Pathways to Net Zero Precincts

RACE for 2030 BUSINESS

Precincts are defined urban areas that include buildings, infrastructure, streets and open space. Precincts vary in scale, but are typically synonymous with neighbourhoods and as such they present an ideal scale for trialing, monitoring and managing decarbonisation activities that integrate land uses and distributed energy resources.

A Net zero precinct is one that achieves an overall zero balance between CO_2-e emissions and removal of carbon from the atmosphere. This project will involve research into seven net zero innovation areas and how these can be scaled through synthesis pathways to accelerate adoption.

Curtin University

Australian Government
Department of Industry, Science and Resources

AusIndustry
Cooperative Research Centres Program

Novel approaches emerging from partner projects

- Knowledge sharing
- Market transformation
- Impact

The opportunity

The Net zero precincts (NZP) project will generate and share knowledge to accelerate the decarbonisation of places like university campuses, light industrial precincts, shopping centres, apartment complexes and suburbs.

The project will do this with tests and trials, developing new governance, commercial, legal, urban design and digital network systems that integrate distributed energy systems to maximise benefits and enable rapid scaling.

NZP innovations being tested by case study sites

- Renewable energy and power systems engineering
- Digital networks and smart technology
- Carbon modelling and decision support tools
- Planning and urban design
- Governance and policy
- Systems transition
- Engagement and impact

3 TYPOLOGIES:

Residential | Mixed Use | Light Industrial

MATURITY:

Planning | Delivery | Operational

10+ case studies

13+ industry partners

5 universities

The project will:

- Involve decarbonisation technology suites linked to ICT smart solutions relevant to the kind of precinct typology (residential, mixed-use, or light industrial) and urban fabric being created
- Test varying governance models to enable smart monitoring, new kinds of tariff arrangements, power purchase agreements, or demand management tools to optimise energy efficiency
- Deliver policy and industry recommendations that could inform decarbonisation principles at the precincts scale and realised through everything from local council planning guidelines through to industry business models, energy contracts and pricing.

The project - pathways to Net zero precincts

Pathways to Net zero precincts is a collaboration of industry, communities, government and academia. It examines a range of precincts across 5 states with researchers from 5 universities in a 'collaborative model' involving 13+ project partners.

All partners are involved in real-world projects to accelerate decarbonisation through NZP delivery. The project will give policy makers, developers and citizens the opportunity to connect across multiple domains (energy, buildings, mobility, water etc.) to develop innovative technologies and governance arrangements to support net zero transitions.

NZPs are an effective and efficient geographic scale for accelerating urban decarbonisation with, for example, distributed energy systems, solar, batteries and electric vehicles. The precinct scale is small enough to innovate and replicate quickly and big enough to achieve economies of scale and leverage meaningful investment and test novel governance and commercial models.

This project will deliver:

- Knowledge from precinct case studies arising from 'test and trial' activities and evidence based outcomes
- Policy and regulation commentary on how to enable scaling of NZP innovations
- A suite of high impact communications materials, videos, factsheets and web content.

Embedding research to accelerate adoption

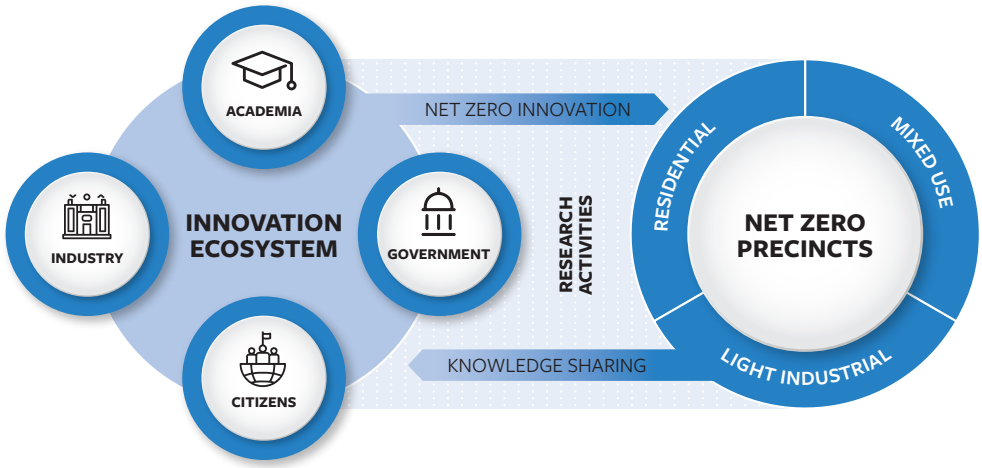

Figure 1: Diagrammatic model showing the relationship between actors and case studies involving embedded research.

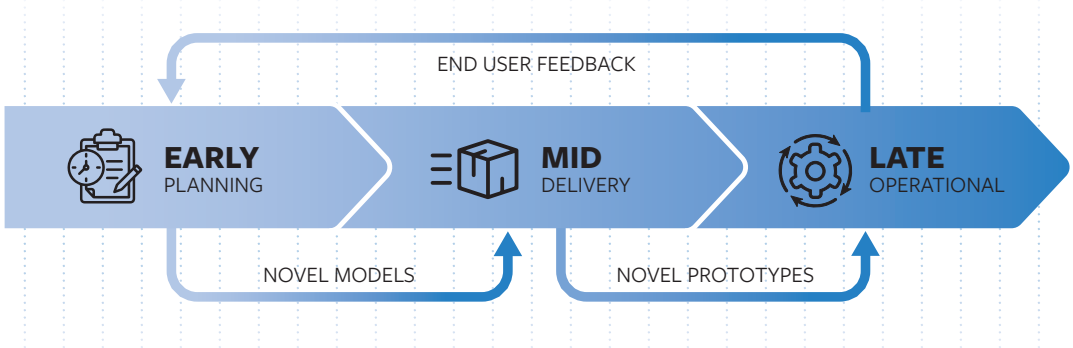

Figure 2: Diagrammatic model showing the stages of precinct case study maturity and associated intervention and knowledge feedback opportunities.

13 Net zero precinct case study sites

	RESEARCH LEAD	CASE STUDY, DEVELOPMENT TYPE, MATURITY STAGE	NET ZERO PRECINCT INNOVATIONS	INNOVATION FOCUS
RESIDENTIAL PRECINCTS	Curtin University	**Knutsford Urban Regeneration Area** DevelopmentWA, WA, Infill, Planning, Delivery, Operational	• Planning and urban design • Governance and policy • Digital networks and smart technology • Engagement and impact	Review benefits and operations of WGV after 10 years, integrate lessons from the East Village innovations (e.g. microgrid, shared battery and rapid EV charger) and plan the next stages of this NZP in Swanbourne Street Structure Plan Area.
	Curtin University	**Rivermark** Hesperia, WA, Infill, Delivery	• Planning and urban design • Governance and policy • Carbon modelling and decision support tools • Engagement and impact	Evaluate net zero urban planning and governance innovations. In addition to operational energy it will consider construction materials and ecological place making.
	Curtin University	**A case study site in development**		
MIXED USE PRECINCTS	Curtin University	**Alkimos Central** DevelopmentWA WA, Greenfield, Planning	• Planning and urban design • Governance and policy • Carbon modelling and decision support tools • Engagement and impact	Prepare net zero urban planning options for a new city centre around a new train station.
	Curtin University	**Curtin University (Bentley Campus)**, Curtin Properties, WA, Retrofit, Operational	• Planning and urban design • Governance and policy • Digital networks and smart technology • Carbon modelling and decision support tools	Develop a decarbonisation action plan to support Climate Active certification, integrating the existing novel campus energy management system and net zero transport plan.
	UTS	**UTS (Ultimo Campus)** UTS properties, NSW, Retrofit, Operational	• Governance and policy • Carbon modelling and decision support tools • Engagement and impact	Refine and test a novel tool (net zero optimisation engine) to reduce barriers and support organisations to easily strategise, develop and implement their net zero response.
	Griffith University Queensland, Australia	**Griffith University (Logan Campus)**, QLD, Retrofit, Operational	• Governance and policy • Renewable energy and power systems engineering • Digital networks and smart technology • Carbon modelling and decision support tools	Design and help deliver a multidirectional and multi-faceted system with real time monitoring to develop a NZP, and to trial effective carbon decision support programs.
	University of South Australia	**Rundle Mall** Rundle Mall Traders Association, City of Adelaide, SA, Retrofit, Operational	• Governance and policy • Carbon modelling and decision support tools • Engagement and impact	Develop governance options for enabling multiple ownership of a net zero system within a predominantly commercial mixed-use CBD precinct.
	MONASH University	**Monash University (Clayton Campus)**, VIC, Retrofit, Operational	• Planning and urban design • Governance and policy • Renewable energy and power systems engineering • Engagement and impact	Establish a detailed certified NZP based on carbon modelling and strategic operational optimisation and examine potential net zero corridor.
	Curtin University	**Net Zero Corridors** Sustainable Built Environment Research Centre partnered with several precincts, WA, Infill, Planning	• Planning and urban design • Governance and policy • Renewable energy and power systems engineering • Engagement and impact	Develop a net zero corridor linking NZP with net zero transport to scale and amplify impact. Possibilities include Monash Campus (VIC), Knutsford (WA) and City of Stirling/Curtin campus (WA).
LIGHT INDUSTRIAL PRECINCTS	Curtin University	**Roe Logistics Park** Hesperia, WA, Greenfield, Operational	• Governance and policy • Renewable energy and power systems engineering • Digital networks & smart technology • Systems transition • Engagement and impact	Review operations of CEFC-funded first stage, and deliver a NZP certification for a logistics-based industrial estate.
	Curtin University	**Peel BusinessPark** DevelopmentWA, WA, Greenfield, Operational	• Planning and urban design • Governance and policy • Digital networks and smart technology • Carbon modelling and decision support tools	Evaluate operations of first stage solar and battery based system for enabling green industrial development and work on NZP certification.
	CLIMATE KIC Australia UTS	**A case study site in development**		

The precinct study area includes the whole Bentley campus located about 6 kilometres SE of Perth CBD.

116 hectares

30,000 students

100 academic, residential and commercial buildings

CASE STUDY

Curtin University, Bentley – Transitioning to a 'Net Zero' campus

Curtin University will use its Bentley campus as a living lab to accelerate net zero outcomes.

Aligning net zero accreditation to a scheduled campus masterplan review, provides an opportunity to create a net zero campus plan and embed research into this major mixed use development; including an evaluation of lifecycle implications of refurbishment versus new buildings and infrastructure renewal, and consideration of emission reduction targets across all scopes.

Curtin Properties hold an enormous amount of data which they are willing to share to support research and carbon modelling of campus activities. Research activities include an operational evaluation to support rapid campus decarbonisation and lower campus operating costs. Research activities will focus on Scope I and 2, but opportunities for addressing scope 3 activities, e.g. student and staff transport, will also be explored through the development of a decarbonisation action plan.

The research will be closely integrated into the work going on at Monash, UTS and Griffith campuses.

Net zero precinct innovation focus

- Planning and urban design – including campus planning activities
- Governance and policy – for large scale precinct energy transition and decarbonisation
- Carbon modelling and decision support tools – including load balancing, DER and storage optimisation modelling
- Digital networks and smart technology developed with CISCO Centre for Networks (technological audit) for new technical opportunities and monitoring

This case study site will enable:

- Carbon modelling and technological audit on the new technical opportunities
- Developing a decarbonisation action plan
- Pathway to net zero Climate Active certification
- Knowledge sharing 'living campus' website, videos and factsheets.

520 metres long

700 retailers

over 300 services with many in the health domain

15 arcades and centres

2500 food court seats

5000 carparks

University of South Australia

CASE STUDY

Rundle Mall – Iconic Mixed Use CBD Shopping Precinct

Rundle Mall is an iconic 'Shopping and Living' mixed-use precinct in Adelaide CBD and is well positioned to be a genuine Net zero precinct. However, with many building owners, operators and tenancies, with different characteristics and cultures, real energy saving and carbon reduction initiatives is currently challenging.

Broad high-level precinct energy and carbon footprint analysis will be followed by identifying candidates for detailed energy and behaviour modelling, providing recommendations on energy-saving initiatives that have strong stakeholder acceptance, and finally measure energy savings once initiatives have been implemented.

It will include:

- Processes that mimic the local Planning Infrastructure Act SA
- Several governance models to create a Socio-technical Multi Level Governance (STMLG)
- The Precinct Carbon Assessment (PCA) tool developed by the UniSA researchers

In the long term the net zero designs, technologies and governance will be made part of professional practice for CBD's through Town Planning Schemes, building by-laws, and best practice guides, contributing to the processes for documenting and verifying long-term impacts. This will be of great use to government agencies (local, state and federal), urban planners, legal professionals, building and ESD consultants, political scientists and others.

This case study site will enable:

- An improved understanding of the energy consumption profiles of buildings and infrastructure within the precinct
- The identification of socio-technical drivers of, or barriers to, developing a net zero carbon precinct
- An assessment of the relative efficacy, both in terms of energy reduction and stakeholder acceptance, of different engineering and behaviour change strategies to achieve emissions reduction across stakeholders and contexts
- Recommendations on energy saving initiatives, policy instruments and actionable packages for decarbonisation pathways that governments, building owners, operators could use to facilitate 'net zero carbon' adoption.

- **23-hectare former industrial area**
- **2013-2023 - first two parts of this regeneration project (WGV and East Village) designed to be net zero and documented by Curtin researchers**
- **2023-2040 Becomes a vibrant residential community with 1000 new dwellings**

knutsford

Curtin University

CASE STUDY

Knutsford Urban Regeneration Residential Precinct

This DevelopmentWA led urban regeneration precinct in Fremantle includes three distinct projects spanning three stages of maturity: planning, delivery and operational.

The WGV development includes three apartment buildings with strata solar PV and batteries, plus 30 detached high performance dwellings with solar PV.

East Village includes 36 townhomes and an apartment building under construction on a shared microgrid. An additional townhome development is being planned with the potential to expand the microgrid.

The Swanbourne Street Structure Plan Area is 8ha of development ready land in planning. Stage 1 will include a range of housing typologies. DevelopmentWA will build on the learnings from WGV and East Village as they seek to understand the opportunities and barriers to deliver a net zero development across all emission scopes.

This case study site will enable

- Performance evaluation and a review of lessons learned from the WGV precinct
- Monitoring and analysis of the East Village precinct which is nearing completion, allowing an opportunity for NZP knowledge sharing across all the other related precincts
- Investigating the extent to which microgrids in each part of all these developments can be linked
- Development of a transferable governance model for Net zero precincts
- Knowledge sharing resources will be made available in several formats on all this work, including reports and information sheets. A crucial output will be a professional set of videos.