



FINAL REPORT

Collaborative Energy Transition – Unlocking Precinct-Scale
Industrial CER

A case study at the Port of Mackay

October 2026



Final report

RACE for Networks

Research Theme NT6: Collaborative Energy Transition
24.NT6.R.o894

Collaborative Energy Transition – Unlocking Precinct-Scale
Industrial CER: A case study at the Port of Mackay

Draft March 2026

Final draft May 2026

Final October 2026

Citation

Mortimer, G., Sturges, J., Walpole, S., Kirkwood, D., Makhalfih, A., & Ibrahim, I. (2026). *Collaborative Energy Transition*. Prepared for RACE for 2030.

Project partners

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Acknowledgements

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Glenn Springall – Energy Queensland, Peter Haenke – ARENA, Ty Taylor – Queensland Treasury, Brooke Walters – Economic Development Queensland, Michael Dello-Lacovo – Energy Consumers Australia, Steven Cutting – Regional Development Australia, Alan Pears – A2EP, Neil Horrocks & Annie Carapetian – RACE for 2030, Sally Sala & Kate Large – North Queensland Bulk Ports, Dean Kirkwood – Resource Industry Network

Acknowledgement of Country

The authors of this report would like to respectfully acknowledge the Traditional Owners of the ancestral lands throughout Australia and their connection to land, sea and community. We recognise their continuing connection to the land, waters, and culture and pay our respects to them, their cultures and to their Elders past, present, and emerging.

What is RACE for 2030?

[RACE for 2030](#) is a 10-year cooperative research centre (CRC) with \$350 million of resources to fund and support research towards a reliable, affordable, and clean energy future.

Disclaimer

The authors have used all due care and skill to ensure the material is accurate as at the date of this report. The authors do not accept any responsibility for any loss that may arise by anyone relying upon its contents.

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Executive Summary

Consumer energy resources (CER) are expected to play an increasingly pivotal role in Australia's energy transition. There are opportunities for win-win-win outcomes across cost, reliability, and decarbonisation. For industry, CER present an opportunity for lower operating costs and progress towards sustainability commitments. For regions, they support decarbonisation, resilience, and economic development. For the energy system, they could mean better network utilisation, reduced peak demand and reduced reliance on transmission and large-scale renewables (Paterson & Bird, 2024; Mortimer et al., 2022; Committee for Sydney, 2025). However, the commercial and industrial (C&I) segment is not keeping pace with its CER potential – a gap now being described as the “missing middle” (IEEFA, 2026; Smart Energy Council, 2026).

Two related problems explain why the C&I CER opportunity is not being realised. The first is the complexity individual businesses face: internal approval processes, insurance uncertainty, capital allocation pressures, split incentives between building owners and tenants, and connection timelines that can run beyond a year – all while energy is rarely core business (IEEFA, 2026; Energy Consumers Australia, 2023). The second is that much of the value only becomes available by integrating assets designed to work together, coordinating deployment with the network, and aligning the strategies of actors operating at regional, state and national levels.

Addressing both these challenges simultaneously requires coordination, collaboration and the building of trust. The aggregated value of C&I CER is unlocked by connecting actors, designing at a whole-of-precinct level and sharing the benefits that emerge. The systems innovation literature has long identified this work – bringing actors together, seeing the whole and reshaping value flows – as a distinct collaborative process run by people or organisations with a specific set of capabilities, sometimes referred to as intermediaries, backbones, orchestrators or brokers (e.g. Howells, 2006; Klerkx & Leeuwis, 2009; Kivimaa et al., 2019). This research asked two questions: what value do collaborative processes produce in accelerating investment in C&I CER, and what did we learn about how such processes can be designed and improved?

The Port of Mackay served as a testbed for exploring these questions. Over twelve months, a structured collaborative process was run at the Port of Mackay, owned by North Queensland Bulk Ports (NQBP), with a diverse tenant base operating across different sectors. The project ran a collaborative process that brought together tenants, the distribution network business, vendors, regional bodies and national actors to build trust, develop a shared picture of possibilities for renewable energy, electrification and smart energy management across the precinct, and ultimately support investment in CER. The intention was to shift conditions at the Port towards investment in cost-effective, reliable energy that supports network reliability and contributes to the regional economy.

The most significant outcome of the collaborative process is that it created the conditions for investment in precinct-scale CER. At the outset of the project, investment in renewables was limited, and decision-making occurred at the individual business level, with no visibility of shared opportunities or coordinated pathways. By the close of the project, four tenants had self-nominated as early adopters, NQBP was committed alongside them, a further eight tenants were engaged and ready to move once early evidence became available, and Energy Queensland, the Industry Reference Group and regional actors were positioned to support next steps. It is this combination – an integrated precinct-wide view of what is possible, a commercial direction with tested appetite, and stakeholder trust and buy-in – that created a bridge to investment and action.

Collaboration is widely acknowledged as essential to the energy transition, but it is rarely treated as something worth explicitly designing, resourcing and learning from. This research sought both to provide evidence of the value of these processes and to share lessons that could inform other efforts to scale CER at the precinct level. Four themes emerged as particularly important for designing collaborative processes intended to scale precinct-level CER investment:

***Build on the cohesion that already exists:** The project drew on trust and legitimacy that were already present – established relationships, regional forums and a history of working together. Precincts have a natural cohesion through shared geography, common infrastructure and exposure to the same risks. That cohesion will look different in other places, but the aim is to build on and strengthen it through the energy transition.*

***Anchor institutions create momentum:** Anchors also carry weight in conversations about insurance, risk, approvals and funding that would otherwise fall to individual businesses. In this case, NQBP's leadership provided the anchor support. Anchor organisations do not need to hold the same position as NQBP; what matters is that they perform particular roles in these processes, such as conferring legitimacy, accessing funding, creating pathways to scale and de-risking investment.*

***The commercial direction does not require everyone to move together:** Businesses have different constraints, timelines and internal decision processes, and any approach that depends on universal readiness will fail. The four early adopters represent a small proportion of the Port's tenants, but could provide enough momentum to begin implementation. Whatever model is pursued must be able to start with those ready to move, while others watch, learn and opt in as their decision-making timeframes align.*

***Regional intermediaries can play a critical role:** The delivery team, in performing the intermediary function, benefited from connections to regional, state and national networks. This allowed for better integration and alignment of win-win-win outcomes. In particular, Resource Industry Network's role meant that the process built on existing local trust to access informal as well as formal decision-making channels. There are many similar regional network organisations across Australia that, if resourced appropriately, could provide strategic leverage to achieve C&I CER goals.*

Taken together, the collaborative process and the intermediary function that stewards it may be understood as collaboration infrastructure – enabling capacity that makes CER investment with integrated win-win-win benefits possible and can help bridge the “missing middle”. Trust, collaboration and partnership have long been described as enablers of the energy transition. A recommendation of this report is that trust, collaboration and partnership should be explicitly designed for, funded, strengthened and sustained.

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1. Introduction: The Industrial CER Challenge and the Case for Collaboration

Australia's energy transition is entering a critical phase. Consumer energy resources (CER) – rooftop solar, battery storage, electric vehicles, load flexibility, smart energy management and demand response – are now central to the least-cost pathway. AEMO's 2026 Integrated System Plan expands the expected role of CER further. It projects 87 GW of rooftop and other small-scale solar by 2050 – up from 72 GW in the 2024 plan – alongside 35 GW of small-scale batteries. The rise of CER is treated as a cost-reducing factor in the optimal development path (AEMO, 2026). While household uptake is tracking well against that ambition – Australia leads the world in residential rooftop solar, with roughly 22 GW installed across more than four million homes (IEEFA, 2026) – the commercial and industrial (C&I) segment is not keeping pace. Businesses across Australia have installed approximately 5.6 GW against a technical rooftop potential estimated at close to 40 GW (IEEFA, 2026).

This substantial and currently underutilised CER potential across the commercial and industrial sector is now described as the "missing middle" (IEEFA, 2026; Smart Energy Council, 2026). Addressing this gap matters not only because it would help meet renewable energy targets, but also because well-designed C&I CER deployment can address several challenges and opportunities simultaneously. An individual business can lower its energy costs and improve reliability. A precinct can unlock value stacking through shared infrastructure, new partnerships and resource stewardship. The network can avoid upgrade costs, reduce peak demand and become less reliant on large-scale generation and transmission. The region can gain resilience, attract new businesses and support sustainable economic development (Paterson & Bird, 2024; Mortimer et al., 2022). Figure 1 sets out these

potential layers of value, showing how individual businesses' investments in CER can collectively generate benefits for the precinct, the network, the region and the broader energy system.

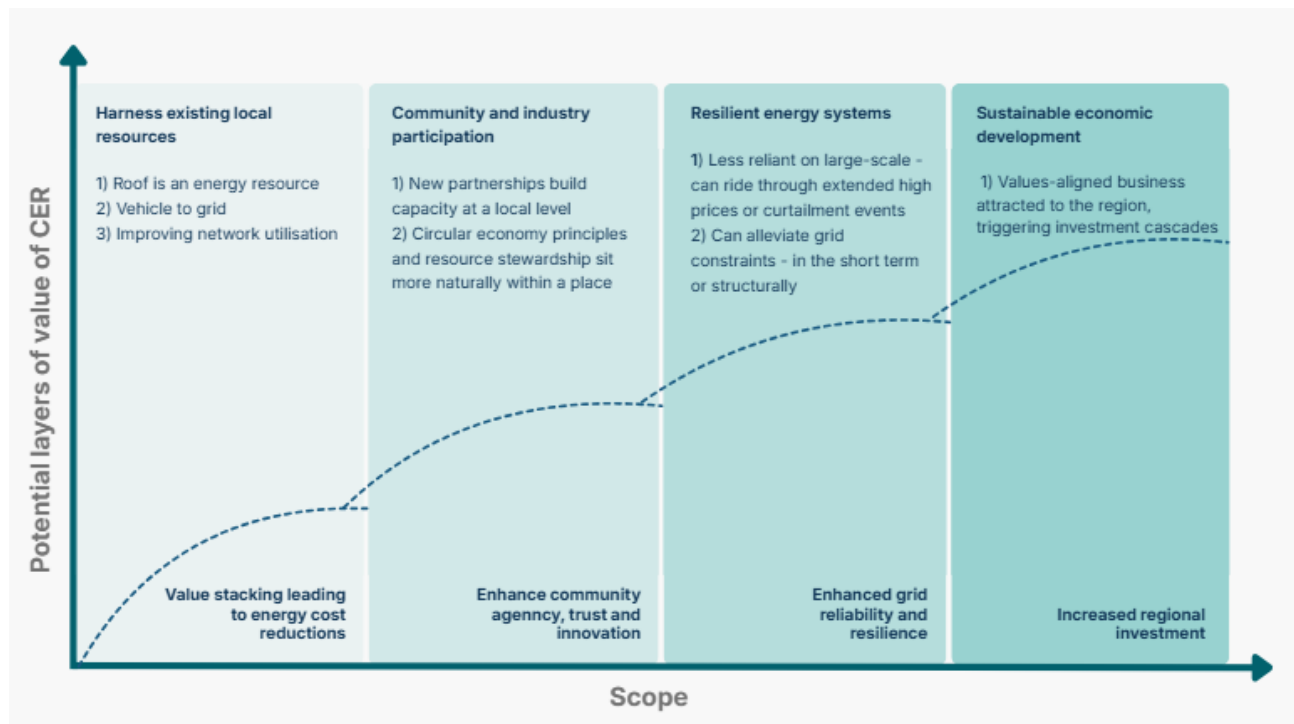


Figure 1 – Potential layers of win-win-win outcomes from CER (adapted from Mortimer et al., 2022)

Two related but distinct problems explain why the CER opportunity is not being realised.

The first is the complexity that individual businesses face. For most businesses, energy is not core-business, and energy projects compete with core operational investment for capital and management attention. Businesses that do want to act encounter real constraints such as internal approval processes, insurance uncertainty, capital allocation pressures, and – where premises are leased – a split incentive between building owners and tenants that leaves neither confident of recovering the investment, particularly where assets outlast the lease. With many vendors and options in the market, it can be difficult to know who to trust. Grid connection timelines for commercial systems can run from months to more than a year, with processes varying between jurisdictions and network businesses (IEEFA, 2026; Smart Energy Council, 2026; Energy Consumers Australia, 2023).

The second is that much of the potential value in Figure 1 only becomes available through integration. It requires technology integration: shared storage, coordinated solar, flexible load and virtual power plants make up the value stack – but stacking value requires assets that are designed to work together rather than installed independently (IEEFA, 2026). It requires network integration: CER that is aligned with network conditions delivers flexibility, defers upgrades and reduces peak demand, and this only works where deployment is coordinated with the distribution business rather than approved site by site (AEMO, 2026; Committee for Sydney, 2025). It requires strategic integration across the region and the wider energy system: aggregated industrial CER makes material progress towards regional, state and national energy and emissions goals, and a precinct with reliable, low-cost,

well-matched energy could become a place where new industry wants to locate – particularly industry whose demand profile complements what is already there (Beyond Zero Emissions, 2023).

Realising the outcomes in Figure 1 therefore requires two things at once: simplifying the pathway for individual businesses to act and integrating decision-making between the precinct owner, its tenants, the distribution network business, regional bodies and national programs – each operating with different mandates, timelines and, sometimes, definitions of success. It is addressing both together that unlocks the win-win-win.

Simplification and integration both require a coordination process. The systems innovation literature has for some time treated the work of connecting fragmented actors and integrating diverse potential benefits as a function in its own right. Howells (2006) sets out the intermediation functions this involves, including the combination and recombination of knowledge from multiple sources into something no single party held. Klerkx and Leeuwis (2009) describe three core roles for innovation brokers: articulating demand that actors cannot fully express themselves, composing the network of parties required, and managing the innovation process itself. Kivimaa et al. (2019) extend this to sustainability transitions, distinguishing systemic intermediaries that work across a whole configuration from those acting on behalf of a single actor. In practice-facing work, the same function appears as the ‘backbone’ organisation in collective impact (Kania & Kramer, 2011). Across this work, two findings recur: the function requires specific capabilities that do not arise by default, and it is chronically under-resourced because the value it creates is distributed across many beneficiaries.

In other words, coordination is work – a process driven by people with distinct capabilities. In this report, we call the practice the collaborative process and the role that runs it the intermediary function. Exploring what this process and function require in practice is the purpose of this report.

2. Research Questions

This project set out to understand how collaborative processes run by an intermediary can accelerate C&I CER deployment and precinct-scale electrification. A structured collaborative process was run at the Port of Mackay with the aim of increasing investment in CER in a way that delivers outcomes for tenants, the network and the region more broadly. The intent of this report is to contribute a grounded data point to a currently thin evidence base on how collaboration – including the processes and the teams that run them – works as a leverage point for increasing investment in precinct-scale CER. The report also reflects on how these processes can be run more effectively to help other precincts improve their approaches. To this end, the research explored two questions.

The first question is:

What value do collaborative processes produce in accelerating investment in CER?

This question seeks to make explicit how the collaborative process adds value to the energy transition.

The second question is:

What did we learn about how collaborative processes can be designed and run well?

This question examines the conditions under which collaborative processes work, the configuration of actors needed, the process design that builds trust, and the capabilities required of the intermediary function that holds the process together. Taken together, these strands are intended to offer practical guidance to those seeking to increase precinct-scale CER investment in a way that delivers win-win-win outcomes.

Context: *What characteristics of a precinct accelerate success?*

- What existing contextual attributes raise the probability that collaboration will succeed, and what does that tell us about where to start?

Actors and architecture: *Who needs to be involved, in what configuration, and why?*

- Which actors should be included, and what are their roles?

Process: *What engagement and decision-making approaches enable progress?*

- What timing and sequencing of engagement help surface constraints without derailing momentum?

Intermediary function: *What does the integrating function require?*

- What capabilities were needed in practice, and who can credibly hold them?

These questions guided a twelve-month project combining stakeholder engagement, technical modelling and engagement design.

3. Method

This section sets out the existing frameworks brought to the project, what was done, and how the evidence behind the findings was generated – including the scope and limits of that evidence.

3.1 Applying a collaborative process

The approach was developed through practical experience across community energy and precinct electrification projects and informed by systems innovation literature, with an emphasis on intermediary and integrative capability. Four elements were brought to the Port of Mackay:

1. The **win-win-win frame**, which sets out the outcomes being sought and the rationale for pursuing them collectively.
2. The **Collaborative Energy Transition Model**, which structures how those outcomes are pursued in practice.
3. **Four structured project phases**, moving from understanding individual needs to precinct-scale opportunities.
4. The **intermediary function**, which ran the process.

Data were collected throughout the project so that evidence to answer the research questions was gathered as the work proceeded, rather than reconstructed afterwards.

Win-win-win frame

In this project, “win-win-win” refers to outcomes that simultaneously benefit multiple organisations and stakeholders. The specific suite of wins differs by context, but in general terms, the frame means benefits that flow to:

1. **Industry**, by delivering access to cheaper, reliable and sustainable energy solutions;
2. **The energy network**, through enhanced flexibility, stability and capacity from coordinated CER; and
3. **The energy transition more broadly**, by delivering scalable models that accelerate decarbonisation, reduce overall expenditure and encourage regional economic development.

The win-win-win frame is not a claim to be tested; rather, it guides what success looks like.

Collaborative Energy Transition Model

The Collaborative Energy Transition Model is the framework that structures the collaborative process and sets out the intended transformation. Developed by Advancing Communities Australia and Climate-KIC Australia, it draws on previous community energy work, including participation in the Advance Queensland Connects Program, leadership of the RACE for 2030 Pathways for Urban Renewable Energy Zones project, and professional experience in precinct electrification projects. It draws on the MIT Regional Entrepreneurship Acceleration Program (REAP), which convenes the distinct stakeholder groups within a region to build a shared strategy and act together (Budden &

Murray, 2019). Together, these informed a model designed to mobilise regional stakeholders and deliver collective, mutually beneficial outcomes across the energy transition.

The model describes a transformation from fragmented and uncoordinated energy approaches to shared, coordinated action. Figure 2 sets out the four parts of that transformation.

- **Who is involved.** The arrows at the top and bottom define who is brought in and when: the precinct owner and industry network organisation lead and legitimise the work, while local steering, national reference and research linkages extend the project's reach and connect it to funding pathways.
- **Inputs** on the left are what the precinct already holds but has never assembled: current snapshots of each business's energy position, the future possibilities each is considering, and industry best practice, including vendor advice on batteries, electric vehicles, solar and load.
- **What happens in the middle.** The win-win-win analysis integrates those individual positions to establish what is actually possible in practice rather than in principle.
- **Outputs** on the right are oriented to action: ranked possibilities that indicate what to do first, commercial models that make those possibilities investable, and a network of trust across the participants.

The outputs then inform the next round of engagement, helping participants move towards the shared outcomes described below as trust and shared understanding grow.



Figure 2 – The Collaborative Energy Transition Model

Project phases

The model describes the intended transformation; the four project phases structured how it was pursued over twelve months. The four project phases were:

1. **Building inclusive foundations** – establish governance, map stakeholders, document a baseline, and launch engagement.
2. **Identifying opportunities** – surface energy needs and barriers through interviews and workshops.
3. **Creating an integrative perspective** – combine technical modelling with governance design to develop a precinct-wide energy opportunities map and test collaborative delivery and commercial models.
4. **Activating pathways to action** – confirm priority projects and next steps at the Port, while connecting findings to state and national networks to understand where the approach might extend.

Together, the win-win-win frame and the Collaborative Energy Transition Model, applied through the project phases, created a structured yet adaptive process that worked on three levels simultaneously:

- Understanding the real constraints, opportunities and needs at the Port;
- Building a precinct-wide view of where collaboration and aggregation unlock value that individual approaches cannot access;
- Identifying practical pathways to action – readily achievable opportunities, sequenced opportunities and commercial directions that connect precinct-scale benefits to implementation.

The purpose of the collaborative process is to create a bridge to action by building trust in the process and clarifying where to start.

Intermediary function

In systems innovation, there is also a body of work concerned with the role of intermediation in connecting fragmented actors where no single party holds the mandate to do so (Howells, 2006; Klerkx & Leeuwis, 2009; Kivimaa et al., 2019). In other words, a person or organisation needs to take responsibility for driving the transformational process described above. There is value in understanding which capacities and resources enable this process to work effectively.

The intermediary function for this project was delivered through a partnership of three organisations:

- 1) Resource Industry Network connects businesses across the Mackay region;
- 2) Advancing Communities Australia works between communities, governance and commercial structures; and
- 3) Climate-KIC Australia operates between research, industry and national actors.

Each of these organisations already acts as a type of intermediary within its own part of the system. Their networks and capabilities span different scales, and it is that span – local relationships and legitimacy through to state and national connections, alongside technical, commercial and facilitation expertise – that allows the model to work across multiple levels at once. An important part of the research is to reflect on the capabilities that supported the process to inform how other projects structure this intermediary role.

3.2 Data collection and synthesis

Data collection

The evidence base for this report was developed from records of engagement kept throughout the project. Data collection followed the four project phases outlined in Table 1.

Table 1 – Data collection approach

Phase	Purpose of data collection
Phase 1 – Building inclusive foundations	Establish a baseline of what each business had already installed, how it perceived its energy situation, and its constraints and drivers.
Phase 2 – Identifying opportunities	Understand drivers in more depth and identify where alignment exists within the precinct and with wider stakeholders.
Phase 3 – Creating an integrative perspective	Test appetite for an integrated, coordinated approach.
Phase 4 – Activating pathways to action	Establish readiness to take next steps and share what was learned.

Three data collection methods were used across these phases:

- **Interviews** with participating tenants, conducted in two rounds – the first at the outset to establish the baseline, the second later in the project to track how positions had shifted.
- **Engagement records** from one-on-one conversations, workshops and meetings with tenants, the precinct owner, the distribution network business, vendors, regional bodies and national actors, with notes taken at the time.
- **Weekly team meetings**, in which the partners performing the intermediary function reported how the project was influencing conversations in their wider networks.

Alongside these methods, energy consumption data were collected to inform the modelling. Tenants were invited to authorise the release of their metered National Metering Identifier (NMI) data; approximately half of participating tenants provided authorisation, and five datasets were of sufficient quality to support site-level modelling. Where data were unavailable, the modelling used maximum and minimum assumptions for rooftop solar usage.

The purpose of this report is not to present the specific data or modelling generated for the project. It is to track how the orientation towards action shifted: what changed at the Port of Mackay between the start and end of the project, and what evidence there is that participants were more oriented to investing in CER as a result.

Synthesis

Synthesis was an iterative process rather than a discrete phase of analysis. Engagement records, interview notes and modelling outputs were held in a shared Miro workspace, which allowed individual tenant positions to be compared with one another and considered in the network and regional context. This made patterns and points of alignment visible that were not apparent in any single conversation. Sense-making was done collectively through the delivery team's weekly meetings, where emerging interpretations were tested against

what each partner was hearing in their own networks. Findings were then played back to participants through workshops, briefings and individual tenant reports, which served as a further check: where an interpretation did not match a participant's own account, it was revised.

Scope and limitations

Some important limitations to note are:

- **Participation was voluntary.** Around half of the tenants participated in the project. As a result, the findings do not provide a complete picture of precinct-wide potential or explain why particular businesses chose not to participate. For voluntary engagement, the relevant test is not whether everyone participated, but whether enough participated to generate reliable insight and build momentum for a process that others can join later.
- **Nature of the evidence.** Findings rest on what participants said and did, recorded at the time, not on measured post-implementation outcomes. Where the report describes constraints or opportunities, these reflect participants' accounts.
- **No counterfactual.** The evaluation can trace the mechanism by which positions shifted between the baseline and the second round, but it cannot isolate the effect of the process from other developments during the same period.
- **Timeframe.** Twelve months is a short period relative to industrial capital-investment decision cycles, so the report describes conditions created rather than investment delivered.
- **Single case.** A single case cannot establish which conditions or design choices hold generally.

4. The Collaborative Process at the Port of Mackay

The Port of Mackay is a commercial-industrial precinct managed by North Queensland Bulk Ports Corporation (NQBP), a government-owned corporation operating four ports across northern Queensland. The Port hosts a diverse mix of tenants – logistics operators, resource services businesses, chemical handlers, food processors and marina operators. They share a defined geographic boundary, common network infrastructure, and existing governance structures through NQBP's hosted forums and other programs it runs. The land is wholly owned by NQBP and leased to industrial tenants, sometimes under very long-term arrangements. In most cases, tenants have built and own their buildings.

The Port of Mackay Collaborative Energy Transition Project brought together industry, government and research partners to design a precinct-scale model for shared renewable energy infrastructure. It explored the feasibility of renewable energy, electrification options and smart energy management within the Port precinct, with the aim of delivering reliable, affordable and clean energy for Port tenants and users while contributing to Queensland Government's net zero ambitions.

The project was built on a win-win-win approach, bringing actors together to pursue practical, scalable solutions for four groups:

- **Tenants** – cost-effective, reliable and sustainable energy solutions, delivering lower energy costs for Port users and improved energy reliability and resilience.
- **Port** – positioning the Port of Mackay as a leader in industrial and regional innovation, with benefits extending to the broader Mackay community.
- **Grid** – enhanced grid flexibility and stability, contributing to Queensland's sustainable, affordable and reliable energy future.
- **Region** – supporting practical decarbonisation efforts, reducing carbon emissions in line with Queensland's net zero by 2050 target, and creating new opportunities for local jobs, investment and regional growth.

Throughout, the project remained in a pre-feasibility stage – exploring potential options without committing participants.

4.1 How the collaborative process ran

The collaborative process was run across the four project phases – moving from initial conversations to a shared precinct-wide picture, and from that picture to integrated opportunities with a credible path to implementation. While a more typical consulting approach would produce a technical assessment of renewable energy options with modelling of what is possible, the collaborative process was designed to understand whether there was a shared direction for investment, document the level of buy-in and clarify the questions and pathways for moving towards investment in the next phase. Figure 3 shows how stakeholder engagement and technical inputs were woven together across the project phases. The following subsections describe what happened during each phase in more detail.

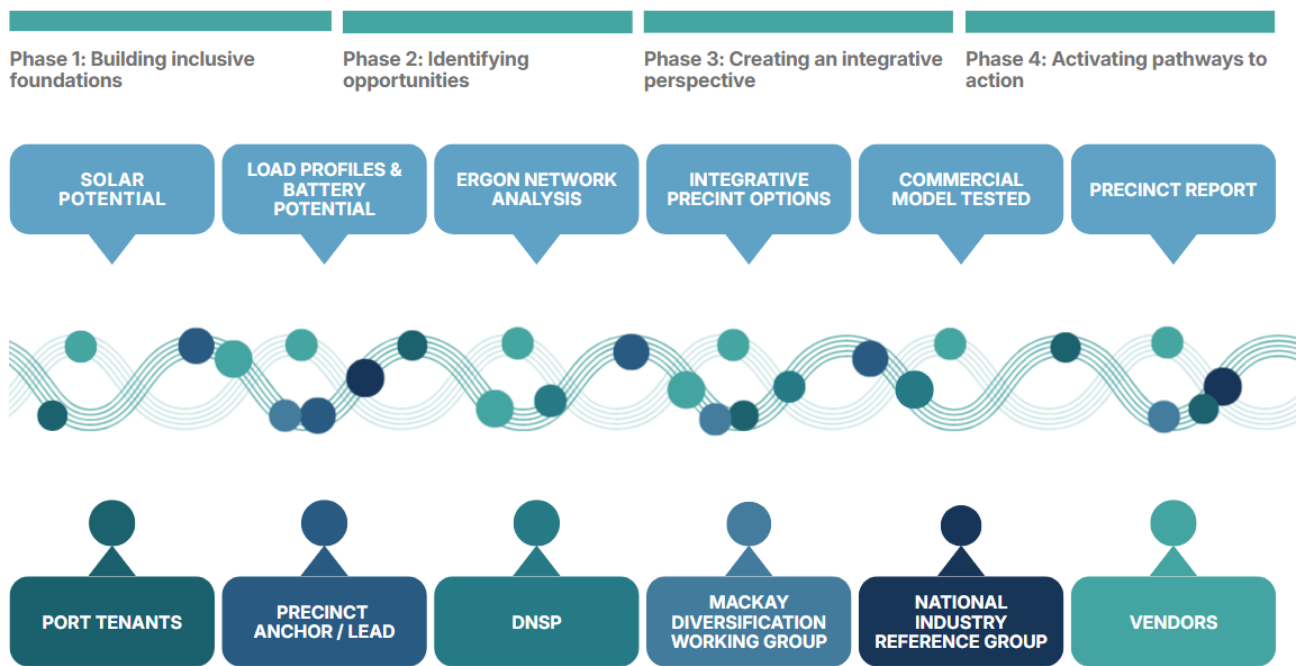


Figure 3 – Stakeholder engagement integrated with modelling inputs across the four project phases

Phase 1 – Building inclusive foundations

The project was launched at NQBP’s Quarterly Site Meeting, after which 18 tenants self-selected to participate, representing around half of all Port tenants. Each participating tenant was engaged through an in-person site visit and interview exploring its drivers for renewables and electrification, current energy use, barriers to adoption, reliability concerns and readiness for collaboration. Concepts around smart energy management and flexible loads were introduced at this stage – establishing a baseline not only of what tenants had installed and what CER they had considered, but of whether they had thought about aspects like demand flexibility at all. The tenants varied widely in sector and scale, ranging from sites operated by large industrial companies to family-owned businesses.

These conversations established the baseline against which later positions were compared. The conversations were approached without a predetermined solution. The purpose was to surface operational realities and concerns, not to advocate for a particular outcome.

In parallel, Resource Industry Network (RIN) led regular engagement with NQBP and participation in the existing Regional Diversification Working Group. The group included GW3, Mackay Regional Council, Trade and Investment Queensland, AusIndustry, Mackay Manufacturing Hub, Resources Centre of Excellence and Reef Catchments. This engagement ensured that both the precinct owner’s perspective and the broader regional context were integrated from the outset. The project drew on other established industry forums and long-standing regional relationships. RIN kept the project as an ongoing agenda item within these forums rather than convening a separate forum to discuss it in the regional context.

The first Industry Reference Group workshop brought together representatives from government, industry and research to share the collaborative approach and explore with participants how the project supported and aligned with their own priorities.

Phase 2 – Identifying opportunities

With relationships established and a baseline picture of tenant needs, the project moved into analysis of potential opportunities. Solar potential modelling was completed for all participating tenants. Tenants were invited to release NMI data and share energy bills to enable load profile modelling, which would allow a more site-specific business case to be developed. Half of the participating tenants signed NMI data release forms, though only five had data of sufficient quality for use in the models. This represented a low level of coverage relative to the Port as a whole.

Where NMI data were unavailable, the modelling used maximum and minimum assumptions for rooftop solar usage to indicate a range of solar payback periods. The interviews filled much of the remaining gap: the scale and timing of operations, seasonality, whether a site operated during the day or continuously, obvious peaks, and future electrification potential could all be inferred from what businesses themselves described. The limited data were a real constraint on precision and would have been a risk if the aim of the process had been to produce detailed business cases. However, the collaborative process focused on surfacing options and barriers and understanding where there was buy-in. For that purpose, conceptual-level information was sufficient to sustain momentum. At this stage, participation did not indicate a tenant's commitment to a particular solution, so keeping the insights conceptual allowed for more open conversations.

For this reason, the interviews proved the more important source for understanding concerns and opportunities. There were consistent concerns, for example, about how renewable energy and electrification equipment would fare in the cyclonic, highly corrosive and humid conditions of a coastal port. The energy consumption data alone would not have surfaced these concerns. Because the project was working across the precinct rather than with a single business, it became a shared problem that could be put to the market rather than a one-off issue for a vendor to solve at one site.

This was the pattern in vendor engagement more broadly. The limited data did not inhibit high-level conversations with targeted vendors to ground emerging solutions in what was technically and commercially feasible. If anything, the precinct-wide scope made vendors more interested in engaging than a single-site enquiry would have, because the potential scale was different and the problems being described were common across multiple businesses.

In parallel, the delivery team engaged Energy Queensland directly and conducted an energy network analysis using publicly available information to map feeder and transformer capacity across the precinct. This provided a view of where the grid had available capacity and where constraints existed. All modelling at this stage was conceptual – sufficient to support emerging ideas and build momentum, but not at the level of detail required for a formal business case.

An executive briefing brought NQBP senior leadership into the process, and project communications were aligned with the release of the Queensland Government's Queensland Energy Roadmap. The project was not timed for that release; the alignment was opportunistic. However, the alignment strengthened the message and gave NQBP visibility of how the project connected to broader state government strategy. The point is not that the approach is designed to align with policy milestones. It is that a collaborative, networked approach makes it more likely that such alignments can be recognised and used as they emerge.

Regional engagement deepened throughout this phase through monthly briefings to the Regional Diversification Working Group.

Phase 3 – Creating an integrative perspective

The project entered this phase with a qualitative picture, supported in places by quantitative detail, of individual tenant drivers and constraints, interest in rooftop and ground-mounted solar, short-, medium- and long-term electrification ideas, network constraints and high-level conceptual business cases. Phase 3 focused on building an integrated picture across the precinct and testing appetite for coordinated action.

At baseline, most tenants had not considered demand flexibility, and when it was explained, most did not think they had much scope for it. A second tenant workshop was held to deepen understanding and introduce energy management options and the possibilities of coordinated approaches. Attendance was limited, and the delivery team followed up with a series of one-on-one conversations. The limited attendance at a voluntary cross-tenant meeting can be read in more than one way. It may indicate that, while interest is real, energy is not sufficiently central to tenants' core business to sustain attendance at additional meetings. It may equally be that group discussion does not suit the kind of conversation needed at this stage, and that conceptual-stage work is better suited to one-on-one conversations. Either way, the practical lesson is to be deliberate about when and why tenants are brought together and to reserve group settings for what cannot be done more effectively in direct conversation.

Through those conversations, it became clear that coordination across sites offered converging benefits: reducing the implementation burden and transaction costs for tenants, enabling value stacking by capturing excess solar that individual sites could not use alone, and supporting a coordinated rollout that the distribution network could plan around. Because those benefits were understood across the stakeholders, the proposition of a third-party aggregator model was put forward and tested.

Had the coordination benefits not been recognised, the intermediary function would have continued supporting individual tenants to transact with individual vendors – potentially establishing a trusted vendor database or sharing testimonials of industry experience in engaging with the distribution network. This would have been useful work, but it would have remained a brokering role that ended with the transactions. Instead, the recognition of shared benefit shifted the work towards early-stage

development of a third-party model: some initial calculation of potential financial benefits, an understanding of the risk and capital position, and early testing of the concept with tenants.

This shift changes what the intermediary function is for. Supporting one-to-one transactions is a matter of connection and trust between two parties. Supporting a shared model means holding the questions that a shared model raises – who carries which risk, how value is distributed, and how neutrality is maintained between parties who will have commercial relationships with each other.

Energy Queensland was a particularly important partner in this phase. Conversations explored how a coordinated approach could streamline connection approvals and feed into network planning processes, and what role Ergon and Energy Queensland might play in a third-party aggregator model. There was also discussion of what a deeper partnership could look like, including access to more detailed information over time – potentially through a digital twin – to understand how CER could be rolled out across the Port to deliver win-win-win benefits. State government representatives from Treasury and Economic Development were engaged to position the precinct for future funding conversations.

The output of this phase was a concept-level view of precinct possibilities and a high-level commercial direction that could support implementation – indicative in nature, designed to maintain momentum and enable credible next steps rather than to prescribe a technical solution.

Phase 4 – Activating pathways to action

The final phase shifted focus from building a picture to activating next steps and sharing what had been learned. At the Port, this meant translating the concept-level work into a plan for phased commercial implementation. Individual tenant reports were prepared, giving each participating business a personalised account of its energy opportunities and the option to participate now or in the future in a third-party aggregator model.

A second executive briefing was delivered to NQBP leadership, presenting the integrated findings and the recommended pathway forward. Members of the Industry Reference Group were engaged to scope how they could support next steps.

Beyond the Port, the project's findings were shared with state and national audiences to understand where the approach might extend and what would be required. The team presented at the Port Electrification Conference, to state government research forums, and to distribution network businesses and ports in other jurisdictions. The phase closed with a direction shaped by the parties and a clear understanding of what they still needed to agree before making commitments.

4.2 The data collected

Documenting the engagement served to answer the research questions and generate lessons that could be shared. Table 2 sets out what was collected, when and from whom.

Table 2 – Data sources

Phase	Purpose of data collection	Who was engaged	What was recorded
Phase 1 – Building inclusive foundations	Establish a baseline	18 tenants (energy, food and manufacturing) through in-person site visits and interviews	Interview notes for each tenant covering drivers, barriers, renewable energy, electrification and load profiles
		NQBP team	Fortnightly briefing notes
		Industry Reference Group workshop; Regional Diversification Working Group	Notes from industry briefings and meetings; insights shared at weekly team meetings
Phase 2 – Identifying opportunities	Understand drivers and identify where alignment exists	Participating tenants, through online workshops	Records of tenant responses to indicative solar modelling and emerging solution concepts NMI data release requests issued; authorisations received from approximately half of participants, with five datasets of sufficient quality to support modelling
		Targeted vendors	Conversation notes and indicative information shared
		Energy Queensland	Engagement notes; network screening outputs from publicly available feeder and transformer data
		NQBP executive leadership briefing	Meeting notes
Phase 3 – Creating an integrative perspective	Test appetite for an integrated, coordinated approach	Participating tenants, through a second workshop and follow-up one-on-one conversations	Interview notes
		Energy Queensland, at strategic and Ergon connections levels	Notes on technical feasibility, multi-site approvals and network planning alignment
		Follow-up conversations with individual members of the Industry Reference Group	Meeting notes or insights shared at weekly team meetings
		Participation in Regional Diversification Working Group	Meeting notes or insights shared at weekly team meetings
Phase 4 – Activating pathways to action	Establish readiness to take next steps and share what was learned	Each participating tenant, through individual opportunity reports	Early adopter self-nominations (four tenants plus NQBP); expressions of continued interest (eight tenants)
		NQBP executive leadership briefing	Meeting notes or insights shared at team meetings
		Briefing and information sharing with other ports and DNSPs	Meeting notes or insights shared at team meetings
Across all phases – regional	Track how the project was influencing	Weekly delivery team meetings, including sense-making about connections and other team observations	Connections made and emerging industry interest, as reported by RIN

network engagement	conversations across wider networks		
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5. What the Collaborative Process Produced

This section sets out four changes in conditions between project commencement and completion. These are:

1. **A grounded view of what is possible** – a better understanding of the technical opportunity, the constraints, and how each actor's interests align.
2. **A readiness to collaborate** – parties who understand a commercial direction well enough to consider acting together, and a cohort willing to move first.
3. **A clearer path forward** – an understanding of next steps and the key questions that must be answered during the next phase.
4. **Conditions beyond the precinct better aligned to support implementation** – market signals to vendors and insurers, institutional alignment, and regional momentum that could make the next steps easier.

These outcomes do not yet represent precinct-scale investment in CER. They provide evidence that the process has created a bridge to such investment in the next stage.

5.1 A grounded view of what is possible

The process produced a technical picture of what the precinct could support and a shared understanding of how each actor's interests align.

Technical view of opportunities and constraints

Solar

A desktop assessment of available rooftop space across participating sites identified approximately 14 MW of rooftop solar potential. Real uptake will depend on site-specific constraints including roof integrity, insurance, structural and cyclone requirements, as well as each business's internal decision processes. A high-level business case analysis for solar-only installations indicates simple payback periods of around three to four years across sites that expressed interest. Tenants generally own their buildings, giving them some autonomy over investment decisions. However, shorter-term lease agreements with NQBP can affect those decisions.

Batteries and electrification

Early calculations compared a single precinct-scale battery with a fleet of distributed batteries. These calculations indicated material benefits from a fleet of distributed batteries across multiple sites, as the batteries can access available incentives, absorb midday solar, smooth exports and spread resilience benefits across the precinct. Electrification opportunities are strongest in the short term for light vehicles and forklifts, with heavy plant electrification identified as a longer-term pathway.

Load shapes and demand flexibility

Understanding of load profiles came from a combination of metering data, where available and usable, and direct conversations with tenants about their operating patterns. Around half of participating businesses described predictable daytime demand aligned with standard operating hours, while others operated seasonally, with intense energy use aligned with harvest seasons. In other cases, energy use was linked to the timing of deliveries rather than to seasonal activity.

Understanding of the potential benefits of demand flexibility evolved over the course of the project. In the first round of interviews, most tenants reported little operational flexibility because electricity-using processes were tightly coupled to core business activity. By the second round, with electrification options under consideration, there was some interest in exploring demand flexibility, provided the incentives were right. EV and forklift charging are the practical near-term candidates, with longer-term potential in electric ship charging and heavy electrified port equipment.

Network capacity

Screening checks were run against the export capacity of the substation, transformers and feeders serving the precinct, down to the individual site level, using publicly available network information. The scenario tested was a maximum-solar case: every participating tenant's roof fully covered with solar, with all sites exporting simultaneously. This was an upper-bound scenario rather than a proposal, chosen to establish where headroom existed rather than to size any particular system. Under that scenario, most sites had sufficient capacity. In a small number of cases – sites with particularly large roof areas – maximum solar would exceed the feeder limit. In such cases, storage, active export management or, as a last resort, targeted network upgrades would be required if a full-coverage installation were pursued. At the remaining sites, the maximum-solar case sat within existing limits.

The practical implication is that network capacity is not a first-order constraint on precinct-scale solar at the Port, though it does shape how the largest sites are configured. These findings rest on publicly available data and would need to be verified with Energy Queensland at the next stage.

A better understanding of win-win-win possibilities

The engagement produced a clear picture of what each stakeholder is seeking and how those interests connect to the Port. Set out below are the drivers, constraints and operating realities of the tenants, the network business, the region, and state and national actors – and where those positions converge on a coordinated precinct-scale approach.

Tenants

One-on-one engagement produced a grounded picture of business drivers and operational realities. Interest in electrification is genuine, with environmental, social and governance (ESG) and Scope 3 reporting drivers increasingly material. However, solutions must still deliver on cost and reliability, and many tenants prefer options that carry less operational burden. Energy is not core business for most, and any solution requiring them to become energy managers will struggle to gain traction.

Barriers vary considerably across the tenant base. Site conditions – corrosion, cyclonic exposure and hazardous-area requirements – are real constraints, particularly for operations with specific risk-management requirements, such as fuel loading and unloading. Internal approval cycles vary widely across businesses, and this variation does not track neatly with organisational size: some businesses with established sustainability targets move quickly, while others without them take longer to reach a decision.

Lease arrangements are a structural feature of this precinct that shapes what is possible. Tenants lease land from NQBP and generally own their buildings. This is a version of the split-incentive problem, with the particular feature that the landlord here is a government-owned corporation with

its own decarbonisation objectives – a different position from a private landlord, and one that shapes both the options available and the responsibility for pursuing them. Insurance and liability questions remain unresolved at both the site and precinct levels.

Energy Queensland

Energy Queensland's engagement was pivotal and took place at two levels: strategic engagement on how a precinct-scale approach aligns with its direction on industrial rooftops and electrification, and engagement at the Ergon connections level on technical feasibility and multi-site approvals. Engaging at both levels allowed Energy Queensland to move from only administering a site-by-site assessment process to being engaged as a strategic partner providing active support in a precinct-scale model. There is substantial shared interest: Energy Queensland's CER strategy sees precinct-scale collaboration as a pathway to reduce upgrade costs, improve reliability and integrate renewables without destabilising the grid. This engagement positions the Port as a credible testbed for streamlined precinct-scale connection approvals and coordinated export management. Formalising Energy Queensland's role in governance, data-sharing and coordinated export arrangements is a priority for the next phase.

Regional economic development alignment

The project has generated significant interest in running a similar process in other parts of Mackay – particularly at Paget, where approximately 600 commercial and industrial sites represent a substantial expansion opportunity. Large energy users in the region have expressed interest in purchasing energy from aggregated CER for the dual benefit of supporting their community and advancing Scope 1, 2 and 3 decarbonisation. Wider regional conversations also opened, including new-industry attraction signals and connections to existing regional economic development priorities – for example, conversations about the benefits of operating data centres within a renewable precinct. Resource Industry Network continues to present to the Regional Diversification Working Group, keeping the project visible across regional economic development conversations. Next-phase solutions are being developed that build on the precinct-scale approach demonstrated at the Port. This positions the Mackay region as a testbed for precinct-scale energy transition that connects industrial decarbonisation with regional economic development priorities.

State and national energy system alignment

The Industry Reference Group brought together representatives from Energy Queensland, ARENA, Queensland Treasury, State Development, Energy Consumers Australia, A2EP and RACE for 2030 to test the emerging work against national policy settings and funding landscapes. The engagement generated discussions about where a precinct-scale approach could connect with existing programs. Some of these discussions continued beyond the project.

5.2 A readiness to collaborate

At the outset of the project, tenants were considering CER options on a site-by-site, ad hoc basis. There was limited visibility of shared opportunities, and coordinating CER across the precinct was not on anyone's

agenda. By the close of the project, there was an option to pursue a coordinated approach through a precinct-integrated third-party model and a better understanding of who was ready to move forward.

Third-party aggregator model and stakeholder alignment

A third-party aggregator model emerged as a likely direction for the Port. In this model, a third party would own and operate distributed solar and battery assets – and potentially other CER infrastructure – across the precinct on behalf of tenants, who would license roof space and participate under simple opt-in terms with no upfront capital. The aggregator would coordinate the distributed fleet, manage performance and maintenance, and interface with the network business on coordinated export arrangements.

The realistic alternative to introducing a third-party aggregator model was to continue with the status quo: supporting individual tenants to transact with individual vendors to install CER. The direction towards a third-party aggregator model emerged from two findings. First, energy is not a core business priority for most tenants: any model requiring them to own or manage energy assets or take on their associated complexity will struggle. Second, additional CER value is accessible only at precinct scale. Early market pricing indicated that a fleet of batteries, coordinated export management and complementary load profiles could strengthen the business case for sharing and exporting solar through a precinct-scale approach. The direction is consistent with evidence from Project Symphony (Western Power et al., 2024) and community-scale virtual power plant (VPP) deployments in Australia (Liu et al., 2023), both of which found that aggregating distributed renewables and storage across multiple sites delivers greater economic and network benefits than site-by-site installation alone. Verified pricing, alongside the governance, risk and operational detail needed to support investment decisions, will come from the expression of interest (EOI) process in the next phase.

In addition, the larger deal size is more likely to attract capable delivery partners and funding. A third-party model could address questions about ownership, risk and tenant lease length because it could shift asset ownership, governance, insurance and technical complexity to a specialist delivery partner while keeping participation simple for tenants.

Who is ready to move, and when

Readiness is not evenly distributed across the precinct. The project identified a cohort ready to act immediately and a further group of tenants positioned to follow. NQBP executive leadership supported moving to the next stage. The early adopter cohort does not represent the majority of businesses, but could provide enough momentum to start a process that others can join over time.

An early adopter cohort. Four tenants self-nominated as ready to move, alongside NQBP's own sites. The four businesses had no significant technical or organisational constraints and saw the value in a coordinated approach. Two of these four businesses have multiple other sites across Australia or are part of sectors where they can share their influence. Adoption of this kind typically begins with a small number of users whose experience makes the proposition legible to others. Although the cohort represents a small proportion of the precinct, the questions are whether it can generate enough momentum to attract later participants and whether the commercial model can be staged to accommodate them.

Tenants considering later participation. A further eight tenants engaged consistently throughout the project and indicated interest in continuing, particularly as the commercial arrangements are clarified. For most businesses, electrification will proceed incrementally through staged investments, and this is part of where a precinct approach could add value: rather than each business making isolated short-term decisions, tenants gain visibility of how their own short-, medium- and long-term plans might connect to what is happening across the precinct. Several businesses have also broadened discussions about future energy opportunities at their Mackay operations. These discussions have, in some cases, raised energy as a strategic issue at board level and, in others, prompted longer-term energy considerations to be factored into capital planning. These shifts were reported by participants.

A network business exploring what it could enable. There is an open conversation with Energy Queensland about moving from assessing individual connection applications to actively supporting a coordinated approach. Conversations covered how coordination could streamline connection approvals and feed into network planning, and what role Ergon and Energy Queensland might play in a precinct model, including access to more detailed information over time to understand how CER could be rolled out across the Port. This reflects a working relationship that did not exist at the outset.

5.3 A clearer path forward

This readiness can be translated into action by planning a path forward. A report outlining the next steps, design questions and more focused questions to guide the next stage of work has been provided to NQBP and presented to its executive team.

Defined next steps

The next step is to run an expression of interest (EOI) process, led by North Queensland Bulk Ports, inviting capable delivery partners to propose how they would deliver and manage an early-adopter pilot across the self-nominated tenants and NQBP's own sites. The EOI is the bridge between the momentum built through the collaborative process and on-the-ground investment. Beyond it, the pathway is staged:

- **Early adopter delivery (0–12 months)** – first assets operating under the third-party arrangement, with safety and governance protocols established and the data gathered to support a directional business case.
- **Scalable adoption (12–24 months)** – deployment broadens to additional tenants as evidence from the early rollout accumulates, with governance and data visibility strengthened.
- **Resilient precinct energy operations (24+ months)** – the precinct operates as a stable platform, with attention shifting to resilience and additional services where evidence supports them.

Design considerations drawn from the process

A precinct-scale model should be designed as a platform for ongoing CER investment rather than a set of solar and battery installations, because tenants and NQBP move at different speeds and on different timelines. The considerations below follow from what the process surfaced about how these businesses make decisions, rather than from technical specifications.

- **Start small, without lock-in** – Contracts and architecture should allow businesses to join incrementally without requiring earlier agreements to be rewritten. Open protocols and modular schedules should allow new services to be added as they prove valuable.
- **Transparent, modular terms** – Terms covering roof licence and access, safety and insurance responsibilities, and price structures should be clear and consistent for both early adopters and later participants.
- **Insurance and risk** – Open questions remain about safety in cyclonic and corrosive conditions and how these issues feed into risk processes for individual businesses and the Port.

Sharper questions, better-directed effort

Understanding the precinct's current position and intended direction makes it possible to ask more focused questions about unlocking investment. The key questions that remain are:

- **Delivery model** – what forms of partnership or third-party involvement are practical for early pilots, and what minimum assurances around safety, insurance and transparency are required?
- **Roles and risk** – how are risk, maintenance obligations and performance responsibility allocated between the aggregator, the precinct owner, tenants and the network business?
- **Governance and trust** – how should roles, responsibilities and dispute pathways be designed to maintain neutrality and support a durable relationship with Energy Queensland and Ergon?
- **Shared value** – how is the value created at precinct scale distributed among the parties who contribute to it?
- **Funding pathways** – which mechanisms may support early pilots and later scale-up?

Identifying these questions and the parties that must answer them together puts the precinct in a materially different position from where it started.

What this implies for the intermediary function

Answering these questions requires ongoing stewardship of the process. The intermediary's role in the Port's energy transition is likely to shift in the next stages. In this first stage, the role was to surface individual positions and integrate them into a shared picture. The focus is now shifting towards stewardship of a shared arrangement between parties who will have commercial relationships with each other: maintaining neutrality as those relationships form, keeping the questions above open until they are properly resolved rather than settled by default, and sustaining trust over a timeframe longer than any single transaction.

5.4 Conditions beyond the precinct better aligned to support implementation

The preceding sections describe how the collaborative process created a bridge to action at the Port. The process also generated wider ripple effects that could make implementation easier, support delivery at greater scale and create conditions for replication elsewhere. These effects were captured through the delivery team's weekly meetings, where partners reported conversations the project was

generating in their networks. They are reported here as observations rather than measured outcomes. Five categories of ripple effect were observed.

Market signals. After meetings, tenants sometimes contacted suppliers directly to ask about electrification options, bringing the opportunity to suppliers' attention in ways the project team had not orchestrated. These conversations with vendors, insurers and suppliers communicated that there is real demand at precinct scale, giving them reason to develop fit-for-purpose products and offers.

Peer diffusion. Several businesses operating at the Port also manage commercial and industrial sites across multiple locations in Australia, including bulk grain-handling sites, sugar terminals and fuel terminals with national distribution footprints. Two of the four self-nominated early adopters collectively operate 27 additional sites across Australia, and both reported that the project had prompted internal prioritisation across those wider portfolios. Beyond individual organisations, peer effects also operated across the precinct and through sector networks – for example, early adopters shared progress at industry events.

Internal reorientation. Engagement prompted strategic conversations within businesses. Even for companies not ready to move at that stage, the project highlighted energy as an issue for longer-term planning – a change in position that can precede investment.

Institutional alignment. The Industry Reference Group connected local work to state and national policy conversations, regulatory settings and potential funding pathways. These discussions are ongoing and, as the work develops, may open up funding opportunities or other ways for these groups to support implementation.

Wider regional economic development. Discussions naturally expanded into workforce development and potential industry attraction to the region. Resource Industry Network discussed the potential to attract industries, including data centres, to operate within a renewable precinct. The project became a catalyst for broader conversations about deploying more renewable energy across the region.

THE RIPPLE EFFECTS OF WELL-DESIGNED COLLABORATION

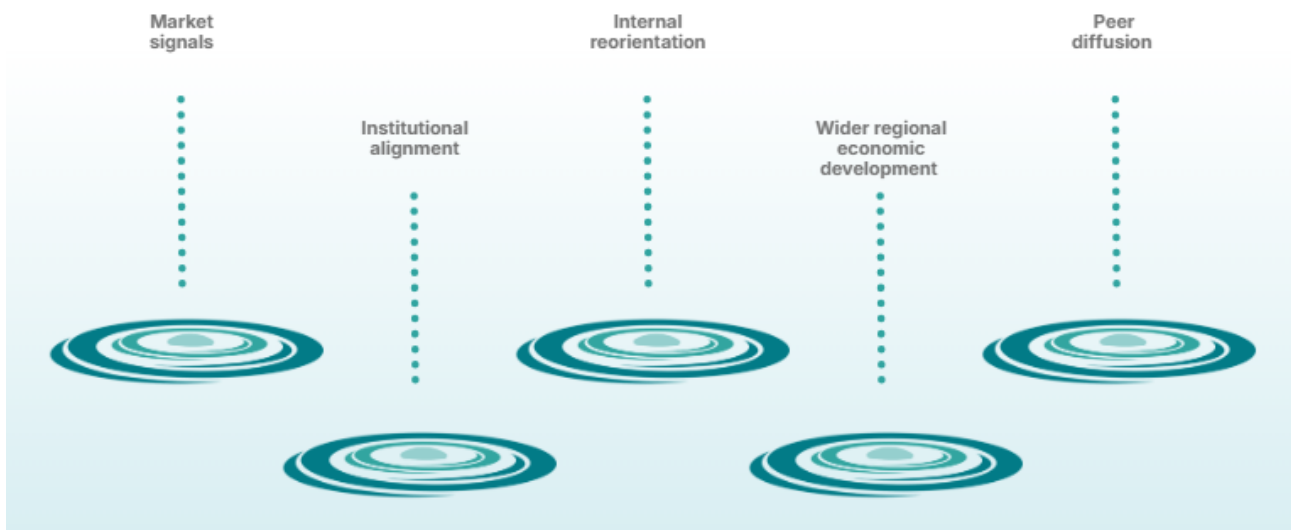


Figure 4 – Observed ripple effects of collaboration infrastructure

5.5 The value the collaborative process produced

Taken together, the four changes in conditions described in this section distinguish the collaborative approach from a conventional advisory exercise. The approach produced a direction the parties helped shape and a clear view of how to move forward. These are the practical leverage points for building trust and moving to action, rather than a theoretical account of what should happen. Table 3 sets out the changes at the Port of Mackay.

Table 3 – What changed at the Port of Mackay

	At the outset of the project	At the close of the project
View of what is possible	Energy was not a high priority for tenants. The Port had a renewable energy goal but no pathway that worked with its tenants. Regional, state and national actors held strategic objectives but lacked a practical case to test them against.	A grounded technical and stakeholder picture: rooftop and battery potential mapped across participating sites, tested against feeder and transformer capacity and set alongside what each business said about its own constraints and plans.
Readiness to collaborate	Tenants were considering CER options site by site and to a very limited extent. Decision-making sat with individual businesses, with limited visibility of shared opportunities, and coordination across the precinct was not on anyone's agenda.	A shared direction towards a precinct-integrated model, with tenants self-nominating to move first alongside NQBP, a further group ready to participate as evidence builds, and the network business engaged on how it could actively support a coordinated approach rather than only assessing applications site by site.
A clearer path forward	No defined pathway from precinct-scale ambition to delivery. The questions raised by a shared model had not been identified, let alone taken on by the parties who would need to answer them.	A staged implementation sequence beginning with an EOI. A defined set of questions about roles, risk allocation, governance, neutrality and shared value, held by parties who know they must resolve them together. A clearer view of the intermediary function needed to steward the process.

Conditions beyond the precinct better aligned to support implementation	Effects confined to individual site decisions, with no mechanism for precinct-level activity to reach markets or institutions.	Demand signalled to vendors, insurers and suppliers at precinct scale. Reported momentum across participating businesses' wider national portfolios. Institutional buy-in through the Industry Reference Group. Discussions about regional industry attraction and planning for future projects are underway.
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This combined value – what is realised at the precinct and what is set in motion beyond it – supports the case for treating collaborative processes as a strategic feature of the energy transition. At this stage, investment outcomes cannot yet be quantified. The project produced some qualitative evidence that the collaborative process, run by an intermediary function, can create a bridge to increased CER investment. Further research is needed to establish the value of a coordinated precinct-scale approach for tenants, the network and the region. Identifying valid ways to quantify these benefits would materially strengthen the case for the coordination described here.

6. What was Learned About Running a Collaborative Process

Section 5 set out what the collaborative process produced at the Port of Mackay. Those findings provide qualitative evidence supporting the case for well-designed collaborative processes as a strategic feature of the energy transition. This section turns to the second research question:

What did we learn about how collaborative processes can be designed and run well?

Four strands are examined – the contextual conditions that accelerate or constrain progress, the actor architecture and the sequencing of engagement, the design choices that shape the process itself, and what the intermediary function required to run it. This discussion examines what worked, what needed adjusting, and what took longer than expected at this precinct, under these conditions. It is offered as a grounded account that others can draw on and adapt.

6.1 Context: what characteristics of a precinct accelerate success?

Starting in the right context is essential – even the right process will stall in a context that is not ready to receive it. At the Port of Mackay, four conditions combined to create a foundation for progress: natural cohesion across the precinct, anchor institution leadership, trusted relationships held by those performing the intermediary function, and room to start small and scale. Together, these meant the project could build on trust and legitimacy that were already present rather than having to establish them from scratch. Tenants and other stakeholders engaged, invested time and wanted to be part of what came next.

Natural cohesion

The Port has a natural cohesion that provided a strong foundation: tenants share geography and common network infrastructure, and all participate in existing NQBP-led forums and processes. That cohesion is partly a function of physical and operational interconnection and partly the product of NQBP's existing relationship with its tenants. These conditions made a collaborative process easier to run.

Other precincts will not have the same combination of natural cohesion. Cohesion may also sit in different places altogether – in a sector rather than a location, or in a community rather than a supply chain. The point is not that these conditions at the Port of Mackay must be replicated. Rather, collaborative processes designed to support energy transitions should identify where cohesion already exists, build on it and strengthen it as they proceed.

Anchor institution leadership

Leadership from an anchor institution is critical. At Mackay, NQBP's role as both precinct owner and project funder provided a distinct kind of legitimacy: the project was not externally imposed but internally championed. NQBP is a government-owned corporation that operates several ports across North Queensland, and at Mackay it owns the land outright, with tenants leasing sites under long-term arrangements. That scale gives it influence in conversations about insurance, risk, approvals, investment and funding pathways – conversations that would otherwise fall to individual businesses to navigate alone.

As with natural cohesion, the point is not that an anchor needs to hold the same position NQBP does. It is that anchors perform particular roles in these processes: conferring legitimacy, opening funding and scaling

pathways, and de-risking investment for those who follow. Elsewhere, an anchor might look quite different. For example, it could be a large energy user with the capacity to underwrite CER investment by purchasing aggregated energy, a local government with planning levers, or a major employer whose participation makes the proposition credible to others in the region. What matters is that some party holds enough standing and enough stake to create and drive momentum.

The intermediary function builds on trusted relationships

The people and organisations performing the intermediary function bring trusted relationships that the collaborative process can build on. In this project, Resource Industry Network's established regional relationships provided access to informal as well as formal decision-making channels. The delivery partnership combined this local trust and knowledge with technical, commercial and facilitation expertise and connections to state and national networks. The process could therefore draw on existing relationships rather than establish every connection from scratch.

This is distinct from the precinct's natural cohesion or the legitimacy provided by an anchor institution. It concerns the relationships held by those running the process and their ability to connect local perspectives with wider opportunities. For other precincts, the implication is to identify where trusted relationships already exist and involve organisations that can bring them into the collaborative process. Resourcing these organisations to perform the intermediary function allows the process to build on that trust while developing the new relationships needed for coordinated action.

Room to start with a few tenants and scale

A workable commercial model cannot require everyone to be ready at the same time. Whole-of-precinct progress becomes possible when implementation can start with those ready to move, while others watch, learn and opt in when they are ready. That said, some threshold of aggregate scale is needed to make vendors and delivery partners interested in participating in the first stages of investment. With four tenants ready to move, alongside NQBP's own sites, this appears to be around the minimum scale needed to generate that interest.

The diversity of the tenant base will be an asset under the right model. In this case, family-owned businesses were able to make quicker decisions and made up three of the four early adopters, while many larger organisations needed more time to work through internal layers of governance. This pattern held at this precinct, but the point is not to generalise about a particular type of business. It is to design processes and models that allow organisations ready to move to make decisions and participate, while accommodating those that require a longer timeframe to join.

Implications for where to start – these conditions are not a checklist to be satisfied; rather, they provide a diagnostic guide to where further effort should be focused.

6.2 Actors and architecture: who needs to be involved, in what configuration, and why?

The stakeholder engagement architecture is a deliberate sequence through which trust is continuously built and legitimacy deepened as engagement unfolds. What worked well was starting with tenants' operational constraints and business realities, then building outward to understand alignment with regional, state and

national actors. Vendors were brought in once a more integrated view of the opportunities had been established, and the DNSP emerged as a central partner.

Start with tenants: the operational reality is the foundation

The primacy of tenant conversations is what gives everything that follows its credibility. Every subsequent conversation with vendors, the DNSP, or national actors is grounded in what tenants actually face. Without that grounding, the process risks becoming a technical exercise disconnected from the real barriers to participation.

Schumacher's caution about applying incomplete knowledge at large scale is relevant here (Schumacher, 1973). In this project, we apply that principle by starting at the human scale, with one-on-one conversations grounded in businesses' operating conditions. These conversations surface insurance implications, corrosion risks, internal approval pathways, safety requirements and the diverse mix of interests, capacities and constraints across the tenant base, providing a foundation for developing a coordinated precinct-scale approach.

It also means recognising what those conversations cost the people having them. Participation requires time, attention, internal processes and a degree of commercial disclosure from businesses for which energy is not core work. Yet the potential aggregated value shown in Figure 1 also flows to the network, the region and the wider energy transition. This asymmetry shaped how the process had to be run and has implications beyond this project, which are taken up in Section 7.

Find alignment with local and national actors

As tenant perspectives take shape, local and national actors are brought in to find alignment between what is emerging at the Port and what is already on their own strategic agendas. The question is not "Here is what we are doing; please support it." Rather, it is "Here is what we are finding; where does this connect to your priorities, and what is your reason for driving this forward?"

At the local level, participation in existing regional forums through Resource Industry Network embedded the project in regional economic development conversations and priorities. At the national level, the Industry Reference Group was structured deliberately: the collaborative model was presented, the outcomes it was pursuing were named, and participants were asked directly how this connected to their own objectives. This illustrates how institutional alignment is built: the purpose is not simply to communicate with stakeholders, but to help each stakeholder recognise their own stake in the outcome.

Introducing vendors to an aggregated opportunity

Vendor engagement was woven into the process but kept at a high level, without revealing tenant-specific information. The strategic value of this was clear: engaging vendors at precinct scale, rather than as suppliers to individual sites, changed the nature of the conversation. Vendors are willing to invest time, propose solutions to site-specific technical challenges such as cyclonic and corrosive conditions, and develop fit-for-purpose offers when the potential deal size justifies that effort. This is a strategic benefit of the collaborative approach: precinct scale makes the Port a more interesting proposition than any individual site could be.

The DNSP as an integrated strategic partner

The relationship with the distribution network business was central. What became clear is that cost, resilience and reliability sit at the top of the agenda for tenants, NQBP and the network simultaneously. At an operational

level, the intention was always to engage Energy Queensland to streamline connection approvals. The conversation moved beyond network connection approvals. Energy Queensland engaged in discussions about how a precinct-scale approach could feed into network planning, what role Ergon and Energy Queensland might play in a third-party model, and what a deeper partnership might make possible over time – including building the detailed picture needed to understand how CER could be rolled out across the Port. This reflects a network business helping to shape the solution rather than only assessing applications to connect to its network.

In practice, this requires engagement that spans both the strategic and operational dimensions of Energy Queensland at once. Conversations ranged across connection approval processes, network planning that benefits from precinct-wide foresight, and broader strategic objectives held by both the Port and Energy Queensland. Being able to reach both levels is what allowed the relationship to develop as it did. In future projects, this could be strengthened further by treating the network business as a co-designer of the solution from the outset.

6.3 Process: what engagement and decision-making approaches enable progress?

The process logic described in Sections 3 and 4 – starting with individual tenant conversations, building towards a precinct-wide picture, and converging on a credible implementation pathway – worked as designed. A commercial direction in which tenants could participate emerged from the convergence of what tenants needed, what the network required and what vendors could viably deliver. This convergence is the mechanism by which collaborative processes unlock precinct-wide value: no single actor working alone could have produced a direction that accommodates the operational realities of tenants, the technical constraints of the network, and the commercial requirements of vendors.

Two areas for calibration would likely strengthen future iterations: one concerns how appetite for delivery-model characteristics might be tested earlier without compromising that sequencing; the other concerns the role of tenant-facing digital tools.

Calibration 1: Testing appetite for delivery-model characteristics earlier

There could be benefits in introducing possible third-party commercial arrangements earlier. This could accelerate the process and provide insight into how interest in a precinct-wide approach changes over the course of engagement. The calibration is not to predetermine the model, but to test appetite for its characteristics sooner. Tenants could be asked early about their response to arrangements involving no upfront capital, managed assets, roof licensing and third-party ownership – without naming a model or implying one has been chosen. This would surface concerns about insurance, liability and role clarity earlier, when there is more time to work through them, while allowing the eventual direction to emerge from the engagement, which gave it credibility. Vendors, similarly, could be engaged around a more defined delivery context rather than open-ended technical exploration.

Calibration 2: An open question about tenant-facing digital tools

A second question, raised rather than resolved by this project, is what role integrated software and artificial intelligence (AI)-supported decision tools might play in tenant engagement. In this project, authorising NMI data release was a manual, multi-step process: tenants signed individual release forms, data were returned in inconsistent formats, and delays between requesting and receiving usable information disrupted momentum at critical points. A platform could allow tenants to provide consent within the system and have their data

loaded directly into a profile they control. If a tenant could see their own load profile, solar potential and opportunity modelling directly, the value proposition of participation would become more tangible, and they could explore scenarios between engagement sessions rather than waiting for the next interview or workshop. Given that the cost of participating falls disproportionately on tenants, anything that reduces the time it demands of them is worth serious consideration.

But the limits should be stated plainly. Tools of this kind give an individual business better visibility of its own position. They do not, by themselves, produce the collective view on which a precinct approach depends – and a tenant with a better view of their own site is closer to the status quo than to coordinated action. Nor can software manufacture the trust that makes disclosure possible in the first place. In this project, half of participating tenants authorised data release and only five datasets proved usable. These limitations highlight the need to address willingness and capacity to share commercially sensitive information, alongside data availability and quality; improving the interface alone would not necessarily resolve them. There are also open questions about data quality, the risk of AI-generated errors in analysis, and whether such tools can adequately account for the nuances of these decisions.

6.4 Intermediary function: what does the integrating function require?

The transition described by the Collaborative Energy Transition Model needs someone to steward it. The systems innovation literature describes this as an intermediary, brokering or orchestrating function. The delivery team performed this role in the project. Understanding the work involved can inform others designing and funding precinct-scale CER investment. Four kinds of work were involved:

- **Surfacing.** Drawing out what each business actually needed, including constraints they had not previously articulated, without advocating for a particular outcome.
- **Integrating.** Combining individual positions into a precinct-scale picture that no participant could see from their own vantage point, and assessing it against network and vendor realities.
- **Translating.** Returning that picture to each party in terms relevant to their own decisions, including engaging different levels within the same organisation.

All four activities depended on the capacity to recognise alignment where it existed – between strategies, timing, mandates and interests – and make use of it. The nature of that alignment will differ in every setting; the transferable capability is the ability to identify and act on it. This required the delivery team to have credibility with tenants, the Port, vendors, the network business, local government and national actors, while maintaining sufficient independence to be trusted by all of them. Performing the intermediary function requires a combination of local embeddedness, national connections and governance continuity. It builds on existing relationships while developing the new connections needed for coordinated action.

Much of this capability already exists within regional industry networks, chambers of commerce, regional development bodies and manufacturing hubs, which support their members on issues such as workforce, supply chains, regulation and market access. Resource Industry Network is one such organisation, and its role in this project drew on standing relationships, access to informal as well as formal decision-making channels, and institutional memory of what has and has not worked locally. Resourced deliberately to perform the intermediary function for C&I CER, organisations of this kind could play an important role in scaling precinct-scale investment. The literature supports this – it shows that intermediaries with existing local embeddedness and connections to wider networks are more effective at bridging from niche initiatives to broader change

than intermediaries constructed for the purpose (Laborgne, 2023), and a backbone function combining local trust with broader reach and governance continuity is a key determinant of whether collaborative initiatives produce durable outcomes (Kania & Kramer, 2011; Turner et al., 2012).

How the function changes over time. The role played in this project is not the role the next stage requires. Surfacing and integrating positions are the activities involved in establishing a direction. What is needed now is stewardship of a shared arrangement between parties who will hold commercial relationships with each other: maintaining neutrality as those relationships form, keeping the questions open until they are properly resolved rather than settled by default, and sustaining trust over a timeframe longer than any single transaction. Intermediary capability is therefore not a project input that ends when a project does. If it is required across the life of a precinct's transition, it needs to be resourced accordingly.

7. Conclusions: Collaboration as Energy Transition Infrastructure

There is substantial value in unlocking C&I CER – the “missing middle”. This value goes beyond progress against energy targets to include value stacking at the site and precinct levels, network resilience and deferred upgrades, and competitive regional economies, as shown in Figure 1. Yet on-ground investment in C&I CER remains well short of current targets. This project produced evidence that collaborative processes can be an important leverage point for reducing that investment gap.

The collaborative process and the intermediary function that stewards it together form collaboration infrastructure: an enabling capacity in the energy transition. Figure 5 sets out the proposed mechanism through which collaboration infrastructure connects inputs to precinct-level outputs and investment-ready pathways, with the potential to accelerate electrification. Related work supports the importance of resourcing coordination and local capacity. *Building blocks: Developing community capacity for a just transition* recommends sustained funding for community capability (Evans & Stewart, 2025). Metropolitan-scale analysis has also called for a coordinating body where the work exceeds what any single stakeholder can manage (Committee for Sydney, 2025).



Figure 5 – Collaboration infrastructure as a strategic leverage point in the energy transition

Collaboration infrastructure is valuable but often under-resourced. Trust, collaboration and partnership are named as essential in energy transition discussions and strategies. Yet funding, resourcing and recommendations focus on individual transactions: faster connections, better tariffs, restored rebates, technology subsidies. None of these are wrong, and reform is moving on several of them. This project provides evidence that the connective work between these interventions carries value of its own.

The comparison with transmission-scale coordination may be instructive. Where coordination has been judged necessary at that scale, it has been established and resourced accordingly, with statutory functions, named entities and dedicated funding. This comparison raises a question about whether coordination at the precinct

and distribution scales is being recognised and resourced in proportion to its potential value. In particular, local and regional intermediary networks warrant recognition as a strategic resource in the energy system transition. Resourced properly, these networks can put established trust to work without having to build every relationship from scratch.

Collaboration infrastructure is difficult to commission because its form and the value it produces are diffuse. Part of the difficulty in funding it is that its scope and deliverables have not been clearly specified. A funder can commission a feasibility study, a technical assessment or an engineering design because each has a recognised scope, a set of deliverables and a price. This research set out to describe the collaborative process more clearly, evaluate it and reflect on how it might be improved. It did not undertake a cost-benefit analysis to quantify its monetary value – a difficult task given the systemic nature of the change. However, that difficulty is a reason to pursue further research rather than set the question aside. Identifying valid ways to quantify these benefits would strengthen the case made here and support both the resourcing and continued improvement of these processes.

Who pays for collaboration infrastructure? The costs of running a collaborative process – convening, governance design, intermediary capacity and modelling – need to be considered alongside the potential value of coordination, both within the precinct and through wider ripple effects. However, there is an asymmetry of cost and benefit. The costs of participation – time, attention, internal processes and commercial disclosure – fall on individual businesses, while benefits are shared more widely through better network utilisation, regional development and system-level transition. Even a business that ends up with a cheaper energy bill may have spent disproportionate effort to get there. This could be a structural asymmetry in the energy transition.

Collaboration infrastructure can help address this asymmetry. A well-run process should reduce the time and cost burden on participating businesses by coordinating shared work and asking each participant only for what is genuinely required. The intermediary function holds the precinct-wide picture and can target requests accordingly, rather than requiring each business to navigate the whole process independently. Actors that benefit from the wider network, regional and energy-system outcomes should therefore consider contributing to the funding of collaboration infrastructure.

Trust, collaboration and partnership are widely recognised as enablers of the energy transition, but they require deliberate work to build and sustain. Collaborative processes and the intermediary function that stewards them together form collaboration infrastructure: the capacity to connect actors, build trust, integrate opportunities and create a bridge to investment. The core argument of this report is that this infrastructure should be explicitly designed, funded, strengthened and sustained as a strategic resource for accelerating C&I CER investment and enabling its wider benefits.

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