is essential. Curtin should evaluate the required financial resources to lower Scope 3 emissions and assess how these costs align with Curtin's broader financial obligations.

1.3

Curtin University's Decarbonisation Pathway to Operational Net Zero

Figure 4 Curtin University's Decarbonisation Pathway to Operational Net Zero 2035



2

Context and Approach

2.1

Introduction to program

Curtin is committed to sustainable operations and has developed a Decarbonisation Plan to reach Net Zero Scope 1 and 2 emissions by 2035. This plan also aims to boost energy efficiency, and optimise waste and water consumption, all while maintaining uninterrupted operations.

The Plan targets reducing emissions directly within Curtin's control, focusing on Scope 1 and 2, which make up roughly 25% of total emissions. To meet a full Net Zero goal that includes both direct and indirect emissions, Curtin will also need to measure, report, and address Scope 3 emissions, such as those from investments and other indirect sources. Additionally, Curtin will follow sector-specific guidelines for the buildings sector.

Curtin's Decarbonisation Plan is more than just a carbon reduction effort. It reflects the university's broader vision of driving meaningful environmental change for both people and the planet. By guiding Curtin's transition to a sustainable future, the Plan positions the university as a leader in sustainability and environmental stewardship.

2.2

Context

2.2.1 Strategic Planning Framework

The Decarbonisation Plan supports Curtin's 2030 Strategic Plan and plays a central role in delivering the university's Sustainable Development Strategy, which envisions Curtin as a community dedicated to the betterment of people, planet, and prosperity. Aligned with the 17 United Nations Sustainable Development Goals, adopted globally in 2015 to end poverty, protect the planet, and ensure peace and prosperity by 2030, this plan helps embed sustainability across all university actions.

The Decarbonisation Plan also informs updates to the Greater Curtin Master Plan, with key workstreams integrated as a dedicated infrastructure layer. The planning framework focuses on asset reinvestment, adaptive reuse, and regeneration of facilities with an emphasis on reducing embodied carbon across the campus.

Figure 5 Curtin University's Strategic Planning framework

2.2
Context

2.2.2 Global GHG emissions reduction frameworks

To support the development of the Decarbonisation Plan, globally recognised Greehouse Gas Emissions reduction frameworks applicable to Higher education were identified. The Plan and its continuous improvement workstream will also incorporate opportunities arising from a range of research initiatives. The reference frameworks and research opportunities include:

1. Race to Zero Universities and Colleges initiative - this is a higher eduction sector specific United Nations (UN) backed framework which encourages higher education institutions to commit to ahieving net zero greenhouse gases by mid century and demands ambitious, immediate actions to reduce emissions and has a goal to halve global emissions by 2030.

Additionally, the Decarbonisation Plan will contribute to research through the **Net Zero Precincts Race 2030 Project**, led by Curtin University. This three-year initiative aims to guide urban precincts toward net zero by 2030 through innovative strategies and real-world case studies.

2. Science-Based Target Initiative SBTi this framework focuses on ensuring organisations develop emissions reduction targets that align with the Paris Agreement goals. Many universities, such as Cambridge and Columbia, have adopted 1.5C-aligned Science-Based Targets for emissions reduction. This approach is both environmentally and economically sound, benefiting the planet and strengthening organisations by building regulatory resilience, fostering innovation, and enhancing competitiveness. The SBTi and the Race to Zero for Universities and Colleges are both part of the global climate effort. Race to Zero focuses on getting universities to commit to net-zero emissions by mid century, while SBTi offers a framework for setting science-based targets. Although not formally connected, they complement each other—Race to Zero builds momentum and SBTi helps ensure commitments are credible and science-aligned.

3. Curtin University Sustainability Research Initiatives - Curtin University has a range of research initiatives aimed at addressing global challenges like climate change, resource depletion, and sustainable development. The decarbonisation workstreams support organisational research and sustainability. Some key highlights of Curtin's work in this area includes:

i-Green Technology Hub: Curtin University is the operator of WA's new GreenTech Hub. This initiative, funded by a $40 million partnership, aims to accelerate green technologies and services across the state. The hub fosters collaboration between researchers, industry, and government to address decarbonisation and sustainability challenges. It supports innovation, commercialisation, and tech development to catalyse a green, low-carbon future.

ii-Curtin University Sustainability Policy Institute: This institute leads research on sustainable development, focusing on ecological, economic, social, and cultural perspectives. Their work aims to create a net-zero emissions and zero-waste future.

iii-Sustainable Engineering Group (SEG): This group focuses on sustainable systems thinking, industrial ecology principles, and life cycle assessment approaches to reduce environmental impacts and enhance resource efficiency.

iv-Hydrogen Storage Research Group (HSRG): This group undertakes experimental research into energy storage systems, including hydrogen storage materials for export, transport, or stationary energy storage. They are also developing sustainable and cost-effective green hydrogen power solutions for transport and construction industries.

v-Sustainable Engineering Group: This group focuses on sustainable systems thinking, industrial ecology principles, and life cycle assessment approaches to reduce environmental impacts and enhance resource efficiency.

vi-Hydrogen Storage Research Group: This group undertakes experimental research into a vast array of energy storage systems, including hydrogen storage materials for export, transport, or stationary energy storage. They are also developing sustainable and cost-effective green hydrogen power solutions for transport and construction industries.

2.3
Scope 1, 2 and 3 Emissions

2.3.1 Definitions

Greenhouse gases, which contribute to global climate change, are defined by the United Nations' Intergovernmental Panel on Climate Change (IPCC). The IPCC identifies seven key greenhouse gases responsible for human-induced climate change:

- Carbon Dioxide (CO_2)
- Methane (CH_4)
- Nitrous Oxide (N_2O)
- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)
- Sulphur Hexafluoride (SF_6)
- Nitrogen Trifluoride (NF_3)

All these gases are converted into carbon dioxide equivalents (CO2e) based on their concentration in the atmosphere, their greenhouse effect and the length of time they remain in the atmosphere. The term 'carbon' used throughout this report, refers to CO2e and includes all the greenhouse gases listed above.

The Greenhouse Gas Protocol provides the framework for carbon emission inventories, categorising emissions into three groups, known as scopes:

- *Scope 1 emissions* are direct emissions from sources owned or controlled by Curtin.
- *Scope 2 emissions* are indirect emissions from the consumption of purchased electricity by Curtin.
- *Scope 3 emissions* are all other indirect emissions except those covered in Scope 2, including emissions not directly produced by Curtin and from assets not owned or controlled by Curtin.

Figure 6 Scope 1, 2 and 3 Carbon Emission Definition and Sources

Scope 1, 2, and 3 are categories used to describe different sources of greenhouse gas emissions that contribute to climate change.

Scope 1

Emissions from sources that are owned or controlled by an organisation, such as emissions from on-site fuel combustion or industrial processes.

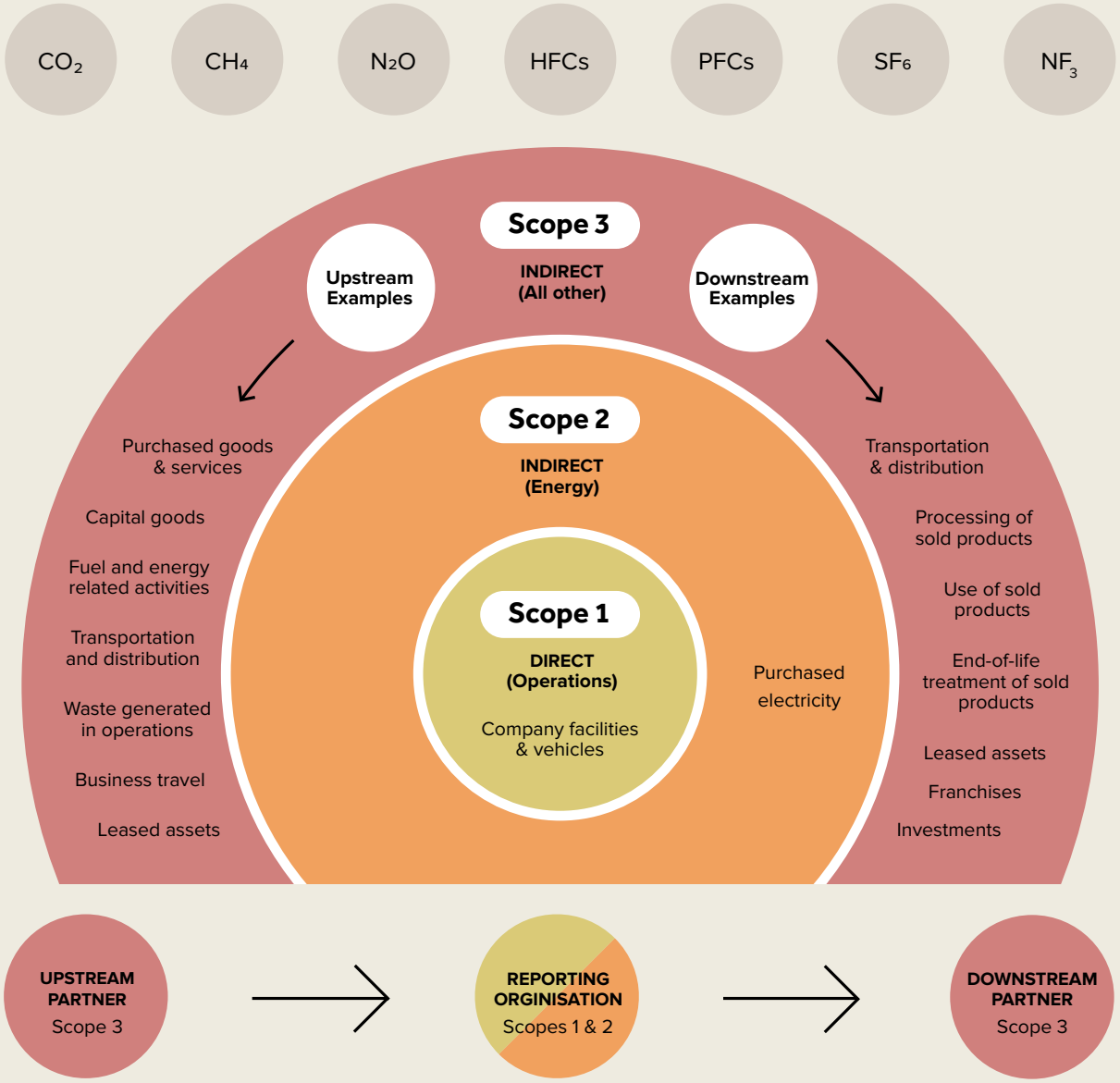
Scope 2

Indirect emissions from the consumption of purchased electricity, heat, or steam. These emissions are created by activities outside the organisation's control, but are associated with its energy consumption.

Scope 3

All other indirect emissions that occur in the value chain of the organisation, including emissions from the production of purchased goods and services, transportation of products, and waste generated by the organisation. These emissions occur outside the organisation's operational control but can be influenced through its supply chain and business decisions.

Source: Greenhouse Gas Protocol



2.3.2 Curtin University's current position

Curtin University undertakes carbon accounting every six months to track trends and analyse the impact of various sources of carbon emissions. Calendar Year (CY) 2023 data was utilised as the benchmark for the Decarbonisation Plan.

Scope 1

Scope 1 emissions for CY2023 equated to 3.9 kt CO2e and is based on direct carbon emissions from sources that are owned or controlled by Curtin such as natural gas usage to heat and cool our campuses.

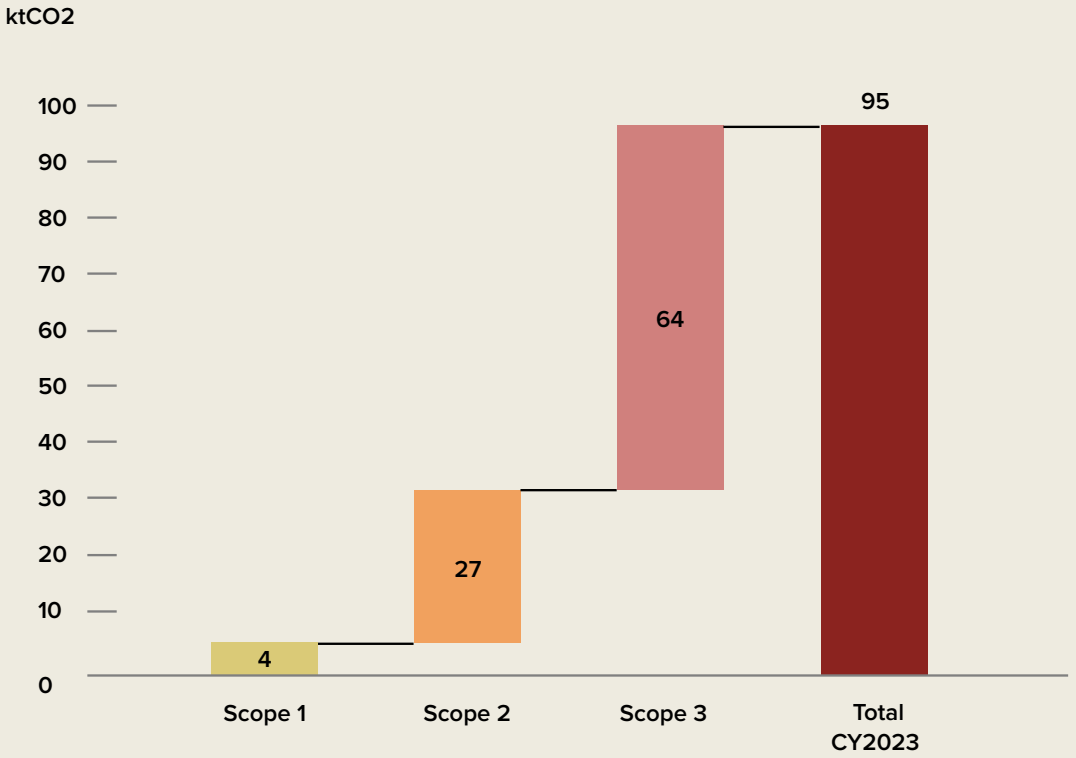
Scope 2

Scope 2 emissions equated to 27 kt CO2e and is directly related to the volume of electricity sourced by the University from the grid and fluctuates based on adjustments to the grid's sources of energy.

Scope 3

Curtin's Scope 3 emissions have been re-baselined in July 2024 to provide a clearer understanding of Curtin's overall carbon footprint. Due to more comprehensive data collection, the re-baseline significantly increased Curtin's estimated Scope 3 emissions to 64 kt CO2e in CY23. Major contributors included emissions from the purchase of goods and services and employee and student commute to campus.

Figure 7 Curtin University's CY2023 carbon account by Scope (ktCO2)



2.3.3
Approach to target selection

The process of selecting the optimal Decarbonisation Plan for Curtin involved five stages. It began with reaching a consensus on the overall approach and objectives, followed by identifying all possible initiatives for implementation. These initiatives were then prioritised based on their potential impact and feasibility. A Dynamic Model was developed to assess the financial implications and explore various scenarios, ensuring the chosen pathway was both effective and cost-efficient in reducing emissions.

This comprehensive process, which involved extensive stakeholder engagement and rigorous analysis, resulted in a well-supported and strategically sound pathway to achieving Net Zero for Scope 1 and 2 by 2035.

The process also identified a recommended approach for initiating the materiality assessment to address Scope 3 emissions through a broader, parallel process to be defined as a future workstream.

The decision to pursue Net Zero by 2035 for Scope 1 and 2 emissions was driven by methodically analysing the benefits and challenges associated with three target years: 2030, 2035 and 2050, as shown in Figure 8.

The 2035 timeline offers a balanced, methodical approach, allowing sufficent time to design and implement essential infrastructure without straining Curtin's resources or disrupting daily operations.

Setting this target reflects Curtin's strong commitment to sustainability, surpassing federal and Science-Based Targets initiative (SBTi) goals, while maintaining a feasible and prudent approach to risk.

Financially, the 2035 target is projected to yield a positive Net Present Value (NPV), combining ambition with practicality. Though a 2050 target was rejected for lacking urgency, and external constraints make a 2030 goal unfeasible, the 2035 target emerges as an achievable middle ground. This positions Curtin as a responsible, forward-thinking leader in addressing climate change through a plan that is both ambitious and grounded in reality.

Figure 8 Net Zero target year analysis.

Scope 1 & 2 Net Zero target years	Recommendation	Findings
2030	Not Recommended	+ Ambitious and SBTi aligned NPV Positive – Very Tight Timeframes – Significant inherent risks
2035	Recommended	+ SBTi aligned and moderately ambitious + NPV Positive + Achievable timeframe + Less inherent risks
2050	Not Recommended	+ Not SBTi aligned nor ambitious – Longest Timeframe – Least inherent risks

+ Opportunity – Risk

3

Decarbonisation Plan

3.1

Strategy to achieve Net Zero Scope 1 and 2

The Decarbonisation Plan for achieving Net Zero Scope 1 and 2 emissions by 2035 is anchored in an approach that addresses key areas of energy consumption and efficiency. This decarbonisation effort goes beyond the goal of reaching Net Zero and also integrates additional objectives, including reducing overall energy intensity, water, and waste usage across Curtin. To achieve these ambitious targets, the Decarbonisation Plan involves six primary workstreams (Figure 9) focused on executing initiatives prioritised based on carbon abatement potentials, costs (CAPEX and OPEX), impact on business continuity, ease of implementation and timeframes.

Figure 9 Six workstreams underpin Curtin's Decarbonisation Plan (See Apendicies section 6.4 for futher workstream details)

1 Building Efficiency

1. Infrastructure Upgrades
2. Refurbishments
3. Operational Adjustments

2 Green Electricity + Energy

4. Install a 25MW/100MWh battery farm on Bentley campus

5a. Install rooftop solar where practicable on new & refurbished buildings

5b. Procure Green Energy

3 Gas Electrification

6. Install 1.5MW of heat recovery chiller to provide ~40% of the heat required for space heating
7. Install 1MW of electric boiler to the hot water loop to provide additional heating
8. Install ~2.2MW of heat pumps to electrify gas boilers

4 Waste & Water

9. Refine management policies
10. Review the procurement policies to minimise purchase that will result in waste

5 Fleet Electrification

11. Monitor the EV market and plan for EV charging facilities

6 Decarbonisation continuous improvement approach

12. Monitor progress against KPIs

3.1.1 Scope 1 emission reduction

Scope 1 emissions will be substantially reduced through Gas Electrification (Workstream 3) and Fleet Electrification (Workstream 5), supplemented by purchasing carbon credits to offset any remaining emissions:

- Workstream 3: Gas electrification is aimed at transitioning to electric alternatives. This shift from gas to electricity is expected to reduce over 85% of Scope 1 emissions from gas. Key initiatives include the installation of a 1.5-Megawatt (MW) heat recovery chiller to meet approximately 40% of space heating requirements, a 1MW electric boiler for hot water, and 2.2MW of heat pumps to electrify existing gas boilers in critical buildings such as B155, Technology Park, and Kalgoorlie Campus. Electrification of Curtin's infrastructure will increase Scope 2 emissions, which will need to be addressed through strategic procurement of renewable electricity and/or carbon off-sets.
- Workstream 5: From the state grid transitioning Curtin's vehicle fleet to electric, further reducing Scope 1 emissions by ~3%.
- The remainder of Scope 1 emissions comes mainly from hard to abate gasses such as refrigerants and would be offset by carbon credits.

3.1.2 Scope 2 emission reduction

Scope 2 emissions will be reduced through the transition to Green Electricity (Workstream 2):

- The ongoing decarbonisation of the South West Interconnected System (SWIS) network is anticipated to impact emissions reductions. Curtin's Scope 2 emissions are projected to decrease by 50–60% by 2035, driven largely by the greening of Western Australia's grid, as illustrated in Figure 10. The continuous improvement workstream will monitor the progress of the SWIS grid decarbonisation and should the current stated targets lag, investment in renewable energy through procured green energy, verified through largescale generation certificates or LGCs, can address a potential gap as an interim measure.
- The Decarbonisation Plan is modelled on batteries storing energy during the middle of the day, indicating that 35–40% of the Scope 2 emissions will be addressed with a 2-phased installation of a large battery farm on Bentley campus capable of storing up to 25MW/100MWh. The intent is that the batteries will store excess solar energy generated in the SWIS network during the the day when supply is high and costs are lower. They will also be charged using procured green energy and discharge during periods of peak demand, when demand and costs are higher and supply lower. This strategy will lower costs as Curtin can participate in demand response programs.
- The initial phase of the battery farm will allow for testing the approach as Curtin will launch a pilot program to conduct a feasibility study and engineering design of a smaller 6.25MWh battery for its new B316 building. This trial will provide valuable insights into how the system works in practice. The second phase of the project will use the lessons learned from the pilot.
- The full system rollout will happen between 2031 and 2034. This timeframe will align with the anticipated acceleration of the SWIS network's transition to renewable energy, maximizing the benefits of this expected shift.

Deploying rooftop solar panels where practicable on new and refurbished buildings will complement the battery system and will reduce Scope 2 emissions, contributing to energy cost savings, and enhancing energy security.

3.1.3 Reduction in energy intensity

A reduction in energy intensity means using less energy to operate our assets and spans Scope 1 and 2 emissions. This will be achieved through improvements in Building Efficiency (Workstream 1) and effectively managing Waste and Water (Workstream 4):

- Workstream 1: Three main energy efficiency measures will reduce energy usage by 8–12% by 2035: the upgrade of Building Management Systems (BMS), Light Emitting Diode (LED) efficient lighting, and strategic space utilisation.
- Workstream 4: The waste and water workstreams will refine existing practices to minimise associated emissions, noting preliminary estimates show waste and water combined account for less than 3% of Curtin's total emissions.

A continuous improvement approach (Workstream 6) will oversee the other workstreams to ensure that sustainability efforts are continuously monitored, updated, and aligned with Curtin's broader goals. This continuous improvement approach will also help identify new opportunities for emissions reduction as technology and practices evolve. At each procurement milestone, supply options for emerging development of energy and storage options will be re-evaluated.

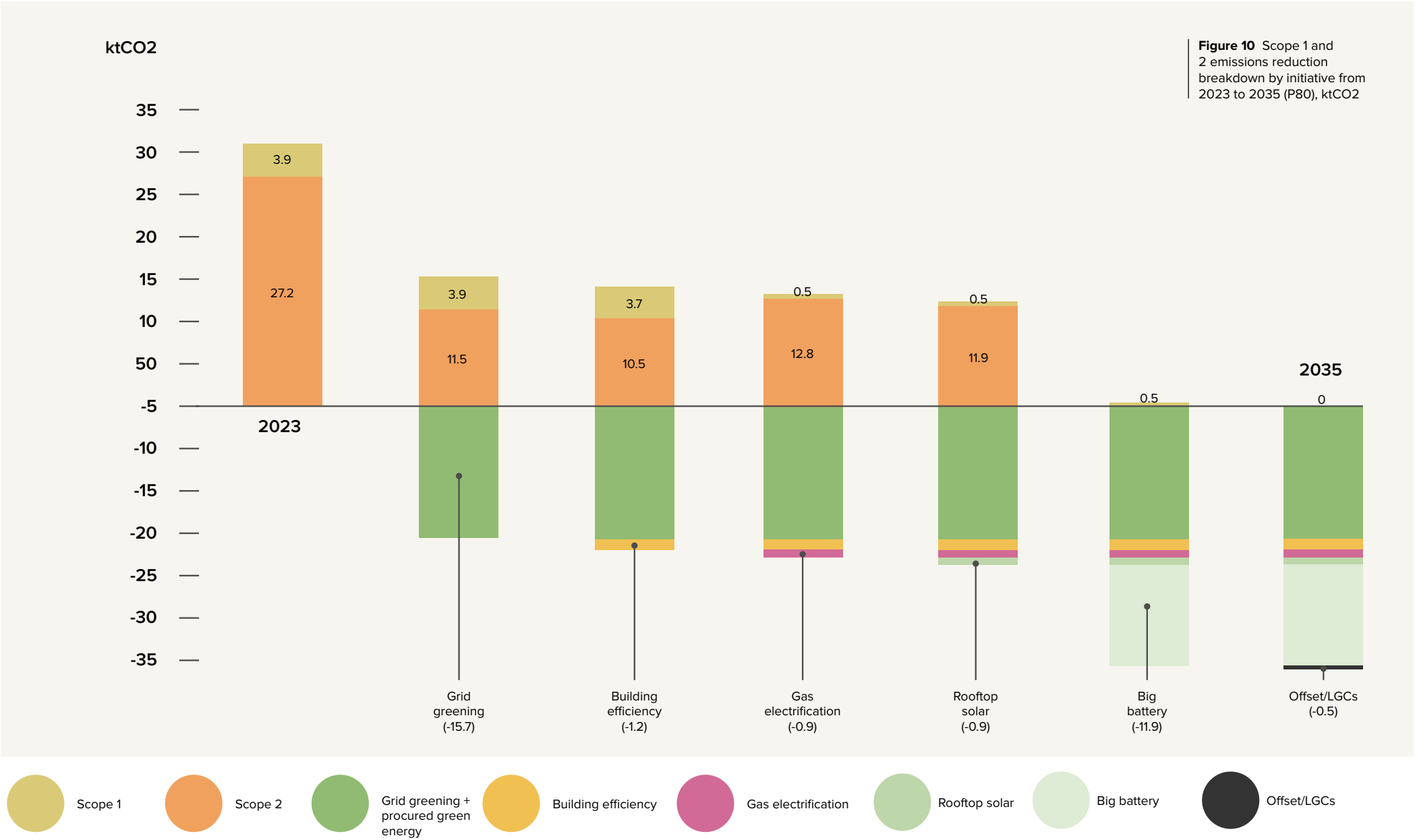


Figure 10 Scope 1 and 2 emissions reduction breakdown by initiative from 2023 to 2035 (P80), ktCO2

3.2

Scope 3 Net Zero

As part of the development of the Decarbonisation Plan, Curtin's Scope 3 emissions were reassessed to obtain an updated view of the university's overall carbon footprint.

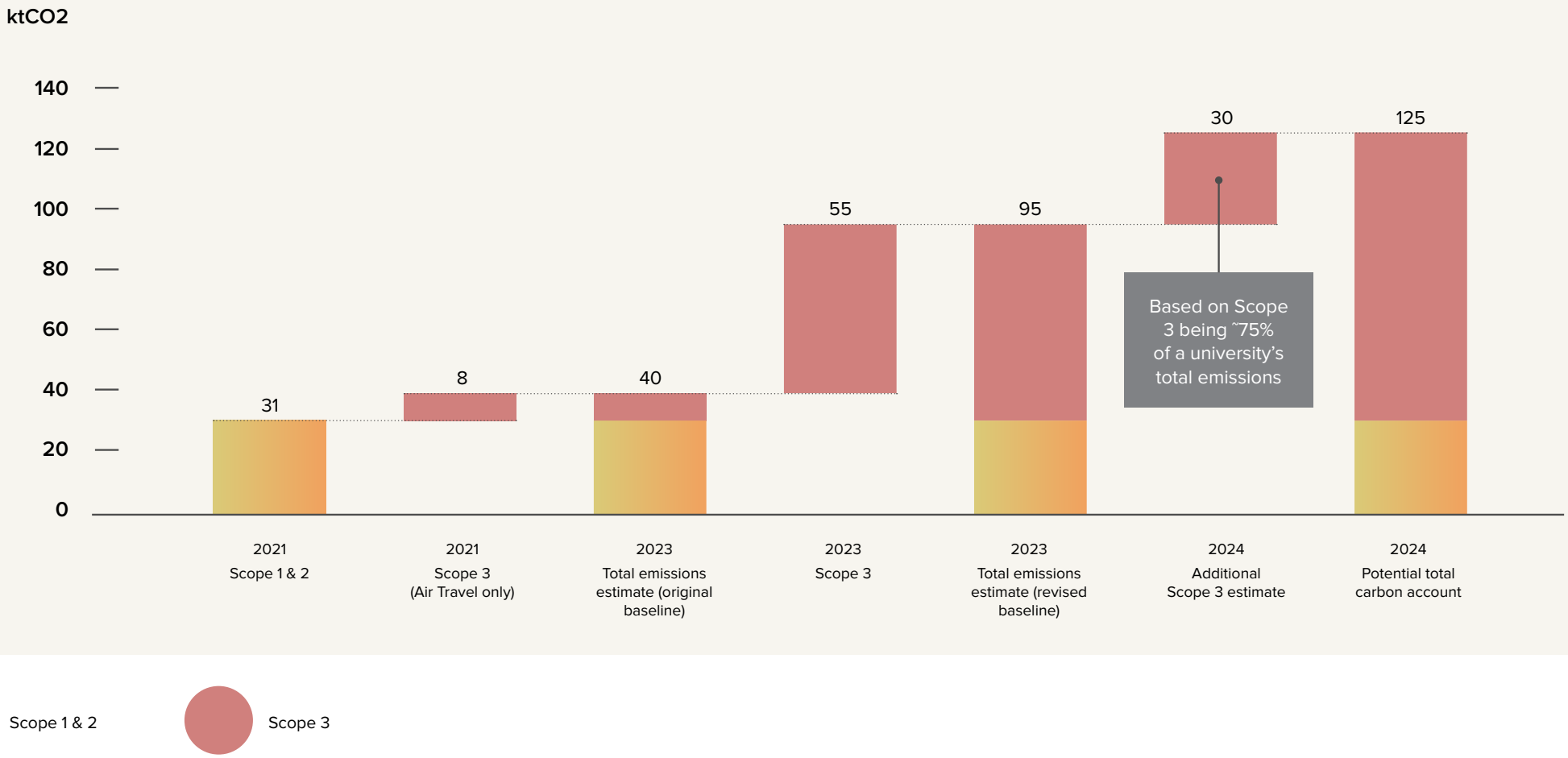
Because of expanded data collection, the reassessment revealed a substantial increase in Scope 3 emissions, from 8 kt in 2021 to 64 kt in 2023. As such, it is understood that Scope 3 emissions currently represent around two-thirds of Curtin's total 95 kt annual emissions.

However, there are some more complex Scope 3 categories that are yet to be assessed. Once data for all categories is fully incorporated, the Scope 3 emission account is estimated to rise by a further 30 kt annually, meaning Curtin's actual total annual emissions baseline would be in the area of 125 kt.

3.2.1 Scope 3 emissions estimate

Curtin's Scope 3 carbon footprint could increase by another 30ktCO2-e when data for the outstanding categories becomes available (particularly for the investments category).

Figure 11 Curtin University's Scope 3 emissions estimates FY21-FY24.



3.2.2 Setting a Scope 3 Net Zero target

Curtin's current Scope 3 emissions are estimated to be 64 ktCO2-e, which is over 67% of its total emissions of 95 ktCO2-e. SBTi recommends a Scope 3 target if those emissions make up over 40% of an organisation's total emissions, covering at least two-thirds of Scope 3. To become SBTi compliant, Curtin would have to set a near-term Scope 3 target. For "Race to Zero", Curtin would have to set a near-term emission reduction target that includes Scope 3, but there are fewer Scope 3 specific conditions to be met than SBTi. These four activities are integral to advancing Curtin's Scope 3 Maturity Program and the detailed action plan is outlined in Section 5 Next Steps.

Figure 12 Four activities should be undertaken to address Scope 3 emissions:

1

Scope 3 working group

Establish the working group responsible for Scope 3 reporting and target setting to include representatives for all the material Scope 3 sub-categories.

2

Define reporting boundaries

A number of Australian universities report their Scope 3 emissions publicly. A critical initial step before reporting Scope 3 publicly is to agree on updating the boundaries for external Scope 3 reporting. This includes defining which emission sources will be covered and the extent of reporting across the value chain.

3

Develop emissions forecast

Curtin should develop a detailed Scope 3 emissions forecast based on its future operational plans, suppliers' decarbonisation targets, and expectations regarding staff and student commuting. This forecast should consider to what extent Curtin can influence its suppliers, staff, and students to support Scope 3 decarbonisation efforts.

4

Assess financial resources

Assessing the cost of key Scope 3 emission reduction levers is essential. Curtin should evaluate the required financial resources to lower Scope 3 emissions and assess how these costs align with Curtin's broader financial obligations. This includes considering the potential impact on operational budgets, the cost of greener products, services and carbon credits as well as the investment needed to influence staff, students and suppliers or implement new technologies.

3.3

Energy Intensity Reduction

By implementing the aforementioned strategic initiatives, Curtin aims to achieve long-term reductions in energy intensity through enhanced building efficiency, optimised space management, and improved water and waste management. This comprehensive approach is designed to advance both sustainability and operational efficiency across the campus.

Long-term reductions in energy intensity

Enhanced building efficiency

Optimised space management

Improved water and waste management

3.3.1 Building Efficiency

A core element of Curtin's strategy is enhancing building efficiency, with refurbishments designed to meet the National Australian Built Enviroment Rating System (NABERS) minimum rating standards of 4 to 5 stars, ensuring substantial energy savings. Additionally, adjusting building temperature set points by 0.5°C to 1.5°C is expected to yield energy savings of 3–9% per building. The integration of an advanced Building Management System (BMS) is anticipated to boost energy efficiency by an additional 5–15% per building, allowing for intelligent monitoring and control of infrastructure and lighting to ensure optimal energy use.

3.3.2 Space Management

Curtin's Planning Framework includes a suite of Strategic Space Plans (SSP) to address future space needs across its campuses. The Decarbonisation Plan aligns with the SSPs, promoting efficient space management to reduce energy consumption. This involves integrating space management with the BMS and using scheduling to match energy use with occupancy patterns, potentially supported by digital twins for enhanced campus operations.

Strategic efforts focus on reusing and repurposing spaces over new construction, which has a higher embodied carbon cost. Effective space management enables flexibility to adapt to occupancy changes, such as deactivating large buildings during low-demand periods like weekends, reducing unnecessary energy use. Though energy savings from such initiatives are challenging to quantify, they offer substantial potential for energy conservation and operational efficiency.

3.3.3 Water Management

Curtin's water management strategy is focused on improving water usage efficiency by identifying key drivers and patterns of consumption. This effort involves developing a comprehensive water management plan that emphasises efficiency, conservation, and installing sub-meters on every building and in other key locations across the water network. The strategy aims to lower water consumption per capita and reduce associated CO2-e emissions; noting these emissions are understood to be a very low percentage of the total and therefore considered to be lower priority.

Water management will have four areas of focus (potable, wastewater, stormwater and irrigation/ groundwater) and incorporate water sensitive urban design. Given Curtin is planning to grow the number of staff and students on campus, water management should focus on efficiency rather than absolute reduction.

3.3.4 Waste Management

Curtin is partnering with its service provider to enhance its Waste Management Plan, focusing on minimising waste generation and improving sustainability across both Bentley and Kalgoorlie campuses. Key strategic initiatives include:

1. Conducting quarterly waste audits to establish the composition of the general waste, and recycling waste streams, highlighting resource recovery and identifying any areas for improvement in waste disposal.
2. Implementing waste avoidance programs in food and beverage outlets, such as promoting reusable coffee cups and reducing single-use items to decrease waste generation and foster a culture of sustainability.
3. Deploying educational programs to raise awareness about waste reduction practices among students and staff.
4. Increasing the collection and recycling rates of food organic waste, such as introducing more food organic bins where there is demand, to further reduce the environmental impact.
5. Setting clear waste diversion targets for service providers, aiming to reduce energy consumption and emissions associated with waste processing.
6. Integrating waste reduction guidelines into procurement contracts and tenant leases.

Collectively, these waste management initiatives will contribute to Curtin's broader environmental sustainability goals.

3.4

Energy Cost Reduction

The pathway to operational Net Zero by 2035 is informed by third-party commercial modelling. Of note are initiatives with a positive NPV forecast, indicating that the forecast cost savings and revenue will exceed the initial and ongoing project costs.

Installing a large-scale battery system on Bentley campus will allow Curtin to strategically store energy and discharge during more expensive peak demand periods, reducing operational costs.

Curtin can also partner with WA energy providers to tap into energy markets, potentially generating additional revenue streams and further improving the financial viability of the battery system.

Further, Curtin can explore broader opportunities within the WA renewables sector, which may offer cost reduction avenues through large-scale renewable energy projects and storage initiatives. Engaging in these larger projects could unlock financial benefits that contribute to stabilising or lowering energy expenses. over the longer-term. These opportunities align with the WA Governments push for decarbonisation and increased renewable energy penetration into the state grid.

4

Governance

4.1

Governance framework and resourcing

The delivery schedule, shown in Figure 2, is divided into several phases, each targeting critical aspects of Curtin's carbon footprint. The staggered approach allows Curtin to strategically allocate both human and technical resources across different project milestones while ensuring that project management adheres to a structured process, from initiation to completion, as outlined in Figure 13. The Properties, Facilities and Development 3D governance framework shows the critical path in project control and project commitment, establishing a clear rationale and ensuring the team secures necessary approvals before moving into the tender and construction phases. The 3D framework also ensures that Curtin finalises its commitment to project delivery during the Construction Contract Award phase, followed by practical completion and operational readiness to confirm that all contractual obligations are met before the project is handed over for use. This structured approach is vital to the success of the schedule, particularly in managing the availability of skilled labour and technical expertise.

The majority of Scope 1 and 2 decarbonisation initiatives can continue to be delivered by the current initiative owners. However, over the course of 2025, Curtin should establish all six workstreams and appoint workstream leads who oversee the implementation of several decarbonisation initiatives. Each workstream lead will be responsible for tracking progress against specific KPIs, aligning with other workstreams and escalating and resolving issues. The Consultant's recommendation based on the experience with other universities is that an additional 1–3 full-time employee equivalents (FTEs) are on boarded to support the successful implementation of all initiatives enabling Curtin to achieve Scope 1 and 2 Net Zero by 2035.

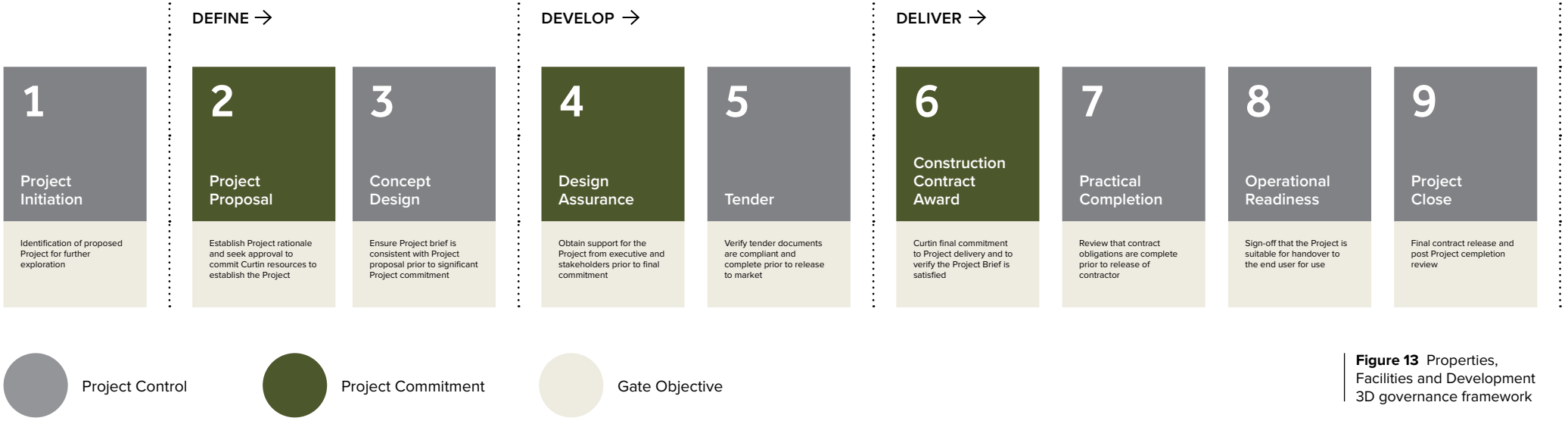


Figure 13 Properties, Facilities and Development 3D governance framework

4.2

Key Performance Indicators

To ensure that the Decarbonisation Plan is successful in meeting its targets and objectives, a set of internal and external Key Performance Indicators (KPIs) will be developed. Example KPIs are shown in Tables 1 and 2. These KPIs will be managed, monitored and reported upon by the Portfolio Manager - Net Zero, supported by other KPI owners.

Table 1 Decarbonisation Plan external KPIs

#	Workstream	Item	Definition	Measure	Unit	Owner	Leading/ Lagging
External KPI 1	**6. Continuous improvement**	**Reduce Carbon Footprint (Scope 1 and 2)**	Decrease tonnes of CO2-e emitted by Curtin University as an Organisation (WA sites) from Scope 1 and 2 activities	Cumulative Reduction vs 2023 % Reduction vs 2023	tCO2-e %	Portfolio Manager - Net Zero	Lagging
External KPI 2	**6. Continuous improvement**	**Implement Action Plan for Scope 3 emissions**	Undertake comprehensive audit to enable forecasting and target setting for Scope 3 reductions.	Cumulative Reduction vs 2023 % Reduction vs 2023	tCO2-e %	Portfolio Manager - Net Zero	Leading
External KPI 3	**2. Green Electricity**	**Install Battery Storage Capacity**	Deploy a Battery Energy Storage System on the Curtin Bentley Campus (behind the meter)	Cumulative Capacity	MWh	Infrastructure Manager – Electrical	Leading
External KPI 4	**2. Green Electricity**	**Increase Green Energy Use**	Energy supplied from the grid generated by renewable sources in place of fossil fuels	Annual Ratio	%	Utilities Manager	Lagging
External KPI 5	**4. Waste / Water**	**Enhance Waste Stream Management**	Expand current Waste Stream Management processes to incorporate decarbonisation data	KPIs to be determined when new waste services contract is awarded in 2025	TBC	Portfolio Manager - Net Zero	Lagging

Table 2 Decarbonisation Plan internal KPIs.

#	Workstream	Item	Definition	Measure	Unit	Owner	Leading/ Lagging
Internal KPI 1	1. Building Efficiency	Increase Building Energy Efficiency	Infrastructure upgrades, refurbishment and operational adjustments (targeting minimum NABERs rating)	Number of buildings refurbished/upgraded in reporting period	Building	Portfolio Manager - Net Zero	Lagging
Internal KPI 2	1. Building Efficiency	Remediate Mechanical Water Underground Infrastructure	Preventative and reactive replacement of the underground heated and chilled water networks to minimise leaks	Pipe replaced/repaired (as % of a total network length)	%	Infrastructure Manager – Mechanical	Lagging
Internal KPI 3	2. Green Electricity	Generate Renewable Energy (onsite)	Install solar PV systems on new buildings and as part of major refurbishments	Cumulative PV generation capacity (on Curtin owned buildings WA)	KW	Infrastructure Manager – Electrical	Leading
Internal KPI 4	3. Gas Electrification	Replace Gas-fired Assets With Electric	Gradually replace gas-fired assets with electric heat-pumps and boilers	% of total heating energy produced by electric assets	%	Infrastructure Manager – Mechanical	Leading
Internal KPI 5	4. Waste / Water	Increase Potable Water Metering	Install/upgrade water flow meters at the 75 largest buildings on Bentley campus to allow the investigation of water losses across the potable water infrastructure	Buildings metered (as % of 75)	%	Infrastructure Manager – Hydraulic	Leading
Internal KPI 6	4. Waste / Water	Minimise Groundwater Usage	Efficient use of bore water consumed by Curtin University at Bentley campus for irrigation	Water extracted from bores must not exceed allocation under Curtin's two licenses	KL/yr	Portfolio Manager, Parks and Resource Recovery	Lagging
Internal KPI 7	6. Continuous improvement	Reduce Energy Intensity	Decrease in the amount of energy consumed by Curtin University at Bentley campus as a result of implementing the initiatives outlined in the Decarbonisation Plan	Reduction in GJ per GFA (versus 2023 baseline)	GL/GFA	Portfolio Manager - Net Zero	Lagging

5

Next Steps

5.1

Immediate next steps for Scope 1 and 2

To advance Curtin's decarbonisation goals, the following actions are recommended as immediate next steps for implementation:

- **Appoint Workstream Leaders (all workstreams):** Designate leaders for each workstream to coordinate decarbonisation efforts, with a clear focus on immediate actions and strategic objectives. Leaders will define scope and KPIs, identify stakeholders, establish meeting cadence, and develop workstream plans. They will oversee KPIs, manage initiatives, and coordinate capital works within their workstreams. These roles may involve formalising decarbonisation responsibilities within existing PF&D positions.
- **Agree on Budget for Additional Resources (select workstreams):** Achieving Net Zero Scope 1 and 2 by 2035 will increase the workload within PF&D. It is recommended that Curtin considers recruiting additional resources with relevant technical or commercial expertise to lead key initiatives in the Decarbonisation Plan. Modelling suggests up to 3 full-time equivalents (FTEs) will be required for implementing, tracking, and operating initiatives. These could be part-time or contract roles. Three immediate and time sensitive priorities include:
  - **Portfolio Management:** Set up tracking for decarbonisation KPIs, manage data on BAU and emissions, and provide project support across workstreams. Initially, this may require full-time support but is expected to scale down for ongoing tracking and support.
  - **Energy Efficiency Targets:** Establish energy efficiency standards for refurbishment designs and oversee the implementation of building efficiency initiatives. This role is expected to be a part time role (0.25–0.5 FTE).
  - **Big Battery Feasibility and Project Management:** Lead the feasibility study for the battery project, including both pilot and full rollout phases, and subsequently manage further design and development phases. The role may start as part-time during feasibility but would likely require full-time involvement for future phases
- **Decarbonisation Continuous Improvement (Workstream 6):** Establish an overarching workstream to ensure accountability and continuous improvement towards decarbonisation targets. This workstream should track progress across the program, focusing on both leading indicators (e.g. milestone achievement) and lagging indicators (e.g. emissions, energy, waste, and water efficiency).
- To align with the new governance structure and mobilise resources, the following activities should begin as soon as practical:
  - **Building Efficiency (Workstream 1):** Establish formal design requirements for refurbishments to contribute to energy savings, agree on NABERS rating targets and commission NABERS assessments.
  - **Gas Electrification (Workstream 3):** Progress the tender for heat recovery chillers, which are critical to the electrification strategy.
  - **Green Electricity (Workstream 2):** Consider the impact on NPV and eligibility for government incentives when implementing the big battery project in multiple phases. Feasibility studies should validate compatibility with Curtin's existing infrastructure, assess suitable battery technologies and explore potential partnerships with energy providers.
  - **Waste and Water Management (Workstream 4):** Prepare for the upcoming waste contract tender, ensuring future contracts focus on reducing Scope 3 emissions related to waste management.

5.2

Scope 3 maturity and target setting action plan

From First Half of Calendar Year 2025

Curtin should prioritise completing a comprehensive Scope 3 carbon account and adjust the composition of its Scope 3 working group. Key actions include:

- **Developing a Baseline:** A full Scope 3 carbon account is essential to establish a credible and transparent baseline, guiding Curtin's future reduction strategies. This process should focus on gathering data across more reporting categories, with particular attention on investments and upstream leased assets in alignment with an agreed upon reporting methodology (e.g. Environmental Association for Universities and Colleges or EAUC, Tertiary Education and Facilities Management Association - TEFMA).
- **Strengthening Governance:** Effective governance is critical for managing Scope 3 emissions, ensuring accountability, and maintaining consistency in reporting. To support this, Curtin is reviewing the composition of its Scope 3 working group, which should encompass all Curtin functions that contribute to significant Scope 3 subcategories and hotspots (see Figure 12). Roles and responsibilities will also be defined through this exercise.

With the Scope 3 carbon account completed, Curtin can begin external reporting for Scope 3 emissions based on its defined boundaries and evaluate alignment with criteria.

- **Defining Boundaries:** Curtin will need to determine the boundaries for external Scope 3 reporting. While TEFMA, EAUC, and GHG frameworks don't mandate specific boundaries, SBTi's criteria for the Buildings Sector does specify Scope 3 categories that must be reported.
- **SBTi Alignment Requirements:** To align with SBTi standards, companies must set Scope 3 emission reduction targets that cover a significant portion of their emissions, especially for the most impactful categories. These targets should aim for near-complete coverage over the long term. Feasibility studies should be conducted to validate target suitability, with a minimum duration of five years and a maximum of 15 years from the public announcement.

From Second Half of Calendar Year 2025

Curtin should engage with its faculties and value chain partners and identify Scope 3 emission reduction opportunities and:

1. Develop a Scope 3 Forecast: Project Scope 3 emissions to 2035, focusing on the sources that will account for 60–80% of future emissions.
2. Engagement Strategies: Curtin can employ three engagement strategies with stakeholders and value chain partners:
    - Informative: Host workshops to share best practices and resources on emission reduction.
    - Passive: Update procurement guidelines to prioritise suppliers that meet sustainability criteria.
    - Active: Include contract terms or a Code of Conduct for key suppliers, requiring them to disclose emissions and commit to reduction targets.

These engagement strategies will enable Curtin to take proactive control of its Scope 3 emissions and guide its suppliers, partners, staff, and students toward sustainable practices.

Once reduction opportunities are identified, Curtin can set a formal Scope 3 target. If the target adheres to SBTi standards, Curtin can publicly declare its net-zero ambitions as SBTi compliant.

6

Appendices

6.1

Glossary

Term	Abbreviation	Definition
Australian Carbon Credit Unit	ACCU	A tradable unit representing one tonne of CO2e reduction or removal in Australia
Battery Energy Storage System	BESS	System for managing battery operation and performance
Building Management System	BMS	
Business as Usual	BAU	
Calendar Year	CY	The year starting from January 1 and ending on December 31
Capital Expenditure	CAPEX	Funds used by a company to acquire or upgrade physical assets
Carbon Dioxide / Carbon Emissions	CO2	Each year, human activities release more carbon dioxide into the atmosphere than natural processes can remove, causing the amount of carbon dioxide in the atmosphere to increase
Carbon Neutral		Achieving a balance between the carbon emissions produced and the carbon removed from the atmosphere, typically through offsetting emissions with actions like carbon credits or reforestation. To be carbon neutral in Scope 2 Emissions, means we have procured and used green electricity via LGCs for a full calendar year.
Circular Economy		Curtin will support a Circular Economy by reducing waste, avoiding unnecessary consumption, and keeping resources in use through reuse, refurbishment, and recycling to reduce its environmental impact
Curtin University	Curtin	Curtin University is Western Australia's largest university, with over 60,000 enrolled students across its Australian and international campuses in 2023. Curtin is a globally focused institution that offers a wide range of undergraduate and postgraduate courses in business, humanities, health sciences, resources, engineering and science. Curtin has campuses in Australia, Malaysia, Singapore, Dubai and Mauritius. Curtin's largest campus, Curtin Perth, is in the suburb of Bentley, Western Australia. Curtin has four other sites in the Perth central business district, a campus in east metropolitan Midland and a regional campus in Kalgoorlie
Curtin University Decarbonisation Plan	The Plan or Decarbonisation Plan	The strategic plan which addresses the decarbonisation pathway for Curtin University's WA Operations. This Plan will initially address the decarbonisation needs of Curtin's WA operations within the existing local frameworks, and be utilised to inform the decarbonisation needs of global campuses in the future
Decarbonised Energy		Decarbonised energy is low or zero-carbon energy, mainly from renewables like solar, wind, and hydro. These are energy sources and systems that produce little to no carbon emissions. Decarbonised energy relies on technologies such as batteries that improve energy efficiency, or store low carbon energy, and reduce reliance on fossil fuels

Term	Abbreviation	Definition
Electric Vehicle	EV	Vehicles powered entirely by electricity
Equitable Societies		Curtin will remove systemic barriers and provide tailored support to create fair and equal opportunities for individuals and groups, where everyone can participate, access the resources they need and thrive
Financial Year	FY	Australian Tax Office definition of Financial Year (1 July–30 June)
Greater Curtin Master Plan	GCMP	The Greater Curtin Master Plan is a long-term development framework aimed at transforming Curtin University's main campus in Bentley into a vibrant, sustainable urban hub that integrates education, research, business, and community facilities
Green Energy		Renewable or decarbonised energy
Greenhouse Gas	GHG	Gases that trap heat in the atmosphere, contributing to global warming
Greenhouse Gas Protocol	GHG Protocol	A widely used global framework for measuring and managing GHG emissions
Heating, Ventilation, and Air Conditioning Sensor	HVAC sensor	A sensor that regulates HVAC systems to ensure energy efficiency
Inherent Risk		The level of exposure to a risk without any controls or mitigation
International Organisation for Standardisation 14064	ISO 14064	An international standard for GHG reporting and verification
Key Performance Indicators	KPIs	Metrics used to measure the success of each initiative
Kilo tonnes of carbon dioxide equivalent	KtCO2e	Overall organisational carbon emissions are given as a single figure, measured in kilo tonnes of carbon dioxide equivalent, by weighting non-carbon dioxide gases by their global warming potential
Kilowatt-hour	kWh	A unit of energy used to measure electricity consumption. It represents the amount of energy consumed by a device that uses one kilowatt (1,000 watts) of power for one hour
Large scale generation certificates	LGCs	LGCs are tradable certificates created for eligible large-scale renewable energy power stations. The certificates represent the amount of renewable energy generated by these facilities
Light Emitting Diode Upgrades	LED upgrades	Energy-efficient lighting upgrades that replace traditional bulbs
Megawatt	MW	A unit of power equivalent to one million watts
Megawatt-hour	MWh	A unit of energy equivalent to one megawatt of power used for one hour

Term	Abbreviation	Definition
National Australian Built Environment Rating System	NABERs	A rating system measuring the environmental performance of buildings
National Greenhouse and Energy Reporting	NGER	Australian national framework for reporting GHG emissions and energy use
Nature Positive		Curtin will adopt practices that actively restore and protect ecosystems and biodiversity, ensuring human activities contribute to net environmental improvement and ecological regeneration. Nature Positive practices at Curtin incorporate First Nations knowledge and wisdom in caring for Country
Net Present Value	NPV	
Net Zero		Curtin will reduce its emissions as fully as possible by prioritising efficiency improvements and renewable energy, with carbon offsets used only as a final measure to balance any remaining emissions. Achieving a balance between all greenhouse gases emitted and those removed, addressing not just carbon dioxide but also other greenhouse gases, through reduction strategies and offsetting remaining emissions
Net Zero Precincts	NZP	The Net Zero Precincts Race 2030 project is a three-year research initiative aimed at transitioning urban precincts towards net zero emissions by 2030. It involves innovative strategies, real-world case studies, and partnerships with industry and government to develop and implement effective decarbonisation solutions. The project is led by Curtin University and involves 13 partners from industry and government: DevelopmentWA, Hesperia, Western Power, Cisco-Curtin Centre for Networks, Sustainable Built Environment National Research Centre (SBEnrc), City of Fremantle, City of Perth, City of Stirling, City of Canning, LandCorp, Synergy, Water Corporation, and the Property Council of Australia
Onsite renewable generation		Electricity produced at Curtin's West Australian campuses from renewable sources, largely using rooftop solar
Operations and Maintenance	O&M	Activities related to the operation and maintenance of assets
Operating Expenditure	OPEX	Operating expenses incurred during day-to-day business activities
Plug-in Hybrid Electric Vehicles	PHEVs	Vehicles that use both a rechargeable battery and an internal combustion engine
Procured Green Electricity		Electricity procured from external parties with associated renewable energy certificates in the form of large scale generation certificates (LGC)
Properties Facilities and Development	PF&D	Curtin Properties, Facilities & Development (PF&D) directorate plays an important role in ensuring Curtin's physical presence enables ongoing transformation and supports the University's vision to be a recognised global leader in research, education and engagement

Term	Abbreviation	Definition
Race to Zero		The Race to Zero is a global initiative that encourages universities and colleges to commit to achieving net-zero emissions by 2050 through detailed action plans, regular reporting, and reducing their carbon footprint across all scopes
Science-Based Targets initiative	SBTi	An initiative helping companies set science-based emissions reduction targets
Scope 3 Hotspots		Subcategories under the 15 Scope 3 categories that account for over 3% of the total Scope 3 emissions
Scope 3 Material Categories		Scope 3 categories that contribute more than 5% of Scope 3 emissions
South West Interconnected System Network	SWIS	The electricity transmission network serving Western Australia
Strategic Space Plans	SSPs	Faculty Strategic Space Plans developed by Curtin PF&D in partnership with Faculties to identify optimal accommodation strategies for future anticipated space requirements for the Faculties for the short, medium and long term
Sustainable Development	SD	Curtin will conduct its operations and activities with consideration of the long-term impact of our actions on future generations and the environment, aligning with the United Nations Sustainable Development Goals (UN SDGs) and the vision of Curtin's 2030 Strategic Plan: Through partnership, we will make a difference for people and our planet. Through Curtin's global learning activities, research, knowledge, business practices, collaborations, and lifestyles Curtin will act to prioritise the well-being of both the planet and its inhabitants
Sustainable Development Goals	SDGs	The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals, which are an urgent call for action by all countries – developed and developing – in a global partnership
Task Force on Climate-related Financial Disclosures	TCFD	A framework for organisations to disclose climate-related financial risks
TEFMA and Standardised Carbon Emission Reporting Framework		The framework used for carbon emission reporting in educational institutions
Tonnes of Carbon Dioxide Equivalent	tCO2e	A standard unit used to measure the emissions of GHGs
United Nations	UN	The United Nations is an international organisation founded in 1945 to promote peace, security, human rights, and sustainable development through cooperation among its member states
Utility Electric Vehicles		Electric vehicles used for utility and service operations
Western Australia	WA	The state where Curtin University's Australian operations and campuses are located

6.2

Key Assumptions

6.2.1 Energy Cost Forecast Assumptions

- Over a 25 year period, the Consultants predict that the electricity wholesale price will trend downwards while the gas price will increase if both energy demand and renewable penetration grow at moderate rates. This will lead to an overall 37% increase in electricity costs.
- WA's electricity price is predicted to go up by 50% in the next 6 years before it decreases.
- Gas retail price in WA is expected to increase by 5% annually (at least).

6.2.2 Grid Greening Assumptions

Forecast energy demand in WA is driven by increased electrification and industrial activity and tempered by behind the meter investments:

- Demand is driven by Commercial and Industrial (C&I) growth, where baseline electricity demand grows by 3% p.a. from 2024.
- Uptake of rooftop solar and household batteries increases rate of self-consumption to offset 94% of household demand by 2050, despite underlying demand growth by 1.7% p.a.
- From 2026, C&I heat electrification is driven by alumina refineries, with 20% of processes electrified by 2030 and 100% by 2050.
- Uptake of new passenger EVs purchased based off government targets (30% by 2030, 100% by 2050).
- C&I EV loads are 5-6 times higher than passenger vehicles and is the primary driver of fleet electrification demand.
- Hydrogen production is expected to have minimal impact on the grid, as electricity required will be generated behind the meter.

Wind and distributed PV is expected to be the main sources of energy supply in SWIS, with renewable penetration reaching 50% by 2030 and 80% by 2040:

- Sufficient energy supply is available from gas and renewables to meet average demand from 2030.
- Combined Cycle Gas Turbine (CCGT) gas and biomass are primary sources of baseload thermal generation to substitute coal.
- Before 2036-2040, sufficient capacity exists for flexible gas peaker plants to meet demand not fulfilled by renewable generation and storage.
- Utility-scale Battery Energy Storage System and distributed storage become main source of firming from 2045 onwards.
- No existing gas capacity (CCGT and Open Cycle Gas Turbines) is forecasted to shut, given the government's plans to maintain flexible gas in the system to support renewable energy transition.
- Uptake of renewables contingent on the WA government delivering on their Energy Transformation Strategy on time to meet decarbonisation targets.

6.3

Global GHG emissions reduction frameworks details

6.3.1 SBTi compliance requirements

The current key requirements for SBTi compliance are listed below.

Scope 1, 2, and 3 Emissions: SBTi compliance would require Curtin to address emissions across their entire value chain. This includes direct emissions from owned or controlled sources (Scope 1), indirect emissions from the generation of purchased energy (Scope 2), and all other indirect emissions that occur in the value chain (Scope 3), such as those from suppliers and end-users.

Setting Targets: Since the re-baseline of Scope 3, Scope 3 emissions exceed 40% for Curtin. Thus, Curtin must set both a near term and Net Zero Scope 3 target, alongside with its Scope 1 and 2 targets, and provide external reporting if it wants to be SBTi compliant. The target must align with SBTi's criteria and reflect the goals of the Paris Agreement.

- Scope 1 and 2 targets must, at a minimum, align with a 1.5°C pathway, expecting to reduce Curtin's absolute Scope 1 and 2 emissions by approximately 4.2% annually. This suggests a long-term science-based target will be equivalent to reduce 26% by 2030 and 40% by 2035.
- A Scope 3 target must at a minimum be in line with a 1.5°C pathway, covering at least 67% of total Scope 3 emissions and include the Scope 3 categories that are most material.
- Targets should cover a period of 5 to 15 years from the date of submission, with interim targets required for Scope 1, 2 and 3 if Curtin wants to be SBTi compliant.

Target boundaries: The newly published SBTi criteria for buildings sector requires organisations like Curtin to account for all building-related operational emissions including both landlord and tenant-controlled spaces.

Target Validation: Once targets are set, they must be submitted to SBTi for validation. This process ensures that the targets are science-based and aligned with SBTi criteria. Curtin may receive feedback and be required to revise their targets to achieve full compliance.

Public Disclosure: SBTi mandates that organisations publicly disclose their targets and report on their progress annually. This transparency is crucial for accountability and allows stakeholders to monitor Curtin's progress toward its climate goals.

Regular Review and Updates: Curtin would be expected to review and, if necessary, update its targets regularly to reflect new scientific developments, changes in business operations, or other relevant factors. Additionally, Curtin must report any significant changes in their Scope 3 emissions, ensuring that targets remain relevant and effective.

6.3.2 Race to Zero overview

Curtin is currently assessing the alignment of the proposed decarbonisation pathway against both the SBTi and the Race to Zero frameworks. As part of this process, mapped within Workstream 6, Curtin will consider setting a target that aligns with initiatives, such as Race to Zero, which many other Australian universities have already signed and committed to. Race to Zero is an UN-backed global campaign aimed at rallying non-state actors like educational institutions to take immediate and rigorous action to halve global emissions by 2030 and reach net-zero by 2050 at the latest. It focuses on decarbonising in line with the Paris Agreement. The initiative includes a broad coalition of actors working together to deliver a healthier, fairer, and zero-carbon world.

Participation Criteria :

1. Pledge: Participants commit to reaching net-zero emissions by 2050 or earlier, setting interim targets to halve emissions by 2030. These targets must cover all relevant sources of greenhouse gas emissions, including direct and indirect emissions.

2. Plan: Within 12 months of joining, participants must publish a detailed action plan outlining steps they will take over the next decade. This plan should include short, medium, and long-term strategies for emissions reduction and address how the transition will be equitable and just.

3. Proceed: Immediate actions must be taken to meet interim targets, focusing on the most emission-intensive areas. These actions must be aligned with science-based targets, supporting climate solutions and scaling up decarbonisation activities.

4. Publish: Annual reporting is required to track progress against set targets, including interim and long-term targets. These reports must be publicly available and presented in a standardised format.

5. Persuade: Participants are encouraged to advocate for ambitious climate actions among their peers and stakeholders, creating momentum for broader change and ensuring that policies and practices are aligned with net-zero goals.

These criteria are intended to ensure participants take meaningful actions to reduce emissions and support a sustainable future, and Curtin's Decarbonisation Plan is well-structured to meet these criteria.

6.4

Emissions reduction schedule

The cumulative impact breakdown for each initiative is shown in Tables 9 and 10:

For Scope 1 emissions

Significant emissions reductions will be primarily achieved through gas electrification, led by the heat recovery chiller, which is expected to be fully operational by 2026 and deliver a 47% reduction. Additional reductions will come from the installation of heat pumps and electric boilers , with residual emissions (such as refrigerants) to be offset by carbon credits. This approach will ultimately enable Curtin to achieve a complete 100% reduction in Scope 1 emissions by 2035.

For Scope 2 emissions

The impact is largely driven by green electricty initiatives, including rooftop solar installations starting in 2026 and large-scale battery storage in 2027. Combined with building efficiency upgrades (such as BMS enhancements, temperature set point adjustments, and refurbishments) these efforts will achieve a progressive reduction, culminating in a full 100% reduction in Scope 2 emissions by 2034.

Table 9 Scope 1 emission impact (cumulative)

Scope 1 emission impact (cumulative)		2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Building efficiency	Planned refurbishments	-	-	-	-1%	-1%	-2%	-3%	-3%	-4%	-4%	-4%	-4%
	BMS Upgrades	-	-	-1%	-1%	-1%	-2%	-2%	-2%	-2%	-3%	-3%	-3%
	Modification of building temperature set points	-	-	-0.1%	-0.3%	-0.5%	-1%	-1%	-1%	-1%	-1%	-1%	-1%
	Unscheduled refurbishments	-	-	-	-	-	-	-	-1%	-1%	-1%	-1%	-1%
Gas electrification	Heat recovery chiller	-	-	-47%	-47%	-47%	-47%	-47%	-47%	-47%	-47%	-47%	-47%
	Electric boiler	-	-	-	-	-	-	-	-	-	-21%	-21%	-20%
	Heat pump for B155	-	-	-	-	-	-	-	-	-	-	-	-10%
	Heat pump for Technology Park and Kalgoorlie	-	-	-	-	-	-	-	-	-	-	-	-2%
Procurement	Offset residual emissions	-	-	-	-	-	-	-	-	-	-	-	-11%
Total				-48%	-49%	-50%	-52%	-52%	-53%	-55%	-77%	-77%	-100%

Table 10 Scope 2 emission impact (cumulative)

Scope 2 emission impact (cumulative)		2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Building efficiency	Heat pump for Technology Park and Kalgoorlie	-	-	-	-	-	-	-	-	-	-	-	0.1%
	Heat pump for B155	-	-	-	-	-	-	-	-	-	-	-	0.2%
	Heat recovery chiller	-	-	2%	2%	2%	2%	1%	1%	1%	1%	1%	1%
	Electric boiler	-	-	-	-	-	-	-	-	-	5%	4%	4%
Green Electricity + Energy	Big battery storage	-	-	-	-3%	-3%	-3%	-3%	-33%	-41%	-48%	-50%	-46%
	Rooftop for solar new & refurbishment	-	-	-1%	-3%	-4%	-4%	-3%	-3%	-3%	-3%	-3%	-2%
	SWIS grid greening	-	-4%	-16%	-23%	-25%	-24%	-38%	-46%	-47%	-49%	-54%	-58%
Gas electrification	Planned refurbishments	-	-	-	-1%	-1%	-2%	-2%	-2%	-2%	-2%	-2%	-2%
	BMS Upgrades	-	-	-1%	-1%	-1%	-1%	-1%	-1%	-1%	-2%	-2%	-2%
	Modification of building temperature set points	-	-	-	-	-	-1%	-1%	-1%	-1%	-1%	-1%	-1%
	Unscheduled refurbishments	-	-	-	-	-	-	-	-0.4%	-0.4%	-0.4%	-0.4%	-0.3%
Total			**-4%**	-16%	-30%	-33%	-33%	-47%	-84%	-95%	-100%	-100%	-100%

6.5

Scope 3 maturity program

6.5.1 Materiality

Given the comprehensive nature of Scope 3 emissions, which span 15 categories and encompass all indirect emissions throughout the value chain, it is essential to undertake a full accounting of these emissions. However, due to the inherent complexity of Scope 3 accounting, obtaining complete data for all categories can be challenging. Therefore, materiality assessments are used to prioritise the most relevant categories for disclosure and abatement.

Figure 15 presents an overview of Curtin's most significant Scope 3 emission categories, using currently available data. It highlights the top 10 hotspots within these key categories, which collectively contribute over 65% of Scope 3 emissions. By identifying these critical categories and hotspots, Curtin can make sure that relevant business areas are represented in the Scope 3 working group, enabling efforts and resources to be strategically focused on the most impactful areas.

Figure 14 CY 2023 Scope 3 emissions by category

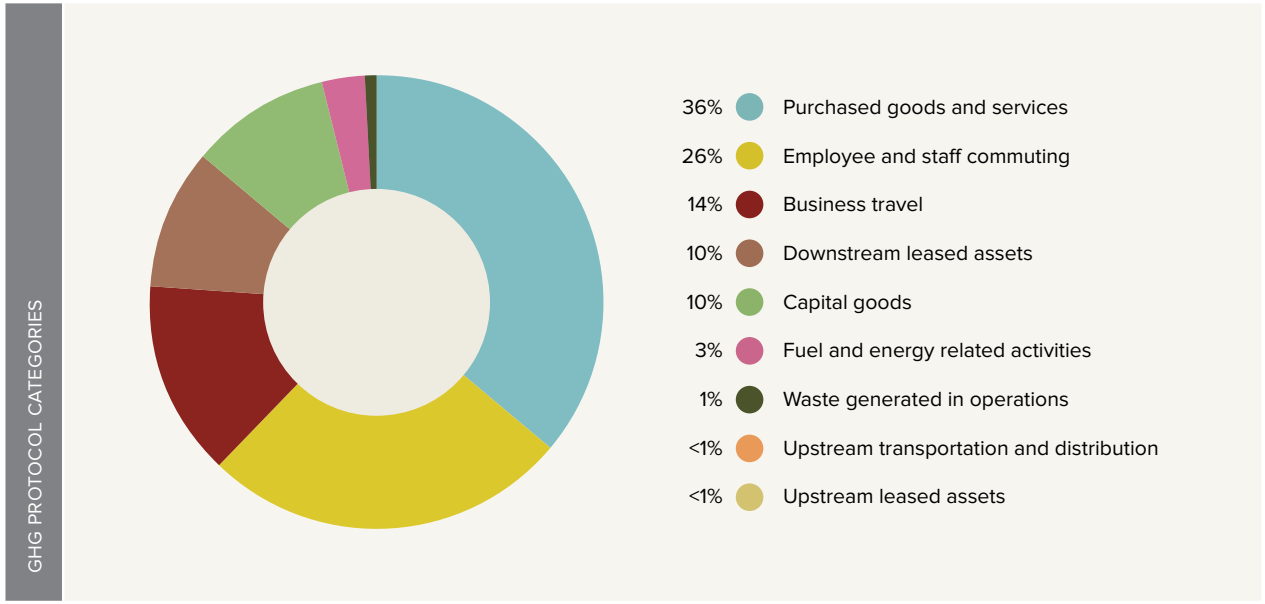
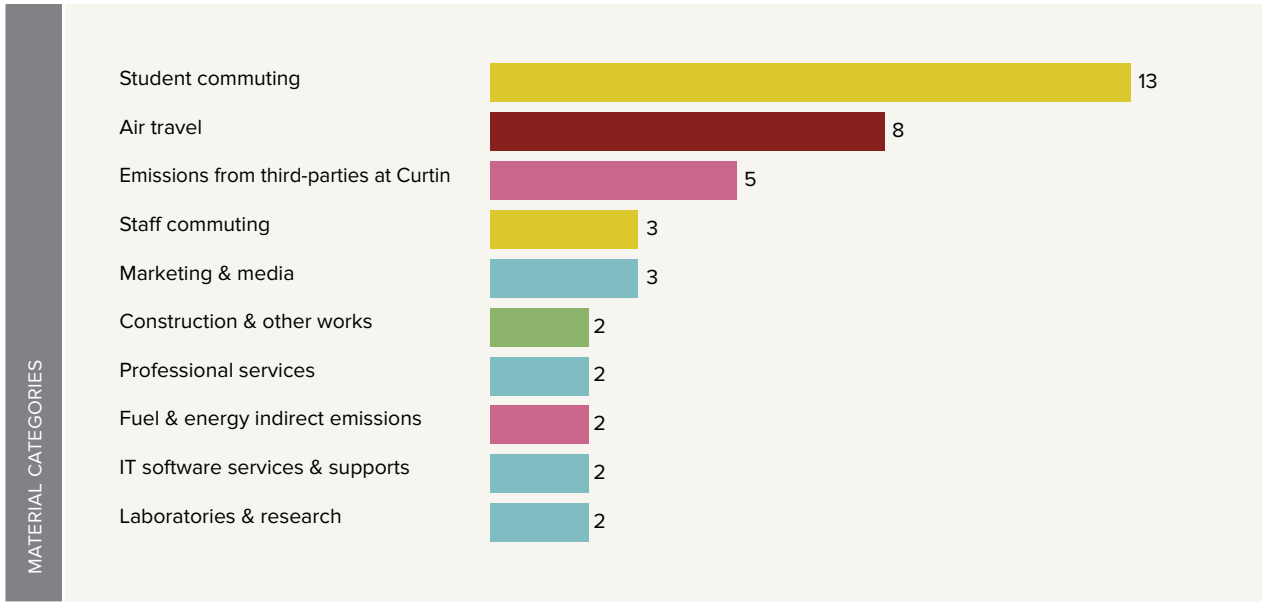


Figure 15 Top 10 hotspots account for 65% of Scope 3 emissions (kt CO_2)



6.5.2 Scope 3 Governance

Effective governance is essential for accurate Scope 3 emissions reporting, to align and define reduction targets and achieve them. Curtin has started to define its Scope 3 working group (and their accountabilities) to include key stakeholders from all departments who manage material Scope 3 emissions, such as the Office of Strategy and Marketing, PF&D, Procurement, Finance, and the global team. This will enable all relevant stakeholders to be involved as Curtin progresses on its Scope 3 maturity journey. Additionally, it is essential to assign dedicated owners to drive improvements in reporting, data management, abatement, and prioritising the budget allocation. Key responsibilities and accountabilities have been identified and are under review, as shown in Figure 16.

Figure 16 Scope 3 working group's accountability and responsibility (indicative only – under review).

WHAT	Set up reporting regime			Data mgmt. & Collection			Abatement			
WHO	Ensure all material scope 3 categories are reported	Define boundaries for external reporting	Decide on scope 3 accounting methods to use	Create data mganagement plan, policies & proccesses	Automate reporting	Collect data from value chain partners	Develop abatement plan	Set abatement target	Implement & monitor abatement (incl. carbon credits)	Allocate abatement budget
Office of Strategy and Marketing		Accountable		Accountable			Accountable	Accountable		
COO Portfolio (including DTS, PF&D and COO PMO)	Responsible for re-baseline				Accountable	Responsible: waste			Responsible for carbon project selection (air travel)	
Finance (including Procurement)	Accountable		Accountable			Accountable & responsible: all other categories			Accountable	Accountable
Global						Responsible: int'l partners				

6.6

Carbon credit risk framework and expansion of the carbon credit pilot

Curtin will need to obtain carbon credits to reach its Scope 1 and 2 Net Zero target by 2035, an interim Scope 3 target may necessitate credits sooner.

Next steps:

- **Budgeting and Risk Assessment:** The Scope 3 working group should set a budget for carbon credits and appoint a member to undertake risk analysis before buying credits, including the risk of being accused of greenwashing.
- **Expanding Offsetting Pilot:** Curtin has the opportunity to transition from procuring international offsets to investing in ACCU projects that are based in WA, and are aligned with Curtin's values and research focus. Projects related to vegetation, Indigenous co-benefits, and waste could serve as 'living laboratories', enhancing academic programs and research.
- **Carbon Credit Project Evaluation:** Should Curtin expand its carbon offsetting efforts, potential carbon credit projects should be evaluated using a checklist specific to ACCU methodology.

6.7

Key Performance Indicators

It is recommended that Curtin should develop both overall and workstream-specific KPIs to measure its progress towards decarbonisation, example KPIs are shown in Tables 11-14. These KPIs should be designed to cover all buildings and infrastructure within Curtin's reporting boundaries.

Table 11 Decarbonisation Plan external KPI's

#	Item	Definition	Owner	Leading/Lagging
External KPI 1	**Reduce Carbon Footprint (Scope 1 and 2)**	Decrease tonnes of CO2-e emitted by Curtin University as an Organisation (WA sites) from Scope 1 and 2 activities	Portfolio Manager - Net Zero	Lagging
External KPI 2	**Implement Action Plan for Scope 3 emissions**	Undertake comprehensive audit to enable forecasting and target setting for Scope 3 reductions.	Portfolio Manager - Net Zero	Leading
External KPI 3	**Install Battery Storage Capacity**	Deploy a Battery Energy Storage System on the Curtin Bentley Campus (behind the meter)	Infrastructure Manager – Electrical	Leading
External KPI 4	**Increase Green Electricity Use**	Energy supplied from the grid generated by renewable sources in place of fossil fuels. If there is a shortfall in the forecast greening of the SWIS grid, procured green energy through Largescale Generation Certificates are to be used as an interim measure.	Utilities Manager	Lagging
External KPI 5	**Enhance Waste Stream Management**	Expand current Waste Stream Management processes to incorporate decarbonisation data	Portfolio Manager - Net Zero	Lagging

Table 12 Decarbonisation Plan external KPI annual breakdown

#	Measure	Unit	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
External KPI 1	Cumulative Reduction vs 2023	t CO2-e	31,217	Planning	30,072	25,004	21,222	20,157	20,058	16,394	6,096	3,137	943	897	Net Zero
	% Reduction vs 2023	%			-4%	-20%	-32%	-35%	-36%	-47%	-80%	-90%	-97%	-97%	100%
External KPI 2	% Reduction vs 2023	t CO2-e	~94,000	Materiality Assessment	Full Audit, Set Targets	Expand Reporting	Review and Adjust								
	% Reduction vs 2023	%	TBC												
External KPI 3	Cumulative Capacity	MWh	nil	Start Feasibility	Complete Feasibility	Install Pilot Phase	6.25								100
External KPI 4	Annual Ratio	%	35%				100%	100%	100%	100%	100%	100%	100%	100%	100%
External KPI 5	KPIs to be determined when new waste services contract is awarded in 2025			75%	80%										

Table 13 Decarbonisation Plan internal KPIs

#	Item	Definition	Owner	Leading/Lagging
Internal KPI 1	Increase Building Energy Efficiency	Infrastructure upgrades, refurbishment and operational adjustments (targeting minimum NABERs rating)	Portfolio Manager - Net Zero	Lagging
Internal KPI 2	Remediate Mechanical Water Underground Infrastructure	Preventative and reactive replacement of the underground heated and chilled water networks to minimise leaks	Infrastructure Manager – Mechanical	Lagging
Internal KPI 3	Generate Renewable Energy (onsite)	Install solar PV systems on new buildings and as part of major refurbishments	Infrastructure Manager – Electrical	Leading
Internal KPI 4	Replace Gas-fired Assets With Electric	Gradually replace gas-fired assets with electric heat-pumps and boilers	Infrastructure Manager – Mechanical	Leading
Internal KPI 5	Increase Potable Water Metering	Install/upgrade water flow meters at the 75 largest buildings on Bentley campus to allow the investigation of water losses across the potable water infrastructure	Infrastructure Manager – Hydraulic	Leading
Internal KPI 6	Minimise Groundwater Usage	Efficient use of bore water consumed by Curtin University at Bentley campus for irrigation	Portfolio Manager, Parks and Resource Recovery	Lagging
Internal KPI 7	Reduce Energy Intensity	Decrease in the amount of energy consumed by Curtin University at Bentley campus as a result of implementing the initiatives outlined in the Decarbonisation Plan	Portfolio Manager - Net Zero	Lagging

Table 14 Decarbonisation Plan internal KPIs annual breakdown

#	Measure	Unit	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Internal KPI 1	Number of buildings refurbished/ upgraded in reporting period	Building	n/a	0	0	3	1	3	1	0	1	0	0	0	0
Internal KPI 2	"Pipe replaced/repaired (as % of total network length)"	%	10%	10%	10%	10%	30%	30%	35%	35%	40%	40%	45%	45%	50%
Internal KPI 3	"Cumulative PV generation capacity (on Curtin owned buildings WA)"	kW	340	340	340	340	1,220	Review & Update							
Internal KPI 4	% of total heating energy produced by electric assets	%	0%	0%	0%	54%	55%	56%	56%	57%	58%	59%	83%		91%
Internal KPI 5	"Buildings metered (as % of 75)"	%	10%	10%	10%	40%	60%	80%	100%	100%	100%	100%	100%	100%	100%
Internal KPI 6	Water extracted from bores must not exceed allocation under Curtin's two licenses	kL/yr	587,290	587,290	587,290	587,290	587,290	587,290	587,290	587,290	587,290	587,290	587,290	587,290	587,290
Internal KPI 7	"Reduction in GJ per GFA (versus 2023 baseline)"	GJ/GFA	0.8							0.72					0.65

6.8

Strategic risk analysis

Curtin has conducted a strategic risk assessment, shown in *Table 15*, to evaluate the potential challenges of achieving Net Zero by 2030 compared to extending the target to 2035. The analysis reveals that aiming for Net Zero by 2035 significantly reduces the inherent risks, particularly concerning delivery timeline slippage, which is a critical factor in the successful implementation of the Decarbonisation Plan.

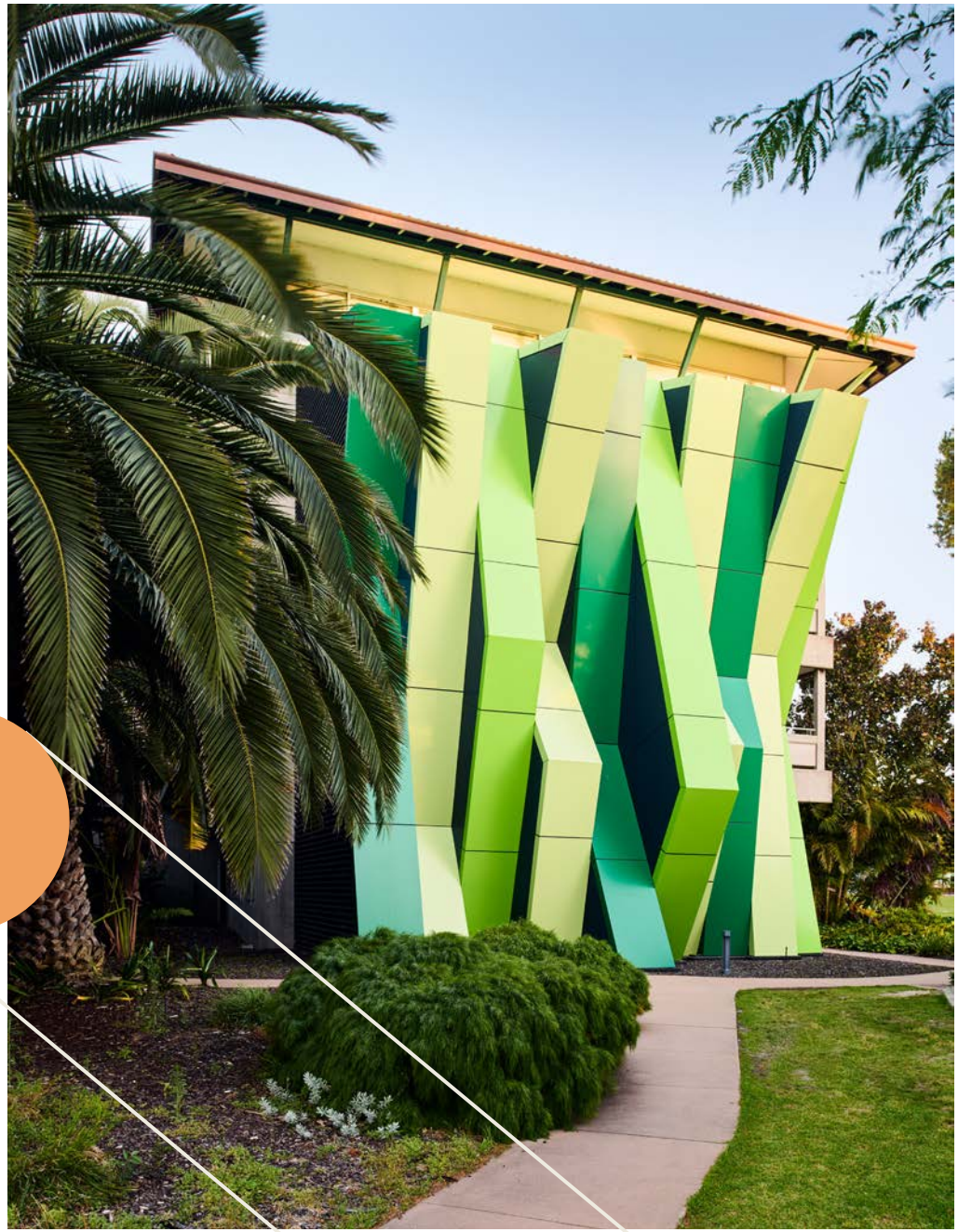


Table 15 Risk Analysis for Net Zero Target Year

Category Risk	Description	2030 Inherent risk rating			2035 Inherent risk rating			Treatment plan
		LIKELIHOOD	IMPACT	RATING	LIKELIHOOD	IMPACT	RATING	
Delivery	Key person discontinuing in their role at Curtin creating a delay, e.g., for gas electrification	Possible	Major	High	Unlikely	Major	Medium	Develop succession plans for key roles required for the decarbonisation implementation
	Disruptions to Curtin's operations including ability to accommodate multiple simultaneous construction activities on Bentley campus	Likely	Major	High	Unlikely	Major	Medium	Planning ahead, re-schedule some activities if needed
	Delay in approving the program/initiatives	Likely	Moderate	High	Possible	Moderate	Medium	Set up dedicated governance
	Not enough internal capacity and capability required to deliver the program	Likely	Major	High	Possible	Moderate	Medium	Identify the limitation and plan early
	Delay and overrun costs in designing detailed solutions and/or with construction / installation	Likely	Moderate	High	Possible	Moderate	Medium	Detailed costing and allow enough contingency
	Tight labour market of required trades creating delays and inflating delivery costs	Likely	Moderate	High	Possible	Moderate	Medium	Hire additional required resource for Project Delivery
Operation	Higher than expected increase in the electricity price	Possible	Major	High	Possible	Moderate	Medium	Actively monitor the market and regularly review modelling
	Not enough additional Large Scale Generation Certificates available for purchase to offset 100% of Curtin's electricity consumption	Possible	Major	High	Possible	Moderate	Medium	Actively monitor the market
	Technical feasibility of the solutions	Unlikely	Moderate	Medium	Rare	Moderate	Low	Engage reputable deliverable partners
Future strategy	More advanced electrical heating technology becomes available	Unlikely	Moderate	Medium	Rate	Moderate	Low	Regularly review the latest technologies available
	Risk of potential change in government, with the Liberals indicating they may revoke the current Labor 2030 target	Unlikely	Major	Medium	Rare	Moderate	Low	Review and potentially adjust the Decarbonisation Plan (subject to due process)
	Accusation of greenwashing causing reputational damage	Unlikely	Major	Medium	Rare	Major	Low	Clear communications on decarbonisation activities with stakeholders
	Delay in introduction of REGO certificates could mean that LGCs are needed in 2030	Unlikely	Major	Medium	Rare	Moderate	Low	Closely monitor policy changes
	Changes in emission accounting standards and requirements of frameworks (e.g., SBTi) impacting Curtin's baseline and progress to achieve targets	Rare	Moderate	Low	Rare	Moderate	Low	Closely monitor standard and policy changes

6.8.1

Risk categories

Delivery risk

These include the potential for resourcing challenges in a constrained market, key personnel discontinuing their roles, delays in program approvals, and the internal capacity to deliver the program. For a 2030 target, these risks are rated as “High” due to the compressed timeline, which intensifies the pressure on resources and decision-making processes. The treatment plan for these risks includes developing succession plans for essential roles to ensure continuity, setting up dedicated governance structures to streamline decision-making, and identifying limitations early to allow for proactive planning. For example, succession planning will mitigate the risk of losing key personnel by ensuring that critical roles have designated successors who are prepared to step in without disrupting the project’s momentum.

A significant delivery risk is the tight labour market for the trades required for construction and installation, which could lead to cost overruns and delays. By opting for a 2035 target, the likelihood of these risks is reduced from “Likely” to “Possible”, and the impact is rated from “Major” to “Moderate”. This reduction is because the extended timeline provides more flexibility in securing necessary trades and resources, allowing Curtin to go to market as early as possible, secure contracts, and allocate sufficient contingency in the project budget to manage any potential cost increases.

Operational risk

These include potential higher-than-expected increases in electricity prices and the risk of not securing LGCs to offset 100% of Curtin’s electricity consumption. With a 2030 target, these risks are significant due to the need to secure LGCs within a short timeframe, and the volatility of electricity prices. A longer timeline provides Curtin with the flexibility to monitor these trends and adjust its energy procurement strategies accordingly. This could involve locking in favourable rates when prices are lower, or adjusting the mix of energy sources to mitigate against impact of price increases.

Future strategic risk

These include the potential for changes in more advanced technologies, Government’s decarbonisation targets, carbon accounting standards, accusations of greenwashing, and delays in the introduction of Renewable Energy Guarantees of Origin (REGO) certificates, which could impact the ability to meet the 2030 goal. The risks of target changes or accusations of greenwashing are rated as “Major” for a 2030 target but are reduced to “Moderate” with a 2035 target. By extending the target to 2035, Curtin will have time to engage with stakeholders comprehensively, reducing the risk of backlash, and allowing for the demonstration of real progress, backed by data and transparent reporting. To address these risks, the treatment plan recommends maintaining clear and consistent communication with stakeholders about Curtin’s decarbonisation activities and regularly reviewing the latest technologies and policy developments, adjusting the Decarbonisation Plan as needed. This proactive approach helps to safeguard Curtin’s reputation and ensures that the Decarbonisation Plan remains aligned with evolving regulatory and technological landscapes.

Setting the Net Zero target for 2035 instead of 2030 allows Curtin to navigate substantial risks more effectively, especially regarding timelines and operational challenges. The proposed treatment plans take a comprehensive approach to risk management, ensuring Curtin can achieve its decarbonisation goals with a plan that is resilient and adaptable.