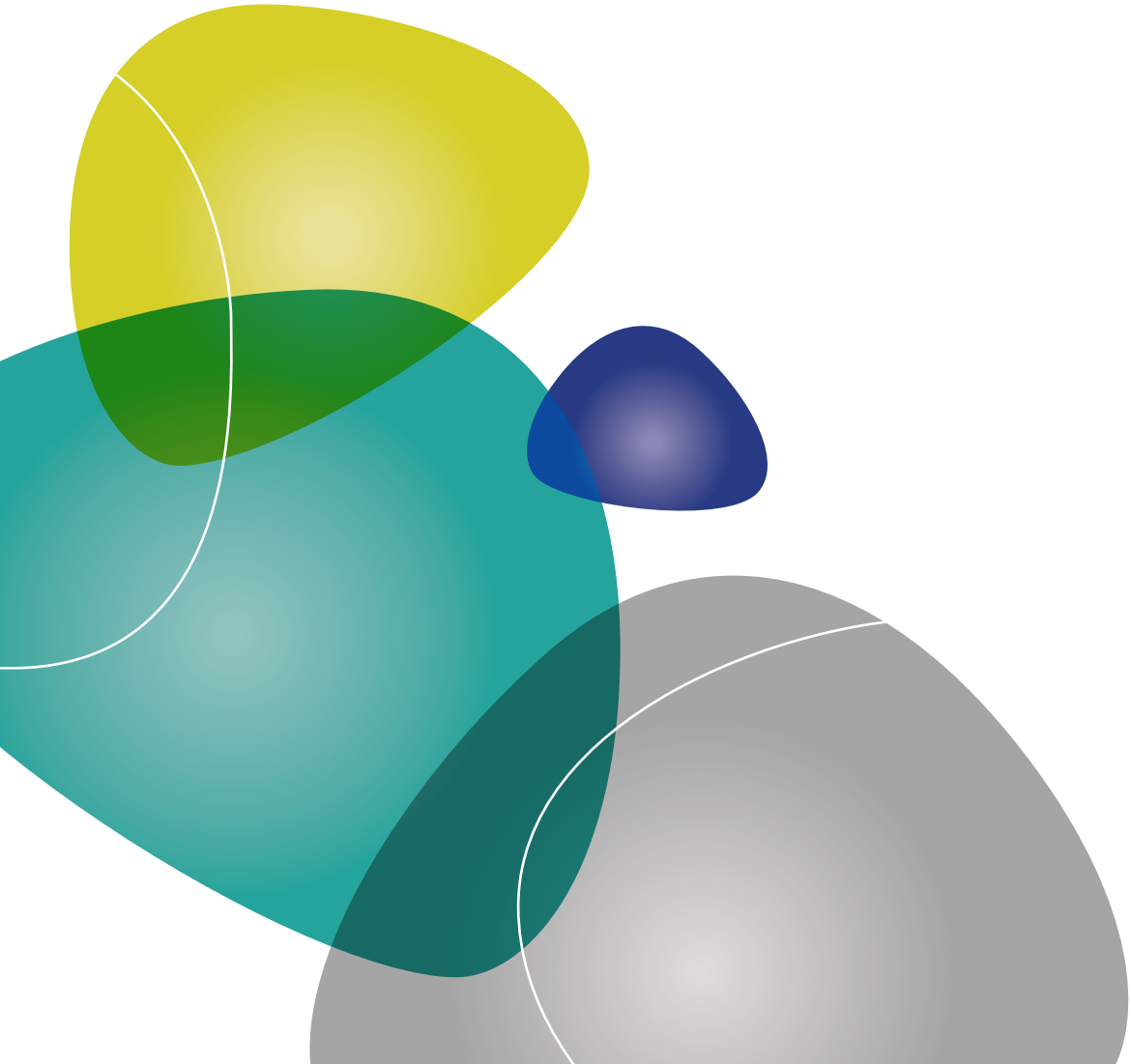
Energy Networks Australia

Network Innovation

2022 Report

This report details case studies that were submitted to Energy Networks Australia for the 2022 Industry Innovation Award.

Energy Networks Australia is the national industry body representing Australia's electricity transmission and distribution and gas distribution networks. Our members provide more than 16 million electricity and gas connections to almost every home and business across Australia.



Andrew Dillon
CEO, Energy Networks Australia

INTRODUCTION

Every year I am impressed to see the new ways networks are innovating to improve system security and reliability, reduce costs, and incorporate more renewables onto the grid.

These awards are a way to recognise leadership in the design, development and application of a ground-breaking Australian energy network initiative, technology, service or solution and share these lessons in the sector.

Energy Networks Australia received nine entries of an extremely high standard for the 2022 Industry Innovation Award. Nominating companies included Ausgrid, Endeavour Energy, Energy Queensland, Essential Energy, Jemena, Transgrid and Western Power.

The independent judging panel, comprising members from the Australian Energy Market Commission, Australian Energy Market Operator, Australian Renewable Energy Agency, Clean Energy Council, St Vincent de Paul Society and Energy Networks Australia, was unanimous in its decision.

There were four shortlisted finalists:

- Endeavour Energy - Using a Network Digital Twin for Digital Emergency Response and Resilience
- Energy Queensland - EV SmartCharge Queensland – research program drives network benefits
- Essential Energy - evolve DER project
- Transgrid - Use of SmartValve technology for the delivery of the Victoria-New South Wales Interconnector (VNI) Minor.

The innovative and creative use of technology featured prominently in this year's entries. Whether it be the integration of various data sets, trialling and testing new building techniques or in-depth research on how consumers engage with new technology, energy networks are at the forefront of securing a safe and fit-for-purpose grid for the 21st century.

Endeavour Energy's submission 'Using a Network Digital Twin for Digital Emergency Response and Resilience' was named the 2022 Energy Network Industry Innovation Award recipient. Endeavour Energy and its partner Neara developed flood modeling capability within the Digital Twin. This model was supported by a purpose-built inspection app with real-time feeds to coordinate the on-ground response to flood restoration across multiple work parties, allowing Endeavour Energy to quickly inspect, isolate and rectify customer premises. This innovation has been leveraged to improve public safety and restoration response times for several floods in the Hawkesbury region over 2021-2022.

This report demonstrates how energy networks are innovating across the sector and within their businesses to respond to changes in customer behaviour and environmental shifts. Thanks once again to the judging panel for their time and thoughtfulness assessing the nominations and to the entrants for their inspiring entries to the award.

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JUDGING PANEL

Dominic Adams
General Manager, Networks, Energy Networks Australia (Chair)

Dominic is responsible for crucial areas of policy to support the rapid transformation of Australia's energy networks sector. In his role, Dominic leads advocacy strategies and a program of work for the development and transformation of our transmission, distribution, and gas networks.

Dominic has more than 10 years' experience working across the energy supply chain, with particular emphasis on policy and regulatory engagement with market bodies.

Dominic has a combined bachelor's degrees in Law and Arts from the University of Newcastle with a focus on climate and environmental law.

Benn Barr
Chief Executive Officer, Australian Energy Market Commission

Benn became the Chief Executive of the Australian Energy Market Commission in early 2020, bringing with him two decades of energy and climate change experience and deep expertise in energy markets and regulation. He was previously Deputy Director-General of Queensland's Department of Natural Resources, Mines and Energy.

Benn has a strong interest in effective modern governance, pursuing this field at the John F Kennedy School of Government at Harvard. He places high value on meaningful stakeholder engagement and has built the AEMC's capacity considerably since 2020.

Violette Mouchaileh
Executive General Manager, Emerging Markets & Services, Australian Energy Market Operator

Violette is responsible for strategies relating to the Wholesale, Gas and Retail Reform Delivery programs, Distributed Energy Resources program and data initiatives. Since joining AEMO in 2009, Violette has held various roles across gas and electricity in market design development, market change implementation and operational roles.

Violette has more than 17 years' experience in the Australian energy industry holding various positions in Commonwealth Government departments and regulatory bodies. Her experience includes economic regulation, energy policy development, development of regulatory frameworks, market development and design, and market change implementation.

Violette has a Bachelor of Economics and Commerce with Honours.

Rachele Williams
General Manager Projects, Australian Renewable Energy Agency

Rachele Williams has more than 20 years' experience in the electricity industry, working across a range of portfolios including technical, commercial, policy and regulatory settings.

In Rachele's current role she is responsible for the management and knowledge sharing of ARENA's portfolio, and leads the Distributed Energy Integration program, a collaborative initiative to realise the value of full customer interaction in the energy system.

Rachele has a bachelor's degree in Electrical Engineering from The University of Wollongong, and a Master's degree in Engineering Management from the University of Technology, Sydney.

Darren Gladman
Director, Distributed Energy, Clean Energy Council

Darren has extensive experience in policy, communications and stakeholder engagement in energy and climate change policy.

He leads the Clean Energy Council's policy and advocacy for distributed energy, which includes industry development and regulatory issues in areas such as distribution networks, solar and battery systems, product standards and consumer protection.

Darren has been with CEC since 2012. Before joining CEC he was a senior manager and policy adviser for the Victorian Government.

Gavin Dufty
Manager Policy and Research, St Vincent de Paul Society

Gavin has been as a consumer representative in the energy sector for more than 25 years. During this time, he has undertaken research of electricity disconnections; documented changes in energy pricing and its impacts on households; and, been involved in the development of state and federal energy consumer protection and concession frameworks.

Gavin is a representative on several industry and government committees including: gas and electricity distribution companies customer consultative committees; the AER's customer consultative group; and, he is an Energy Consumers Australia board member.

Ausgrid – Community Battery Trial

Principal company:
Ausgrid

Name of project:
Community Battery Trial

Project partners:
Network Innovation Advisory Committee, Simply Energy, Northern Beaches Council, City of Canterbury-Bankstown, Lake Macquarie City Council and the communities of Beacon Hill, Bankstown and Cameron Park

Project timeline:
Jan 2020 – present
Location(s): Bankstown, Beacon Hill and Cameron Park (NSW)

Funding:
Self-funded by partners through internal/regulatory innovation funding

Description:
Ausgrid's trial tested the combination of three cases for community batteries:

- Local network voltage and thermal constraint alleviation.
- Virtual shared storage service for local solar customers.
- Leasing service for spare capacity to a market partner.

The trial aimed to test how the benefits of community batteries can be captured and shared between local customers, the wider community and electricity networks while supporting the take up of solar power by households and businesses.

Approach:
A comprehensive scope was drawn up to look at all barriers and opportunities to make community batteries viable, including designing solutions that support community energy generally.

Customer benefits:
Since the start of the trial, participating customers have received an average benefit of $14/month by storing their excess solar during the day and offsetting their bills in the evening. Collectively, customers have so far stored more than 38MWh of solar energy in the community batteries.

Key lessons learned:

- Close, on-going and supported engagement with regulatory bodies is crucial in the absence of an implemented regulatory sandbox.
- Cyber security requirements in Australia place limitations on integration with international suppliers and modern remote support arrangements.
- Early engagement with council was critical in site identification, as was their support with community engagement.
- Factory testing of noise output levels and consideration of the orientation of batteries were needed to minimise potential impacts.
- Maturity of control systems and greater specification of integration requirements within an Australian context is required.

Innovation Indicators:

Leadership: The community battery trial is pioneering work that forms an important test bed, providing critical insights that will enable further community energy projects to be developed in the NEM.

Impact:

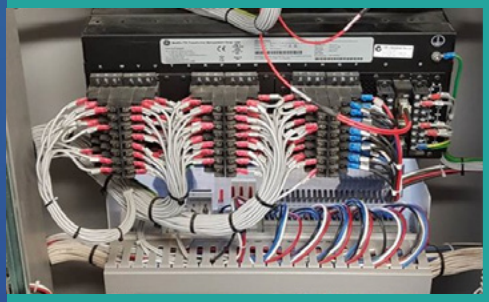
- The project has set the precedent for managing multifaceted innovation projects within Ausgrid, with enduring governance changes.
- Ausgrid developed a Community Battery Subthreshold tariff that removes variable charges from local flows to and from the battery. The tariff is available to any community battery proponent connecting to Ausgrid's LV network and marks a significant shift in tariff reform.
- The project has also been very successful at raising community and industry awareness of the potential benefits of community batteries.

Knowledge Sharing: Ausgrid continues to:

- Collaborate with its Network Innovation Advisory Committee.
- Share insights with other projects through the Community Scale Battery Working Group and other industry forums.
- Engage with federal, state, and local government.
- Share insights with market and regulatory bodies to support the energy transition.

Efficiency and Productivity: The project developed technical and commercial arrangements for sharing community battery capacity which supports unhindered network use and improved commercial certainty. The community battery storage service demonstrated a model to provide a simpler and more cost-effective alternative to customers installing their own battery.

Endeavour Energy Digital Substation Transformation – South Erskine Park Zone Substation



Principal company:
Endeavour Energy

Name of project:
Digital Substation Transformation – South Erskine Park Zone Substation

Project timeline:
project approved October 2019, the substation supplied electricity to its first customer in June 2022

Location:
Erskine Park, NSW

Funding:
Funded by Endeavour Energy

Description:
This project reset traditional substation designs by utilising modular buildings to reduce civil costs, environmental impacts, and provide opportunities for offsite construction and commissioning. It was critical to the rapid growth and needs of customers in the Western Sydney Employment Area.

Approach:
A comprehensive R&D phase was undertaken. It commenced with a formal expression of interest in the supply of Idigital substation equipment and engineering software. The Secondary Systems team engaged local and international utilities to share its experiences and knowledge of digital substation technologies.

A pilot project was commissioned where a 33kV feeder differential scheme was installed on the Endeavour Energy network in a supervisory state. The success of this trial ensured that all relevant stakeholders were confident in the establishment of a complete substation utilising digital technology.

Benefits, Results and Outcomes:
The digital transformation of South Erskine Park Zone Substation yielded significant financial savings compared to an identical conventional construction method:

- Modular buildings provided savings of $5.5M.
- A reduction in copper cabling and installation saved $0.4M.
- A reduction in protection and control panels saved $0.25M.
- Modular buildings saved nine months' construction time compared with traditional civil and building techniques.

This model provides Endeavour Energy with a scalable design and renewed greenfield substation establishment strategy to deliver efficiencies and expedite the delivery of critical electricity infrastructure.

Employee safety and network reliability have been improved by using digital technology and Endeavour Energy's agility has significantly improved.

Innovation Indicators:

Leadership: Building the knowledge internal to Endeavour Energy rather than contracted resources has provided a modernised solution which closely aligns the overall operations of existing design philosophies. Sharing this experience with other utilities has encouraged them to follow a similar process and envisage a similar reduction in project costs and timelines.

Impact: The delivery of South Erskine Park Zone Substation has secured the transition of Endeavour Energy's design philosophy towards a sustainable digital future.

The implementation of various technologies throughout pandemic lockdowns has renewed Endeavour Energy's approach to problem solving and the effective use of digital communications.

Knowledge Sharing: South Erskine Park Zone Substation has provided an Australian case study which multiple vendors are using as a showpiece for their digital substation solutions, further increasing the local knowledge base and providing the necessary support for other Australian utilities to embark on a similar journey.

Efficiency and Productivity: Due to the constant supervision of digital signals and reporting of abnormalities via Endeavour Energy's Advanced Distribution Management System, a reduction in secondary systems maintenance is foreseen.

The addition of a power transformer and subsequent busbar is significantly streamlined with most construction completed offsite using modular buildings. This provides Endeavour Energy the opportunity to remotely configure and test equipment as required to minimise the risk of inadvertent operation or exposure to in-service equipment.

Endeavour Energy - Using a Network Digital Twin for Digital Emergency Response and Resilience

2022 Winner
Industry Innovation Award

Principal company:
Endeavour Energy

Name of project:
Using a Network Digital Twin for Digital Emergency Response and Resilience

Project partners:
Neara

Project timeline:
2020 - 2022

Location:
Hawkesbury, NSW

Description:
Flood modelling within Endeavour's network Digital Twin provides a virtual flood overlay across the modelled 3D network. This innovation has been leveraged to improve public safety and restoration response times to several floods in the Hawkesbury region over 2021-2022.

Approach:
Over several floods, Endeavour Energy and its partner Neara, developed flood modeling capability within the Digital Twin. This model was supported by a purpose-built inspection app with real-time feeds to coordinate the on-ground response to the flood restoration across multiple work parties, allowing Endeavour Energy to leverage non-lineworker staff within Endeavour Energy and ASP partners to quickly inspect, isolate and rectify customer premises.

Benefits, Results and Outcomes:

Community Safety: The flood extents and heights were used during the floods to identify when waters were coming within clearance of mains or customer premises to de-energise for public safety.

Improved customer response: Endeavour Energy was able to narrow down the assets and premises required to be inspected which helped to dramatically improve the restoration time of impacted customers.

Planning for flood resilience: The Digital Twin allows Endeavour Energy to identify where assets are at risk from flood waters based on any potential flood and asset loading scenario.

Customer Safety: The recent inclusion of customer premises into the app helped identify 55 premises where the nearby assets were not water impacted but those on lower ground were.

Innovation Indicators:

Leadership: Endeavour Energy's Digital Twin is the first known application of an electricity network digital twin model and flood modelling with near real-time input in Australia (and potentially the world).

Impact: The project has revolutionalised the response to flood management. Clearances at different network assets can be accurately identified from the office rather than on-site. This frees up field resources to perform critical functions, while office-based staff use the digital twin.

The Digital Twin has provided a platform that will facilitate collaboration across the organisation in a variety of teams for different uses including: LiDAR classification, vegetation management, network resilience, customer connection self-service, and GIS improvement and integration.

Knowledge Sharing: This innovation has been built into the Neara cloud platform for use world-wide. With Neara's increasing customer base its anticipated that this capability will be picked up by an increasing number of distributors and utilities.

Efficiency and Productivity: The Digital Twin delivers value across the business including network planning and analysis, design optimisation and vegetation management. It has provided intelligence and data which Endeavour Energy has used to start planning for a more flood resilient network.

Energy Queensland – EV SmartCharge Queensland

2022 Finalist
Industry Innovation Award

Principal company:
Energy Queensland

Name of project:
EV SmartCharge Queensland

Project partners:
Ergon Energy Network, Energex, Geotab (formerly Fleetcarma)

Project timeline:
May 2020 – August 2022

Location:
Queensland

Funding:
Demand Management Innovation Allowance

Description:
This research aimed to capture residential EV charging and trip data, and better understand current behaviour so Energy Queensland could prepare and influence EV charging behaviour to benefit the network and its customers.

Rationale:
Before this research, there was no visibility of real-world, EV charging or trip profile data for Queensland residential customers. This program has identified and understood measurable uncontrolled and controlled charging behaviour of private electric vehicle owners to:

- Assess the impact on network businesses for planning, forecasting, demand management and other EV-related purposes.
- Determine any opportunities and issues regarding connection of private and public EV chargers.
- Design and further enable managed charging solutions for customer benefit.

Approach:
More than 20 months' charging and trip data was been captured in 15-minute intervals for 184 participants. The data identified characteristics including home and away-from-home charging, charge session length, maximum demand, kWh charge, charge losses, starting and end-state of charge, distances travelled, auxiliary power use, kWh consumed and distances travelled.

Benefits, Results and Outcomes:
Successful trial outcomes and benefits include:

- Quantifying the positive impact of solar and battery ownership.
- A charging tariff has significant influence on the customers' approach to charging behaviour.
- A charging tariff also influences customers' desire to manage how and when their EVs charge.

This program has illustrated the flexibility of EV charging and the significant ability – and willingness – of EV owners to manage their charging behaviour that can be employed for maximum benefit with no loss of amenity.

Innovation Indicators:
EV SmartCharge Queensland is the only research program in Australia, and most likely internationally, that has gathered:

- A complete residential EV charging and trip dataset, collected from the EV itself.
- Data from a breadth of EV makes and models.
- Data from customers in urban, regional and remote areas of Queensland.
- Customer segmentation based on variables that will influence EV charging practices (including house type, charging connection type, tariff, more than one EV).

The research data and associated insights have allowed network businesses to share and collaborate with other industry players about the charging behaviour of early adopters, hypothesise how this will change with mass market EV adoption but allow for early exposure and awareness as to the implications on the network to allow for early preparation and planning.

The data confirms that balancing behavioural change, tariff signals, integrating with dynamic operating environments, third party aggregation, control options and determining best practice outcomes is in the best interests of the end EV user.

These findings have accelerated organisational discussion, external collaboration, and planning towards integrating EV load into the existing network load, allowing for the planned the use of renewables.

Energy Queensland – Test and Verify Virtual Training Aid

Principal company:
Energy Queensland

Name of project:
Test and Verify Virtual Training Aid

Project partners:
Ergon Energy Network, Energex, Esitrain and Maxart

Project timeline:
January 2020 – October 2021

Location:
Queensland

Funding:
Ergon Energy Network and Energex

Description:
Ergon Energy Network/Energex and training partner Esitrain developed an innovative 'Electrical Installation Fault Finding and Compliance Testing (Domestic)' (EIFFCT)Virtual Training Aid that provides real-life domestic scenarios to identify electrical faults and perform electrical compliance testing without the danger of having electricity present.

It tests in accordance with Australian Standards, maintains a very realistic environment and can be accessed from any type of device. This innovative and safe delivery medium offers significantly more user-friendly student training due to its inherent functionality, mobility and accessibility.

Approach:
The final product was crafted from end user feedback which included over 500 changes across three major versions. Input from various stakeholders and end users has resulted in the delivery of an innovative and customer centric digital electrical virtual training aid which is the first of its type in Australia.

Benefits, Results and Outcomes:
By developing EIFFCT, there is now a training medium that delivers:

- A safe learning environment for trainees by eliminating the risk of electricity.
- A very realistic learning environment.
- Enabling the trainee/trainer to be interactive with the training material to progress in training.

This new standard for electrical training delivery can be shared across all industries, including all network members and their customers.

EIFFCT has been built so there is no limitation on who can access the training technology. The program also requires an interactive student, adding a tactile element to the training delivery.

The EIFFCT Virtual Training Aid is being used by fourth-year electrical apprentices to help prepare them for their Electrical Capstone Test. It has been designed so it can be accessed by all employees and external trainees, including electrical contractors and authorised persons.

Innovation Indicators:
The EIFFCT Virtual Training Aid innovation has enabled the use of tablets in electrical training which is a far more user-friendly training delivery medium.

The safe learning environment is also changing how the organisation looks at future training to inform its staff of potential risks and hazards in other fields, including safe driving and high voltage switching.

Apprentices can train in this module more often, at any time and from any location, ultimately providing more consistent training opportunities, without the costs and administration of traditional face-to-face and in person training and assessments.

Virtual reality was selected as a preferred delivery medium because it is highly experiential in nature, placing the learner at the centre of the educational experience, allowing them to learn through trial and error.

During its development, this part of the project had to overcome several hurdles, mostly related to impacts from the COVID-19 pandemic. Ironically, COVID-19 helped the business wide acceptance of this new safe learning Virtual Training Aid technology.

Essential Energy – evolve DER project

2022 Finalist
Industry Innovation Award

Principal company:
Essential Energy

Name of project:
evolve DER project

Project partners:
Zepben (lead), The Australian National University (ANU), Essential Energy, Energy Queensland, Ergon Energy, Energex, Endeavour Energy, Ausgrid, Reposit Power, Evergen, Redback Technologies, SwitchDIn, NSW Government

Project timeline:
February 2019 to April 2022

Location:
Australian Capital Territory, New South Wales and Queensland Distribution Network Service Providers

Funding:
ARENA ($4.29m) and consortium including NSW Government ($8.65m)

Description:
The evolve DER project led the world in the development and demonstration of dynamic operating envelopes (DOEs) – a new capability for coordinating network-connected distributed energy resources (DER). This approach maximises customers' ability to export to the network, while ensuring network technical limits are not breached. It radically improves the opportunity for network operators to facilitate increased customer uptake of DER without the need for significant network infrastructure investment.

Rationale:
The uptake of DER in Australia, and internationally, is dramatically increasing. Without coordination, DER can result in two-way energy flows that may threaten the physical or operational limits of distribution networks.

Approach:
To successfully develop and demonstrate DOEs, the project used several approaches:

- Developing a scalable technology solution that demonstrated the end-to-end calculation, publication and verification of DOEs.
- Investing in, contributing to and coordinating complementary activities and initiatives that supported sector-wide innovation.
- Recruiting solar and battery customers across NSW and Qld for real-world validation of the effectiveness of DOEs for coordinating DER, for both rural and urban electricity distribution networks.

Benefits, Results and Outcomes:
The project demonstrated in real-world trials that DOEs significantly increase networks' capacity to host DER. The project has paved the way for greater uptake of DER by customers, without the need for significant network infrastructure investment.

Work remains to ensure customer-owned DER are installed and integrated appropriately. A project challenge was the lack of manageable DER devices. It became evident during the project that regulatory changes are needed to ensure new DER connecting to the network have appropriate communication capabilities.

Innovation Indicators:
Within Australia, project outcomes are being used by DNSPs to inform next steps for DOE adoption. It is also underpinning new DOE and distribution service operator (DSO) projects, involving nearly all DNSPs across the NEM.

The project also drove consensus and standardisation within the energy industry, by leading the development of the evolve Common Information Model profile and the Australian Common Smart Inverter Profile (CSIP-AUS).

The technology solution developed by the project includes open-source software, the evolve Common Information Model profile, and the acquisition and curation of a continuous electrical network model.

With the efficient management of power flows from DER being the key electrical network performance focus for the 2024-29 regulatory period, industrialisation of project outcomes is a key element within Essential Energy's 2024-29 regulatory submission.

By developing and demonstrating DOEs, and sharing the tools and approaches across the industry, the evolve DER project radically improved the opportunity for distribution networks to support customers' uptake of network-connected DER.

Jemena – End to End (E2E) Project

Project delivery team alongside Jemena and Zinfra representatives in front the electrolyser

Principal company:
Jemena

Name of project:
End to End (E2E) Project

Project partners:
A joint project between Jemena, the asset owners, and Zinfra, the operations and maintenance partner

Project timeline:
August 2020 through to November 2022

Location:
Online with satellite groups supporting across Sydney and Melbourne

Funding:
Self-funded at a cost of $30M and has a payback period of 2.5 years

Description:
The End to End (E2E) Project is a transformation project impacting over 1000 employees across Jemena and Zinfra.

Rationale:
The energy market is changing rapidly. With rising costs, the complexity of a large gas network and small electricity networks plus the business's strategic drive towards a NetZero future, the need to continually evolve is paramount.

Jemena's MD Frank Tudor wanted to invest in the company's most critical asset - its people – by creating more innovative ways to work that would lead to better support of its people, assets and customers.

Approach:
By allowing its teams to have a voice, submit feedback and be involved in any design and build of a system, it has ensured there are high levels of engagement and a continuous drive within the organisation to question the norm. The project has created a culture where the approach to problem solving has become about engaging with those directly impacted and consulting best practice approaches to ensure sustainable changes and improvements for the business. The E2E Project commenced the delivery of approximately 50 initiatives in June 2021.

Benefits, Results and Outcomes:
The E2E Project has demonstrated the ground swell of innovation and improvement by targeting key focus initiatives with those people directly impacted. This showed improved customer experience and significant cost savings - currently $2.5M per month - all while maintaining critical safety and operational risk.

Key learnings:

- Recognition and visibility of team members' contributions in identifying opportunities and delivering solutions key to successful implementation and sustained change.
- The importance of structuring business transformation and change management - from ideation to implementation - are keys to success.
- Early and clear business engagement/ownership and demonstration of designed solution are key.
- Ensuring staff from multiple business areas are involved in implementation each step of the way to build trust and ensure sustained acceptance and integration right from the beginning of the project.

Innovation Indicators:
The E2E Project has had a number of successes and is committed to putting people at the centre of decision-making to continuously improve in making processes simple.

Through the implementation of new tools and processes, the team has increased optimisation and improved the visibility of data to maintain transparency between employees.

The learnings from E2E Project have significant potential to drive benefits with other similar distribution businesses to improve overall sector efficiency by reducing costs and improving ways of working.

The E2E journey to date has primarily been internally focused, however, as the benefits have accumulated, the executive steering committee has identified an opportunity to share the E2E story within the Energy sector.

Transgrid – Use of SmartValve technology for the delivery of VNI Minor

2022 Finalist
Industry Innovation Award

Principal company:
Transgrid

Name of project:
Use of SmartValve technology for the delivery of VNI Minor

Project partners:
Transgrid with SmartWires

Project timeline:
March 2020 to June 2022

Location:
Stockdill, ACT and Yass, NSW

Funding:
Project funding was secured via the Australian Energy Regulator following a Contingent Project Application

Description:
VNI Minor involves the installation of new Modular Power Flow Controllers (MPFC or 'SmartValves') at Transgrid's Yass and Stockdill substations to uplift transfer capacity between NSW and Victoria by 170 MW during demand peaks.

MPFC enable real-time control of electricity flows along power lines. The system detects areas of congestion in the network and automatically redirects flows to less congested lines.

Strengthening the transmission backbone of the NEM is central to delivering the energy transition for consumers, enabling the connection of renewable generation and sharing of energy and system services between regions. AEMO's ISP highlights the power system's increasing reliance on regional interconnectors, including VNI.

Approach:
Transgrid engaged SmartWires early to work collaboratively in developing a solution to meet Transgrid's network, regulatory and project requirements.

A prototype MPFC was subjected to rigorous tests and improvements were made prior to proceeding with manufacturing units for the project. Transgrid and SmartWires maintained open communications and close collaboration, to make informed decisions and solve challenges as they emerged.

Benefits, Results and Outcomes:
The use of SmartValves improves consumer and stakeholder outcomes in the following ways:

- Lower cost – SmartValve technology reduced the cost to deliver the uplift in transfer capacity by 12 per cent compared to the next-best option,.
- Reduced duration of transmission outages - from 6 months to 50 days.
- Reduced environmental and community impact – avoided heavy vehicle movements needed for transmission line works.

VNI Minor is expected to deliver net benefits of $268m (including network augmentation in Victoria) by providing consumers with access to lower cost generation.

Innovation Indicators:
Leadership: MPFC is a viable alternative to conventional network augmentation (such as line upgrades) or traditional power flow control solutions. This helps to de-risk the technology and proves its c8pabilities in the Australian, high-voltage transmission context. This should lead to its broader adoption across the NEM.

Impact: Successfully delivering the project has required Transgrid to innovate outside of its standard practices, and solve problems in new ways. It used a collaborative partnership model for equipment procurement and collaborated with SmartWires early. This allowed Transgrid and SmartWires to rapidly progress with design, testing, manufacturing and integration to meet the project requirements.

This experience has built internal organisational capacity, and provided a valuable example of how to deliver projects in a faster, more agile and collaborative way.

Knowledge Sharing: The project has highlighted a number of insights about MPFC technology:

- Different applications for SmartValves.
- The benefit of using durable switching devices.
- Optimisation between performance and noise
- Installation location.

Efficiency and Productivity: VNI Minor has demonstrated that SmartValve technology can successfully be deployed to reduce the cost of increasing capacity in the transmission system. VNI Minor is expected to deliver $268m in net benefits, by providing consumers with access to low-cost generation.

Western Power – Western Power Standalone Power Systems

Principal company:
Western Power

Name of project:
Western Power Standalone Power Systems

Project timeline:
2016 – present (ongoing)

Location:
Western Australia (various, predominantly remote and regional)

Description:
Western Power is leading the nation in the rollout of Stand-alone Power Systems (SPS). SPS includes solar, battery and a backup generator and is replacing traditional poles and wires in remote and regional areas.

Rationale:
Long distribution distances, remoteness and vulnerability to external impacts means regional customers are more likely to experience reliability issues, long outages and higher bushfire risk.

To alleviate these issues, integrate more renewable generation, enable cost efficiencies, improve safety and spearhead the transition to an autonomous grid Western Power is rolling out SPS on a scale never seen before in Australia.

Approach:
Power reliability is an ongoing concern for regional communities serviced by long stretches of power lines, which are impacted by wind, rain, vegetation, lightning and bushfires.

As part of the grid's transformation, we embarked proactively on a trial to test the suitability of SPS for customers and the grid. The trial exceeded expectations for reliability, cost effectiveness and customer benefits.

Benefits, Results and Outcomes:
The SPS program demonstrates how technology and future-focused solutions can be used to reshape the network to provide benefits for a range of stakeholders and how challenging the status quo can play a role in transforming electricity grids into the future.

Following the success of the 2021/22 installations, a $37 million roll-out of more than 180 SPS will begin in 2023. The deployment will replace around 762km of overhead powerlines resulting in less maintenance and the renewal of aging infrastructure. In addition to improved safety, reduced bushfire risk and use of renewable energy the SPS program is bearing fruit for future generations of regional communities.

Innovation Indicators:

Leadership: Western Power led the legislative and regulatory reform to pave the way for the inclusion of SPS technology as standard service offering. In addition to this, Western Power was fundamental in enabling the research and development of SPS technology and supporting a pipeline for future sector development in WA.

Impact: Western Power has developed a technical solution to integrate existing customer PV systems that allows the customer to maximise the benefits of their PV system while maintaining the safety of the SPS unit.

Knowledge Sharing: The SPS roll-out has involved extensive customer research before installation, during planning and implementation and once systems were operational, to understand customer needs and satisfaction with the new technology.

Efficiency and Productivity: Providing customers with the confidence and opportunity to embrace new and sustainable technologies regardless of location is a key part of decarbonising the grid.

The installation of SPS in the wake of a catastrophic weather events rather than re-building poles and wires has led to reliability and power quality improvements, reduced land access impacts and biosecurity risks.

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