RACE for 2030 CRC Pathways to Net Zero Precincts Project

Background Information for PhD Applicants

The RACE for 2030 Cooperative Research Centre Pathways to Net Zero Precincts (NZP) project has been awarded to Curtin University for a three-year period and includes three PhD industry scholarships. The project's overarching research question is: *How do we integrate appropriate design, technologies and governance models to enable net zero to work effectively in different urban fabrics?* In order to address this fundamental question, the NZP project will address three key research gaps namely: the identification of NZP certification pathways, NZP distributed energy resources and grid integration pathways, and NZP governance pathways. While recognising a systems approach to the problem, each of the PhDs will focus in on one of these research areas.

THE THREE RESEARCH GAPS

NZP certification pathways: What are the most appropriate certification approaches for different precinct typologies; how do they vary with the different types of urban fabric; does the design phase of certification include all the key factors; is there a different approach needed in each state and what are local government responsibilities?

NZP DER and grid integration pathways: How do NZP provide the right smart systems to enable adequate storage to provide baseload and grid firming; how do EV's fit into these NZP systems; how do NZP enable microgrids from these precincts to integrate with surrounding areas; what kinds of tariffs and regulations can enable the combined success of these technical approaches; what is the role of the individual and/or community in enabling these systems to operate successfully?

NZP governance practices pathways: How are prosumer and end-user needs and aspirations included in precinct planning, design, and implementation; how are decisions made about decarbonisation strategies, infrastructure, and management and by whom; how to improve information sharing and technical training among NZP members and who is responsible; what governance processes exist and to which extent do they foster stakeholder dialogue, deliberation, and experimentation; how are collaborative decision making and local leadership strengthened along pathways to the NZP transition ?

METHOD & APPROACH

Transdisciplinary approaches are required to bring industry, government and academia together to combine expertise and experience in a range of areas. This is particularly true of complex sustainability challenges such as the urgent need to rapidly transform to a net zero emission society (Fazey et al., 2020; Lang et al., 2012; Upham et al. 2022). This project aims to create a transdisciplinary 'community of practice' that will function as an innovation ecosystem to embed research into practice to advance NZPs.

The core of the research project will be a series of case studies. To understand the NZP innovations, detailed case study exploration will be conducted by researchers working closely with industry partners. The case study approach will allow us to analyse multiple social and technical NZP innovation factors in depth e.g. trialling new tools, engaging stakeholders, addressing barriers, and aligning policies and incentives to enable the rapid uptake of clean energy solutions. The case studies are at different stages of maturity (planning, development and operational). This will allow the case studies in the planning or development phase to learn from the experience of those case studies already in operation. Successful transition management involves creating a vision for a net zero energy system and setting clear goals, developing and deploying innovative technologies, building capacity and skills among diverse stakeholders, and establishing new business and governance models. Each of these aspects provides a rich area for NZP innovation investigation and joint learning within the case studies.

The case studies focus on three NZP Synthesis Pathways that are related to different aspects of an NZP. The research process will therefore conduct case study comparisons centred around three precinct typologies (residential, mixed use, light industrial) to describe synthesis pathways that are integrated into 'NZP Foundations' as a final outcome (see Figure 1).

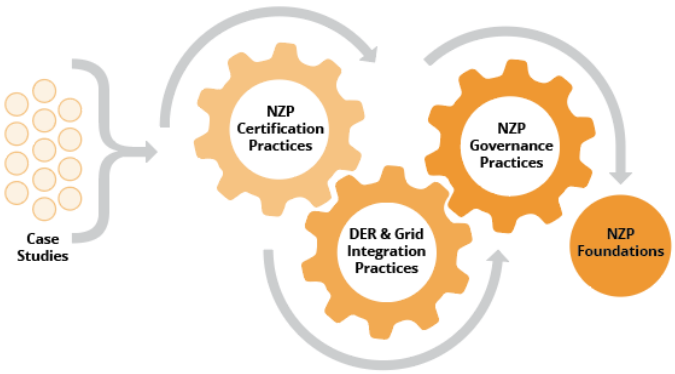

Figure 1: Synthesis pathways for NZP case studies integrating into NZP Foundations.

The three synthesis pathways include:

NZP certification practices: This will focus on the relevance, strengths and weaknesses of the various existing NZP certification tools and guidance (e.g., Climate Active Carbon Neutral Standard for Precincts, and the Green Building Council of Australia (GBCA) Climate Positive Roadmap for Precincts, along with other emerging standards). The goal being to use a common language for all precinct case studies in this project. Representatives from these groups will be part of the Industry Reference Group.

NZP DER and grid integration practices: Drawing upon all the case studies and the broader industry, government and academic expertise in the community of practice, this pathway will focus on the various types of smart systems used for local management and grid integration. Core Partners in RACE are being sought to be part of this project and enable their innovations to be further adopted and to join the Industry Steering Group.

NZP governance practices: Learning from the case studies, this pathway will focus on collaborative governance processes and practices that can help overcome path dependencies and lock-ins, foster inclusive decision making, and strengthen leadership to manage the NZP transition. It is envisaged that representatives from local government, peak industry bodies and the local communities involved in the governance aspects of DER and NZP will be invited to participate in the project's Industry Reference Group.

Each synthesis pathway will draw upon the four activities of transition management as described by Loorbach and Rotmans, 2010). These are central to the overall project's research logic: (1) *strategic* (problem structuring, envisioning, and establishing of a transition arena); (2) *tactical* (developing coalitions, images, and transition-agendas); (3) *operational* (mobilizing actors and executing projects and experiments); and 4) *reflexive* (monitoring, evaluation, and learning). Transition management approaches are highly relevant to NZPs as they involve a comprehensive approach that seeks to understand a niche innovation and find leverage points to shift it from niche to mainstream activity, and in turn catalysing market transformation.

The three synthesis pathways will each form a work package led by an expert technical lead, a professorial technical advisor[1], supported by a work package specific PhD student, to describe in detail the certification practices, DER and grid integration practices, and governance practices. Each synthesis pathway will be the subject of a forum that brings together community of practice representatives from each case study, culminating in a summary report signed off by RACE (see Figure 2).

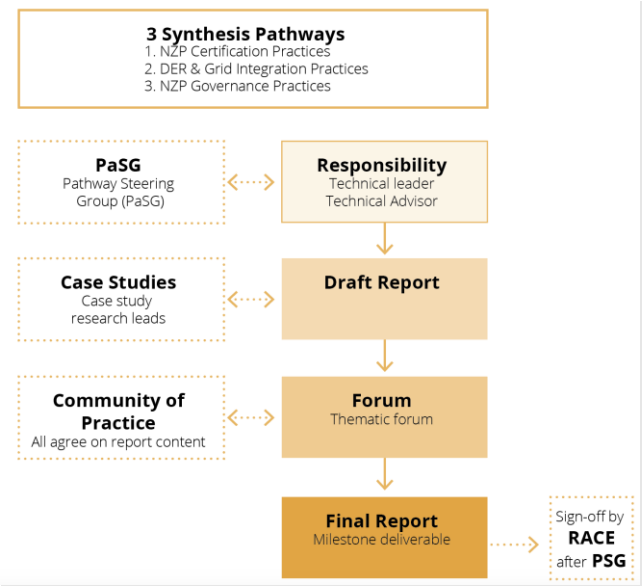

Figure 2: How Synthesis Pathways will be researched and reported.

[1] Professor Peter Newman (NZP certification practices), Professor Peta Ashworth (DER and grid integration Practices) and Professor Petra Tschakert (NZP governance practices).

RATIONALE FOR THREE NZP SYNTHESIS PATHWAYS

1. NZP certification pathways

Concern around net zero certification was recently raised by the Secretary General of the United Nations who stated that despite many net zero pledges *"We urgently need every business, investor, city, state and region to walk the talk on their net zero promises. We cannot afford slow movers, fake movers or any form of greenwashing."* This was stated while launching the UN report Integrity Matters: Net Zero Commitments by Businesses, Financial Institutions, Cities and Regions (*United Nations Expert Group on Net Zero Commitments for Non-State Entities*, 2022) which highlighted the rapid growth in local DER like NZP and the need to upgrade certification. To increase trust in certification commitments the International Sustainability Standards Board (ISSB) Expert Group on Net Zero Emissions plan to release the finalised versions for the first global standards for sustainability and climate-related reporting in June of this year, and in 2022 the International Standards Office released *IWA 42:2022(en) Net Zero Guidelines* to aid consistency of reporting, language and certification practices.

In Australia, doubt has been cast over the reliability in aspects of national emission reduction accounting, particularly as they relate to carbon credits. Various net zero precinct certification frameworks exist, but they are not consistent with these global processes. The Federal Treasury has begun a process to enable *mandatory climate risk disclosure* as part of all financial activity to assist ASIC in its growing assessment of greenwashing. Precinct certification will thus become highly significant in future as a means of obtaining finance, approvals and social licence (Newman, 2023).

Australian certification host organisations have expressed interest in this project to explore opportunities to refine future iterations of their requirements as the national guidelines are outlined in more detail. This project will address these gaps by researching NZP certification pathways.

2. NZP DER and grid integration pathways

The technology for net zero precincts is now available for solar, batteries and EVs but each kind of precinct has different needs for how they are integrated into the functions of the precinct and into the needs and opportunities of being linked to the grid. Given this integration is being enabled by smart systems technology there are a range of providers that will be part of each case study in this project.

The first issues are to ensure people who live or work or visit a precinct, can share the decarbonized services and have a way to meet all the charges and record keeping required. These systems are now very sophisticated (with a number of core CRC partners providing such options) and their effectiveness will be evaluated along with the broader goals of achieving net zero outcomes.

The second set of issues are about how to connect and aggregate DER technologies with the broader grid. Network providers have expressed the risks associated with poor guidance and regulation in this area, e.g. for safety and liability, and also the emerging benefits from this integration. This project will address these gaps by researching DER and grid integration pathways**.**

3. NZP governance pathways

Governance in precincts is a combination of how and by whom each precinct is managed, how the people who live, work, and commute there are included in decision making, and how local governments deliver such projects. Within each precinct case study, there are already governance processes in place, but they are generally not established to provide local energy services and negotiate diverse precinct sustainability needs. This will be a major issue to ensure that innovations and joint learning are not lost because the various stakeholders lack inclusive governance practices and best praxis guidelines and may not have been fully engaged throughout precinct community processes.

Local governments have a critical role to play in net zero precincts and there are questions around how local governments can help unlock the potential of DER, as well as ensuring quality standards are met as part of the development application process. Within local governments there often is a lack of understanding or capacity to perform these tasks but a desire to help where possible. Therefore, a critical piece of this work is not only to trial and document NZP innovations and decision-making processes, but also to co-develop, communicate, and share knowledge (Goddard & Farrelly 2018). Hence, this project will help address this gap through a suite of participatory workshops, videos, fact sheets, and reports to enhance capacity within target audiences, such as developers, local communities, and local government.

In addition to energy utilities there are technical planning considerations that can be managed at the precinct scale yet require careful deliberations and alignment with local visions for net-zero futures, e.g. urban design to maximise roof area, to minimise overshadowing for PV, to reduce demand through efficient building envelopes, to cool urban environments, to minimise the embodied energy of pumped water (potable and sewerage), and to integrate battery storage as well as electric vehicles (e.g. alignment with the sister RACE SEVI project). This project will address these considerations by researching best models for inclusive and equitable NZP governance pathways.

REFERENCES

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