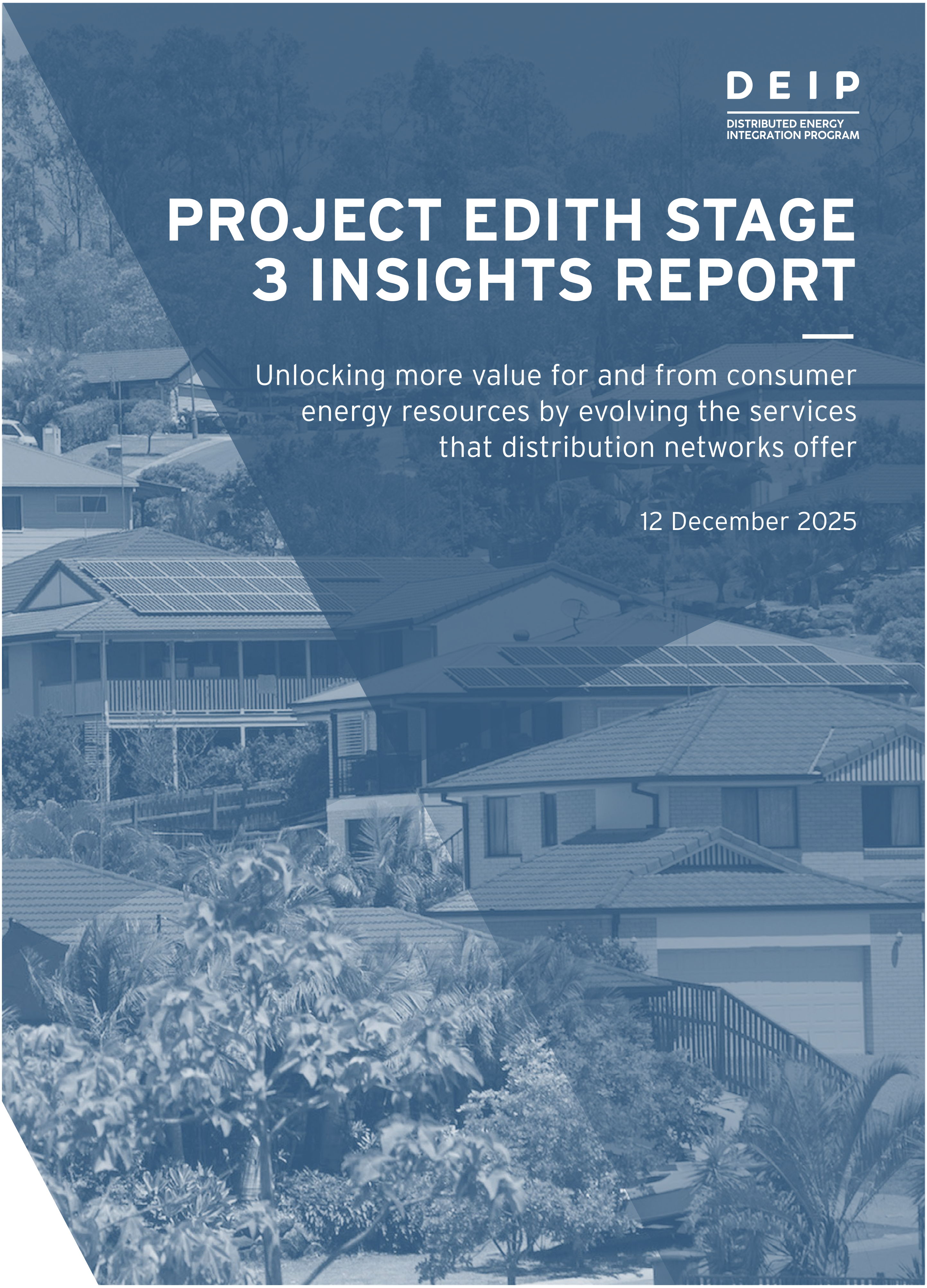

DEIP

DISTRIBUTED ENERGY INTEGRATION PROGRAM

PROJECT EDITH STAGE 3 INSIGHTS REPORT

Unlocking more value for and from consumer energy resources by evolving the services that distribution networks offer

12 December 2025

Ausgrid

Authors & acknowledgements

DISCLAIMER

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ABOUT THIS REPORT

Project Edith is a demonstration of dynamic network pricing currently underway in New South Wales, Australia. It is led by electricity distributor Ausgrid and developed in partnership with the Australian National University and customer agents Reposit, Shinehub, Energy Australia, and Origin Energy.

This report provides an overview of insights and lessons learnt throughout the trial to date, and future focus areas of the project.

The findings of Project Edith are intended to inform the evolution of the energy system in Australia.

1 EXECUTIVE SUMMARY

Project Edith is a trial run by Ausgrid to test dynamic network prices (DNP) – network tariffs that change depending on forecasted local network conditions. Unlike traditional network tariffs, dynamic network prices better reflect the cost of using the network at different times and locations, providing price signals that can incentivise consumer energy resources (CER) to support the local network.

The trial is testing two primary objectives of dynamic network prices: supporting greater customer participation in electricity markets by working alongside wholesale price signals, and shaping customer demand and export patterns to shift from the current "duck curve" toward a more responsive load profile that takes advantage of low network utilisation periods.

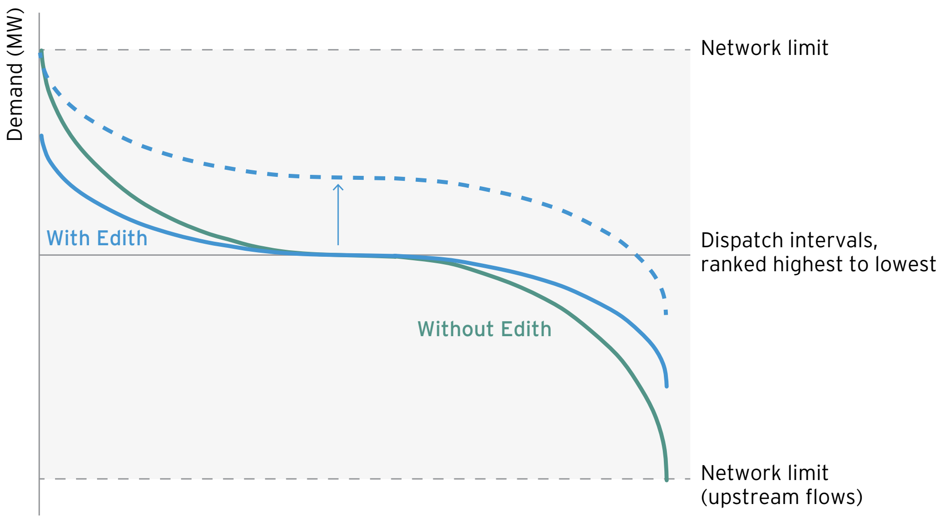

Figure 1 Illustrative example – load duration curves at the feeder level, with and without Edith

The trial has evolved significantly from its initial demonstration phase (Stage 1) of 200 customers and simple weather- based algorithms to a comprehensive trial involving around 1200 customers across multiple retail and aggregator partners, including Reposit Power, Origin Energy, EnergyAustralia, and Shinehub.

Ausgrid aims to offer a widely available subthreshold tariff that includes dynamic pricing in mid-2026 and will extend the accessibility of the tariff over time.

Notable results and lessons learnt from the trial to date are:

- **Price responsiveness.** Preliminary findings suggest that dynamic prices can elicit a response from flexible CER at a competitive rate in specific contexts. CER asset responses to pricing are influenced by complex factors such as household consumption patterns, optimisation algorithms, and aggregator retail offerings, making prediction challenging. Further expansion of the project will aim to increase empirical evidence and understanding of CER responses across different prices and scenarios.
- **The Edith tariff.** Multiple options for creating prices and tariffs were tested throughout the project. Currently, a simple structure is used, which allows for transparency and clarity in how prices are created and applied. This structure is:
  - A fixed network access and metering service charges.
  - A small volumetric import charge price that applies by default.
  - Symmetrical variable import and export prices that are applied when there is less than 20% headroom on the network remaining and increase as that headroom reduces.

- **Diversity of local dynamic prices.** Location-specific dynamic prices can differ significantly, with some customers experiencing highly fluctuating rates and others no variable charges. How dynamic prices are implemented raises questions and trade-offs related to fairness and efficiency that industry and regulation will need to address in collaboration with consumer representatives. It is crucial to provide agents and consumers with access to information on likely price outcomes so they can determine whether a dynamic tariff suits their specific location.
- **Consumer and agent perspective on high prices.** High prices may be welcomed by consumers who can earn revenue from their devices responding flexibly. However, this outcome is not guaranteed – for instance, if a high price event continues for an extended period, customers may end up exposed to a price event that they are unable to manage. To manage this risk, Ausgrid is testing guardrails, such as limits on the duration or frequency of high prices. Future investigation will examine what a suitable price cap, and therefore the value available for responding to network needs, is for dynamic network prices. Currently, a relatively low cap is used (~$1.10/kWh), but higher amounts, such as the wholesale market cap ($20.3/kWh) or NSW value of customer reliability ($38.53/kWh in 2024), could be considered.
- **Measuring the network impact of dynamic prices.** Traditional network utilisation metrics used by organisations such as the Australian Energy Regulator (AER) may not adequately capture the benefits of dynamic pricing, as reducing peak demand through effective CER coordination can paradoxically appear to worsen utilisation figures. Dynamic pricing helps flatten load profiles and improve overall network efficiency, but new standard metrics are needed to measure and demonstrate these benefits appropriately. Additionally, a broader rollout of dynamic tariffs will allow the project to measure better the impact of dynamic tariffs on network utilisation across different network types and subsequent benefits to consumers.
- **Impact on customers' ability to participate in the wholesale market**. A key feature of the dynamic tariff is that it is designed to avoid creating barriers to customer participation in the wholesale market. The dynamic tariff gives customers the opportunity to earn more revenue in the wholesale market than if the customers had been on a time-of-use tariff. These potential additional earnings more than offset the costs associated with Edith's higher daily fixed charge.
- **The need for accurate and timely data.** Dynamic network prices depend on various data inputs with different levels of availability and accuracy, so pricing engines must be resilient to incomplete or inaccurate data. Improving the accessibility and accuracy of this data can lead to more precise and efficient dynamic pricing, and also enhance other mechanisms that depend on this data, such as dynamic operating envelopes.

Dynamic network prices are being considered in a range of reviews and reforms, such as the National Electricity Market (NEM) wholesale market setting review[1] , the National CER roadmap[2] and the AEMC pricing review[3]. Within these reviews and reforms, dynamic network prices are seen as a potentially cost-effective mechanism to incentivise CER to provide value to the local network whilst integrating efficiently into the wholesale market. These and other reforms offer an opportunity to decide on structures related to dynamic network prices, such as roles and responsibilities, pricing principles, and operational requirements of dynamic prices.

Based on learnings from Project Edith to date, there are areas in which the project will focus on during the tariff trial and beyond, such as refinement of tariff parameters, managing diverse outcomes between locations, defining and measuring the impacts of network utilisation, and improving forecast and pricing accuracy.

1 https://www.dcceew.gov.au/energy/markets/nem-wms-review
2 https://consult.dcceew.gov.au/national-cer-roadmap-redefine-roles-m3-p5
3 https://www.aemc.gov.au/market-reviews-advice/pricing-review-electricity-pricing-consumer-driven-future

TABLE OF CONTENTS

DEIP

2 INTRODUCTION

Project Edith is a collaboration between Ausgrid and four customer agents (retailers and/or aggregators) to test dynamic network prices (DNP) for residential virtual power plants (VPPs). Dynamic network prices are network tariffs that vary based on the state of the network. For instance, on sunny days with abundant solar generation, network prices for consuming energy in the middle of the day may be cheap or even negative; however, on cloudy days, these prices may be more expensive.

The objectives for Project Edith and dynamic network prices are to:

- **Support customer participation in electricity markets.** Greater participation of flexible CER in electricity markets is being encouraged to lower the cost of electricity services for consumers and reward owners of these assets for the value they create. This has been highlighted or encouraged through reforms[4], modelling[5], reviews[6] and incentives[7]. Dynamic network prices work alongside wholesale electricity market price signals, allowing CER to provide their flexibility to both the local network and broader system while preserving customer choice.

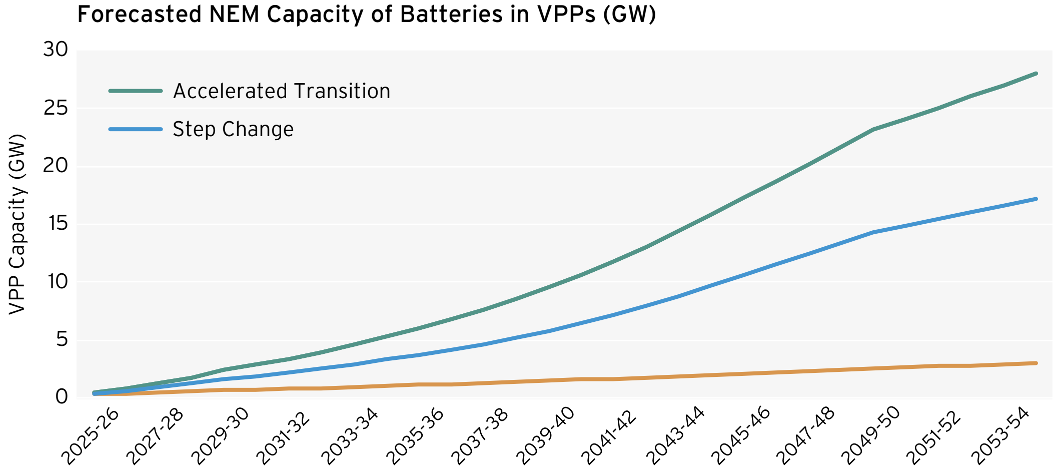

Figure 2 Forecasted battery capacity of VPPs. Source: AEMO 2025-26 ISP Inputs.

- **Shape customer demand and export.** Project Edith aims to shift the current "duck curve" in demand towards a more stable and responsive "platypus" profile. This involves better management of both high and low demand throughout the day, ensuring that extremes in energy usage are smoothed out. By using dynamic network prices, customers can be incentivised to adjust their energy consumption and export patterns in ways that support the grid. This approach not only helps manage local constraints but also improves the overall utilisation of the existing distribution network. Over time, this could reduce the need to build additional network capacity and enable consumers to export more energy.

4 Such as the "integrating price-responsive resources" and "flexible trading" rule changes.
5 AEMO ISP modelling projects an increasing amount of flexible capacity coming from coordinated CER.
6 The Energy Security Board and National Electricity Market review.
7 TThe NSW Peak Demand Reduction Scheme provides incentives for batteries joining a virtual power plant.

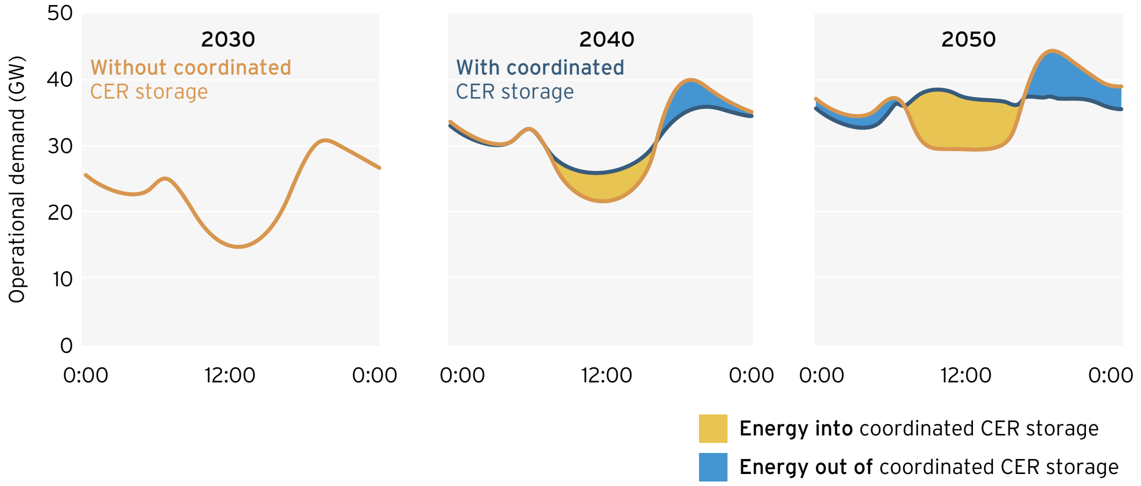

Figure 3 Impact of coordinated storage on average operational demand by time of day in the NEM (GW, 2030 to 2050, Step Change). Source: AEMO 2024 ISP.

Dynamic network prices are near real-time and location-aware tariffs. The network prices generated better reflect the costs of using the network compared to traditional network tariffs.

Additionally, dynamic network prices can reward customers for alleviating network congestion, for example, paying customers to discharge when the network is approaching its import limits. This form of network support could defer or eliminate the need for some network upgrades, which lowers network costs for all energy users.

Dynamic network prices are designed for customers with intelligent CER that can respond to these prices. Many CERs are already responding to dynamic, 5-minute prices from the wholesale spot market in simulated power plant programs and spot pass-through retailers (such as Amber and Localvolts).

DNPs leverage the existing and growing capabilities of CER aggregators and operators to achieve low-cost integration while incentivising and rewarding customers for capabilities they already use in the wholesale energy market.

3 PROGRESS IN THE TRIAL

Stage 1 – Rapid demonstration

Dynamic tariffs are introduced subject to "no worse off guarantee".

Focus is on demonstrating capability to send and respond to dynamic prices.

Stage 2 – Expansion

Growth phase as new partners enter the trial.

Customers receive unique prices based on the available capacity at their location assessed using a simulated feeder.

Billing is done via an off-market reconciliation process.

Stage 3 – Enhancement

Pricing model updated to be more transparent and justifiable.

More simulated feeders are introduced based on main weather zones. Customers are allocated to a simulated feeder based on their geographic location.

Guardrails are introduced and tested.

Stage 4 – Subthreshold tariff

Opt-in dynamic tariffs are offered to eligible customers.

"No worse off guarantee" is lifted.

Implementation of on-market network billing.

More granular prices linked to local network assets are introduced as constraints emerge.

Stage 5 – Listed tariff

Limits on uptake of the tariff are removed.

Dynamic prices become more granular over time as more emerging constraints are managed using flexible CER.

Customers can reduce their energy costs by using their flexible assets in ways that support the grid.

Figure 4 Summary of completed and upcoming stages of the adoption of dynamic network prices

3.1. STAGE 1 – RAPID DEMONSTRATION (MAY 21 – JUNE 23)

The first stage of Project Edith focused on demonstrating that dynamic tariffs could work in a safe, low-risk environment. Ausgrid collaborated with customer agent partner Reposit Power to offer dynamic network prices to 200 customers. In this stage of the project, simple algorithms were used tocreate prices, such as higher import prices when the temperature was above 30 degrees during certain hours. These prices were made available daily to Reposit.

Protections were put in place to ensure that customers were not worse off under dynamic pricing. This was achieved by reimbursing customer's network costs where they performed better under the dynamic price but not charging them extra if they performed worse. This allowed flexibility in setting prices at this stage of the project, so many different types of prices could be tested without negatively impacting customers.

The initial stage of the project focused on understanding:

- Can dynamic prices be generated by a network, shared with customers or their agents and result in a change in CER behaviour using a standard-based API?
- How does this response differ depending on: forecast demand, time of day, size of price signal, duration of price signal?

The learnings from these questions helped to demonstrate the potential of dynamic price signals, so they were more accurately targeted, ensuring they were substantial enough to encourage the desired behavioural change but still proportional to the value provided to the grid.

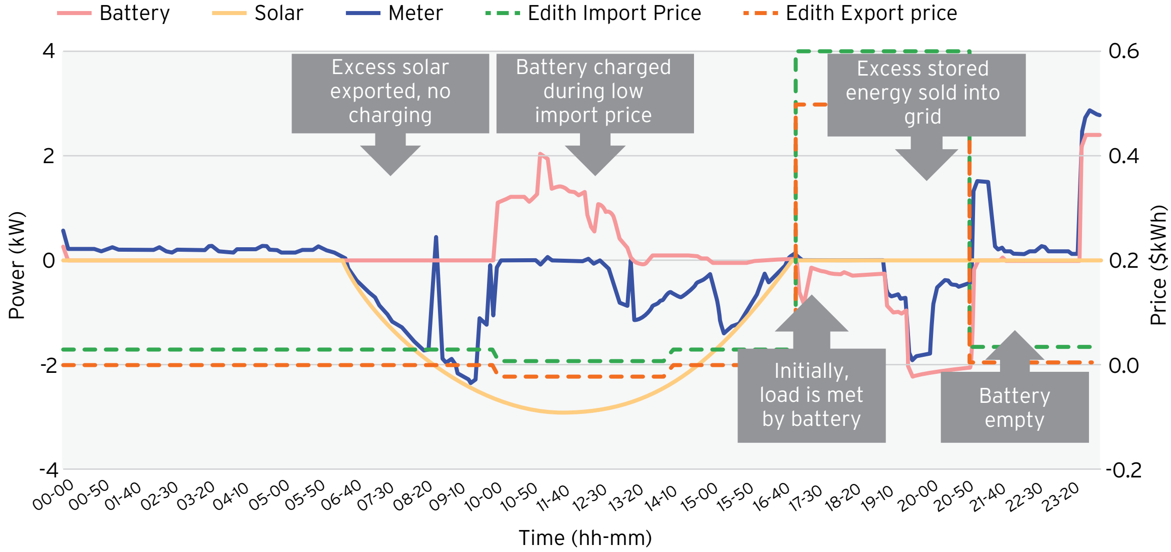

Figure 5 – Reposit customer responding positively to Edith's pricing signals

Figure 5 shows how a Reposit customer responded to dynamic network pricing signals. Early in the morning, excess solar generation was exported, with the battery charging a little later when import prices were lower. In the evening, the battery initially meets the load, with any excess exported later in the evening when export prices are high. This example demonstrates how the solar and battery system shifted consumption and exports to maximise the value of the Edith tariff.

Sending prices through CSIP-AUS

CSIP-AUS is a protocol for networks and retailers to communicate information to solar, batteries and other CER. In Australia it's currently being used by networks to send dynamic export or generation limits to customers in flexible export or emergency backstop programs.

CSIP-AUS inherits its functionality from an underlying standard IEEE 2030.5. To date CSIP-AUS has only used limited functionality from IEEE 2030.5.

For Project Edith, the team has experimented with using the IEEE 2030.5 pricing functionality to send the dynamic network prices. Early testing showed that while using standard IEEE 2030.5 pricing functionality to send dynamic prices alongside export limits in CSIP-AUS worked for aggregators, it required a large amount of communication between the CER (or aggregator) and server. This pricing functionality is now being considered for adoption in the upcoming version 1.3 of CSIP-AUS with adaptations to make it more efficient and suited to the Australian context of 5- minute dynamic prices (which not only apply to dynamic network prices but also energy market participation more broadly).

By integrating pricing into CSIP-AUS, it leverages the existing integrations, testing and governance of a standard adopted Australia wide by networks, manufacturers and technology providers.

3.2. STAGE 2 – EXPANSION (JULY 23 – JUNE 24)

The second stage expanded the trial from 200 customers to approximately 1,200 by bringing in additional partners: Origin Energy, EnergyAustralia, and Shinehub. This enabled both a large customer base to test dynamic pricing and a more diverse set of retail products utilising this pricing.

During this stage, several refinements were made to the pricing methodology. A more advanced weather-adjusted time-of-use model was introduced to improve accuracy and responsiveness. A capacity subscription scheme was also trialled, allowing customers to pay upfront for a specific capacity allocation. However, this approach was later withdrawn due to its limited impact on customer behaviour and the complexity of implementation.

While the rapid demonstration primarily used weather data and a basic algorithm, the expansion stage incorporated forecasted electricity demand from the network. To support this, Ausgrid introduced "simulated feeders," which are simulated network models based on real feeder forecasts. By adjusting elements like transformer capacity, Ausgrid could artificially introduce network constraints to create more volatility in the network prices. We used one simulated feeder that could serve about 200 Edith customers and made copies to accommodate additional customer numbers.

The objective of the pricing engine at this stage was to send signals to customers based on the available capacity at their location. We used an optimal power flow solver to determine the change in power required from participating customers, then translated the solver's output into a price for each individual customer.

In practice, when there were no binding network constraints, a default price was applied. And when binding constraints were forecast, the base price was dynamically adjusted to reflect local network conditions. The dynamic price was a function of the base price, the size of the response sought, and the assumed price elasticity of demand. This method produced a bespoke price for each individual customer for each 5-minute interval.

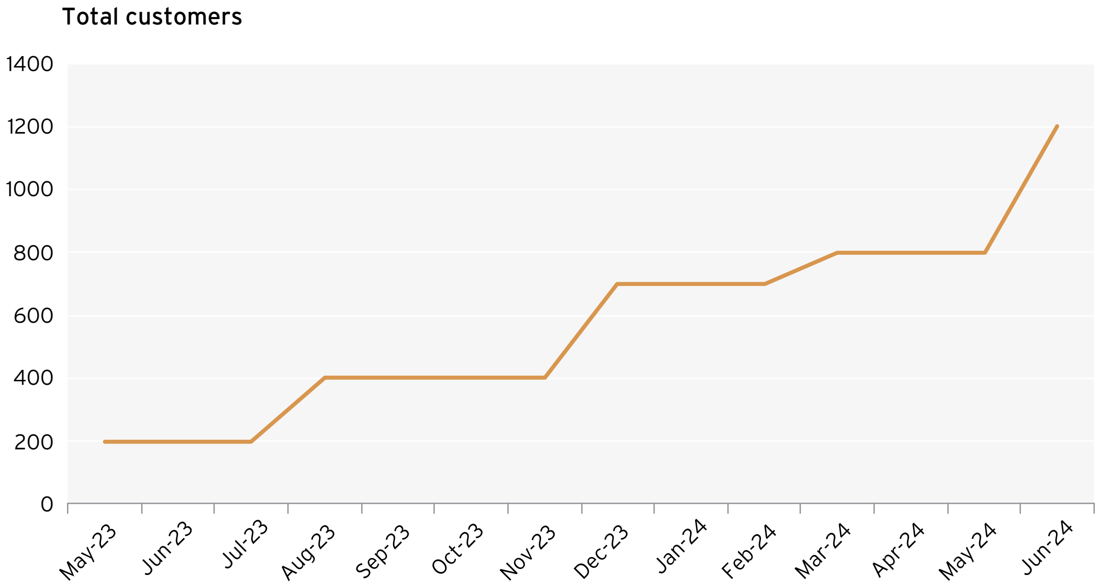

Figure 6 – Total participating customers across four customer agents

What are "simulated feeders"?

When the network is forecast to approach its limits, the dynamic prices increase to reflect that upcoming constraint. Currently, under most conditions, the network won't be at its limits; therefore, the dynamic prices would not include much price volatility, reducing the number of circumstances that the trial could test customer response.

However, Ausgrid can create a model of the network with altered properties, such as lowering the thermal capacity of a line or reducing the size of a transformer.

This creates a "simulated feeder", which allows Ausgrid to use realistic load forecasts on these simulated under-sized networks, meaning the prices can reflect real-world usage patterns of Edith and other customers, but can also simulate introducing constraints to the network, accelerating the types of situations and price dynamics that can occur.

Simulated feeders can be based on real feeders in various locations. Edith customers receive prices relevant to the simulated feeder they are "placed" on with consideration to how this matches their real conditions, ensuring the prices they receive are realistic to the weather and network conditions they're experiencing.

3.3. STAGE 3 – ENHANCEMENT (JULY 24 – JUNE 26)

This is the current stage of the Edith program focused on gearing up for launching a subthreshold tariff, through continued tariff development, system enhancement and integration with Ausgrid's metering and billing system.

Tariff development

In the expansion stage, the pricing engine aimed for "optimal power flow," a complex model that considered all network assets, consumer assets, and operational data to maximise the total amount of energy that can flow through the network. This model is highly complex, and prices are fine-grained (to the individual household level). Therefore, it can often be hard to understand or easily justify the outputs, such as why certain prices were set in different locations. During the enhancement stage, the pricing engine was changed to use a network-aware model, where the engine aimed to signal the utilisation of the assets on the network to represent the cost to serve customers. This made pricing decisions more transparent and justifiable, helping demonstrate how dynamic prices could be linked to network congestion, which was a key step toward developing an on-market tariff.

The tariff structure now includes a low default price that take effect when the network loading at a distribution transformer falls below 80%. These dynamic prices escalate as the available headroom reduces from 20%. The dynamic prices are symmetrical, meaning that a customer who contributes to reducing a constraint is rewarded an amount equal to the amount they would be charged for increasing the constraint. The dynamic tariffs price cap applies when the forecast network utilisation is greater than or equal to 100%. In other words, the maximum price the network is willing to pay to alleviate the constraint is levied once the network is overloaded.

System enhancements

During the enhancement phase, Edith customers were assigned to simulated feeders located nearby to reflect local weather and demand conditions better. The geographic groupings are based on the main weather zones in Ausgrid's distribution area. Weather significantly influences electricity demand and supply and forecasting accuracy was negatively impacted by only using a single simulated feeder.

Allocation to nearby feeders enables prices to mirror real-world CER conditions, simplifies the network data requirements for the pricing engine, and offers flexibility to model various network scenarios. In practice, we have six simulated feeders, which provide a good geographical distribution of our network. By the time dynamic tariffs become fully listed tariffs it is envisioned that real time forecasting can be conducted across the entire network and customers can be digitally assigned to their actual position on the network.

Another innovation that is being developing during the enhancement phase is the introduction of guardrails. Edith's results to date suggest that customers find it challenging to provide flexibility for an extended period, which means that high prices no longer motivate a response (see Figure 8, section 5.1). To address this, the algorithm supporting the pricing engine is being adjusted to ensure that high-priced events do not last more than two consecutive hours. The guardrails aim to build confidence that customers will not be exposed to excessive risk when the trial moves to its on-market phase.

Maximum duration limits aim to match the customers' ability to respond to changing price signals. If there is evidence that customers can respond for a more extended period, for example, if the size of a CER asset changes, then it might be appropriate to extend the maximum duration limit to give customer access to more of the network value. Any adjustments would be implemented through the annual pricing process.

Metering and Billing

The current billing process for participating Edith customers is managed through a post-reconciliation process. This involves assessing how customers perform on the Edith tariff compared to their underlying network tariff. When moving to a sub-threshold tariff, the customer's underlying network tariff will change. Customers can opt in via retailers that have signed up for trial dynamic network pricing tariffs.

The on-market billing will mainly be conducted within Ausgrid's own Billing Data Management and Metering Business System. The 5-minute pricing from the pricing engine is applied to customer energy usage data to determine costs and consumption. These results are sent to the billing system, which ensures accurate pricing, manages customers switching on or off dynamic pricing tariffs, and keeps the system aligned with market data. Finally, the billing platform processes the charges, produces accurate bills, and prepares information for invoicing to customer agents.

Introducing dynamic network pricing tariffs poses a new challenge for network billing, requiring investment in both metering and billing infrastructure. Current systems are often inflexible and were not designed to support the complexity of dynamic tariffs. As these legacy systems near the end of their operational life, new platforms are being introduced that are better equipped to support the development and delivery of innovative pricing structures. Retailers are also beginning to implement new systems to respond to these changes. In preparation, a detailed documentation of business requirements has been completed and is being used to inform an upgrade of the enterprise resource planning system, ensuring alignment with future tariff and billing needs.

3.4. STAGE 4 – SUBTHRESHOLD TARIFFS (JULY 26 – JUNE 29)

Ausgrid plans to commence the on-market phase of Project Edith in mid-2026 through a subthreshold trial tariff. This dynamic tariff will initially be available to eligible residential customers on an opt-in basis. Customers will be assigned to a simulated feeder that accurately represents their local weather conditions.

Currently, Ausgrid's network mostly operates without significant constraints. However, as electricity demand increases due to population growth and electrification, this situation may change. Adapting to dynamic pricing involves behavioural adjustments and customer agent product development that can take time to mature. Using simulated feeders can help customers and customer agents become familiar with dynamic pricing and provide Ausgrid with operational insights before it is necessary to manage network demand.

For the subthreshold tariff, the no-worse-off guarantee will be removed. This change reflects improvements made to the tariff during the trial phase to prevent customers from facing excessive risks. Specifically, the addition of maximum limits on the duration of high-price events will assist customers in managing these events. Further guardrails will be explored during the subthreshold tariff phase.

3.5. STAGE 5 – LISTED TARIFFS (JULY 29 ONWARDS)

Over time, Ausgrid is expected to gradually increase the number of unique local prices offered as different parts of the network become more constrained and require dynamic pricing to manage capacity efficiently.

Dynamic prices in these locations will be set to reflect the level of headroom on the local network, potentially leading to significantly less frequent dynamic price events in some areas and yet more frequent dynamic price events in other areas than would occur on a simulated feeder.

Dynamic prices could help defer network upgrades by using flexible CER to keep the network within technical limits. Ausgrid is also looking to explore how to employ dynamic operating envelopes as a backup once the potential for cost-effective price responses is fully utilised.

Customers with flexible CER or who are willing to adjust usage patterns will be rewarded for their flexibility through incurring lower network cost. This could also lead to net payments from the network if they are in areas requiring grid support services. Customers exposed to dynamic prices might modify their behaviour to reduce grid stress during peak times, resulting in lower investment needs for the distribution network and reduced costs for all energy users.

Dynamic tariffs will also improve customers' ability to participate in the wholesale market. When the network is unconstrained, energy usage charges are set at low levels. This reduces friction associated with network tariffs and helps to maximise the value of CER in addressing imbalances in supply and demand in the wholesale market (see section 5.5). Using CER more efficiently benefits all energy users by reducing the need for investment in utility-scale generation and storage.

Table 1: Summary of implemented and planned enhancements to the pricing engine during Project Edith

INPUTS TO PRICING ENGINE	RAPID DEMONSTRATION	EXPANSION	ENHANCEMENT	SUB THRESHOLD	LISTED TARIFF
Weather	Yes	Yes	Yes	Yes	Yes
Location	No	Yes	Yes	Yes	Yes
Forecasted load	No	Yes	Yes	Yes	Yes
Simulated feeders	No	Yes, one	Yes, multiple	Yes, refined	Moving to actual feeders
Guardrails	No customer worse off	No customer worse off	No customer worse off + 2hr duration limit introduced	2hr duration limit introduced	Likely refined based on subthreshold trial insights
Network objective	NA	Optimal power flow	Asset-based utilisation	Asset-based utilisation	Likely refined based on subthreshold trial insights

4 THE CURRENT EDITH TARIFF

4.1. THE EDITH TARIFF

The current dynamic tariff in Edith is based on the methodologies outlined in Ausgrid's 2024-2029 Tariff Structure Statement and the national electricity rules pricing principles. It is designed to meet Ausgrid's pricing principles, which were developed in consultation with their Pricing Working Group:[8]

1. **Efficiency** – Prices should reflect the overall efficient costs of operating the distribution network, and the costs associated with providing different network services at different times of the day and year.
2. **Flexibility** – Prices should reward customers for being flexible in when and how they use energy.
3. **Fairness** – Prices should recover costs in a way that is fair and equitable to all customers. Prices should consider customer impacts.

Over time, Edith's tariff structure has evolved based on feedback and capability improvements. The initial tariff was a weather-based Time-Of-Use tariff, so for example, if the temperature was above 30 degrees during predetermined price periods, the peak price applied. To this, we added a capacity subscription price, where customers pay for a specific capacity, but this was removed due to the complexity of implementation and its dilution of customer response. The following iteration of the tariff was more complex and included a price elasticity component to help set the price.

We have since moved to a simpler tariff that links the price more directly to network congestion. The current tariff is based on forecasting the conditions at the distribution transformer and comprises the following elements:

- Location-specific demand and generation forecasts at the local transformer level.
- 5-minute pricing for each participating NMI (all customers beyond a local transformer currently receive the same price, but this could be altered to help with spreading the 2-hour battery responses across a whole network peak event).
- Low default (anytime) prices when there are no network constraints.
- A dynamic, two-way, energy-based price reflecting the congestion of the network at different times and locations.
- Symmetrical dynamic energy charges, meaning each charge has a reciprocal reward – incentivising customer flexibility.
- A fixed charge to cover any remaining residual costs.

8 Ausgrid, *Our revised TSS Explanatory Statement for 2024-29*, November 2023, section 2.4

Table 2: The current structure of the Edith dynamic tariff

TARIFF NAME	COMPONENTS	PRICE	MEASUREMENT	CHARGING PARAMETER
Residential Dynamic (load) EA[TBC]	Fixed	High to cover residual costs	cents/day	Access charge reflecting a fixed amount per day
	Metering Service Charge	Standard	cents/day	Metering service charge reflecting a fixed amount per day
	Anytime Energy	Low import charge	cents/kWh	Flat energy usage charge
	Dynamic Energy	Range from rewards to charges	cents/kWh	Charge is applied to 5-minute intervals when the forecast network headroom is less than 20% and gradually increases as headroom decreases.
Residential Dynamic (generation) EA[TBC]	Anytime Energy	No charge	cents/kWh	No export charge when network headroom exceeds 20%
	Dynamic Energy	Range from rewards to charges	cents/kWh	Charge is applied to 5-minute intervals when the forecast network headroom is less than 20% and gradually increases as headroom decreases.
	Metering Service Charge	Standard	cents/day	Metering service charge reflecting a fixed amount per day

Dynamic tariffs are applied when the local network is expected to reach peak or minimum demand conditions. Dynamic load prices are set based on import long-run marginal cost (LRMC) and assumptions about how often peak demand/minimum demand events occur. Dynamic prices for generation are determined by export LRMC and assumptions regarding how frequently minimum system load events happen. These prices are symmetrical. If the dynamic price for load is 30c/kWh, then the corresponding reward for generation will be 30c/kWh. The opposite occurs during solar soak events.

Anytime energy is a flat usage charge that always applies, including during dynamic price events.[9] The anytime energy charge is set at a low level – currently 2.337c/kWh. The Edith tariff also has a relatively high daily network access charge (NAC) which is used to recover all residual network costs that are not recovered by the anytime energy charge.

The anytime energy charge could conceivably be set at zero, with all residual costs recovered via the NAC. Ausgrid has not adopted this approach to date because it is likely to reduce customer and agent acceptance of dynamic tariffs. As the tariff is opt-in, it is necessary to ensure it offers value for money relative to the alternative network tariff structures available.

During the current phase of the experiment, charges are set at a level that includes an approximate 15% discount compared to what equivalent customers would pay on a static tariff, as an incentive for them to take part in the trial.

This tariff structure follows established national electricity rules and pricing principles and is like existing trial tariffs that include dynamic elements, such as community battery tariffs. A key feature of this design is its feasibility within the current regulatory environment governing tariff development. It is expected that this structure will integrate smoothly into existing regulatory arrangements without requiring significant reforms or major structural changes to current frameworks. The biggest challenges will be how to provide the AER with oversight and customers and their agents with predictability and transparency.

9 Dynamic prices are adjusted to reflect the presence of the anytime energy charge.

4.2. HOW DYNAMIC PRICING GETS TRIGGERED

In Edith's current and future expected phases, dynamic prices are primarily influenced by network headroom. Network headroom refers to the remaining spare capacity on a network asset, such as a transformer, before it reaches its technical limits.

When there is sufficient headroom, a flat usage tariff applies, which includes a low import charge and no charge for exporting. This flat charge aims to partly recover jurisdictional schemes and residual network costs. As the network approaches its limits, with less than 20% headroom remaining, dynamic prices are enacted. When the forecasted available headroom falls to zero (e.g. the asset is 100% loaded), the price cap applies. In Edith, the headroom is measured at the distribution transformer

and considers thermal and voltage constraints. Typically, a distribution transformer serves tens to hundreds of customers, demonstrating how location-specific the tariff is.

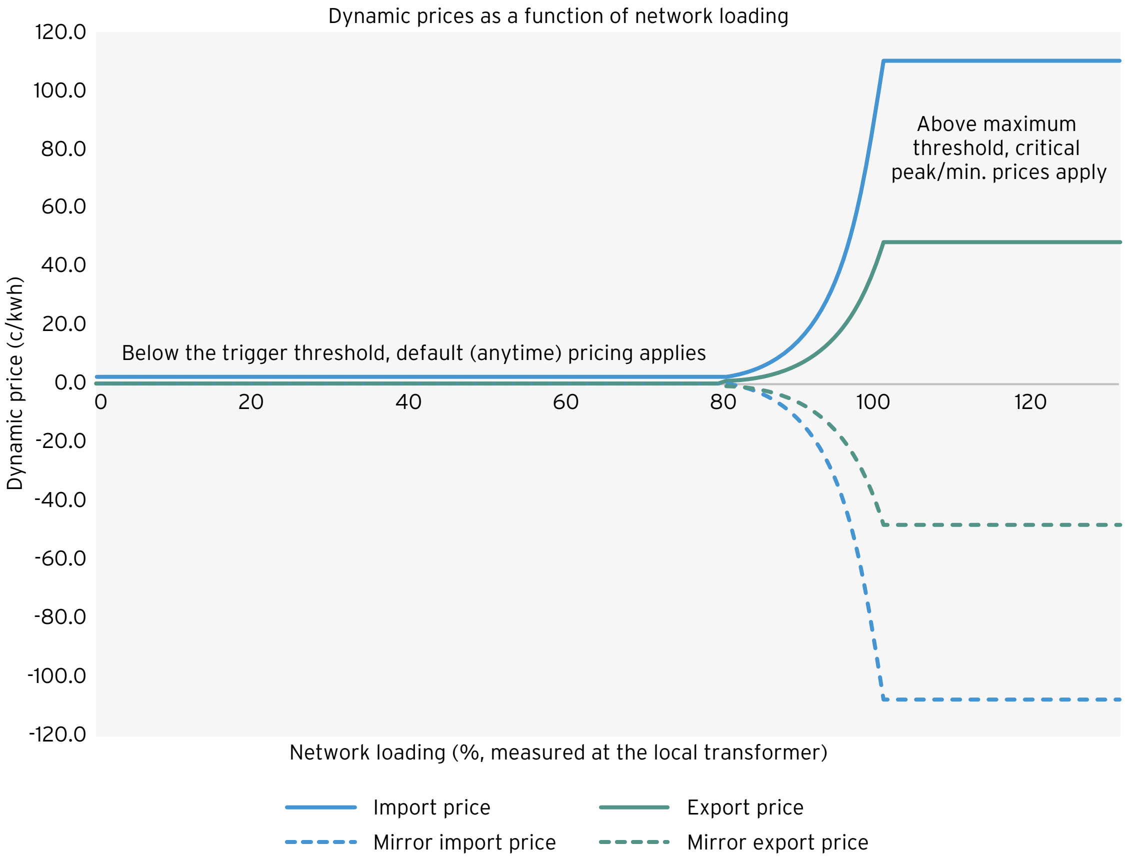

Figure 7 Dynamic prices as a function of reduced network headroom

5 LESSONS LEARNT

Project Edith has provided key insights into the opportunities and challenges associated with dynamic network pricing. While the project's primary focus is on prices, we have also learnt how a typical customer with solar and a battery interacts with the energy market. In summary, some of the key learnings that have emerged are:

Table 3: Summary of lessons learnt

SECTION	SUMMARY
Price responsiveness	Preliminary findings suggest that dynamic prices can elicit a response from flexible CER at a competitive rate in specific contexts. CER asset responses to pricing are influenced by complex factors such as household consumption patterns, optimisation algorithms, and aggregator retail offerings, making prediction challenging. Further expansion of the project will aim to increase empirical evidences and understanding of CER responses across different prices and scenarios.
Diversity of local dynamic prices	Location-specific dynamic prices can differ significantly, with some customers experiencing highly fluctuating rates and others no variable charges. How dynamic prices are implemented raises questions and trade-offs related to fairness and efficiency that industry and regulation will need to address in collaboration with consumer representatives. It is crucial to provide agents and consumers with access to information on likely price outcomes so they can determine whether a dynamic tariff suits their specific location.
Unintended consequences of asymmetric prices	Asymmetric prices should be applied with caution due to the scope for gaming by cycling between charging and discharging during a price event.
Consumer/agent perspectives on high prices	High prices may be welcomed by consumers who can earn revenue from their devices responding flexibly. However, this outcome is not guaranteed – for instance, if a high price event continues for an extended period, customers may end up exposed to a price event that they are unable to manage. To manage this risk, Ausgrid is testing guardrails, such as limits on the duration or frequency of high prices. Future investigation will examine what a suitable price cap, and therefore the value available for responding to network needs, is for dynamic network prices. Currently, a relatively low cap is used (~$1.10/kWh), but higher amounts, such as the wholesale market cap ($20.3/kWh) or NSW value of customer reliability ($38.53/kWh in 2024), could be considered.
Measuring the network impact of dynamic prices	Traditional network like metrics used by organisations such as the Australian Energy Regulator (AER) may not adequately capture the benefits of dynamic pricing, as reducing peak demand through effective CER coordination can paradoxically appear to worsen utilisation figures. Dynamic pricing helps flatten load profiles and improve overall network efficiency, but new standard metrics are needed to measure and demonstrate these benefits appropriately. Additionally, a broader rollout of dynamic tariffs will allow the project to measure better the impact of dynamic tariffs on network utilisation across different network types and subsequent benefits to consumers.
Wider learnings about household battery performance	We have observed that customers with both solar and a battery often have a relatively large solar system compared to the size of their battery. A typical solar plus battery customer still exports energy to the grid in the middle of the day. There is significant wholesale market value available for customers who utilise their batteries to modify their load profile, even after considering the impact of TOU network tariffs. The potential value is further improved by dynamic network tariffs.
The need for accurate and timely data	Dynamic network prices depend on various data inputs with different levels of availability and accuracy, so pricing engines must be resilient to incomplete or inaccurate data. Improving the accessibility and accuracy of this data can lead to more precise and efficient dynamic pricing, and also enhance other mechanisms that depend on this data, such as dynamic operating envelopes.

5.1. PRICE RESPONSIVENESS

Preliminary results indicate that dynamic pricing can elicit a demand response at competitive levels in specific circumstances. On average, from March to November 2024, a 45c/kWh change in price resulted in a 500W variation in the instantaneous demand of Edith customers (Figure 7).

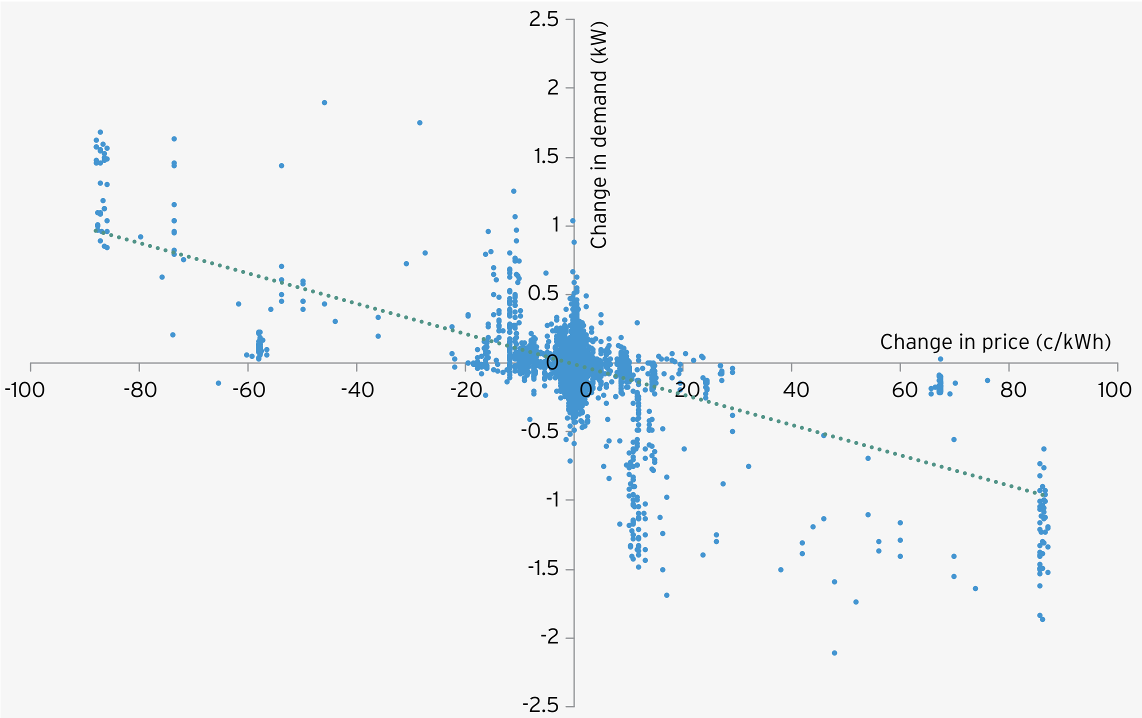

Figure 7 Change in import price vs average change in demand (March-November 2024)

This implies that Edith customers are prepared to adjust their power consumption by 1 kWh for roughly 90c/kWh. For comparison, this is dramatically lower than metrics such as the value of customer reliability ($38.53/kWh in 2024 for NSW) or other demand response payments such as RERT or WDRM, which are often above $3/kWh.

However, this analysis comes with important caveats. It does not consider scalability or the duration of responses. So far, the analysis has looked at changes in price and demand over a 5-minute interval.

Further testing is required to determine the typical duration of a customer response before they exhaust their response and revert to a more usual load pattern. Edith's data analysis suggests that a customer's battery response tends to decrease after about 2 hours, which matches the fact that at the time of the experiment, home batteries and inverters are typically sized for 2 hours of maximum discharge.

Price responsiveness depends on the agent's algorithm and the tools available to them, particularly the charge level in the customer's battery and whether they can directly curtail exports from a customer's solar PV. A customer might be willing to respond for significantly less than 90c/kWh if they have spare energy in their battery or if their load is relatively easy to shift; for example, it might be acceptable for a customer to delay charging their EV if it has plenty of charge. Conversely, they might be unable to reduce their demand when they need to cool their house during a heatwave with insufficient charge in their battery to cover this load.

If there is no limit on the retailer's ability to utilise the customer's battery, they are likely to be highly responsive to prices if the battery has spare capacity to charge or discharge. If a contractual limit exists on how often the retailer may use the customer's battery, then the agent will only respond if the dynamic network price exceeds the forecasted opportunity cost. The opportunity cost reflects the potential revenue the agent could earn by dispatching the VPP in response to a wholesale market price event.

The example below (Figure 8) demonstrates how customers initially responded strongly to a high price event, but the response was not sustained as long as the network price peak.

1. The high network price (orange) was in effect between 5 pm and 10 pm, incentivising customers to reduce demand and increase exports.
2. At 5 pm, the Edith sites began to increase their exports (green), deviating from the baseline demand (blue).
3. Between 6:30 and 8 pm, the exports decreased, and the sites returned to baseline demand, presumably as the batteries no longer had charge.

This example shows that there is a limit to the flexibility a customer can offer, determined by the type of assets they own, how these assets are operated, and external factors such as wholesale electricity prices.

Ideally, these effects would be considered when prices are set, such as the reduced response to high network prices after 2 hours. In the future, understanding the makeup of assets that provide flexibility may become important to understand both the likely network support that can be provided by customers and the risk customers are exposed to when facing high prices they can't mitigate. For example, there could be an increase in longer-duration home battery installations or other assets that offer network flexibility with different response characteristics compared to 2-hour batteries.

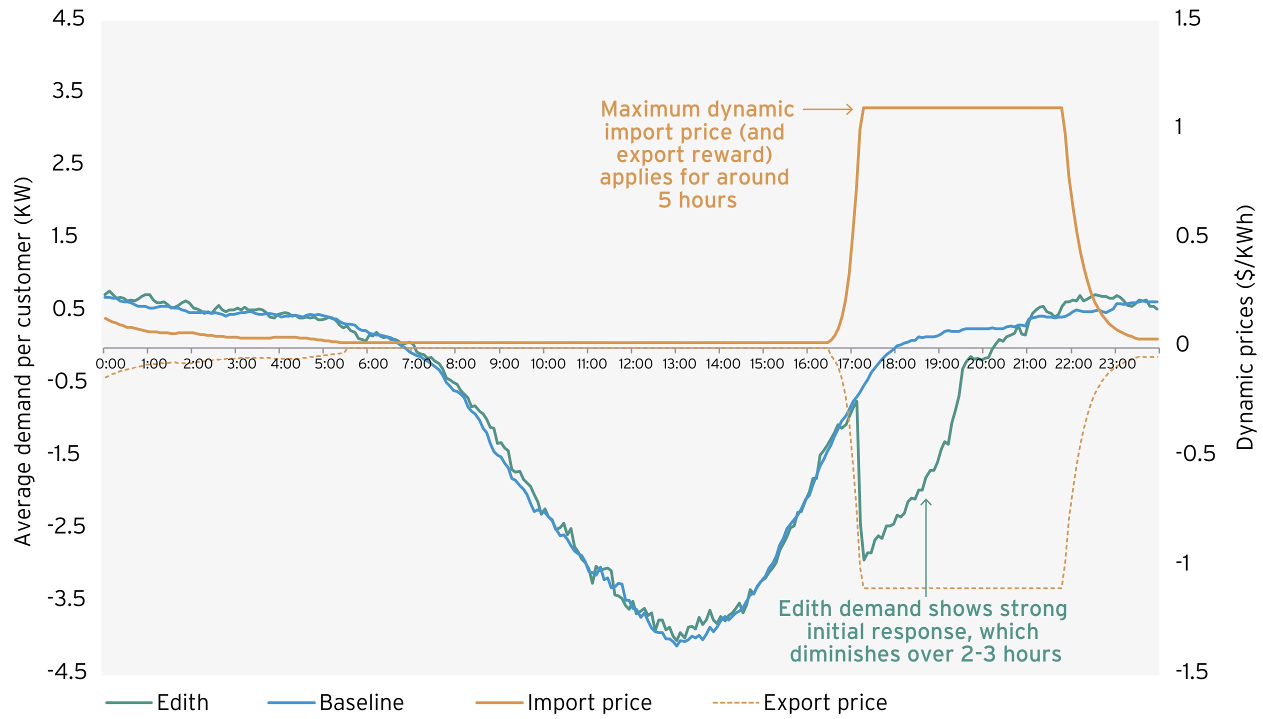

Figure 8 Edith customers' ave. response to dynamic prices relative to baseline cohort, Retailer X, 19/12/2024

Once a customer's battery is fully charged or discharged, the VPP operators currently have limited additional tools to respond to the price signal, resulting in the customer's load profile reverting to the underlying customer load. If this happens during the evening peak, it is common to observe positive price elasticity – that is, higher prices are associated with increased consumption. Similarly, in the middle of the day, we see instances of increasingly negative prices coinciding with higher exports.

However, if battery capacity is available, customer agents have shown that they are price sensitive. A main focus for further work is how to handle these complexities so responses can be predicted for a changing price signal, taking into account factors like the time of day, underlying demand, and the duration of the signal. This might be improved by learning more about the types of CER assets and programs customers participate in, as well as operational or forecasted information about the CER. A key principle that Edith has been working towards is that prices should be within the scope of a customer or their agent's ability respond to it. This is a fundamental consideration when designing guardrails.

Interactions between dynamic prices and the wholesale price

Since the wholesale market price cap for FY25-26 is $20,300/MWh ($20.3/kWh), customers and their agents might find it more profitable to concentrate on responding to wholesale market price spikes, based on their expectations about how often, how large, and how long these spikes might occur.

Further consideration is needed to decide whether incentives should be increased to solicit greater participation or whether dynamic prices should be maintained at low levels relative to the wholesale price, and accept that the tariff may not resolve all network constraints.

To the extent that periods of high network utilisation align with high wholesale market prices, the dynamic price helps to enhance the wholesale price signal. However, considering the unique usage patterns of each feeder and transformer, it is likely that in some locations, local network peaks will happen at times that do not match wholesale market peaks.

Currently, Edith's maximum prices are based on long run marginal cost and relatively low. Using higher maximums, such as the market price cap or the value of customer reliability, offers the advantage of encouraging more flexibility to support the network but can be costly and may lead to inefficient overcompensation.

The Edith team is examining options to develop a reliable measure of price elasticity. As discussed earlier, several complications make it difficult to reach a definitive conclusion. These complications include:

- Most changes in customer demand are entirely unrelated to network price signals, and instead result from non-discretionary, everyday energy use by the customer.
- Customers or customer assets also respond to the wholesale market price, which is often correlated with the dynamic price.
- The aggregators and retailers in the Edith trial cannot adjust the output of all their customers' rooftop PV systems based on price, so some customers' demand depend on their unmanaged solar PV output.
- The responsiveness to a given price change during the high price event, with a strong reaction at the start that diminishes over time (presumably because the customer's battery becomes depleted or fully charged).

At this stage in Edith, the dynamic price signals are managed by customer agents through their VPPs; end-users do not see the prices. Therefore, any measure of price elasticity depends on the customer agents' algorithm rather than the end-user's willingness to adjust their demand in response to a price change. It is anticipated that the customer agent model would lead to a quicker cycle of learning and improvement (as has already been observed in Project Edith).

5.2. DIVERSITY OF LOCAL DYNAMIC PRICES

The current Edith tariffs are designed to reflect local network conditions at the transformer level. If Edith tariffs were to be made available across Ausgrid's network, this could entail thousands of unique dynamic tariffs. The weather and the amount of spare capacity available within local network assets drive the size and prevalence of dynamic price events.

Dynamic tariffs vary significantly across different transformers (Figure 9), which could pose challenges for fairness and acceptance. In the Edith trial, some transformers are heavily loaded and often face critical peak price events. In contrast, other transformers never reach the congestion level needed to trigger a dynamic price event. Customers connected to the unconstrained transformers could have low default prices throughout the year. These differences occur even though the dynamic prices are set based on geographically close locations, with different transformers on the same feeder.

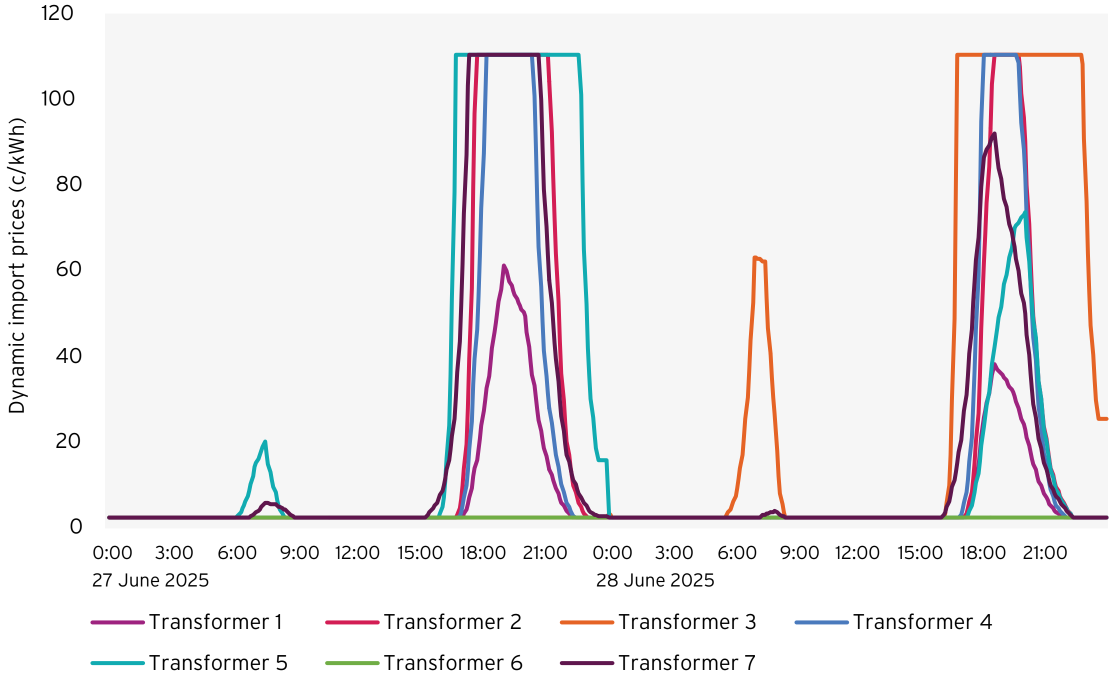

Figure 9 Edith prices by transformer, 27-28 June 2025

The variability in dynamic prices reflects local network conditions, so these prices should accurately represent costs. Dynamic prices give customers a chance to monetise the benefits of their CER investments through supporting the local network assets. This could lead to significantly lower charges (or even negative charges) for highly responsive Edith customers. Proper design principles are essential for dynamic network tariffs to ensure they are fair and beneficial for all customers.

For a widescale rollout of dynamic pricing, it will be essential to focus on strategies for managing the inherent variability in dynamic tariffs. Some points to consider are:

- **Information provision.** Provide materials to help customers and their agents determine whether a dynamic tariff suits them. To create this material effectively, it is essential to understand the characteristics of customers who tend to perform best on Edith, in terms of earning network rewards or avoiding price spikes.
- **Locational granularity of pricing.** The current granularity at the local transformer level is much finer than that of other network tariffs. To make the tariffs easier to understand, it might be necessary to reduce the number of unique tariffs. For instance, a single tariff could be used at the zone substation level, or the network could be divided into larger regions based on local weather conditions. While these adjustments will make the dynamic tariffs more accessible and simpler to implement, they also involve tough trade-offs because they can reduce the tariffs' ability to accurately reflect local conditions.
- **Targeted rollout of dynamic pricing.** Highly localised dynamic prices could be implemented in parts of the network that are becoming constrained. This approach could help address fairness concerns but misses the chance to develop network tariffs that encourage customer participation in the wholesale market (by 'getting out of the way' and avoiding distorted incentives).
- **Comparable with default tariffs.** Making the fixed charge and energy charge that applies when the network is uncongested comparable with the default network tariffs customers are assigned to may reduce inequity as the dynamic element becomes targeted grid rewards in areas where there is a network need, while the underlying network costs are recovered in similar across customers. By setting the daily fixed charge at a level that recovers all residual costs and setting symmetrical dynamic prices at a level that reflects the long-run marginal costs of the network, dynamic tariffs can:
  - avoid cross subsidies,
  - charge customers for their contribution to demand and supply during critical network peaks and minimum demand events, and
  - reward customers for shifting their behaviour in a way that reduces the need for network investment.

Since dynamic pricing is complex, these considerations need to be carefully worked through with a wide range of stakeholders. Many options require trade-offs, and there may be differing opinions on what constitutes a fair balance. Strong stakeholder engagement and clear communication will be vital to inform customers and industry participants about how dynamic tariffs operate and their potential benefits and challenges. This engagement process will be key to fostering understanding and gaining broader acceptance of the proposed tariff models as Project Edith progresses towards wider implementation.

5.3. UNINTENDED CONSEQUENCES OF ASYMMETRIC PRICES

One Edith experiment involved an asymmetric tariff where dynamic prices were applied to exports (e.g. dynamic rewards), but imports remained under traditional TOU pricing (e.g. standard charge). The goal of this tariff was to incentivise customers to use their flexible resources to reduce peak demand without penalising those with limited flexibility. Ausgrid's project partners identified an issue with the tariff. Because the cost to charge batteries is lower than the payments for discharging, the tariff could encourage cycling of batteries to maximise export revenue.

Upon reviewing the data, none of the customer agents took advantage of the flawed tariff design. Figure 10 shows an example of a load profile that might be influenced by battery cycling, but such cases are very rare and could just as likely be due to regular household activities.

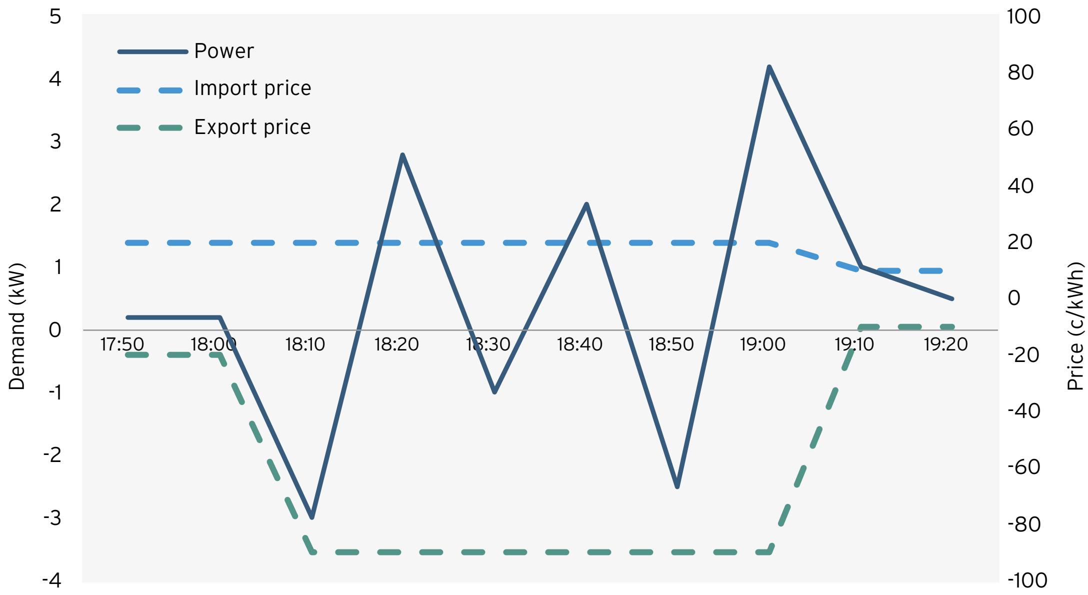

Figure 10 Example of cycling under asymmetric network prices

This experience shows that asymmetric pricing should be used carefully if at all because of the risk of manipulation through cycling between charging and discharging during a price event. While there is potential to develop an asymmetric tariff that addresses this issue, such as by applying the export reward to the customer's net exports over the dynamic price event, doing so would significantly increase the tariff's complexity.

Ausgrid has decided to implement dynamic network prices symmetrically, eliminating the need for complex tariff arrangements to reduce the risk of cycling.

5.4. CUSTOMER PERSPECTIVES ON HIGH PRICES

Dynamic pricing can shift traditional views on high prices, turning them from a risk into an opportunity. In Edith, the dynamic prices which are communicated (which excludes the default anytime energy charge) are symmetrical – so a high import price matches a high export price. When prices are symmetrical, high import prices aren't necessarily a disadvantage for customers. Instead, consumers may perceive high prices as an opportunity to earn rewards by exporting energy.

In our benchmarking analysis, customers on highly constrained transformers face the highest potential annual network charges because they are more exposed to high dynamic prices. In practice, these customers are likely to benefit most from Edith because they have the greatest opportunity to earn money by exporting during peak demand periods or importing during solar soak events. The extent to which this occurs depends on the customers' ability to respond to dynamic price signals – a key focus for the Edith guardrail design.

The flipside is that Edith's customers might feel disadvantaged if they are on a part of the network that is unconstrained, and therefore not exposed to high prices or high rewards. Edith tariffs include high network access charges (NACs) to prevent cross-subsidisation with non-Edith customers. Customers on unconstrained parts of the network have fewer chances to offset their NACs through grid rewards – but they do benefit from lower default usage tariffs.

Since dynamic tariffs are not mandatory, customers or aggregators who cannot provide enough flexibility to meet the local needs of the network, or who believe there isn't enough value, can choose other tariff options. This highlights the interaction between dynamic network tariff options and other tariff options offered by a network.

It will be essential to educate and manage expectations among customers who opt into Edith and ensure that stakeholders do not perceive dynamic tariffs as disadvantaging those without CER or who aren't participating in Edith. The intent is to demonstrate that these tariffs can provide a more cost-effective approach to managing network infrastructure for the benefit of all energy consumers.

5.5. MEASURING THE NETWORK IMPACT OF DYNAMIC CHARGES

Project Edith highlights the need to develop new metrics to measure the effectiveness of distribution network service provider's (DNSP) actions to manage flows across their networks.

Since the network must be designed to accommodate peak demand, a load profile with extreme peaks is less efficient than a flat one because much of the capacity remains unused outside of peak periods. Dynamic pricing strategies aim to level out peak demand by encouraging customers to cut back on their energy consumption during busy periods. A more balanced load profile (Figure 11) enables more energy to be transferred across a network of the same size. It allows the energy requirements of more customers to be met before a network upgrade becomes necessary.

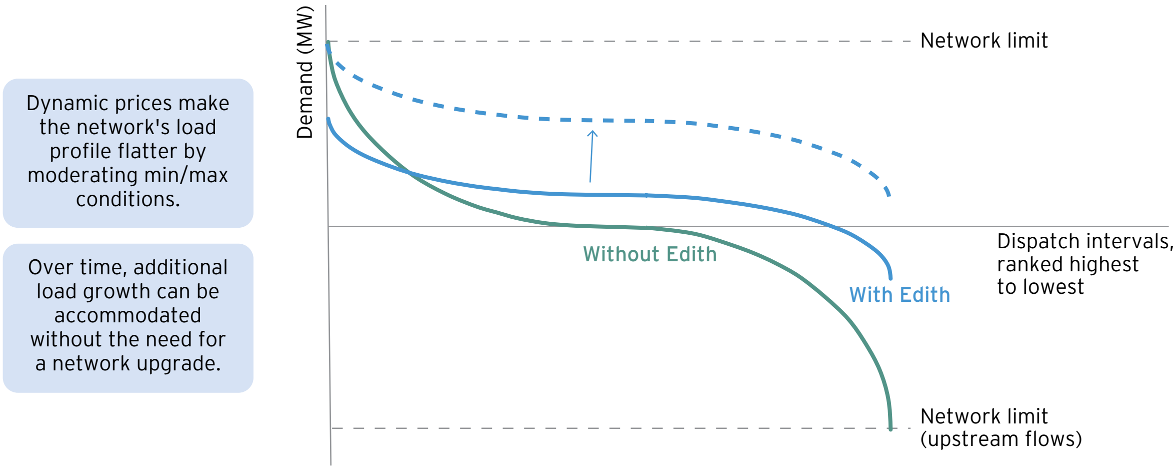

Figure 11 Illustrative example – load duration curves at the feeder level, with and without Edith

However, the AER's current measure of network utilisation, measures peak demand relative to the network's maximum capacity. It attempts to gauge the level of surplus capacity in the network by focusing on peak demand events.

The University of Technology Sydney has noted that:

> *"Using current metrics, if a DNSP is effectively able to integrate high proportions of CER, driving a reduction in summer peak demand, its network utilisation figure would decline, reflecting negatively on the DNSP".*[10]

Since Edith's dynamic prices are designed to reduce demand during peak demand events, they can be expected to drive a reduction in the current network utilisation metric, even though the prices are helping to better manage power system flows.

The AER has recognised that the current network utilisation metric is an incomplete metric and has signalled its willingness to consider improved measures of network utilisation in future performance reports.[11]

In April-May 2024, an experiment was conducted to explore whether dynamic prices could help to flatten customers' load profiles during periods of high exports as well as high demand. A group of Edith customers received an 8-cent dynamic export price (or dynamic import reward) between 11:30 am and 12:30 pm, and a 90-cent dynamic import price (or dynamic export reward) between 4:30 and 5:30 pm. The Edith customers' daily load profile during the experiment is shown in green in Figure 12 above. By way of comparison, the blue line shows the load profile of a group of comparable baseline customers on static tariffs. The baseline cohort is comprised of all Ausgrid residential customers who have both solar and a battery, 5-minute data and who are not participating in Edith.

10 Langham, E, Ibrahim, I., Rispler, J and Roche, D. (2024). *Reimagining Network Utilisation in the Era of Consumer Energy Resources*. Prepared by UTS with the support of Energy Consumers Australia. Version 1.2, December 2024, pg. 13. Available at: UTS_Network-Utilisation-Metrics_Final-Report_v1.2.pdf

11 Australian Energy Regulator, *2024 Electricity and gas networks performance report*, September 2024, pg. 42. Available at: 2024 Electricity and gas networks performance report

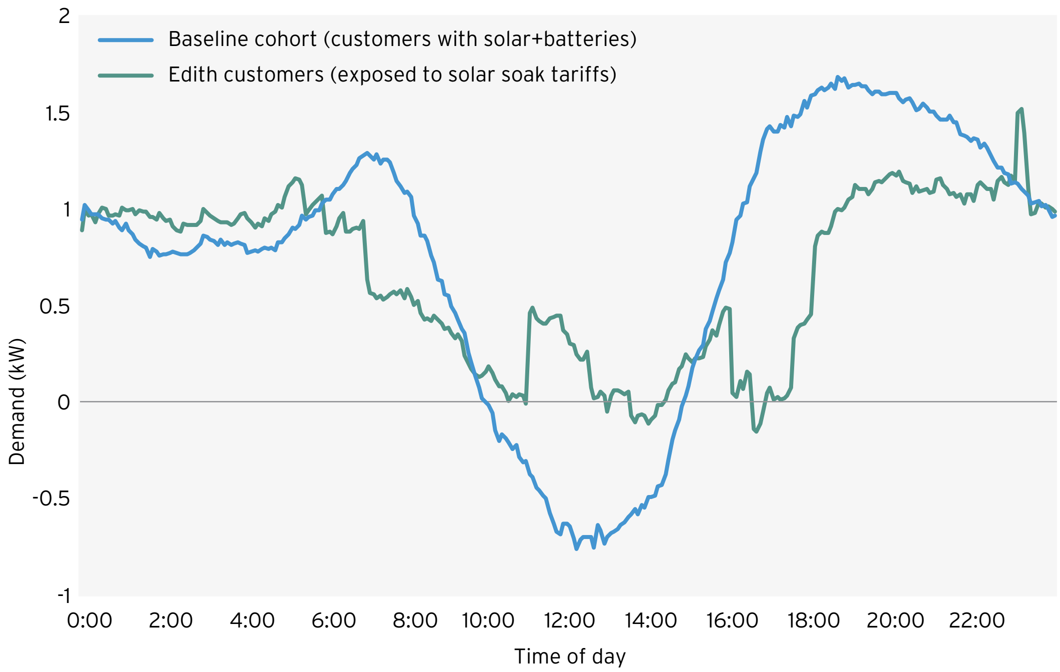

Figure 12 Average daily load profiles during an Edith solar soak experiment vs the average daily load profiles of the baseline cohort, 30 April-10 May 2024

Edith's customers exported less during the day and consumed less in the evening – essentially flattening the load. This experiment demonstrates the potential of dynamic network pricing to balance customer loads and generation. If batteries and other CER can be coordinated in this way at scale, we could lower the size of peak and minimum demand events on the distribution network.

5.6. IMPACT ON CUSTOMERS' ABILITY TO PARTICIPATE IN THE WHOLESALE MARKET

There could be significant wholesale market value accessible for customers who use their batteries to modify their load profile. However, traditional network tariffs can create friction that reduces the potential arbitrage value of a customer's battery.

Since customers use their batteries to power their own homes as well as participating in energy markets, discharging their battery in response to high prices in the early evening can mean that the customer is obliged to import energy from the grid later in the evening. Network charges associated with imported energy need to be factored in when the customer (or their agent) decides whether to respond to the price signal. For instance, if a customer is on a network time-of-use tariff of 30c/kWh during peak periods, this adds a cost for imported energy equivalent to a wholesale market price of $300/MWh.

A key feature of the Edith tariff is that it is designed to "get out of the way" – i.e. to avoid creating barriers to customer participation in the wholesale market. When the network is unconstrained, the Edith network usage tariff is set at the low anytime rate. This removal of network price signals during unconstrained times is intended to reduce barriers to wholesale market participation.

The Edith team has attempted to measure the wholesale market value of the change in the Edith customers' load profile. It is important to note that:

- the Edith price signals do not necessarily cause the change in load profile – since Edith customers are also VPP customers, it is likely that they would be more responsive to the wholesale market price than a typical customer, with or without Edith
- whether that value is passed on to the end-use customer will depend on the VPP contract between the customer and their agent.

Figure 13 below estimates the potential customer benefits arising from wholesale market participation for the median Edith customer between July and October 2024. It compares the load profile of the median Edith customer against the median load profile of a baseline cohort.[12] To calculate additional wholesale market earnings, we assumed that:

- When Edith's customer load is greater than baseline load, Edith's customers are buying from the wholesale market.
- When Edith's customer load is less than baseline load, Edith's customers are selling into the wholesale market.

We then calculated the potential value of the traded energy based on the NSW regional reference price (RRP) for each interval. The analysis estimates the arbitrage value associated with using the customer's spare battery capacity to respond to fluctuations in the wholesale market price – for instance, by charging in the middle of the day (when the wholesale price is low) and discharging in the evening (when the wholesale price is high).

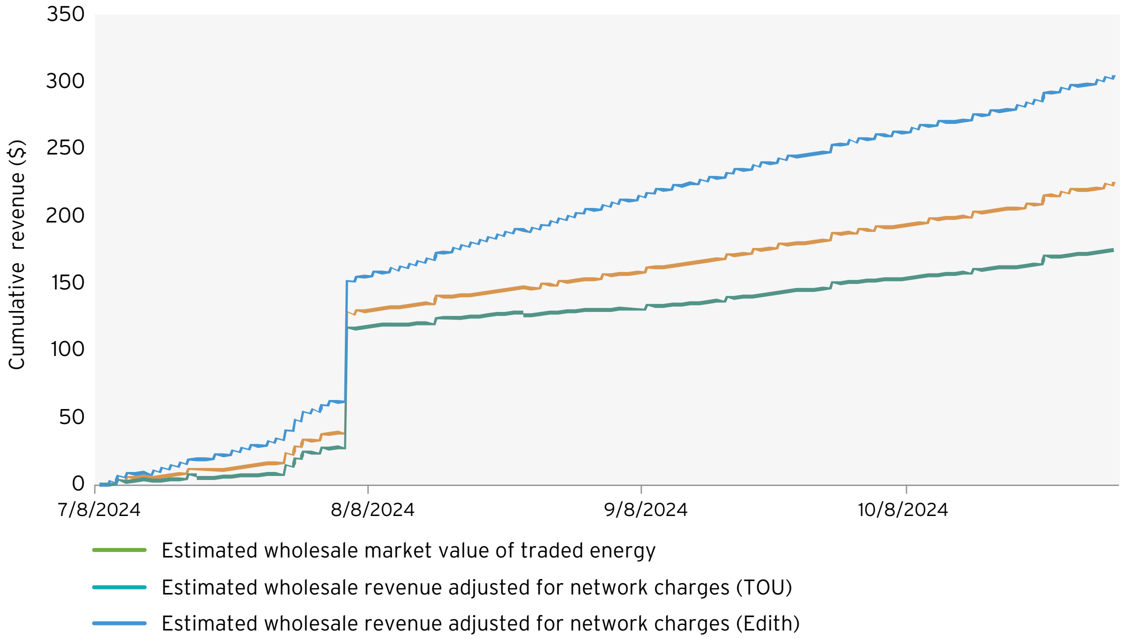

Figure 13 Estimated potential customer benefits arising from wholesale market participation, median Edith customer, 7 July-31 October 2024

The results show that customers with flexible CER assets have the potential to earn significant additional revenue by participating in the wholesale market – in this example, $226 over 4 months. We then adjusted the wholesale market value of the traded energy to account for the impact of network usage charges under (a) a time-of-use tariff and (b) Edith's dynamic tariff.

If the customer had been on a time-of-use network tariff, they still could have earned a significant amount of wholesale market revenue; however, the friction associated with the time-of-use network tariffs reduced the median customer's wholesale market earnings by around $50.

In contrast, when we adjusted the potential earnings to take account of dynamic energy charges, Edith customers earned an extra $79 because they also benefited from dynamic network rewards.[13] Overall, the potential energy arbitrage value for Edith customers was around $129 more than for time-of-use customers.

12 The baseline cohort seeks to emulate a typical solar-battery customer who does not attempt to optimise their battery usage in response to market signals. It is the average load profile of all Ausgrid customers that meet the following criteria:
- Residential customers
- Have both solar and a battery
- 5-minute interval data is available
- The customer is not part of the Edith trial.

13 Note that Edith customers were exposed to relatively frequent dynamic price events during the experimentation phase. In later phases of the Edith project, opportunities to earn dynamic rewards will only arise when the local network is approaching its technical limits.

To properly compare outcomes for Edith customers versus time-of-use customers, it is also necessary to consider the impact of the higher daily network access charge (NAC) that applies to Edith customers. The cost of the higher NAC was $38.29 over the period. This result suggests that the Edith customers' higher NAC was more than offset by the opportunity to earn more revenue in the wholesale market.

5.7. WIDER LEARNINGS ABOUT HOUSEHOLD BATTERY PERFORMANCE

An early observation from the Edith experiment was how the Edith and baseline customers' load profiles resemble the duck curve typically associated with solar customers. Given that both Edith customers and baseline customers almost always have a battery, this raised questions about how much impact the customers' battery was having on their consumption profile. To follow up on this question, we compared the load profile of solar-battery customers to a sample of solar-only customers shown in Figure 14 below. Note that this analysis does not explicitly relate to Edith's customers – it is a sample of all solar-battery customers.

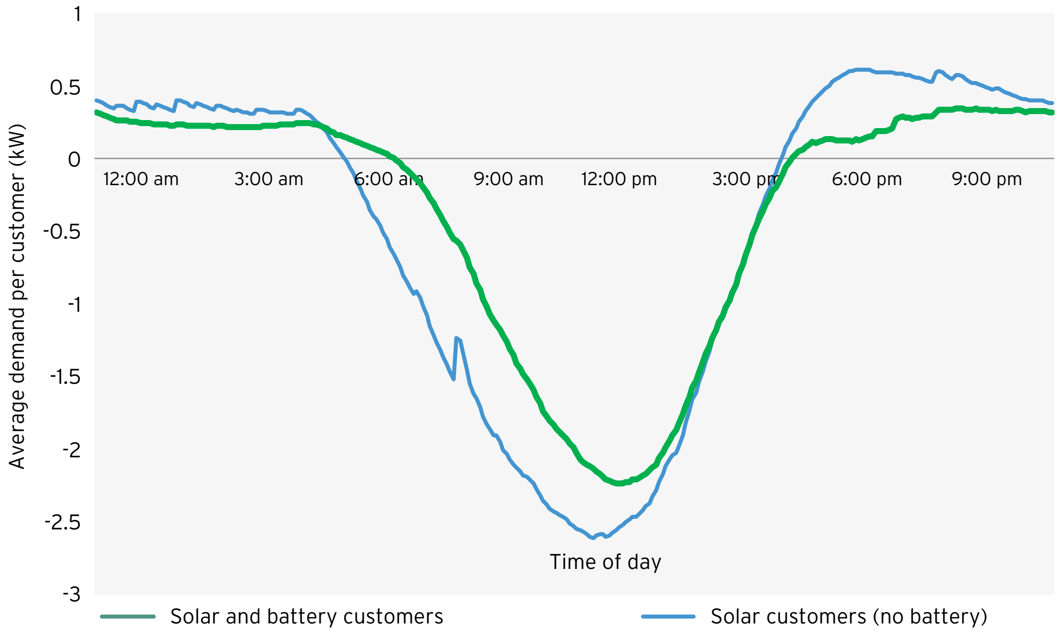

Figure 14 Average daily load profile of Ausgrid solar & battery customers (green) and solar only customers (blue), January 2025)

The analysis indicates differences in load profiles, with battery customers exporting less, especially in the mornings, and consuming less during peak times. This suggests that customers' batteries influence their consumption patterns. However, on average, the solar systems are relatively large compared to the batteries, so the battery's impact isn't substantial enough to fully offset the rooftop PV output of the average customer, particularly later in the afternoon. As a result, the average load profile of a solar-battery customer appears as a more flattened version of a duck curve.

These results can be expected to change as the capacity of residential batteries grows.

5.8. THE NEED FOR ACCURATE AND TIMELY DATA

Dynamic network pricing depends on a wide variety of data inputs that differ greatly in their availability, accuracy, and timeliness. The pricing engine utilises various operational, forecasted, and static data related to the network and CER operating within it. This data appears in many forms and from diverse sources, with varying degrees of reliability and detail across the network. Pricing engines must continue to function and generate reasonable price signals even when data is incomplete, delayed, or incorrect.

Future opportunities exist for improved data collection that could enhance the effectiveness of dynamic pricing. This includes more detailed information about CER asset capabilities and limitations, forward-looking operational schedules from batteries and other flexible resources, and granular customer usage patterns beyond basic load profiles. As CER becomes more integrated into electricity markets, sharing intended operational schedules or availability forecasts could allow for better coordination between network management and CER operations.

Many of the data requirements for dynamic network pricing closely match those for dynamic operating envelopes, such as real-time network visibility, understanding of CER capabilities, accurate forecasting, and dependable communication channels. This overlap offers opportunities for integrated approaches where a data infrastructure can support both dynamic pricing and dynamic operating envelopes, lowering implementation costs while giving network operators multiple tools to manage CER integration.

6 FUTURE FOCUS AREAS

Based on learnings from project Edith to date, there are areas in which the project will focus on during the tariff trial and further rollout:

Development of guardrails: Currently, customers are guaranteed that they won't be worse off under Edith trial. This allows a wide variety of pricing strategies to be tested. In the on-market trial and beyond, these customer guarantees will no longer be available. Therefore, comprehensive guardrails are needed to protect customers from excessive price exposure, including duration limits for high-price events (typically 2-3 hours), price caps, and frequency limits.

On-market trial: The next phase will introduce dynamic tariffs to all eligible residential customers who choose to opt in, using insights gained to improve guardrails and pricing methods. This will assess scalability and customer acceptance while progressing towards broader adoption across Ausgrid's network.

Removing weakeners: Trial-specific settings, like artificial constraints, need to be removed for market deployment. This will help the project understand how customers and aggregators react to more realistic prices and frequency.

Refinement to tariff parameters: Trial experience and modelling indicate that the network access charge may need to be increased to better recover costs and minimise cross-subsidies. Dynamic price triggers, scaling mechanisms, default pricing levels, and maximum prices also require calibration based on real-world performance data.

Managing diverse outcomes between locations: The potential for significant variation in pricing outcomes across different locations requires careful consideration of fairness concerns while ensuring that dynamic tariffs remain cost-reflective. This involves refining tariff parameters, such as network access charges, price gaps, and guardrails, and providing information tools for customers and aggregators on the expected value of tariffs in various locations.

Measuring network impacts: Using dynamic tariffs over a more extended period with more customers will provide a clearer understanding of how these tariffs can influence network outcomes during periods of congestion. This helps in evaluating the effectiveness of different dynamic tariff strategies and parameters and recognising the benefits that dynamic tariffs can offer.

Improved forecast capability: Accurate forecasting of network loads, customer responses, and CER performance is essential for effective dynamic pricing. This involves better integration of demand data from various sources and more comprehensive network data, especially in areas with constraints.

Validating results against actual feedback measurements: Transitioning from simulated feeders to real-world deployment necessitates validation through pilot programs on actual feeders with thorough monitoring. Improved measurement infrastructure will facilitate comparison of forecasted versus actual conditions and promote iterative enhancements to pricing algorithms.

Expansion: Dynamic network pricing is currently available only to customers participating in a VPP program with a retailer or aggregator. We plan to expand dynamic pricing to various customer groups and energy resources, including electric vehicles, commercial batteries, and EV charging stations. Launching on the market will also allow more retailers to participate, as we will have full network billing capability, eliminating the current process of post-reconciliation payments. These payments are currently funded through Ausgrid's Demand Management Innovation Allowance.

7 RELEVANT REFORMS

National Electricity Market (NEM) wholesale market settings review[14]

Under this review, a panel has been tasked with "recommend future market settings to promote investment in firmed, renewable generation and storage capacity in the NEM following the conclusion of Capacity Investment Scheme tenders in 2027." This includes network tariffs where relevant for how electricity uses interact with the NEM.

In the draft report, the panel noted that dynamic network tariffs, when combined with dynamic operating envelopes, could offer a cost-effective way to incentivise CER to deliver value to the local network while integrating smoothly into the wholesale market.

The panel also noted that current network tariffs create barriers to the efficient operation of CER, which dynamic network prices could help remove in some situations. Barriers such as current network tariffs:

- may be misaligned with the cost of building the network to meet peak demand, and
- unnecessarily conflict with wholesale market signals.

National Consumer Energy Resources (CER) Roadmap – Redefine roles for market and power system operations – M3/P5[15]

Under the National Consumer Energy Resources Roadmap, the CER Taskforce is considering the roles, expectations and accountabilities for all parties to better harness the value of CER and effectively integrate it into the market.

This review is considering how to formalise and standardise the roles, expectations and accountabilities for parties involved in using dynamic network prices, and considering other options for managing CER on the distribution network, such as distribution level markets.

The AEMC pricing review[16]

The AEMC is currently reviewing how electricity pricing (referring to both retailer offerings and network tariffs) can better support the diverse needs of customers, including enabling CER as part of the energy transition.

One area the review is examining is how new network tariff designs can support retail energy product innovation, which dynamic network prices could facilitate for certain retail offerings.

14 https://www.dcceew.gov.au/energy/markets/nem-wms-review
15 https://consult.dcceew.gov.au/national-cer-roadmap-redefine-roles-m3-p5
16 https://www.aemc.gov.au/market-reviews-advice/pricing-review-electricity-pricing-consumer-driven-future