30 November 2023

Attachment 5.8: Network innovation program

Ausgrid's 2024-29 Revised Regulatory Proposal

Empowering communities for a resilient, affordable and net-zero future.

Ausgrid

Contents

Executive Summary

Australia's energy system is changing – the traditional unidirectional energy flow from bulk generation to our customers is increasingly being challenged through changes to technology, policy and the needs and expectations of our customers. This is driving the need for electricity network operators to change the way in which networks are planned, designed, operated, maintained and augmented. Transformation of the energy system is required at all levels to ensure we can meet these changing needs whilst still maintaining the safe, efficient and reliable provision of energy services to our customers in a sustainable way.

Ausgrid's Network Innovation Program (**NIP**) is a suite of research, trials and pilots of leading-edge technologies aimed at driving a customer-led transformation across our network for the benefit of all. The program has strong support from Ausgrid's Reset Customer Panel (**RCP**) and Voice of Community (**VoC**) panel, who recognise the potential benefits that innovation can bring and the necessity for all participants across the sector to play their parts in revolutionising the system. The program has continued support and oversight from the Network Innovation Advisory Committee (**NIAC**), who provide pivotal program oversight and input into project direction and development.

We believe that the program is a prudent and efficient demonstration of the potential for new technologies to deliver significant benefits to our customers and the wider energy market if deployed at scale. This is evidenced by two flagship projects in the 2019-24 regulatory control period (**2019-24 period**) – the Community Battery trial and Project Edith, our distribution system operator (**DSO**) rapid demonstration project. Both projects have had positive industry-wide impacts – the former in the implementation of distribution connected batteries, laying the foundations of the Federal Government's Batteries for Household Solar program; and the latter in demonstrating the future of dynamic pricing and network operation as an extension of an earlier Australian Renewable Energy Agency (**ARENA**) funded project.

We have refined our proposed program into four themes to meet the challenges of the energy transition:

Dynamic & Flexible Network Operation

Resilience & CER enabling trials and pilots to evolve the way we operate our network utilising new sources of information, new ways of working and respond to the changing technical challenges and opportunities presented by flexible energy sources

Dynamic & Flexible Network Planning

CER enabling trials and pilots to transform network planning and build capability for responsive, targeted and efficient investments in a changing energy landscape

Digital Transformation

Safety improvements using digital intelligence to better predict defects & faults in an increasingly decentralised and dynamic grid. These projects are focused on how to efficiently equip existing assets with these capabilities to increase asset functionality and reduce long term investment

Emerging Technology Trials

Resilience, emission reduction and CER enabling trials and pilots using leading edge network technology to modernise the grid for the future. These trials and pilots will also support enhancements to customer and employee safety.

The projects proposed under each theme have been assessed as having significant potential benefits to customers. Despite the uncertainties that are inevitable with innovation projects, the NIP has a number of embedded safeguards that ensure that we meet the capex objectives and maximise the potential benefits to customers. These include:

- Strong program governance that has been co-designed with customers over the 2019-24 period;
- Only proposing projects for the 2024-29 period where the benefits are forecast to be at least 50% more than the estimated costs; and
- Deploying asset related innovation projects in areas of network need, realising risk reductions and/or benefits when successful and prior to larger pilots or business as usual deployment.

The Australian Energy Regulator (**AER**) provided feedback about Ausgrid's Initial Proposal (**IP**) in its Draft Decision . We have adjusted our proposed program based on this feedback, as well as providing additional information on each proposed project to support the prudency and efficiency of our program. We are committed to better meeting the needs of our customers by continuing to invest in innovation and to also share the risk of this type of investment with our customers.

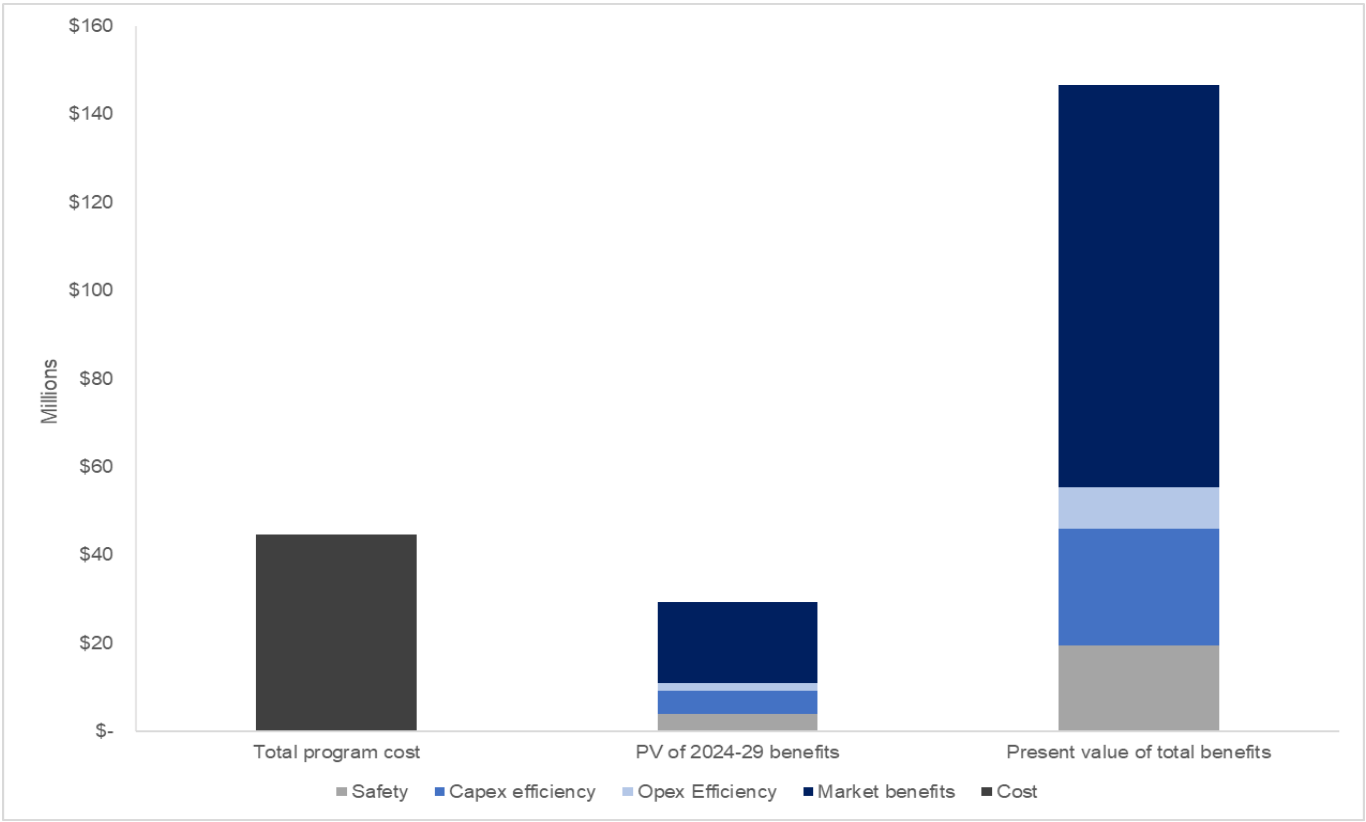
Our revised program forecast is shown in Table 1. We are committing to deliver the full proposed program under the continued oversight of the NIAC but at a reduced cost to customers. This means we will fund a reduction in the proposed NIP allowance equivalent to 10% of the total program across both the capex and opex programs. The concept of partial funding of innovation mirrors elements of other regulated frameworks such as the United Kingdom's Ofgem.

Table 1 Revised Network Innovation Program Forecast ($m, real FY24)

	FY25	FY26	FY27	FY28	FY29	Total
CAPEX	$9.8	$8.5	$7.9	$9.3	$9.2	**$44.7**
OPEX	$0.9	$0.9	$0.9	$0.9	$0.9	**$4.5**

The NIP is expected to realise significant benefits to be realised (**Figure 1**) if implementation of the proposed projects are successful. The benefits are significant when compared to the program cost due to the stringent process applied when deciding if projects would form part of the proposed program. Despite the uncertainty and challenging nature of innovative projects, the safety margin applied should help enable realisation of the benefits as expected.

Figure 1 Expected NIP Benefits ($m, real FY24)



How this investment meets the NEO, and the objectives and criteria within the NER

Ausgrid's proposed network innovation program has been developed to promote the long-term interest of consumers with respect to price, quality, safety, reliability and reducing Australia's greenhouse gas emissions.

Ausgrid considers the level of innovation investment forecast for the 2024-29 period is required to ensure the efficient, effective and timely adoption of new technologies and processes, and the unlocking of more efficient and effective market outcomes. Collectively this ensures efficient investment in, and the efficient operation and use of electricity services over the long term.

Each project proposed under the program has been assessed against its ability to more efficiently meet or mange growth in demand for services over the long term and meet other regulatory obligations, or otherwise cost effectively maintain quality, safety, reliability and security of supply by leveraging emerging technologies as they approach and ultimately reach commercial maturity.

Our robust governance, independent advisory arrangements, rigorous investment hurdles, and use of alternative funding schemes demonstrate that the program as a whole is efficient and represents costs that a prudent operator would require to achieve the capex objectives in the NER.

1. Revised Program for 2024-29

1.1. Revised Program Overview

Australia's energy system is changing – the traditional unidirectional energy flow from bulk generation to our customers is increasingly being challenged through changes to technology, policy and the needs and expectations of our customers. This is driving the need for electricity network operators to change the way in which networks are planned, designed, operated, maintained and augmented. Transformation of the energy system is required at all levels to ensure we can meet these changing needs whilst still maintaining the safe, efficient and reliable provision of energy services to our customers in a sustainable way.

Ausgrid's NIP is a suite of research, trials and pilots of leading-edge technologies aimed at driving a customer-led transformation across our network for the benefit of all. The program has strong customer support from the RCP, the VoC as well as the NIAC. These groups recognise the benefits to customers that can be realised through implementation of innovative ideas and projects.

We have adapted our program into the four following themes to meet the needs of the energy transition, to draw out more clearly the transformative nature of the program and to demonstrate how these projects potentially have broad reaching benefits across Ausgrid's value chain:

Dynamic & Flexible Network Operation

Resilience & CER enabling trials and pilots to evolve the way we operate our network utilising new sources of information, new ways of working and respond to the changing technical challenges and opportunities presented by flexible energy sources

Expected customer benefits:

- Increased reliability
- Customer bill reduction
- Carbon emission reduction

Dynamic & Flexible Network Planning

CER enabling trials and pilots to transform network planning and build capability for responsive, targeted and efficient investments in a changing energy landscape

Expected customer benefits:

- Enables customer electrification
- Increased reliability
- Customer bill reduction

Digital Transformation

Safety improvements using digital intelligence to better predict defects & faults in an increasingly decentralised and dynamic grid. These projects are focused on how to efficiently equip existing assets with these capabilities to increase asset functionality and reduce long term investment

Expected customer benefits:

- Customer bill reduction
- Increased reliability

Emerging Technology Trials

Resilience, emission reduction and CER enabling trials and pilots using leading edge network technology to modernise the grid for the future. These trials and pilots will also support enhancements to customer and employee safety.

Expected customer benefits:

- Carbon emissions reduction
- Increased public safety
- Bushfire prevention

1.2. Revised Project List

In revising our proposed project list, we adapted four project themes to draw out more clearly the transformative nature of the program, to demonstrate how these projects potentially have broad reaching benefits across Ausgrid's value chain. We have also grouped and refined as well as removed some projects.

When discussing the AER's Draft Decision with the NIAC, a concern was raised about the potential risks of being 'too transformative'. More transformative projects typically have high risks associated with them and the committee perceived a transformative only program as not a prudent approach. Our revised proposed project list maintains a balance between medium to high levels of transformation in order to manage this risk.

Dynamic & Flexible Network Operation ($m, real FY24)

Project Name	Estimated $m
Closed loop voltage regulation and optimisation control system	$1.9
Dynamic ratings calculation system for local weather	$1.0
Micro-climate monitoring to manage intermittent generation	$0.2
Dynamic network sectionalising and optimisation engine	$1.2
Advanced smart meter services integration for resilient load management	$0.9
Advanced smart meter data integration for flexible load management	$1.0
Responsive feeder level load shedding schemes (UFLS)	$1.9
Smart Islanding for community resilience	$3.4
Pilot CER integration for OT systems	$1.0
Dynamic controlled load management system	$0.4

Advanced distribution substation monitoring brownfield sites (increase existing assets utility)	$1.8
Flexible network configuration trial using PMUs	$0.5

Dynamic & Flexible Network Planning ($m, real FY24)

Project Name	Estimated $m
Advanced load and generation information system	$1.0
Network state estimator using machine learning	$2.1

Digital Transformation ($m, real FY24)

Project Name	Estimated $m
Fault prediction intelligence system	$1.0
AI driven defect identification trial	$0.5
Digitalising brownfield zone substations to manage bi-directional energy flows	$2.3

Emerging Technology Trials ($m, real FY24)

Project Name	Estimated $m
Multi-functional overhead line prediction sensors	$3.8
Mobile hydrogen units for emergency response	$2.1
Low loss asset trials	$3.0
Low embodied carbon asset trial - SF6 alternatives	$0.8
Low embodied carbon asset trial - Polypropylene cables	$0.8
Low cost automated low voltage switch trial	$1.3
Pilot high accuracy underground cable safety & fault prediction monitors	$0.9
Wires down detection device trials	$5.7
MV cable partial discharge monitoring	$1.0
Trial ultra-sonic discharge detection devices	$0.4
Bushfire risk mitigation wooden pole wraps	$0.3
Heavy vehicle electrification - Ausgrid fleet trial	$1.6
Barriers to electrification field trials	$1.5

In order to be included in the proposed program, projects were subject to a rigorous cost benefit assessment. A cost benefit model was developed based on Ausgrid's Value Framework, to assess at a project level the estimated benefits for each project, either at a widget level or whole of project level. The analysis included consideration of benefits such as:

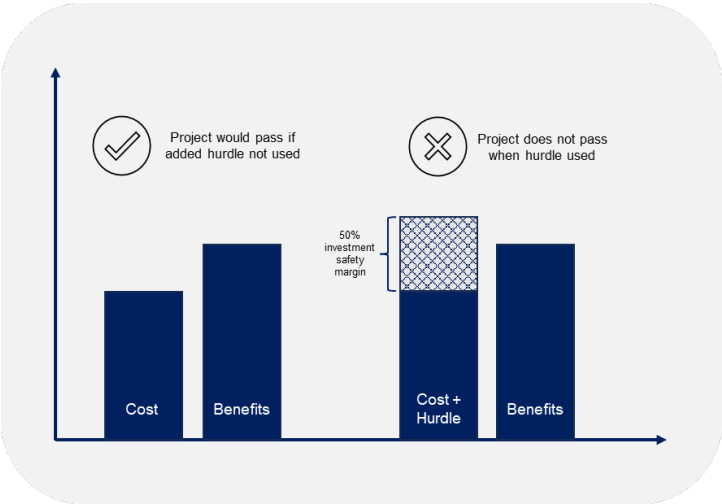
- Probabilistic safety benefits including risk of shocks, bushfires, injury and property damage;
- Capex efficiency across both augex and repex expenditure;

- Opex efficiency benefits in field response; and
- Market benefits, including unserved energy, wholesale pricing, emissions and energy losses.

Benefits were incrementally applied based on the expected degree of development and deployment of the various projects within the scope of this program. This means that projects for device rollouts only considered benefits relating to trial or pilot volumes, rather than broad network-wide benefits. As there are close relationships between the objectives and outcomes of the NIP and those of the Climate Resilience and CER Integration programs, considerable effort has been undertaken to ensure a cohesive alignment between each. In particular, this has ensured that benefits and costs are appropriately allocated and not double-counted. One key outcome of this alignment being that the Customer Energy Curtailment Value (**CECV**) has been excluded to reduce the risk of benefit overstatement within the NIP.

Once the annual benefits for each project were calculated, the annual benefit cost ratio (**BCR**) was calculated, and the expected BCR over the expected life was estimated using a NPV calculation. At this stage, an investment safety margin was used to account for the uncertainty and factor in the higher risk of project failures, cost over-runs or lack of benefits realisation due to the innovative nature of these projects (see **Figure 2**). This approach has resulted in only pursuing projects where benefits are predicted to be at least 50% more than the estimated costs.

Figure 2 Illustration of Investment Safety Margin



1.3. Revised Program Forecast

The NIP has strong customer support from the RCP, the VoC as well as the NIAC. These groups recognise the benefits to customers that can be realised through implementation of innovative ideas and projects. We are committed to better meeting the needs of our customers by continuing to invest in innovation and to also share the risk of this type of investment with our customers.

Our revised program forecast is shown in **Table *2*** and **Table *3***. We are committing to deliver the full proposed program under the continued oversight of the NIAC but at a reduced cost to customers. This means we will fund a reduction in the proposed NIP allowance equivalent to 10% of the total program across both the capex and opex programs. The concept of partial funding of innovation mirrors elements of other regulated frameworks such as the United Kingdom's Ofgem.

Table 2 Revised NIP Capex Forecast ($m, real FY24)

	FY25	FY26	FY27	FY28	FY29	Total
CAPEX	$10.9	$9.5	$8.8	$10.3	$10.2	$49.7
CAPEX (business funded)	($1.1)	($0.9)	($0.9)	($1.0)	($1.0)	($5.0)
RP CAPEX	**$9.8**	**$8.5**	**$7.9**	**$9.3**	**$9.2**	**$44.7**

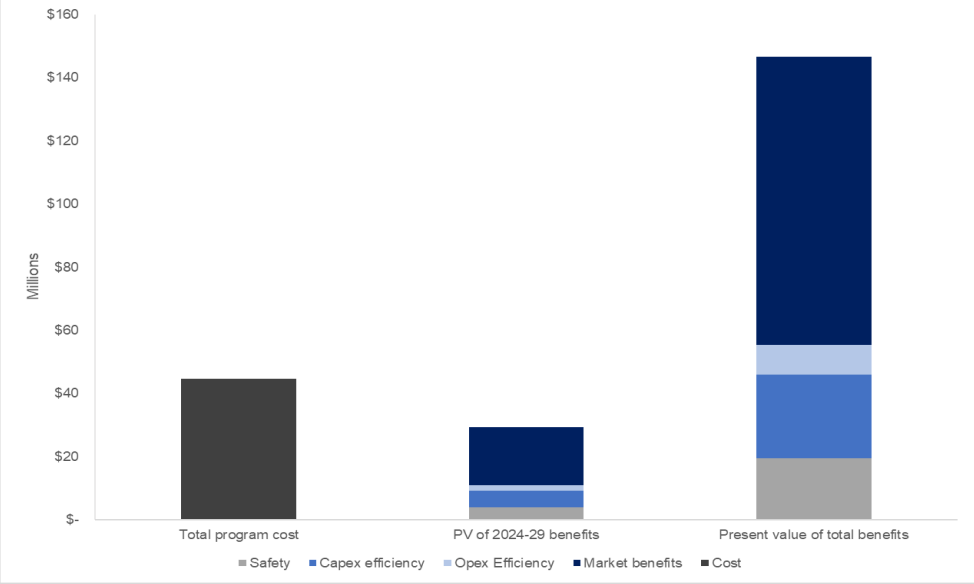
Table 3 Revised NIP Opex Forecast ($m, real FY24)

	FY25	FY26	FY27	FY28	FY29	Total
OPEX	$1.0	$1.0	$1.0	$1.0	$1.0	$5.0
OPEX (business funded)	($0.1)	($0.1)	($0.1)	($0.1)	($0.1)	($0.5)
RP OPEX	**$0.9**	**$0.9**	**$0.9**	**$0.9**	**$0.9**	**$4.5**

1.4. Revised Program Expected Benefits

The total forecast NIP benefits for the 2024-29 period (**Figure 3**) are significant when compared to the program cost. This is due to the stringent process applied when deciding if projects would form part of the proposed program. Despite the uncertainty and challenging nature of innovative projects, the safety margin applied should help enable realisation of the benefits as expected.

Figure 3 Expected NIP Benefits ($m, real FY24)



2. Why Innovation is Important

Based on our experience to date, Ausgrid strongly believes that there is an ongoing place for specific network innovation funding within the Australian electricity regulatory framework. We consider this especially important during the current energy transition due to the powerful pace of change across technology, sources of generation, artificial intelligence and, importantly, the needs and expectations of our customers. This program is how Ausgrid provides a consolidated, cohesive and credible response to the energy transition that is driven and overseen by customers, for the benefit and long-term interest of customers.

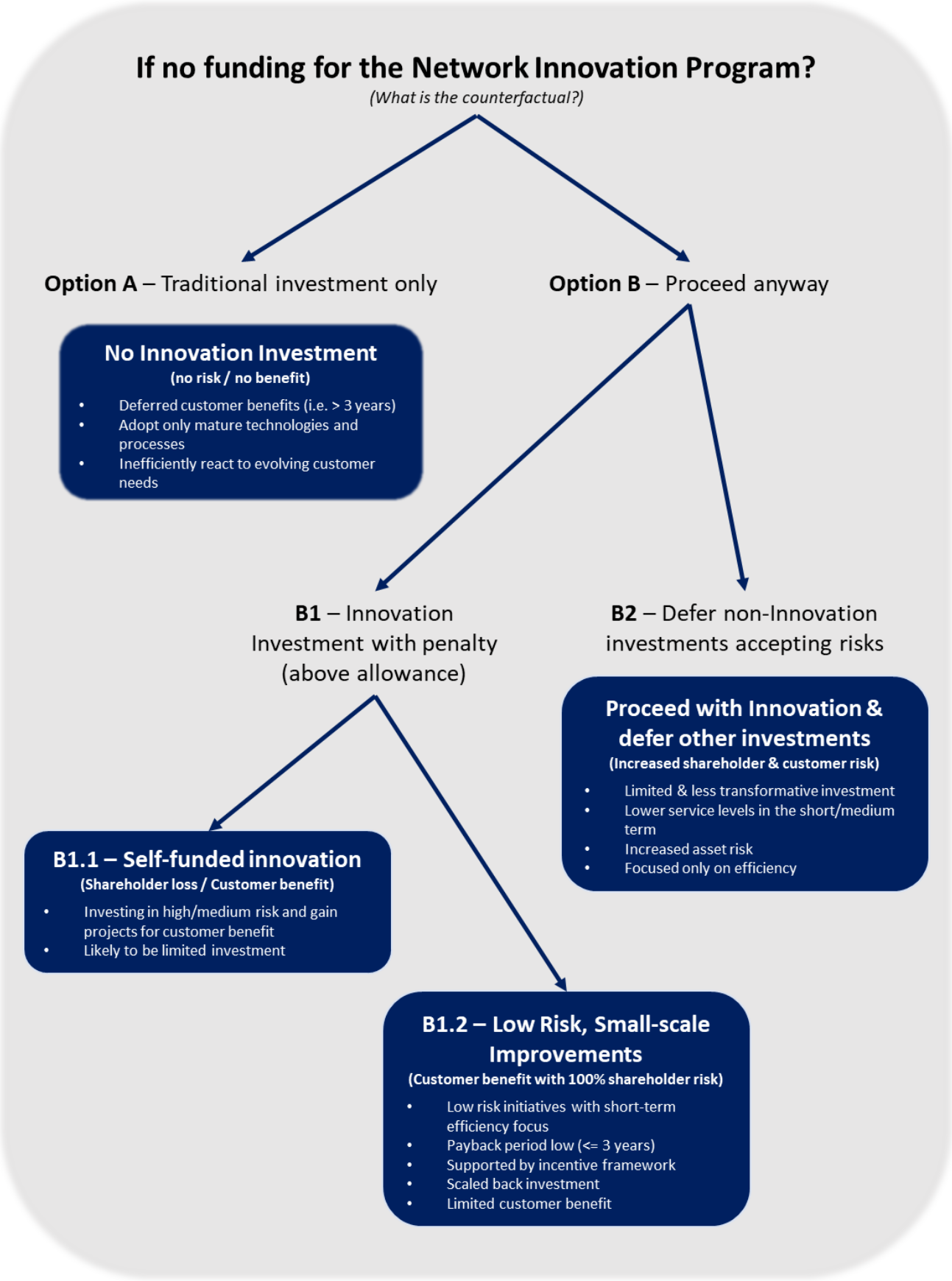
We consider that the NIP for the 2019-24, 2024-29 and 2029-34 periods will represent the likely peak scale of ongoing investment required, and that into future regulatory periods the required scale will decrease. The proposed NIP customer-funded capex for the 2024-29 period represents approximately 1.3% of total proposed capex and proposed NIP customer-funded opex for the 2024-29 period represents approximately 0.2% of total proposed opex. We consider the proposed program to be sufficient to test and drive significant benefits for customers, whilst also allowing us to sustainably embed change across a network of long-lived assets. We suggest that the longer-term trend beyond the energy transition would be less than 1.0% of total capex, and less than 0.2% of total opex.

If there were to be no approved funding for the NIP, there are several potential investment pathways for those investments not considered suitable for other external funding, as outlined in **Figure 4**. The most obvious one is Option A, where only traditional investment is undertaken. This would result in a far slower and more conservative approach to the implementation of new ideas. New asset solutions would be sourced through traditional procurement processes that would favour proven, mature products over those that were newer and less tested.

This would likely result in long-term investments of proven assets being made to resolve network constraints that do not necessarily result in the best benefits to consumers over the long term or meet capex objectives, given the pace of change in the energy sector. There would be a delay of at least 3-5 years in the realisation of benefits that new assets, services and systems could provide whilst these things were tested and proven by others.

Option B, and it's derivatives, outline pathways for proceeding with innovation investment in the absence of an AER approved allowance. Each of these options presents limited customer benefit and significant shareholder risk.

Figure 4 Investment Pathways without the NIP



3. Addressing the AER's Concerns

3.1. Background

In its Draft Decision, the AER stated that Ausgrid had not provided sufficient information to support the prudency and efficiency of the proposed NIP. It also noted that the forecast program was substantially higher when compared with pro-rated expenditure in the 2019-24 period. The Draft Decision outlined guidance for Ausgrid's consideration when developing the revised proposal including:

- A more targeted list of transformative projects, clearly linked to addressing specific needs in line with the capex objectives;
- More detailed information on each proposed project including why the project is transformative;
- Explanations of how alternative sources of funding (e.g. DMIA, ARENA, regulatory sandboxing) have been considered and genuinely exhausted;
- Demonstration of how the findings from the current program has informed our proposed program; and
- Details of intended knowledge sharing activities.

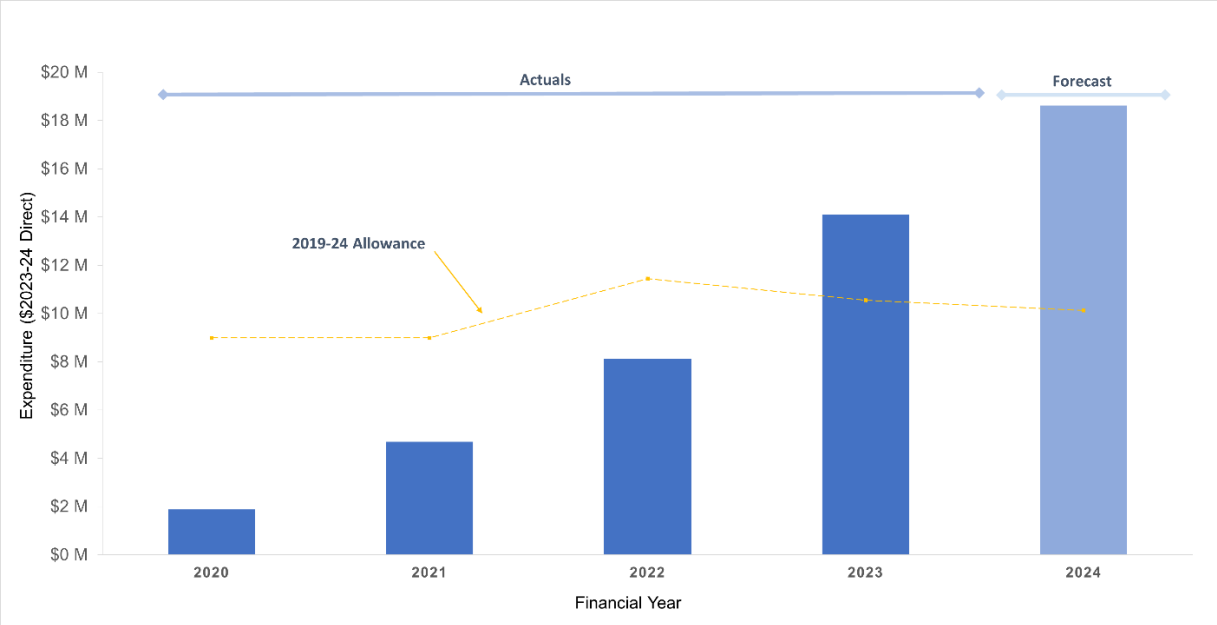
The AER also requested more information regarding Ausgrid's approach to sizing the NIP, including how projects are prioritised and chosen for investment.

3.2. 2019-24 Program Update

In Ausgrid's IP, we foreshadowed an increasing expenditure trend and material increases in program delivery in the second half of the 2019–24 period. As at the end of September 2023, year-to-date expenditure for 2023-24 was $4.0 million, bringing actual program expenditure over the 2019-24 period to $32.8 million (real FY24).

The forecast program expenditure for the 2019-24 period is $47.4 million (real FY24) as shown in **Figure 5**, which is 5.4% lower than the total allowance of $50.1 million (real FY24).

Figure 5 Actual & Forecast NIP Expenditure ($m, real FY24)



3.3. Additional Project Information

We have provided additional project information to address the AER's concerns by creating individual project business case templates. Additional information includes:

- Detailed project need, use cases, options and scope of works;
- Cost details including quotes where applicable and/or available;
- Expected benefits;
- Cost benefit assessment;
- Assessment against the capex objectives; and
- Assessment against the co-designed Innovation Investment Principles

We note that there may be shortcomings in preparing detailed business cases so far in advance of when some of the projects may be delivered. This is particularly relevant for innovation projects, where uncertainty is high. To ensure the robustness of our analysis, we have applied a 50% uplift in costs when assessing the benefit to cost ratio, whilst only including the estimated cost as the proposed capex. This is complemented by robust governance across the development and delivery of innovation projects. These projects are, by their nature, subject to change, but having a framework of accepted principles and subjecting projects to this governance provides a structure and mechanism to adjust the program to ensure maximum value to customers and other stakeholders.

3.4. Alternative Funding Sources

In consultation with the NIAC, we have considered and also used alternative sources of funding for a number of NIP projects in the 2019-24 period – specific examples of these are included in **Table 4** and **Table 5**. We plan to continue leveraging alternative sources of funding as far as practicable for projects where the specific funding guidelines and timeframes can be met. The scope of DMIA is limited as projects must be related to demand management. Similarly, projects funded through ARENA must relate to advancing renewable energy and cannot include research (Technology Readiness levels 1-3)[1]. Our proposed research component, particularly low-technology readiness level research, was a key recommendation received from the NIAC in their independent report.

Table 4 Details of alternative funding using DMIA

Project Name	DMIA Project Description
Stand-alone power systems (SAPS)	This project developed tools for comparing credible network options to SAPS solutions. Case studies in the Ausgrid network where SAPS are a potentially viable alternative to traditional network options and the associated customer engagement processes that might be needed to implement an individual power SAPS system or micro-grid SAPS solution were also produced. This project was a pre-cursor to our SAPS trials. It allowed us to more effectively target areas of potential benefit, which subsequently drove our customer engagement strategy to select trial locations.
Community battery feasibility study & research	This project was carried out over a number of phases in conjunction with our community battery trial and pilot projects. The first phase of the project aimed to assess engineering, regulatory and commercial aspects of the community battery concept within the NEM context via a feasibility study. The second phase of the project aimed to assess the customer response to the concept of a community battery and to better understand customers perceptions, motivations to participate and attitudes.

[1] https://arena.gov.au/assets/2017/05/ARENA_ARP_Guidelines_FA_Single_Pages_LORES.pdf

Project Name	DMIA Project Description
	The outcomes of the feasibility study and customer research has now informed the development of a practical trial for the concept in phase three. As part of Phase 3, the DMIA project continues to explore customer response, perceptions and behaviours as part of the community battery pilot. The main objective of the trial is to test the benefits of stored solar energy to ease network constraints and raise community awareness about the benefits of community batteries.
Dynamic load control	During the period it became apparent that the most optimal way to undertake a dynamic load trial was using the DMIA, rather than capex under the NIP. This project explored the optimal operation of controlled load hot water to identify appropriate dynamic operating terms and schedules and the resultant tariff conditions necessary. The project also sought to understand the efficacy of using hot water load control to better manage local voltage, and the regulatory mechanisms that may assist in effecting optimal operation.
Project Edith Customer Payments & CSIP-Aus Specification Extension	These two DMIA funded projects were carried out in conjunction with the NIP funded component of Project Edith. The first funded payments to participating retailers to reconcile the differences between each customer's network tariff and the tested Edith tariff. This enables the testing of Edith as an off-market tariff for the purpose of allowing a lean and iterative research approach that could not have been achieved with an on- market sub-threshold trial tariff. The second proposes to develop, build and test an extension to the currently published version of the CSIP-Aus API (**Common Smart Inverter Profile – Australia, Application Programming Interface**), that being version 1.1 dated June 2020. This extension is needed in order to provide the functionality required to communicate the dynamic network prices to customer agents (retailers and aggregators) in Project Edith.CSIP-Aus is being adopted by DNSPs across the NEM for the communication of dynamic operating envelopes (including flexible exports).
Barriers to Electrification Study	This project aimed to build Ausgrid's understanding of the impact of decarbonisation through electrification. The research identified electrification pathways and explored how different social, economic and technical customer barriers may impact different customer segments. This project is critical foundational research and is being used too support our proposed Barriers to Electrification field trial, planned for the 2024-29 period.

Table 5 Details of alternative funding from Department of Climate Change, Energy, the Environment & Water (DCCEEW)

Project Name	DCCEEW Project Description
Community battery pilot	Following our community battery pilot (the first three locations), the NIAC provided support for a community battery pilot (a further six locations) to be funded by a combination of NIP capex and DCCEEW funding as part of the Federal Government's Community Batteries for Household Solar program. This pilot is leveraging the learnings of the Community Battery trial project to test a broader number of battery suppliers (and therefore IT system integrations) as well as expanded arrangements with contestable service providers.

3.5. Using the Learnings from the Current Program

We have used the learnings from the current NIP, as well as the learnings for others (see Section 3.6), at both the program and the project level, in both developing our proposed program for the 2024-29 period as well as other projects and programs. In our IP, we outlined the learnings from the 2019-24 program, and also explained how this

led to the design of our proposed program – for example, inclusion of an opex allowance to ensure that the most cost-efficient project option could be selected, and so that innovation related research could be carried out.

We maintain a 'lessons learnt' register for both our NIP projects, as well as our Demand Management Innovation projects. This register is regularly updated and shared with the NIAC as part of the committee materials on an ongoing basis, as well as being published on the Ausgrid website[2]. We also routinely share these lessons with other DNSPs and relevant parties, as outlined in Section 3.6. The register outlines what has been learnt, the next steps as well as expectations for the next regulatory cycle.

There are number of other direct ways in which the learnings from the NIP have been used in Ausgrid's IP for the 2024-29 period, including:

- Proposing the expansion of a number of trials from the 2019-24 period into pilots in the 2024-29 period to trial additional use cases and provide additional learnings;
- Utilising our experience with the commercial purchase and system integration of smart meter data to expand our investigation into potentially economically viable use cases;
- Utilising our actual costs from current innovation projects to help inform and develop better project cost estimates for our proposed projects;
- Learnings from Project Edith have directly informed Ausgrid's CER Integration Program;
- Not proposing a specific community battery capex program in the 2024-29 period, based on learnings from the 2019-24 period as well as the implementation of the Federal Government's Community Batteries for Household Solar Program; and
- Learnings from procurement processes and the impact on project costs and timing, including the negotiation of contractual terms and cyber security assessments, particularly with start-up organisations that have innovative offerings.

3.5.1. Program Sizing & Project Selection

In conjunction with the NIAC, our experience over the 2019-24 period has informed and developed how we incorporate and prioritise new project ideas, reject ideas, as well as how we scale existing project ideas as required. In our IP, we provided an overview of this process but, there are many detailed steps (**Figure 6**) taken in order to firstly generate, scope, and undertake an initial assessment of a potential innovation project. Any new project ideas are assessed using the Network Innovation Investment Principles – this will determine the strategic alignment of the project and its fit in comparison to existing projects in the program.

If the potential project appears to align with the Investment Principles and has initial stakeholder support, then further work can be undertaken to develop project options including estimates and analysis of project costs and benefits. This further work is not carried out for projects that don't align with the investment principles and/or do not have stakeholder support.

If a project passes these first hurdles, it is then assessed against a series of considerations to determine how (including scope and scale) and when the project idea could be implemented. These considerations include, but are not limited to:

- Potential cost benefit (e.g. Is it higher or lower than other planned projects?);
- Resource requirements (e.g. How does this fit into the existing works program? Do we have resource constraints in particular locations that may influence where a trial occurs?);
- Customer, community and/or council engagement (e.g. What customer/community/council engagement is required? What is the potential feedback that could be received from customers? How do we prepare the contact centre for enquiries?);

[2] https://www.ausgrid.com.au/About-Us/Future-Grid/Innovation-Portfolio/NIAC

- Legal considerations (e.g. for the SAPS trials, specific customer agreements were developed – this may impact the location and size of a trial);
- Program management (e.g. How does this project fit within the overall program budget? Have we prioritised the most beneficial projects? Are we managing dependencies appropriately?);
- Materials availability (e.g. Are there multiple potential suppliers? What is the lead time? Are specific customisations required?);
- Ease of installation (e.g. Is special plant required to install the asset? Can it be done safely? Do we have the right skills and training? Do we need to change the Electrical Safety Rules?);
- Ease of integration (e.g. How does this system integrate with our existing IT systems? Can the data be used across corporate databases?
- Ensuring optionality (e.g. How can we limit the scope and cost of the trial whilst maintaining optionality for potential future improvements?)

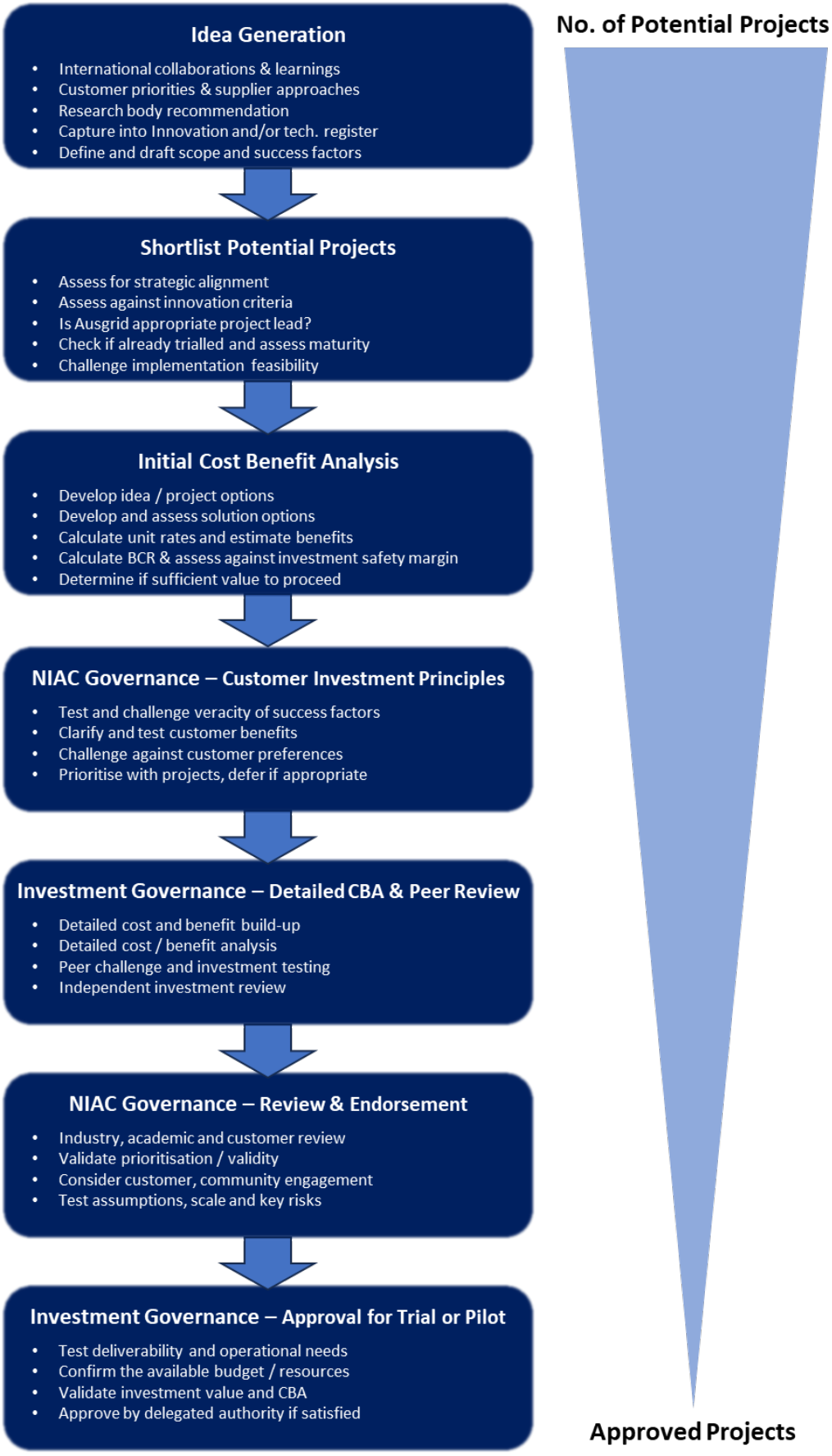
When undertaking testing and assessment against these development considerations, a wide range of internal and external stakeholders are consulted to ensure robustness of the proposed approach before going through formal processes through the NIAC and internal investment governance before to seek project approval before it can commence.

Once a project has commenced, delivery monitoring and reporting is managed through Ausgrid's Program Management Framework. There is also continued review and testing carried out by both the NIAC and internal stakeholders to ensure that the project remains viable, is leading towards the intended outcomes (technical, regulatory, financial etc). Where a project is not meeting expected outcomes, it may be terminated.

Learnings from the 2019-24 program were also used to determine the overall size of the proposed NIP for the 2024-29 period. Throughout engagement on the IP, we had specific feedback from the VoC, RCP and NIAC that the size of the proposed NIP should be at least doubled to ensure that Ausgrid could respond appropriately to the level of change in the industry to provide customers with benefits sooner.

A larger program was considered as part of the program options included in Ausgrid's IP but ultimately rejected for a number of reasons. Innovation projects are challenging to implement due to the practicalities of introducing new assets and ways of working into an existing network and large organisation. Given our experiences to date, we believed that a larger program could put the sustainability of benefits at risk by trying to change too many things at once. At all times, safety is at the heart of Ausgrid's decisions, and the customer experience and reliability of the network are paramount, rather than investment in a greater volume of innovation that could potentially put these factors at risk.

Figure 6 Project Selection Methodology



3.5.2. Maturity Pathway to Business As Usual

Ausgrid defines the maturity of innovation project ideas into several categories (as outlined in our IP):

- Research & Development;
- Trial;
- Pilot; and
- Business as Usual (**BAU**).

Our process requires us to assess the success of projects at each of those steps, providing a basis for whether the project should continue beyond its current stage. The success of a project is measured, and next steps determined using the framework outlined in **Section 4**. Projects must pass through a series of gates in order to progress beyond their current phase (e.g. trial, pilot) on the path to business as usual. If projects do not satisfy the gate requirements, they will be terminated.

Each gate consists of a series of considerations that are used to help determine next steps. The considerations may be qualitative or quantitative in nature, and the exact considerations used will depend on the project specifics. For example, in assessing a physical asset project, we will assess if the asset met the intended technical requirements. This might involve examining:

- Whether the asset is functioning as expected;
- The data produced by the device and/or data from other sources that confirm operation of the device;
- Whether the asset can be installed in a safe and cost-efficient manner;
- If the support and maintenance requirements are as expected;

Even if a project successfully progresses to BAU, this does not necessarily result in a scheduled broader rollout. For example, LV STATCOMS that have been trialled in the 2019-24 period, will soon progress to BAU. This means that the STATCOM is available in the 'planning toolkit' as a potential solution to solve a network constraint, alongside other more traditional solutions. The actual future deployment of more STATCOMs will be dependent on the nature of a specific identified constraint, other options available and the cost estimates of each.

3.5.3. Case Studies

High Accuracy Loop Impedance Meter Trial

- We conducted a trial during the 2019-24 period of a novel high accuracy loop impedance meter for ongoing condition monitoring of low voltage CONSAC cables.
- The trial was designed to test whether these assets could realise the following customer benefits:
    - A reduction in customer bills through deferred capex to replace low voltage underground cables;
    - A reduction in customer bills through reduced opex due to a reduction in cable faults;
    - Improved customer reliability through a reduction in cable faults; and
    - Improved customer (and worker) safety through prioritising the worst condition cables for replacement before safety issues arise.
- This device was developed by a supplier, specifically for Ausgrid. It was specially designed to be contained within a low voltage pillar, measuring the neutral integrity of the low voltage circuit, communicating measurements back to a cloud platform using the 4G network.
- Following bench testing, we installed two of these devices on CONSAC distributors – both devices are working well, however, it appears that the condition of the two distributors being monitored is quite good.
- We plan to implement a larger pilot of these devices with the aim of determining more broadly the condition of more CONSAC cables – this will help us to determine ways to try and predict low voltage faults before

they occur, and better target, and defer where possible, our proactive replacement expenditure. We will also compare this data with available smart meter data to determine if the same patterns can be observed.

Pole Top Battery Trial

- We conducted a trial during the 2019-24 period of pole top batteries to trial how these assets can be used for grid support in maintaining the quality of supply as well as providing the ability to support the local network at times of peak load.
- The trial was designed to test whether these assets could realise the following customer benefits:
    - Allowing greater localised penetration of customer owned renewables such as solar, batteries and electric vehicles without a degradation of power quality; and
    - A reduction in customer bills through reduced capex to upgrade network infrastructure as a result of increased customer owned renewables.
- We chose to keep the first phase of the trial small by only deploying batteries at three locations. This was because although we were reasonably confident about the potential benefits of these assets, we had less certainty about the costs, the ease of installation and the likely response from community and council engagement.
- A shortlist of potential low voltage distributors across all regions of the network that would benefit from a battery based on network need was compiled – proposed connection locations were then assessed based on ease of installation (i.e. locations with little obstructions such as trees), and visual amenity. We engaged with local councils early in the project to help them understand the project and the benefits, as well as get feedback on potential locations. Using this feedback locations were refined – one council provided negative feedback on the several locations suggested resulting in another location (in a different local government area) being selected.
- We produced a standard design for the batteries, which provides a template guide to implement at a specific site. This design was assessed against the Ausgrid Electrical Safety Rules and consulted with subject matter experts. Minor changes to the standard design were implemented as a result of this to ensure the battery had suitable points of electrical isolation to allow the assets to be disconnected in the event of an emergency. Using this standard design, site specific designs for the chosen locations were then prepared and the usual council and local resident notifications were issued.
- At one location, negative feedback from a customer received due to the battery being in proximity to their residence. Following this, we decided to move the location to a different local part of the network where the battery would be less obtrusive.
- We liaised with Fire NSW and the Rural Fire Service to update them about these new assets, the trial being undertaken and the locations, so that they could build response plans in the event of an emergency.
- Following the ease of installing the first three batteries, initial technical feedback and ease of IT integration, it was decided to expand the program to incorporate an additional six locations over FY24. Due to the pace of change in the battery market, we undertook a market exercise to determine if there were new products available that better met our cost and technical requirements. From this it was determined to remain with the current supplier due to unique technical capability (being able to provide load balancing across phases), as well as competitive pricing.

3.6. Knowledge Sharing

Over the 2019-24 period we have regularly sought to share knowledge about our program with industry, consumers and regulators through a variety of mediums and forums including:

- Energy Network's Australia's (**ENA's**) Future Network Forum: a regular forum for DNSP delegates designed to share knowledge about topics and projects related to the energy transition;

- Regular updates presented to Ausgrid's Customer Consultative Committee;
- Publishing our NIAC meeting packs on the Ausgrid website (including the lessons learnt)[2];
- Information about innovation projects and project specific pages on the Ausgrid website[3];
- Presentations at a variety of local and international conference presentations;
- Community launches and information sessions for the community battery trial and pilot;
- Publication of knowledge share reports on Project Edith[4];
- Regular informal knowledge exchanges with Australian and International electricity networks; and
- Presentation at a number of ARENA 'DIEP Dive' conference days.

These mechanisms help ensure that Ausgrid, as well as our peers, remain informed about developments that have potential to shape the direction, scope and timing of our innovation projects in order to avoid the mistakes of others and to improve the likelihood of success. Forums such as the ENA's Future Network Forum allow the initiation of more detailed information sharing on an ongoing basis amongst DNSPs, which provide insights that may be useful but sensitive in nature.

We are committed to continue to share knowledge on our projects through similar mechanisms and channels in the 2024-29 period to expand on the benefits and lessons learnt with other networks in Australia and internationally for greater benefits to our customers and those of our peer networks.

3.7. Why Ausgrid?

Ausgrid's approach draws upon new and emerging technology and approaches in each area, making use of specific opportunities to transplant learning or fast follow and trial technologies that have been successful in other territories. We leverage Ausgrid's unique exposure to international knowledge sharing forums, and ensuring we are a conduit for these technologies being adopted more broadly in Australia.

In addition to reviewing reports, publications, regulatory related documents and conference proceedings, Ausgrid is in regular contact with other networks, retailers, customers, suppliers and others on specific ideas, assets, services and projects. This ongoing collaboration with customers and industry helps ensure that the projects that Ausgrid undertake are robust ideas, supported by reliable and safe technology.

Other networks carrying out similar trials to Ausgrid provides valuable input into our own trials but does not negate the need to undertake such projects in a trial environment. Each network possesses a unique set of characteristics, most of which are driven by history and location. These characteristics may drive necessary differences in approach for research, trials and pilots, which result in the need for different networks to test seemingly similar concepts to understand the impact of the differences.

These characteristics include:

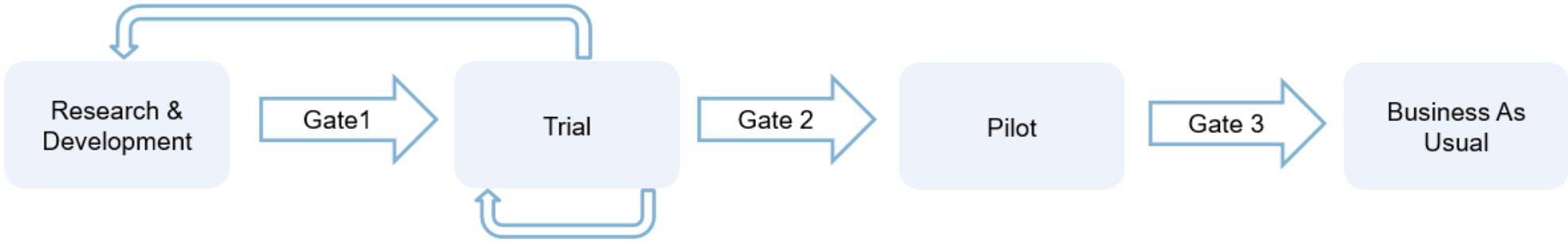
- Geography for network areas;
- Customer numbers, types, density & demographics;
- Network needs & constraints;
- Tariffs & pricing;
- Existing asset base including aged legacy assets;
- Operational technology, IT and cyber security architecture & standards;

[3] https://www.ausgrid.com.au/About-Us/Future-Grid/Innovation-Portfolio
[4] https://www.ausgrid.com.au/About-Us/Future-Grid/Project-Edith

- Jurisdictional requirements, schemes & standards; and
- Company specific standards & practices.

4. Appendix – Maturity Pathway to Business As Usual

- Projects must progress through a series of gates to progress beyond their current stage
- Projects may not need to go through all phases (e.g. a trial may go straight to the suite of BAU options), this will be dependent on the outcomes of that phase, project risks and certainty of project outcomes
- Each gate consists of a series of considerations that are used to determine if a project should progress beyond its current stage
- Positive confirmation to each consideration is not required for a project to progress, but each will go towards forming a recommendation for progression, or otherwise



Gate 1 Considerations

- Meets Network Innovation Investment Principles (strategic alignment)
- Trial funding available & approved
- Trial objectives & measures of success agreed

Gate 2 Considerations

- Trial objectives & measures of success met
- Cost efficiency
- Technology/service capability
- Technology/service availability
- Provides customer & network value
- Scalable solution
- Supportability (e.g. spares, training)
- Regulatory pathway
- Pilot funding available & approved
- Pilot objectives & measures of success agreed

Gate 3 Considerations

- Pilot objectives & measures of success met
- Solutions meet specific, ongoing customer and/or network needs
- Solutions can be readily integrated into the business
- Continued satisfaction of Gate 2 requirements

Ausgrid