



Backup Boost Knowledge Sharing

Report #3
30 April 2021

enel x



Overview of the trial

We are proud to partner with the South Australian government to provide support to local businesses by changing the way they use energy.

Enel X and the South Australian government are investing \$2 million each over three years to unlock the potential for cheaper more reliable electricity, supporting backup generator upgrades across a number of South Australian businesses.

The upgrades will be partially funded by the South Australian government's Demand Management Trials Program, with no requirement to repay, accelerating sites' entry into the market. The remaining costs are recovered from earning revenue under our demand response programs.

This project will upgrade existing backup generators in SA and test the ability to:

- > create an aggregated portfolio of fast-responding, dispatchable generation
- > improve liquidity in the contract market
- > show that demand response can bring financial benefits to participating businesses and consumers more broadly.

This is the second of a number of knowledge sharing reports we will publish to share our findings on the effectiveness and challenges of using backup generation in the wholesale market and to sell financial products.

Meeting the objectives of the trial

The purpose of the trial program is:

To show how businesses' existing backup generators can provide dispatchable demand response capacity in the NEM and to assess the viability of selling a cap product in relation to the aggregated generation capacity.

The first year of the trial focused on recruiting customers. We spoke with a lot of South Australian businesses over the year and found that many have a strong interest in using their backup generators more flexibly and benefitting from opportunities to participate in the spot market.

Enel X now has over 6 MW of dispatchable capacity contracted for participation in the trial program. This generator capacity is located at four sites for businesses in the materials manufacturing, food manufacturing and cold storage sectors. An outline of the lessons learnt and trial outcomes to date is set out in this report.

The next stage of the project will focus on:

- > enrolling more businesses for participation
- > enabling recently signed sites for market participation
- > offering that capacity into the market over the winter period
- > continuing to sell a cap product in relation to that capacity.

Trial outcomes to date

Customers recruited

Enel X now has over 6 MW of dispatchable capacity contracted for participation in the trial program using backup generators. These generators are located at four sites owned by businesses in the materials manufacturing, food manufacturing and cold storage sectors.

All customer sites have on-site backup generators to ensure continuous operations in the event of a power outage. These generators have been upgraded by Enel X, and other metering and communications equipment has been installed to enable those sites to participate in Enel X's virtual power plant (VPP). Participation in the VPP enables the customers to receive a greater return from their generator assets whilst contributing to grid reliability in tight supply/demand conditions.

Enel X continues to engage with identified customers and prospect for new customers to join the program.

Dispatch events

Trial participants' generator capacity is offered into the market as soon as Enel X has completed all site enablement activities. Enel X now has over 5 MW of capacity enabled for market participation through this program.

There were two dispatch events in the reporting period, in January and March 2021. Dispatches tend to occur when spot prices are high because of tight supply/demand conditions across the grid. For the two dispatch events so far this year, these conditions were experienced due to a combination of hot weather, low wind output, large generator outages and transmission line outages.

All enabled customers participated in both events.

Event 1: Sunday 24 January 2021 – 17:00 to 20:00 (market time)

Sunday 24 January saw very high temperatures across South Australia, reaching 42.7°C in Adelaide – the highest all summer. Daily maximum temperatures had been above 30°C since the Wednesday, and so demand was high across the state.

Temperatures were also high in Victoria, driving high demand. Supply was also tight, with low wind conditions meaning South Australia was unable to rely on any significant generation import from Victoria. AEMO published a lack of reserve notice in the afternoon, indicating to the market that there was a shortfall of reserve capacity in the system. Following the trip of some transmission lines, AEMO published another lack of reserve notice, indicating that only 213 MW of reserves were available.

Fortunately, the SA system was able to meet demand that day without AEMO intervention. However, the lack of spare capacity led to high spot prices across the afternoon and into the early evening. Enel X forecasted and dispatched the Backup Boost portfolio for the five highest priced trading intervals, starting dispatch at 17:20 and finishing at 20:00.

Across the event, dispatch prices were as high as \$10,579/MWh and the highest settlement price was \$1,986/MWh.

Event 2: Friday 12 March 2021 – 18:00 to 00:00 (market time)

While temperatures on this Friday were slightly warmer than initially forecast, this was not a major contributing factor for the dispatch event. The main drivers were:

- > Lower than expected wind conditions and no solar PV output after the sun went down, meaning overall output from renewables was close to zero.

- > An unexpected equipment failure at the Torrens Island high voltage switchyard, which forced off around 670 MW of capacity from the Barker Inlet and Torrens Island Power Station B generators. AEMO declared lack of reserve conditions soon after as a result of the loss of capacity.
- > Imports from Victoria were down by about 150-200 MW due to pre-planned transmission works on the Heywood interconnector between South Australia and Victoria.

Fortunately, the SA system was able to meet demand that day without AEMO intervention. However, the lack of spare capacity led to prices spiking for the 12 trading intervals between 18:00 and 00:00. Enel X forecasted and dispatched the Backup Boost portfolio for all 12 intervals.

Across the event, dispatch prices were as high as \$15,000 and the highest settlement price was \$14,348.15.

Financial performance

Trial participants received energy-only payments in accordance with their contract with Enel X for the two dispatch events in Q1 2021.

Enel X also sold 1 MW of caps for Q4 2020 and 3 MW of caps for Q1 and Q2 2021 against the participants' generator capacity. Cap products provide a firmer and more reliable source of revenue for customers because it means they don't have to rely on energy-only revenue if, and when, high price events occur.

Overall, the portfolio's financial performance during the reporting period was strong. Q4 2020 revenue was substantially higher than Q3 due to improving spot market prices, which are generally expected in Q4. We also achieved relatively strong cap prices in Q1 2021 by selling near the end of December, resulting in a strong Q1 revenue. However, cap prices collapsed to historically low levels by the end of January 2021, due to a much cooler summer than normal and higher than expected wind output in South Australia.

Lessons learnt to date

The opportunity is big, and interest is strong

Since the trial program started, Enel X has searched across South Australia's commercial and industrial sectors for sites that might be suited for participation. Businesses have approached Enel X directly, too. This has unearthed a great number of businesses that have backup generator capacity and are interested in an opportunity to maximise the value of that investment.

Conversations with customers have expanded to discussions about the future of the energy grid and the NEM, and the need for alternative supply sources including virtual power plants. This shows a genuine interest in the energy system and the objectives of the demand management trials program.

However, not all sites are suitable for participation

We have had a significant amount of interest in this project from a range of businesses, with many contacting us and keen to be involved. However, not all sites are suitable for participation. Many have been deemed technically and/or commercially unviable for a range of reasons, including:

- > The site doesn't already have a generator, and the cost of installing one would be prohibitive.
- > The site has an old, under-sized or poorly maintained generator.

- > The cost of connecting the generator to the network is prohibitive (explained further below).
- > The site has a solar PV system and/or reduced operations, which means the generator would not have much load to support during an event.
- > The site has a peaky or unpredictable load profile.

Since the program started we've learnt a lot about the types of businesses that are likely to encounter the above issues. This has helped us narrow down which types of sites are likely to be best suited for participation in the trial.

Many businesses are also interested in battery storage solutions.

It's important to really understand the site's load profile

A stable and predictable level of demand is important to be able to rely on the customer to provide the anticipated level of demand response.

While the manufacturing sites' operations can be quite variable within a day, their year-round load profiles are relatively predictable, including through summer. The cold storage site provides storage and distribution services for frozen products to customers across South Australia. Cold storage facilities tend to have a fairly stable baseload demand year-round, dipping slightly in the winter months due to lower ambient temperatures, and increasing between November and March when more cooling is required.

Our experiences so far have shown that we need to have a very accurate and detailed understanding of the site's load during expected dispatch timeframes (e.g. late afternoon to early evening) and the generator's likely output.

We now conduct more comprehensive tests before enrolling a customer. To do this, we request consumption data for the individual loads on site, as well as interval data at the gate/parent meter, including any customer SCADA data available, for the past 12-36 months. This information helps to manage both our expectations and customers' about what demand response capability will be available when an event occurs.

The costs of connecting a generator to the network is a significant barrier

We have found that network connections are the most significant barrier to participation. A network connection is required if the customer wants to earn additional revenue from exporting energy, rather than just displacing their load.

The cost of connections, and therefore the financial viability of export, can vary greatly depending on the geographic location of the site within the network, and whether generator export is permitted.

If there are constraints on the network, the network service provider may either:

- > not permit any additional generation to connect, or
- > require the installation of additional protection and control solutions.

This appears to be particularly the case for sites in the Adelaide CBD.

Protection and control solutions increase the cost of site enablement substantially. So, even if connection is technically achievable, the costs of connection can deem many projects financially unviable.

Therefore, Enel X's ability to recruit customers with grid export capability is limited. We are now focusing our attention on sites that would not require significant network connection works.

It's important to identify the decision makers early

Another lesson we have learnt is the need to progress as quickly and efficiently as possible to a business's decision makers. Sometimes the interest shown by staff at the site level is not matched by higher management, who may not see participation in the trial as a business priority.

If we are able connect with the right people within each business early on, we are likely to get a better understanding of the priority of program participation compared to other business objectives and see a faster turnaround for decision-making.

This was particularly challenging during 2020, as the COVID-19 pandemic diverted management attention away from opportunities like this to focus on core business activities.

Dispatch performance will be lower on days when the site is using less electricity

While it will depend on the individual business, many commercial and industrial customers have Monday-Friday operations, using less electricity overnight and on weekends.

The January dispatch event occurred on a Sunday evening, and the March dispatch event occurred on a Friday night. Some participating customers were therefore using less than normal levels of load at the time. For sites with no export potential, backup generator capacity is used to support site load during a dispatch event. If there is not much load being used at the time, the amount of generator capacity dispatched to serve that load will be lower.

It is still preferable to dispatch a site during an evening or weekend event, even if they can't give their full nomination due to low demand at the time. However, we have learnt that we need to communicate better with customers ahead of time so that all parties have a clear understanding of the site's expected performance in the dispatch event.

Strong communication with customers before and during an event is vital

Several customer sites experienced issues with their technical capability to respond to the two dispatch events in early 2021. This included a technical failure at one site and system configuration issues. As a result, the portfolio's performance during both events was not as strong as we expected.

These issues highlight the inherent unpredictability of an individual load. But it has also shown that we need to communicate better with customers to make sure we are aware of any issues on site before or during an event, and therefore have a clearer understanding of expected performance. Feedback from participants has also indicated that customers are keen to learn about their performance as soon as possible after an event, which we have taken onboard.

Finally, whilst the sites are now largely remotely operated by Enel X, customers still appreciate receiving notification of potential events, as there can be a few minutes of interruption when the generators are starting up and site operations switch from grid supply to backup generator supply. This also gives customers time to ensure adequate fuel levels and to make sure that all hardware is working.

These are important lessons that we will apply to all participants in the Backup Boost program.

Impact of dispatch during high solar PV output

Enel X dispatches the generators during periods of forecast high spot prices. High spot price events usually coincide with periods of high forecast demand (due to weather) and periods of low wind and/or low solar PV generation output. These periods tend to occur in the late afternoon to early-mid evening when there is lower solar PV output than during the middle of the day.

That was the case in the two dispatch events in January and March 2021. Both events occurred in the late afternoon and evening when solar PV output across the grid was low or zero. As a result, we are not yet able to comment on the impact of the portfolio's operation during periods of high solar PV output.

Individual customer experiences

Feedback from the customers we have signed has been generally positive.

Enel X's ability to recruit trial participants has been supported by positive experiences of working with Enel X in other jurisdictions or demand response programs. One of the manufacturing customers cited positive experiences from being enrolled in a previous demand response program with EnerNOC (now Enel X) in 2010-11. The same customer also cited positive experiences with Enel X at one of their sister sites enrolled in a demand response program in Western Australia.

As noted above, interest from potential trial participants is strong and many are eager to participate provided their site is technically and commercially viable.

Sites that respond automatically to an Enel X dispatch instruction generally deliver stronger dispatch performance. Sites that retain manual control can take up to 10 minutes to turn on their generators, whilst automated sites can respond within 1-2 minutes of a price spike. Automated sites therefore deliver greater certainty and speed of dispatch, which means we can negotiate more favourable pricing for this capacity.

Customers have appreciated our regular and timely communication about market conditions and the likelihood of dispatch events. On a broader level, customers see participation in Enel X's VPP as a win-win. It enables them to access a new revenue stream and contribute to the reliability of the grid on days of high demand and / or supply shortfalls.

Patterns in customer experience

As it is still early in the trial program and we have relatively few participants, we are not yet able to identify any clear patterns in customer experience across industry sectors, generator size or geographic location. We hope to do so in the later stages as more businesses are enrolled and enabled for market participation.

However, our experiences to date indicate that:

- > sites that have a stable and consistent load during high demand periods, in both summer and winter, are likely to be better performers in this program
- > sites located in the Adelaide CBD are likely to experience greater barriers to participation if export capability is sought, given network constraints in the area
- > most customers appreciate being able to earn a predictable and steady revenue stream via availability payments, and recover their costs when required to run their generators during dispatch events
- > in most cases, potential customers with more than 5 MW of generation capacity are likely to come across additional time and cost challenges to navigate AEMO's generator exemption process.

Many commercial and industrial businesses have standard retail contracts, which do not include exposure to the wholesale spot price. While the backup generators on site certainly provide protection against power outages and brownouts/blackouts and allow business continuity, they don't provide an explicit hedge against price volatility if the customer is on a standard retail contract.

In future we may recruit customers who have some degree of exposure to wholesale spot prices. If so, we will provide an update on whether their backup generators are effective at being used as a hedge against wholesale price volatility.



Businesses prefer firm availability payments

Enel X's standard pricing structure is to provide businesses with a steady and ongoing stream of "availability payments" for their capacity, and then "energy payments" to cover the costs of running the generators, such as fuel. An alternative is to offer no availability payments but higher energy payments during dispatch events, typically when spot prices are forecast to be high.

We have found that most prospective participants prefer firm availability payments over energy-only payments for energy delivered during events. Like most businesses, they prefer ongoing and predictable revenue streams year-around as opposed to uncertain but potentially very lucrative energy payments.

Sale of cap products, and impact on contract market liquidity

Enel X sold 1 MW of caps for Q4 2020, and 3 MW of caps for Q1 and Q2 2021.

Cap products provide a firmer and more reliable source of revenue for customers than energy-only payments, which are only paid if, and when, high price events occur.

The challenge with selling caps relates to the price of the cap at the time you sell it. Higher cap prices mean higher revenue, but there is always a risk involved in attempting to sell at the right time. Instead of trying to predict price movements in the caps market, we've found it is better to sell as soon as sites have been enabled and the MW have been demonstrated. This "dollar cost averaging" approach guarantees some revenue and allows us to balance out the instances where we sold low against the instances where we sold high.

At this stage, while the portfolio is still relatively small, we are not able to draw any strong conclusions about the impact of the sale of these cap products on liquidity in the contract market.

To find out whether your business can be a part of this program, get in touch with our team at info.enelxanz@enel.com.