Network innovation

Customer Forum

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Overview

▶ **Innovation in regulated energy networks**

▶ **Overview of the innovation process**

▶ **Innovation expenditure areas**

▶ **Innovation program forecasting principles**

▶ **Innovation expenditure**
  › Bill impacts
  › Customer outcomes/benefits

▶ **Questions and options for the Customer Forum to consider**

▶ **Next steps**

Innovation in regulated energy networks

▶ **There are two types of innovation expenditure**

› *Operational innovation:* Aimed at efficiency improvements, short term payback to customers, internally funded

› *Strategic innovation:* Aimed at supporting transformational change, longer term payback to customers, requires regulatory funding

▶ **This funding proposal focusses on "Strategic Innovation"**

▶ **Where do we sit on the innovation spectrum?**

› Basic Research: No (Universities and research bodies)

› Applied Research: Very occasionally (as a partner to research bodies)

› Experimental development: Sometimes (if we have capability + market gap)

› Product & process development: YES (Performance of new approaches)

› Production and market integration: YES (Business case for new approaches)

Innovation in regulated energy networks

▸ **What does "Strategic Innovation" deliver in terms of outcomes**
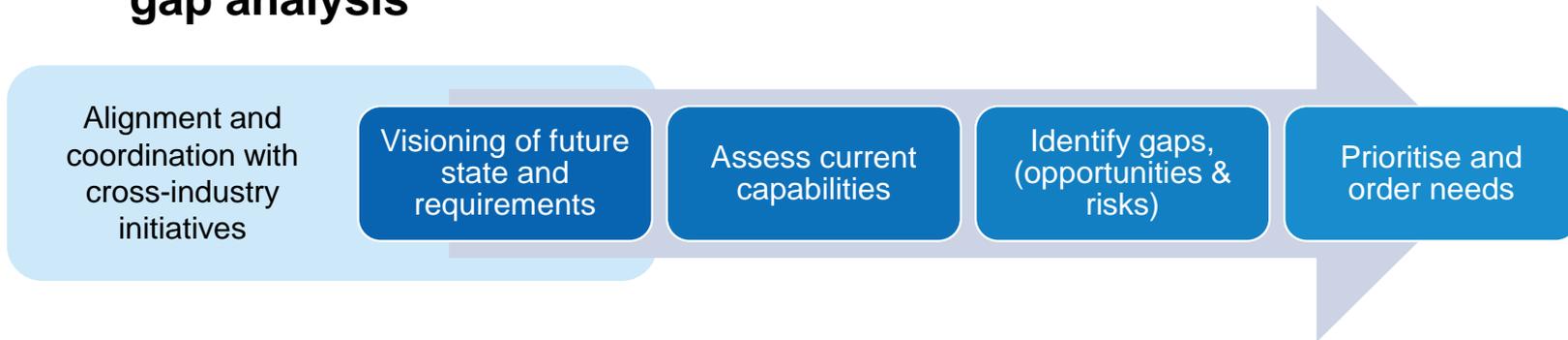
Accelerate future adoption of new/emerging technologies that realise customer and ecosystem value
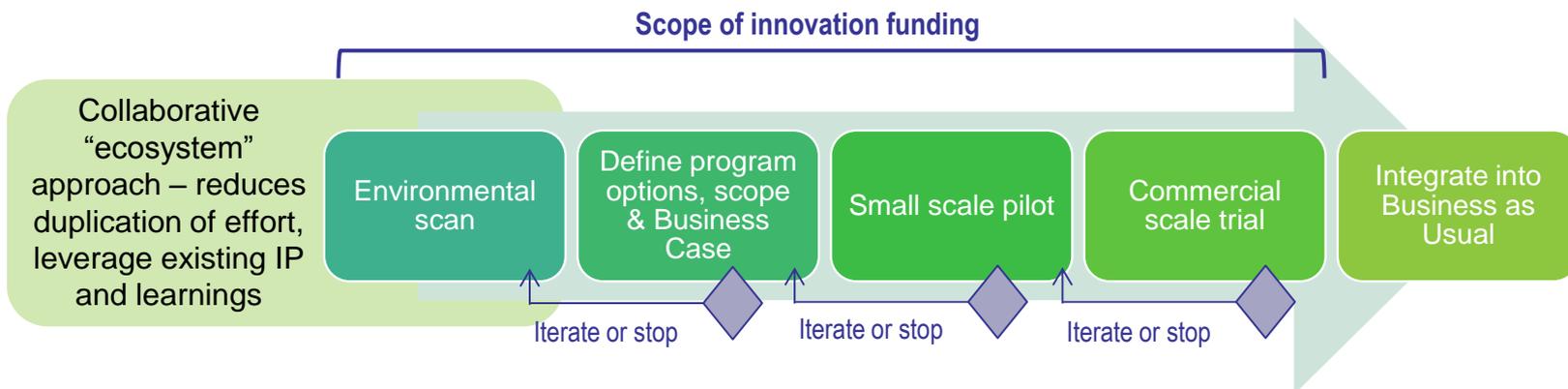
Portfolio of Targeted Innovation Initiatives

Reduce future inefficient BAU investments in both customer and network areas
(significantly reduces risk of inappropriate expenditure in unproven technologies)

Overview of the innovation process

▶ **Map out future requirements to best serve customers and undertake gap analysis**

Alignment and coordination with cross-industry initiatives

| Visioning of future state and requirements | Assess current capabilities | Identify gaps, (opportunities & risks) | Prioritise and order needs |

▶ **For identified needs, establish and follow a development roadmap**

› Different projects will be at different states of development

Scope of innovation funding

Collaborative "ecosystem" approach – reduces duplication of effort, leverage existing IP and learnings

| Environmental scan | Define program options, scope & Business Case | Small scale pilot | Commercial scale trial | Integrate into Business as Usual |

Iterate or stop   Iterate or stop   Iterate or stop

Innovation expenditure areas

▶ **All distribution networks provided with incentives for demand management-related innovation expenditure**

› Demand Management Innovation Allowance

› Annual DMIA = $200k + 0.075% of annual revenue requirement

▶ **Innovation expenditure beyond demand management - particularly to apply technology to improve network operation and to prepare for energy future**

› We are planning modest & prudent expenditure on trials in the 2021-25 period to prepare for transformational changes in our network

• Projects to enhance management of the LV and HV network, including exploring optimisation of DER

• Trial of Stand Alone Power Systems in remote parts of the network

• Leveraging controllable DER to better support the network

• New ways to make data available to customers

• Managing the impacts of electric vehicles

Innovation program forecasting principles

▶ **The forecast process matches top down and bottom-up requirements**

- Alignment and coordination with customer-centric business strategy

- Rate of transformation required to align to customer expectations

- Bill impact
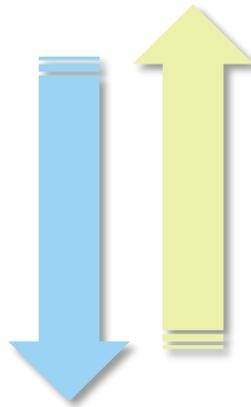
- Costing of individual identified projects (capex & opex)

- Prioritisation process

- Deliverability assessment

▶ **The agile nature of innovation means that the overall scale of the portfolio is more important than the specifics of each project**

› Project priorities are constantly changing (based on external & internal factors)

› Ongoing reviews may stop projects or start new ones

› The forward roadmap for each theme will evolve as experience is gained

Top-down innovation drivers

"Get with the program and you could make it work for you for the next 100 years"
EV Customer, November 2017

Future customers want:

To have a reliable energy supply - if not, show me the alternatives like off-grid and remote area power systems

To decrease costs and make money from generating my own energy

To decrease costs and reduce emissions, show me how to be efficient with my energy/appliances

To share energy with my neighbours/community and be able to buy energy locally at a reasonable price

To have the energy data I need to make my life simple and efficient

To facilitate easy charging solutions in and out of home to power my electric/autonomous vehicle

..but this is only the beginning and expectations will evolve. 8

Innovation expenditure

▶ **2011-15**

 › Demand Management Innovation Allowance: $0.6 million ($2010) per annum ($3 million over the regulatory period)

▶ **2016-20**

  › Demand Management Innovation Allowance: $0.6 million ($2015) per annum

  › Proposed expansion of the DMIA to $10m - *not allowed by AER due to concurrent review of DMIS*

▶ **2021-25 preliminary forecast**

  › Continuation of DMIA – around $0.7 million per annum ($3.5m total)

  › Non DM innovation (preliminary view under refinement): $10.8m over 5 years ($7.5m capex, $3.3m opex)

Bill impact: Revenue per customer 2021 to 2025 (preliminary forecast)
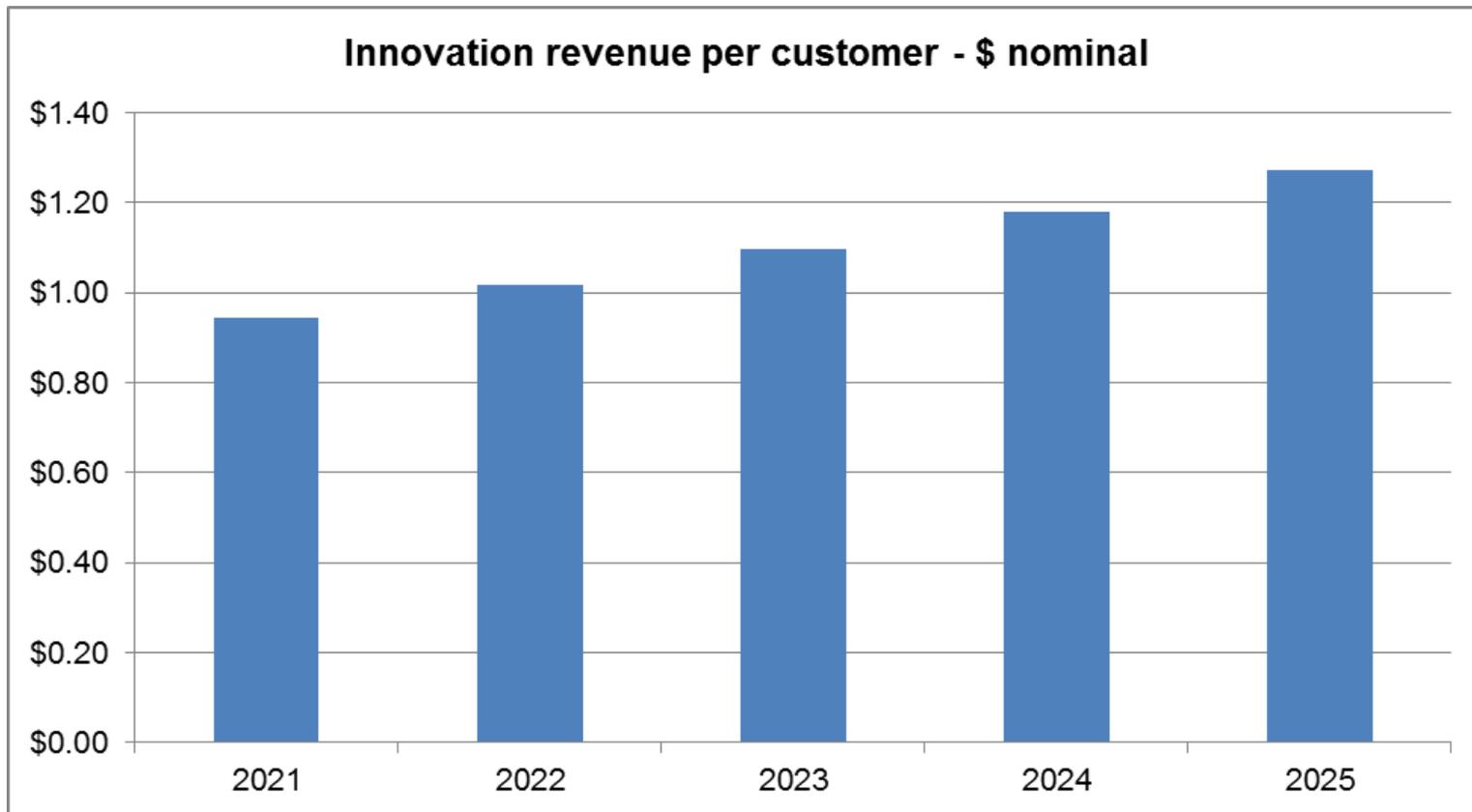
Innovation revenue per customer - $ nominal

Customer outcomes/benefits (Further detail in attachment)

Initiative	Enlarged Customer Choice	Enhanced Value of Customer DER	Improved Power Quality and Reliability	Optimised Use of Network Resources	Efficient Network Investments	Lower Operations Cost
Active load balancing		✓	✓	✓	✓	✓
Advanced voltage regulation	✓	✓	✓	✓	✓	✓
Dynamic DER control	✓	✓	✓			
Leverage solar for network				✓	✓	
22kV Network monitoring pilot		✓	✓	✓	✓	✓
Predictive network "state-estimation"		✓	✓			
Stand-Alone Power Systems pilot	✓	✓				✓
DERMS Integration	✓	✓	✓		✓	

Customer outcomes/benefits (Further detail in attachment)

Initiative	Enlarged Customer Choice	Enhanced Value of Customer DER	Improved Power Quality and Reliability	Optimised Use of Network Resources	Efficient Network Investments	Lower Operations Cost
Distributed energy network optimisation platform development	✓	✓	✓	✓	✓	✓
Trial DSO pilot	✓	✓		✓		
Predictive analytics to leverage DER fleets for abnormal weather events		✓	✓	✓		✓
Automated customer DER connection portal development	✓	✓				✓
Market facing data and information platform trial	✓	✓			✓	
EV Network impact and EV clustering demonstration			✓	✓	✓	✓
Explore Vehicle2Grid opportunities to manage congestion	✓	✓	✓			

Bottom up view

▸ **Factors that shape the scope of the project:**

› Minimum scale and minimum time to achieve the required knowledge & capability

› Potential partners (technology, commercial, industry, academic)

› Funding sources (internal budgets, Government grants, partner contributions)

› Efficiencies of combining different innovations into one project

Questions and options for the Customer Forum to consider

Questions (draft)	Relevant customer research	Customer views
Is upfront customer investment in specific innovation projects justified given their expected benefits? These projects span the following broad categories: • Projects to enhance management of the LV and HV network, including exploring optimisation of DER • Trial of Stand Alone Power Systems in remote parts of the network • Leveraging controllable DER to better support the network • Data availability • Electric vehicles	Will be informed by research on services valued by customers and customer intentions to adopt new technologies/services Customer on innovation expenditure may also be tested in future research	In-depth interviews: New technology adoption intentions tested. Found widespread interest in solar and battery technology. Ethnographic study: If households didn't already have rooftop solar, most wanted to install it. Grid capacity to accommodate solar seen as necessary. Attitudes and perceptions survey: ~58% of residential and SME customers were interested in installing solar panels in the future; 55% of residential and 48% of SMEs interested in getting battery storage in the future; customers wish to sell energy back to the grid with restriction; Several early adopters considered AusNet Services' engagement and support for distributed energy (including mini-/microgrid initiatives) improved recognition, trust and satisfaction with the business

Questions and options for the Customer Forum to consider

Questions (draft)	Relevant customer research	Customer views
Should AusNet Services innovate in other areas?	Will be informed by research on services valued by customers and customer intentions to adopt new technologies/services Customer on innovation expenditure may also be tested in future research	No specific research to date

Next steps

▸ **We will respond to feedback received today from the AER and the Customer Forum**

▸ **Customer research will help the Customer Forum to develop its position on these proposals**
  › Can be tested with advocates and other stakeholders

▸ **Refined innovation forecasts and will be presented for further discussion at the July meetings of the Customer Forum**

Attachment: Description of innovation projects

Project	Description
Active load balancing	Trial new smart network technology solutions that shift LV customer loads so that additional customer DER can be connected without more costly network upgrades being required
Advanced voltage regulation	Test and validate network technology solutions that can cost-effectively compensate the flow of power to better manage customers supply quality
Dynamic DER control	Test and validate a range of dynamic DER control options (pricing, aggregation platforms, Demand Response Enabled Devices, hardware configuration) and establish preferred solutions for optimising networks with growing DER uptake
Leverage solar for network	Explore the value of commercial customers installing solar generation to relieve network congestion, and develop a customer offering to encourage this where it is of mutual benefit
22kV Network monitoring pilot	Implement a demonstration project to test and validate a range of use-cases (instrumentation, network fault and loss detection, overloads, dynamic hosting of DER) of a grid sensing "Internet-of-Things" platform that is low-cost, easy to install, and that can grow in functionality over time without any "on-site" intervention.
Predictive network "state-estimation"	Develop data analytics that enables the network and customer/controlled DER to be preconfigured to best service customer DER participation, and also to establish signals to market-facing platforms to co-optimise network and connected distributed energy resources
Stand-Alone Power Systems (SAPS) pilot	Trial several SAPS in remote parts of the network to test and validate their effectiveness and efficiency in avoiding expensive network asset replacement, improving supply reliability, and in reducing bushfire risk.
Distributed energy network optimisation platform (DENOP) development	Development of the AusNet Services DENOP capability (cloud-based software interfacing with DER systems) to progressively introduce flexible control and dynamic coordination of connected DER in conjunction with network optimisation
Distributed Energy Management Systems Integration	Conduct a study of Distributed Energy Management Systems to discover best practice for application within the AusNet Services network, and to inform the development of the AusNet Services DENOP capability
Trial Distributed System Operator pilot	Develop a real-world trial of a preferred Distributed System Operator (DSO) design option to test its cost-effectiveness and to inform future applications

Note: The projects represent a preliminary view. Further refinement is underway including to clarify timing and integration with ICT expenditure proposals.

Attachment: Description of innovation projects

Project	Description
Predictive analytics to leverage DER fleets for abnormal weather events	Research techniques and develop a short-term predictive analytics capability to respond to abnormal weather events using controlled DER and network management functions
Automated customer DER connection portal development	Develop and implement an automated and personalised DER customer connection portal that accesses required data sets and performs the necessary computations to provide specific customer guidance and approvals
Market facing data and information platform trial	Collaborative development of a data platform to provide external stakeholder information relating to the opportunities presented by DER, including the static and dynamic operational limits of the electricity distribution network on a localised basis, with the aim of aligning customer investment in DER to maximise ecosystem value
EV Network impact and EV clustering demonstration	Conduct a detailed EV network impact study, modelling, and EV clustering demonstration trial that tests response to tariffs and charging management solutions
Explore Vehicle2Grid opportunities to manage congestion	Conduct a trial of Vehicle2Grid energy exchange to understand the overlap and synergies between customer benefits and network benefits, technology capability, and the commercial models that may be required in future

Note: The projects represent a preliminary view. Further refinement is underway including to clarify timing and integration with ICT expenditure proposals.