



Alkimos Beach Energy Storage Trial Final Knowledge Sharing Report

July 2021
Prepared by Synergy

This project received funding from the ARENA Emerging Renewables Program. The views expressed herein are not necessarily the views of the Australian Government, and the Australian Government does not accept responsibility for any information or advice contained within this report.

About Synergy



Synergy supplies reliable and affordable energy to more than one million residential and business customers across Western Australia (WA). The largest gas and electricity provider in the state, Synergy is also a major electricity generator with operations spanning an area known as the South West Interconnected System (SWIS). The SWIS extends from Kalbarri in the north, to Kalgoorlie-Boulder in the east and to Albany in the south.

Synergy has a diverse generation portfolio including various renewable assets located in Albany, Bremer Bay, Coral Bay, Geraldton, Esperance, Kalbarri and Hopetoun. Owned by the WA Government and represented by the Minister for Energy, Synergy proudly supports the people of WA and plays an active role in the projects and communities in which it operates.

About DevelopmentWA



DevelopmentWA is the Western Australian State Government's development agency. Operating throughout WA, DevelopmentWA have a unique capacity to shape and create sustainable developments for tomorrow. Their comprehensive development portfolio ensures WA is firmly positioned for growth as they create the best places for people to live, work, visit and do business. DevelopmentWA are shaping WA's future by

designing and developing connected communities, prosperous industry and resilient regions. From unlocking industrial land to create jobs, to designing and developing new urban infill projects, their work is at the heart of WA's growth. As an innovative and sustainable corporation with a comprehensive portfolio, DevelopmentWA will develop priority government projects to drive growth and prosperity across the state.

About Lendlease



Lendlease is one of the world's leading fully integrated property and infrastructure solutions providers. Lendlease has been creating large-scale, master planned urban communities in Australia for more than 50 years. They have built strong

expertise in areas such as: community enterprise; education; creating town centres; economic development; environmental initiatives; and affordable housing.

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Acronyms, Abbreviations/Definitions

ABEST	Alkimos Beach Energy Storage Trial
AMI	Advanced Metering Infrastructure
ARENA	Australian Renewable Energy Agency
CESS	Community Energy Storage System
PDS	Peak Demand Saver
PV	Photovoltaic
SSR	Synergy Smart Response
SWIS	South West Interconnected System
ToU	Time of Use
WA	Western Australia
WEM	Wholesale Energy Market
WPC	Western Power Corporate



1. Executive Summary

From April 2016 to 31 May 2021, Synergy in collaboration with Alkimos Beach development partners Lendlease and DevelopmentWA, led a project to trial community-scale energy storage.

This project aimed to demonstrate the feasibility of a new energy servicing model that virtually connects individual household solar photovoltaic (PV) systems with a community-scale energy storage system. The trial took place in Alkimos Beach, a multi-award winning 6 Star Green Star residential community in Perth's northern suburbs.

The Alkimos Beach Energy Storage Trial (ABEST) received \$3.3 million in funding (gross of tax) from the Australian Renewable Energy Agency (ARENA) through its Emerging Renewables Program.

Utilising energy storage technology at a residential community level makes this trial the first of its kind in Australia.

For the five-year duration of the trial, a combination of five key initiatives were tested. These were:

Five key initiatives:

1

An Energy Smart Home Package – including a participant rebate towards an energy efficient hot water system and a minimum 1.5 kW solar PV system (mandatory building requirements) and further rebates for additional energy efficiency devices

2

Community-scale energy storage using a lithium-ion energy storage system

3

New electricity retail products and services

4

New metering and data platforms

5

An educational 'eco-coaching' behavioural change program to help participating residents effectively manage their energy usage and assist to reduce their overall electricity consumption

Residents in Alkimos Beach were invited to join the ABEST and over the trial period, more than 100 households participated which met the targets outlined in the agreement with ARENA.

The trial successfully leveraged new technologies such as battery energy storage, solar PV and smart meters in conjunction with new retail tariffs and with the support of an educational behavioural change program.

A key learning point derived from pairing the newly created Peak Demand Saver Plan (PDS) with the virtual battery offering was that it did not encourage participant behaviour to reduce peak household consumption. This led to the conclusion that virtual battery products are best for customers who export in the middle of the day and consume in peak times.

Additionally, the utilisation of the community battery storage during these peak periods reduced demand on the network, which proved to provide benefits to system security and Synergy as an electricity retailer.

Participating households that had access to the virtual battery on the PDS collectively saved over \$81,376* on their electricity costs over the duration of the trial.

Overall, the ABEST fulfilled the key objective to test the feasibility of a new servicing model; delivered economic and non-economic benefits to participants, Synergy as the electricity retailer and LendLease as the property developer; and provided learnings to shape the future of land developments with large-scale community energy storage.

*These savings have been calculated by comparing the costs all participants incurred on the ABEST with the costs those participants would have incurred on the standard residential government regulated Home Plan (A1) while they were participating in the ABEST.

Key recommendations from the ABEST for future project are:

1

Promote and install Advanced Metering Infrastructure (AMI)

2

Have regular and transparent collaboration with stakeholders and counterparties

3

Utilise larger sample sizes and asset capacity

4

Make customer engagement and information transparency key

5

Explore new tariff structures

2. Project Background

The innovative ABEST which trialled large-scale community energy storage has been a joint initiative led by Synergy in collaboration with Alkimos Beach development partners Lendlease and DevelopmentWA. The ABEST received \$3.3 million in funding (gross of tax) from ARENA through its Emerging Renewables Program.

The five-year trial commenced in April 2016 and is understood to be an Australian-first in trialling large-scale community energy storage. It aimed to demonstrate the feasibility of a new energy servicing model that virtually connects individual

household solar PV systems with a community-scale energy storage system at Alkimos Beach, which is a multi-award winning 6 Star Green Star residential community in Perth's northern suburbs.

Project Summary

The ABEST aimed to demonstrate the feasibility of a new energy servicing model that virtually connects individual household solar PV systems with a community-scale energy storage system.

It combined community-scale battery storage, high penetration rooftop solar PV and energy management within the new residential community of Alkimos Beach in WA.

Need

The ABEST recognised there were no existing tariffs to allow community energy storage to discharge into electricity networks.

There was also a need to better understand the electricity supply reliability provided by a combination of renewable energy generation and integration (enabling) products.

Five key initiatives were included as part of the ABEST:

1

The installation of an Energy Smart Home Package in over 100 residences over the life of the pilot, with each package including a rebate towards an energy efficient hot water system and a minimum 1.5 kW solar PV system (mandatory building requirements - average size of solar system installed was 2.5 kW), and further rebates for additional energy efficiency devices

2

The design, manufacture and installation of a fully contained lithium-ion energy storage system of 1.1 MWh (the Community Energy Storage System (CESS)) that was connected to the distribution network and capable of being charged by energy exported from solar PV systems owned by trial participants

3

The development, deployment and testing of new electricity retail products and services

4

The installation of residential smart meters and associated telecommunications infrastructure

5

An educational 'eco-coaching' behavioural change program to help participating residents effectively manage their energy use and assist to reduce their overall and peak electricity consumption

The idea behind the model was to drive benefits for the electricity system as a whole and for individual users connected to it. From a system perspective, discharging a storage device of sufficient size during peak load times reduces overall generation requirements and may obviate the need for expensive investment in large-scale generation plants to meet electricity demand in peak periods. By smoothing load and balancing out some of the peaks and troughs of the daily demand profile, a community battery may also reduce pressure and wear on existing transmission and distribution lines and lower maintenance costs.

From a customer perspective, those who generate excess electricity from their rooftop solar PV system during the day could be granted a credit for the net energy created. It may be possible for the consumer to draw down that credit at a later time from the community battery, particularly during peak demand periods, to reduce the amount of electricity for which they are paying higher, peak rates.

To better understand Alkimos Beach residents' attitudes towards and experiences of ABEST, customer insights research was undertaken in 2018, with a public report published in February 2019. This report provided a summary of the elements of the project and a broad view of lessons learned.

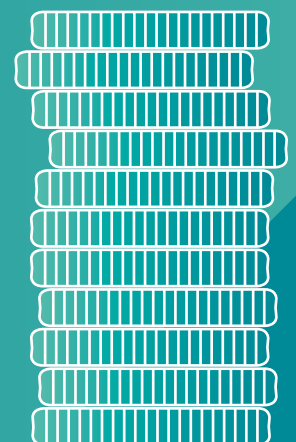
5 year trial period
April 2016 - May 2021



1.1 megawatt hour battery

Unlimited virtual* battery storage per customer

\$11/month
storage fees



Note: Icons are a representation only.

* A virtual battery means there is no physical battery connected to the premises storing electricity generated.

Individual customers are allocated virtual storage capacity in the battery as per the terms and conditions applicable to the ABEST.



Location: Graceful Blvd between Crowned Way and Tristan Way

3. Site Selection and Deployment

At the centre of the trial was the 1.1 MWh battery, which is housed in a shipping container and connected to the electricity network to transmit and distribute electricity to the Alkimos Beach development. During the trial and into the future, the battery will manage peak demand within the suburb by charging from the network during periods when demand is low (early afternoon and overnight) and discharging during peak demand periods (late afternoon and early evening).

A high-level overview and key lessons learnt during the design, construct and commissioning of the battery storage system are outlined as follows.

3.1 Site Selection

Alkimos Beach is a multi-award-winning community located in Perth's northern coastal corridor. It was the first development in WA to achieve all six leaves of the Urban Development Institute of Australia's EnviroDevelopment certification. It is Australia's first 6 Star Green Star community and is the first to recertify under the Green Building Council of Australia's rating.

It is part of the biggest and most significant coastal development north of Perth in 50 years. Through innovative planning and design, Alkimos Beach blends the natural environment with an authentic coastal development.

With the vision of working towards a carbon neutral community, Alkimos Beach has been recognised for its determination to deliver long term economic, social and environmental sustainability and offers a myriad of sustainable lifestyle options for people of all ages.

The sustainable and environmentally conscious community, who had expressed an interest in exploring emerging technologies and ways to reduce energy use, is a key reason for its selection for the trial. It was also a mandatory requirement that all homes in the trial suburb were built with energy efficient hot water systems and solar PV systems.

Within Alkimos Beach, the site selected for the CESS is located on Graceful Boulevard. This falls within the buffer zone for the wastewater treatment plant owned and operated by the Water Corporation. The selected site enabled the CESS to be located in the community without intruding upon residents' potential views.

Alkimos Beach achieves a new benchmark for sustainable living, purposefully designed in harmony with its natural surrounds.

A myriad of sustainable lifestyle options encourages people of all life stages to build a community together, one that is working towards carbon neutrality.

Alkimos Beach takes a long-term view to ensure the commercial, retail, employment and lifelong learning opportunities created today are relevant and sustainable in the future.

6-Star Green-Star Living



Alkimos Beach is the first Australian community to achieve a 6-Star Green-Star certification by the Green Building Council of Australia.



All homes at Alkimos Beach come with an Energy Smart Home Package to set customers up with energy efficient technologies, including solar panels to help customers save on their energy bills.



Over 80% of the lots at Alkimos Beach have good solar orientation ensuring that residents can make the most of the climate for solar energy generation for their homes.

Lessons Learnt

- Consider sites when subdivisions are at the planning stage, allowing development to consider the inclusions of the CESS in their planning.
- Ensure all aspects of site selection are considered to address all potential risks including:
 - safety for residents;
 - safety of personnel;
 - security of the CESS;
 - accessibility to sufficient energy infrastructure;
 - distance from community infrastructure such as parks and schools;
 - size and nature of building requirements;
 - approval and regulation compliance;
 - land ownership/availability on appropriate commercial terms;
 - proximity to residential housing;
 - community reactions and sentiment; and
 - site costs.
- Engage the community early in site selection. The community should be consulted and actively participate in the site selection process. Community sentiment and engagement at every stage of the project including site selection contributes to project success.
- Due to the unique nature of the CESS construction, as well as it being a new concept, early engagement with local government agencies and regulatory bodies is key. Early engagement in the process, even if a site has not been selected or short-listed, can assist with education and navigating the process. Involvement can also help shape future policy and processes.



3.2 Approvals and Regulations

The CESS had to meet several regulatory requirements. These related to construction (building permits), environment, planning and safety. The main obstacle for the CESS was that no precedent existed for the construction and operation of a CESS.

Lessons Learnt

- Planning processes and approvals vary across regions and parties are unlikely to be familiar with this type of proposal. New types of proposals such as community batteries have not been contemplated and there are also no policy frameworks to guide decision-making. As such, early engagement with planning stakeholders is key.
- Provide regular updates to regulatory authorities and stakeholders and where possible, provide visual aids to allow for early clarification of roadblocks and information gaps. The creation of a visual animation of the site proved to be an extremely effective tool and significantly assisted in approvals from authorities and the residents regarding the look of the CESS in the community.
- The aesthetics of the CESS was an important consideration for the local council. Any infrastructure needs to be sensitive to its surrounding environment and the community needs. The CESS shipping container and fence had branded signage to provide context for residents and acknowledge the importance of the trial.



3.3 Network Connection

The CESS was required to be connected into the SWIS. The SWIS is owned and operated by Western Power Corporation (WPC). A number of criteria and obligations contained in the Technical Rules must be met and complied with for any infrastructure to be connected to and operate in the SWIS.

WPC's indicative timeline for network connection did not align with the operational, political and ARENA constraints of the ABEST. This led to a strategy workshop with Synergy and WPC representatives around the ABEST requirements, resulting in a reduction in the proposed timeframe.

Lessons Learnt

- Collaborate closely with the network operators and stakeholders and use iterative processes to determine timeframes, responsibilities and dependencies to address time constraints. If appropriate, consider broadening your risk appetite to achieve the required outcome. By following established and proven procurement and operational standards, risks can be minimised.
- Transmission and network operators can greatly assist in the successful implementation of an asset into the network. However, regulations for secure and safe infrastructure must be adhered to in any accelerated process.
- Treat the cost of network connection for new technologies as either provisional sums or apply a separate contingency for those costs due to the high level of uncertainty.

4. Product Capabilities

The trial enabled the ability to improve participant understanding and interest in a community battery product, while providing insights and learnings from the benefits delivered to participants from a shared storage solution.

This section details the key learnings and insights around customer recruitment, products, services and community engagement.

4.1 Energy Smart Home Package

All homes at Alkimos Beach received a \$4,150 Energy Smart Home Package that included energy efficient technologies.

The Energy Smart Home Package included:

- \$2,500 rebate towards a minimum 1.5 kW solar PV system (average size installed was 2.5 kW and increased over time);
- \$1,200 rebate towards a gas or electric boosted solar hot water system or a heat pump;
- \$300 rebate towards an energy efficient air-conditioning system; and
- An energy monitoring device valued at \$150.

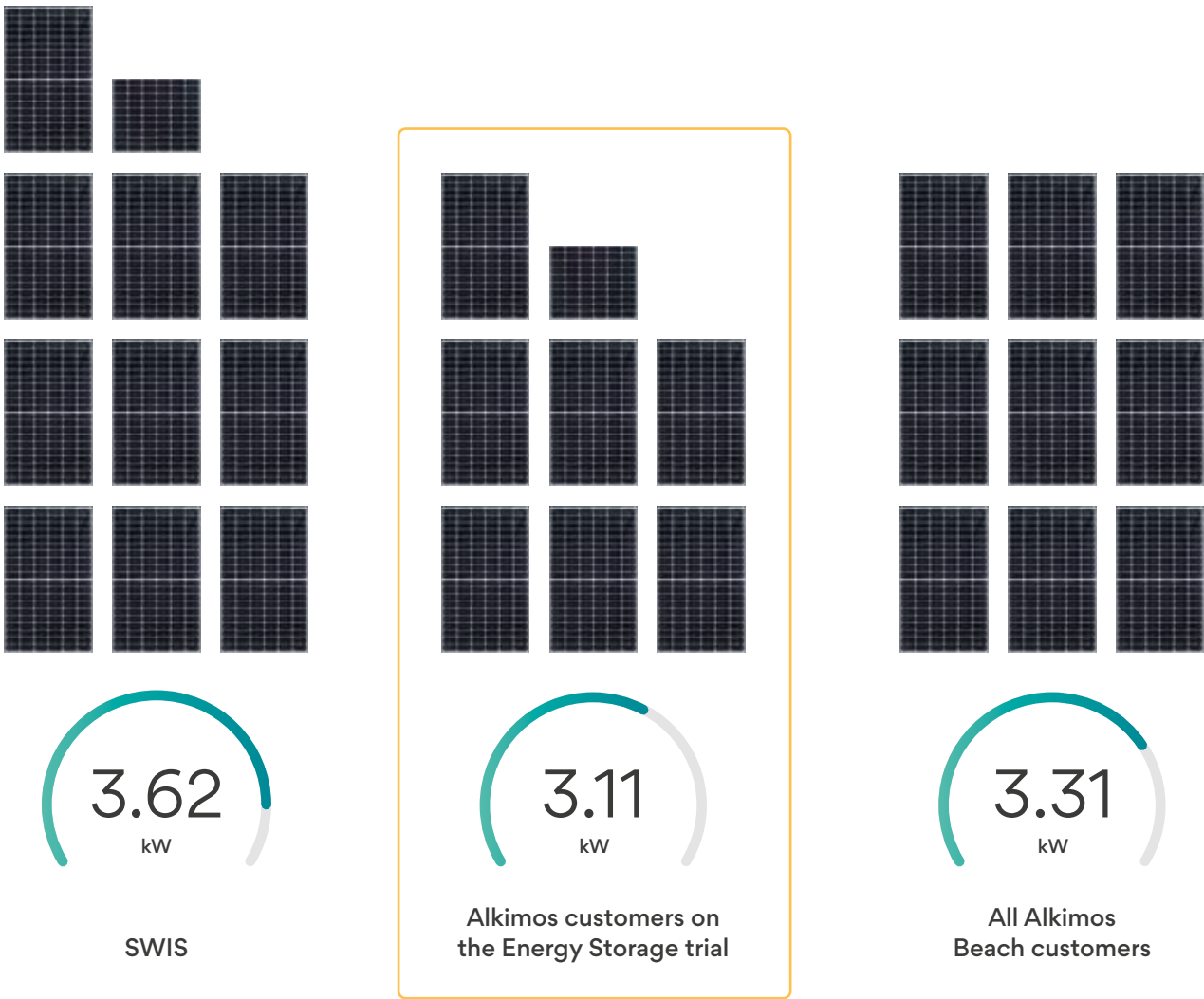
For all homes built in the Alkimos Beach development, installing a solar PV system and an efficient hot water system was mandatory. This was one of the reasons Synergy chose to partner with Lendlease and DevelopmentWA, as high solar penetration was guaranteed.

Lessons Learnt

- Even though it was mandatory for all homes built at Alkimos Beach to install a solar PV system and residents received a rebate to cover the installation cost, controls need to be in place to ensure households install the required systems.
- Some households could not participate as their solar PV system was not large enough to ensure they would benefit on the PDS as a Time of Use (ToU) tariff. Further promotion of the package was done after the trial had commenced but as this mandate applied to the whole development, it was deemed inappropriate to raise the minimum required system size.



Average system sizes*



*Average solar PV system sizes of Synergy residential customers as at 1 February 2019.



All homes at Alkimos Beach receive a \$4,150 Energy Smart Home Package

4.2 Retail Tariffs Model

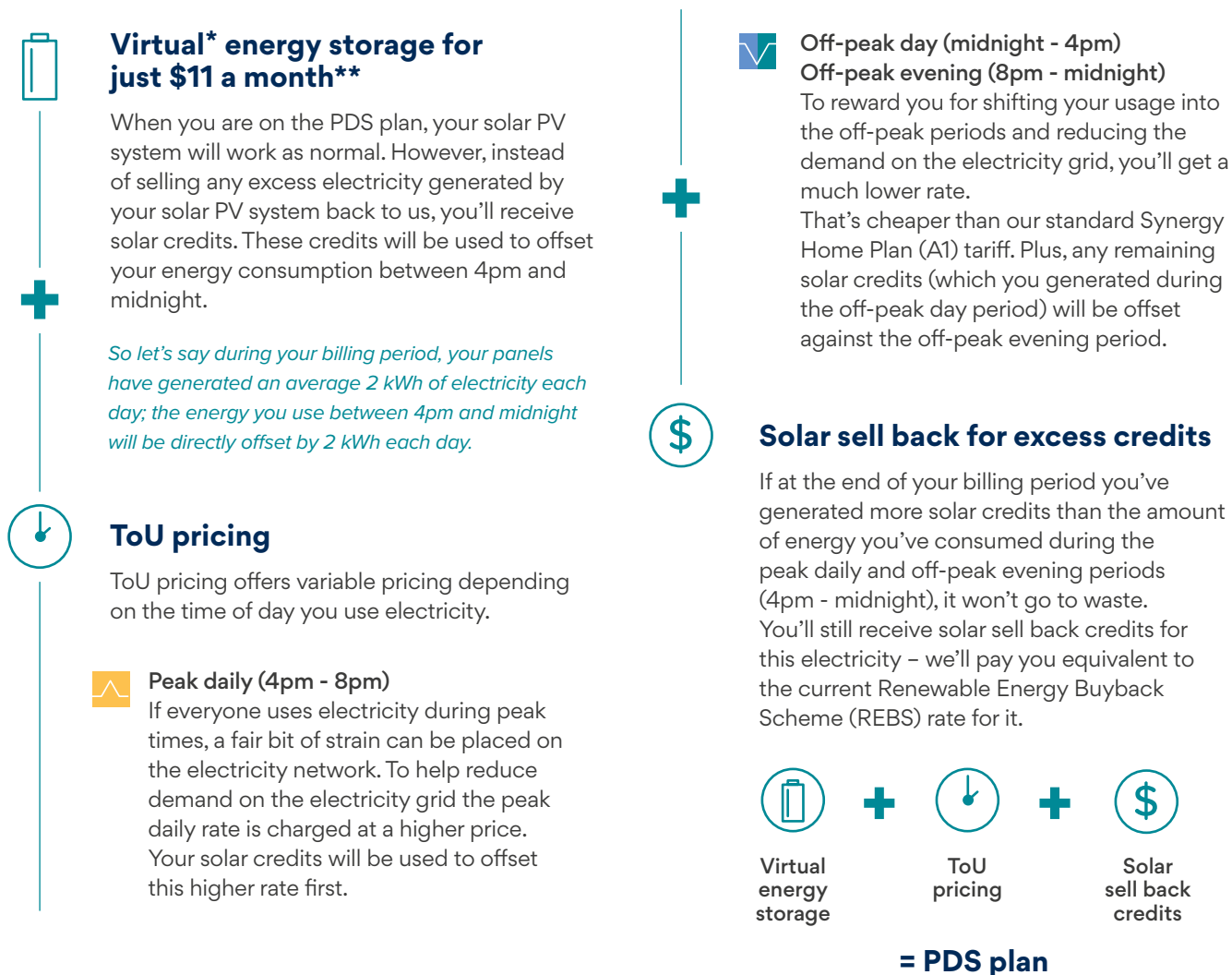
The electricity tariff that applied to all ABEST participants was a simple ToU tariff called the PDS. The PDS enabled participants to virtually store excess electricity generated by their solar PV system, providing them with the benefits of a battery storage solution without the up-front costs.

The plan had two rates across three time bands: off-peak day; off-peak evening; and peak daily.

During off-peak periods, participants were charged a lower electricity usage or consumption rate. This encouraged electricity storage during off-peak times.

The PDS included an \$11 per month battery storage fee. Instead of selling any excess electricity back to Synergy, participants generated solar credits to offset their usage, in the first instance during the peak daily time band.

Here's how it works.



PDS time band pricing

Time bands	Rate
Off-peak day (midnight – 4pm)	26.8145 c / kWh
Off-peak evening (8pm-midnight)	26.8145 c / kWh
Peak daily (4pm-8pm)	51.1995 c / kWh

* A virtual battery means there is no physical battery connected to the premises storing electricity generated. Individual customers are allocated virtual storage capacity in the battery as per the terms and conditions applicable to the ABEST.

**Terms and conditions and eligibility criteria apply. Pricing as at 1 July 2019.

Lessons Learnt

Product Development

- Interval meter energy data was only available after the installation of a smart meter, resulting in delays in data acquisition and analysis to determine participant consumption profiles and the effectiveness of the tariff as well as solar PV system designs.
- Participants in Alkimos Beach had metering which required manual reads and off-market data that was used to inform trial suitability. The advancement of smart meters and AMI technology allowed for greater understanding of participant consumption behaviour to assess their suitability on the tariff and trials. In addition, utilising AMI and its ability to read data at a 30 minute interval with remote technology provided greater understanding and validity of data.
- Developing a compelling retail product proposition focused on simplicity and using a customer lens helped to develop a holistic value proposition that resonated with the target audience and delivered on expectations.
- Insights into customers' interval data and consumption behaviour and patterns can be utilised to assess who will benefit from future investments in a behind the meter battery solution.

Energy Education

- Community engagement and energy coaching sessions were an important component of rolling out a new retail product as it gave Alkimos Beach residents key insights into managing their electricity usage and potentially reducing their overall consumption. These sessions:
 - Introduced participants to the new ToU construct with the PDS; and
 - Expanded on participants' limited knowledge of solar PV, battery solutions and average system sizes.

Product Launch Timing

- The project was launched in April 2016. A colder, wetter and more overcast winter in 2016 (1.3 degrees lower in temperature compared to 2015) saw a seven per cent increase in energy use and a decrease in solar generation across Perth, which reduced potential savings for participants and subsequently saw a number of participants leave the trial. As such, launching in Spring or even Summer would have likely provided a greater opportunity for participants to save as solar PV system energy generation is at its highest.



4.3 Direct Load Control Product

The Synergy Smart Response (SSR) program focused on household air conditioners and their contribution to peak demand on the electricity network. Direct Load Control technology was used to manage the peak load on the network and can potentially provide savings to households on their energy bills. Remote signals were used to link Demand Response Enabling Devices to existing air conditioners, resulting in the ability to manage air conditioner performance, which can be an effective way to reduce electricity demand during peak demand periods.

The SSR program allowed participants who opted in to reduce their electricity costs, through a \$200 incentive payment applied as a credit on their bill for each year they participated in the trial.

The SSR program aimed to recruit 10 to 15 trial participants. Participants underwent an eligibility assessment to ensure the technology would work in their home and circumstances. The assessment found that many households were unsuitable for the program due to air conditioning units not meeting the standard requirements. As a result, eight households participated in the SSR program.

Lessons Learnt

- High penetration of suitable air conditioners (AS4755 standards) was anticipated, however, only 54 per cent of trial applicants were eligible to participate in the program.
- Installation of the required hardware and software takes up to four hours during which the participant must be present at the property. This proved to be a barrier to participation in the program.
- Participants were more likely to be available at weekends which carried additional installation costs.
- Participants at Alkimos Beach appeared less likely to use their air conditioners during SWIS peak events. This was likely to be a positive result of the sustainable planning and programs employed at Alkimos Beach, leveraging environmental factors to implement passive cooling techniques.
- Some participants reported reduced performance of air conditioners, however, upon investigation it was confirmed coincidental.
- Surveys were sent to participants after each peak event to assess their experience and feedback. Engagement response to these surveys was very low.
- Wifi connectivity was not always reliable. The load control technology relied on home wifi which often disconnected and needed to be reset by the participant. Time and resources were spent troubleshooting the participant's site and communications to get them back online.
- It is recommended that alternative connectivity options or backup connectivity is considered for future smart response program trials.



5. Success Factors and Barriers to Trial Participation

5.1 Recruitment

Every Alkimos Beach resident was able to access the Energy Smart Home Package, which offered rebates for various energy efficient systems and appliances including a solar PV system.

Synergy implemented the marketing for the ABEST's retail products based on considerable analysis and modelling of residents of Alkimos Beach and the surrounding suburbs to determine the main participant types and how best to engage with them about the trial. The marketing required extensive analysis of the suburbs regarding:

- the profile of the residents in terms of their segmentation;
- house configuration (number of rooms, people etc);
- house construction;
- purchaser type; and
- family type.

These details were also collected for a similar type of suburb (control group) that did not all have solar PV systems and could not participate in the trial.

Residents were then invited to participate in the trial on a voluntary basis. Participants were informed they may save on their electricity costs, but it would be dependent on several factors including:

- the size of their solar PV system;
- the household daily usage and consumption information;
- the installation of energy efficient appliances and devices;
- how effectively participants could manage the use of electricity at different times of the day; and
- whether they could reduce the overall amount of electricity used in the home.

Lessons Learnt

- In-person demonstrations built trust and confidence in the community. A large number of residents came for a demonstration of the CESS and to find out how much they might financially benefit from being on the trial.
- Ensure the marketing of any new retail product is conducted as close as possible to the actual launch of the product.
- Access to data is critical to have effective participant selection and targeting that leverages customer segmentation and provides an understanding of the target audience. This also facilitates targeted content and multiple channel recruitment.
- As per the above, product launch timing is crucial. Launching in spring or even summer would have likely provided a greater opportunity for participants to save when solar PV system energy generation is at its highest and therefore would possibly increase the overall uptake of the PDS product. There was initial negative feedback from some participants that experienced a bill shock in winter. This saw a number of participants leave the trial leading to some negative sentiment in the community that had to be rectified over time.
- Recruitment was only successful in the first four years of the trial as it was not deemed beneficial for customers to join at a later stage.
- The customer insights research undertaken found that more customers would have likely installed larger solar PV systems and joined the trial, if they had confidence that the PDS product would have become a permanent offering.
- Leveraging the development partners, Lendlease and DevelopmentWA, in recruitment of the trial through existing communication channels proved essential.

5.2 Community Engagement Program

Residents and trial participants of Alkimos Beach were engaged by Synergy and development partners Lendlease and DevelopmentWA throughout the trial at various touch points, including a trial launch event with ARENA and the Minister for Energy; email communications from Synergy and the development partners; bill inserts; energy coaching sessions facilitated by Synergy and the development partners as part of the eco-coaching program and for focus groups; and surveys.

The trial has also been featured numerous times in local media and was presented on at many local industry and stakeholder events.

Lessons Learnt:

- Engaging with the community early via communication and community events was key to the success of this trial.
- Engaging with the community on a regular basis to keep residents informed and up-to-date on the progress or outcomes of the trial was equally important. Additional community events in subsequent years may have been beneficial to recruit additional households.
- The level of trust by residents towards the community partners seemed stronger than towards Synergy, which is likely to be a result of the strong Alkimos Beach brand. Some eligible residents were sceptical of communications sent by Synergy as they felt that predicted savings may not eventuate. Communicating participant results and customer testimonials by the development partners helped manifest the level of trust in the community.

5.3 Customer Insights Research

Customer insights research was conducted in late 2018. The purpose of the research was to explore the trial from the perspective of Alkimos Beach residents, in order to inform further activities with the current trial, as well as possible future community battery schemes.

The research involved residents who were part of the trial, as well as those who were not, and included a survey developed by Synergy, Lendlease and DevelopmentWA, following two focus group sessions.

The full Customer Insights Report 2019 is available on the [ARENA website](#).

Lessons Learnt:

- The research found a reasonable degree of general awareness and understanding of the trial, however, there was not a high level of detailed understanding of how the product and pricing model worked and how households could maximise potential savings. This appeared to be due to a perception by the majority of respondents that there was a lack of simple, readily available information about the trial, and no easy access to help and advice.
- Cost was noted as the main driver behind the decisions households made about energy appliances (including rooftop solar PV systems) and energy use, but other significant influencers were the environment and 'doing the right thing'. Being a part of the community and developing community relationships did not rate highly as drivers behind signing up to the trial.
- Community attitude towards the ABEST was positive, largely driven by lower electricity costs. The positive sentiment was caveated by research suggesting that participants believed there was room for improvement in the trial.
- Customer messaging about attitudes, interests and general understanding of energy issues and technologies are useful to inform future phases of a trial and other trials or projects of this kind.

6. Pilot Operations and Benefits Realisation

The trial has been successful in providing a better understanding of how community-scale infrastructure, combined with energy efficiency incentives, may help manage and potentially reduce household energy costs and support energy retailers. This section details the insights into participants interval data, consumption behaviour and who may benefit from future investments in community battery solutions.

6.1 Participant Benefits

This section details the key learnings and insights around the financial and non-financial benefits realisation for participants in the trial.

6.1.1 Electricity Costs

Over the entire life of the ABEST project, ~83 per cent of participants benefited from the PDS tariff compared to the alternative regulated Home Plan (A1) tariff. This translated to participants saving a total of \$81,376 during the trial.* The economic value to participants improved the longer they were a part of the trial. The economic benefits to trial participants are summarised in table 1.

Table 1: Economic savings received by PDS participants (ABEST project lifetime)**

Measure	Total
Participants	119
Bills issued	2,271
All participants total savings	\$81,376.00*
Average participant saving	\$683.80*
Average participant saving per bill	\$35.83*
Peak consumption offset	85%

*These savings have been calculated by comparing the costs all participants incurred on the ABEST with the costs those participants would have incurred on the standard residential government regulated Home Plan (A1) while they were participating in the ABEST.

**Figures sourced from Alkimos Beach Project Results Overview and Analysis as at April 2021.



~83%
of customers
benefited from
the PDS tariff

Total participant savings*

Participants collectively saved \$81,376.00* during the trial.



Average participant savings**



\$35.83

Average savings per bill



\$683.83

Average total savings
per customer on the trial

*These savings have been calculated by comparing the costs all participants incurred on the ABEST with the costs those participants would have incurred on the standard residential government regulated Home Plan (A1) while they were participating in the ABEST.

**Trial participant average savings only by occupancy as advised to Synergy over the trial as at March 2021. Calculated by comparing consumption and costs incurred on the PDS and the A1 Home Plan over the same period.

6.1.2 Consumption Behaviour

The structure of the PDS product incentivised participants to utilise virtually stored electricity from the community battery in the evening peak period to avoid paying higher rates.

Any solar credits from excess solar production were used to offset this higher rate during the evening peak period in the first instance.

These graphs compare participant usage for the evening peak period over both the summer and winter months.



Figure 1

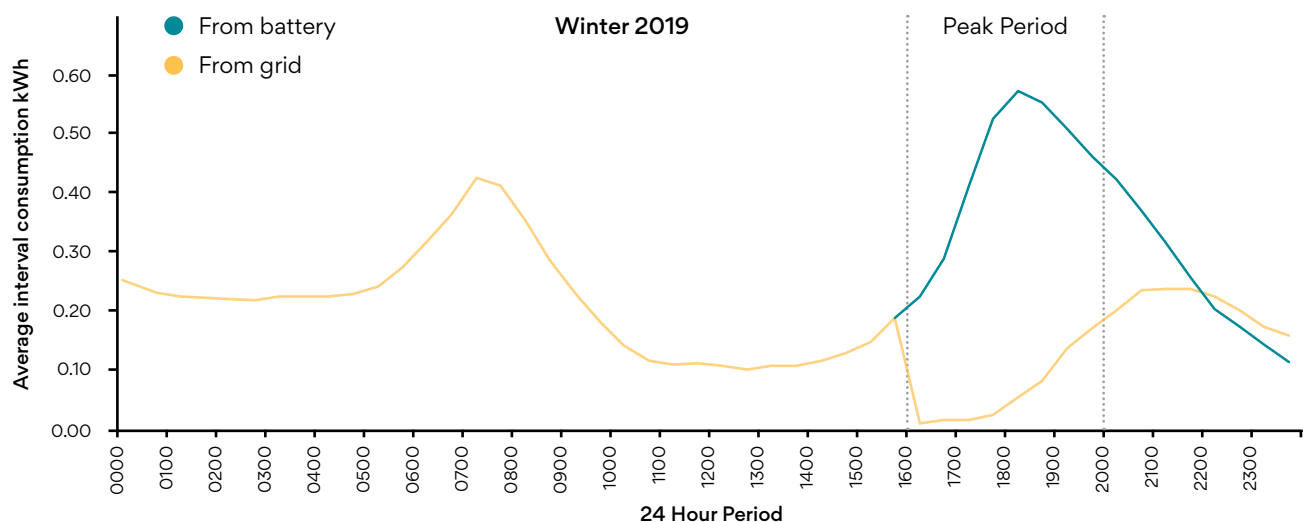
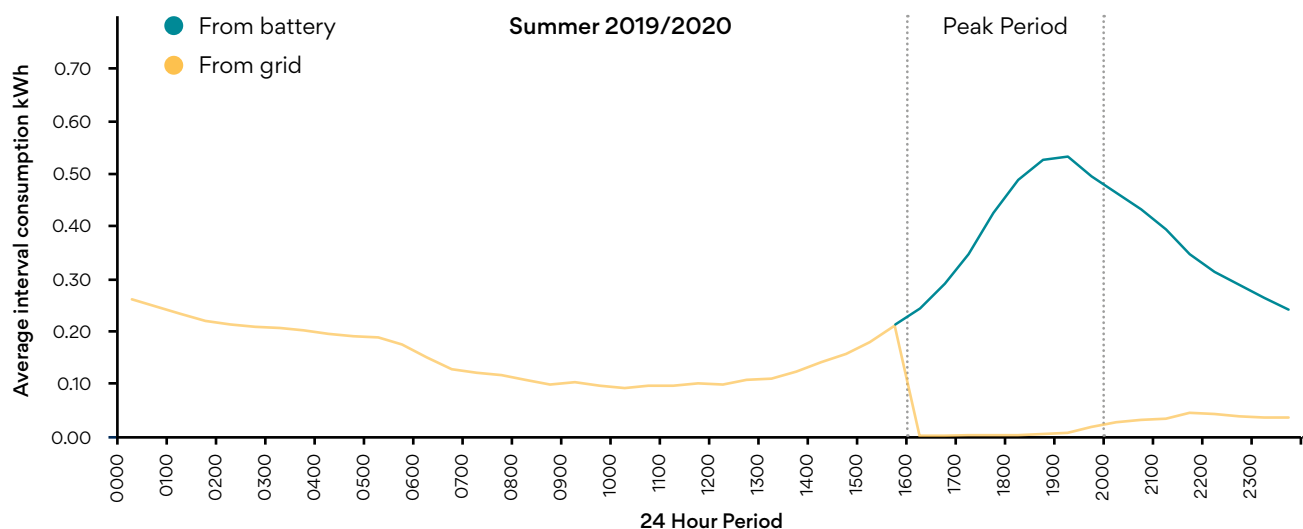


Figure 2



Lessons Learnt

- Participants gained a better understanding of how to manage their electricity consumption as well as electricity costs because of the ToU tariff and more granular information provided.
- The primary participant benefit by participating in the pilot was the benefit of reducing their electricity costs. The virtual battery product assisted participants to achieve lower electricity costs through leveraging the battery during the daily peak time band and therefore reducing network demand but did not encourage participant behaviour to reduce peak consumption.
- The business case for purchasing a battery is commercially more positive without the addition of a customer virtual battery product.
- The \$11 a month battery subscription fee is a highly subsidised rate and not a sustainable product for Synergy to launch to market. Once participants were onboarded to the PDS, and initially after the launch where some participants were offboarded, there was participant movement during the trial largely related to participant “move ins” and “move outs”, consistent with the standard product movement.
- Non-financial benefits are also a driver of participant engagement with a project. Promotion of the trial being the first of its kind in Australia delivered over and above any financial benefits participants may have achieved. Participants were also empowered to become advocates for energy efficient practices by contributing to the whole-of-community sustainability approach offered through the trial.

7. Partner Benefits

Lessons learnt and benefits for the main stakeholders of electricity retailers and property developers are as follows.

7.1 Energy Retailers

Participants on the PDS tariff lowered network electricity consumption during peak periods, compared to the control group by supplementing their energy source from the battery. The reduced network demand during peak periods can provide benefits to energy retailers and for energy infrastructure.

7.1.1 Wholesale Energy Market (WEM)

The battery was designed to charge and discharge in a way that would optimise market costs and support the electricity system as a priority. Generally this was charging during low system demand periods and discharging during high system demand periods. This schedule was established during installation and unable to be changed remotely.

Energy markets are still evolving to consider assets like the CESS. The opportunity for registering the CESS as a generation facility class and applying for Certified Reserve Capacity in the WEM was investigated. At the time, the regulatory framework did not explicitly outline how a battery storage system would participate in the WEM. As such, there were insurmountable risks, boundaries and limitations of the CESS participating in the Reserve Capacity Mechanism during the trial.

We note the WEM is undergoing reform which may include changes made to facility classes and market obligations which would allow the CESS to potentially participate in the Reserve Capacity Mechanism.

Lessons Learnt

- Electricity markets are evolving and at the time, did not have the frameworks in place for community batteries to participate in all elements of the electricity market. Projects such as the ABEST should be leveraged to inform and expediate electricity market reform.
- The battery was setup with a 'set and forget' charge and discharge cycle, but dispatch of the battery and greater value realisation could be achieved through additional smart controllers for smart dispatch. We note work has been completed at Alkimos Beach to enable this capability going forward.
- There is an opportunity for further value extraction by supporting the electricity network with dynamic services such as frequency and voltage support.
- If the network connection point is treated as a normal supply point (business meter), it outweighs the energy arbitrage benefit.

7.2 Property Developers

Land and property developers may achieve a number of benefits from incorporating large-scale community energy storage and products in developments. The benefits could include:

- media opportunities;
- marketing opportunities to industry and buyers;
- stakeholder awareness and industry capacity building;
- energy savings to the particular participant base;
- demonstrating leadership and testing innovative technology;
- being able to receive the learnings from an innovative trial first hand;
- relationship building with energy retailers and other key stakeholders like WPC and Local Governments; and
- assisting with achieving and maintaining a 6 Star Green Star rating.

Lessons Learnt

- Negotiating legal agreements with different key stakeholders required more time than anticipated. Additional provisions should be allowed for in property developers schedules to account for this.
- It cannot be guaranteed that just because the developer and electricity retailer believe that a new technology is beneficial for households that participants feel the same way. While there were some early adopters, a lot of community engagement and education by the developer partners and Synergy was required to get households to sign up.
- One of the anticipated benefits was to determine reduced infrastructure savings from the design so this could be replicated for future developments. Unfortunately, it was not able to demonstrate that this would be the case.
- Without incentivising solar PV systems, other energy efficient appliances and offering programs such as the behavior change program, it would have been unlikely that Alkimos Beach development partners would have been able to partner with Synergy on this trial.



8. Conclusion

The trial explored the commerciality of small-scale renewables, community energy storage systems, smart meters and ToU tariffs for electricity retailers, electricity network providers and participants, to establish the effectiveness of incentive and behaviour change programs to customers.

The project further investigated the economic benefits to electricity users, generators, retailers, network service providers and property developers.

Future trials can build on this report and provide additional, valuable insights to electricity utilities and the wider community about new tariff models, shift in customer demand profiles and network control services.

Based on the results of this study and the key lessons learnt detailed in this report, recommendations for future projects are listed below.

Promote and install AMI

Customer analytics could be further explored by leveraging the technical capabilities of AMI. Specifically, the capacity of remote frequency communications and intelligent metering software systems to deliver electricity metering data at half hourly intervals.

Regular and transparent collaboration with stakeholders and counterparties

This study has shown that cadence and transparency with stakeholders and counterparties improved the installation process of the CESS. Particularly, remedying roadblocks including timeframes, stakeholder engagement and technical implementation.

Utilise larger sample sizes and asset capacity

Further analysis could be undertaken that explores the entire value stack from renewables and community scale energy storage to generators, retailers and customers. Larger solar PV systems improved customer savings for some customers.

Customer engagement and information transparency is key

Messaging and communication of the benefits to seek customer interest and consent upfront should be a priority to ensure successful participant recruitment and ongoing positive experience. The timing of any product launch should also be carefully considered with Summer months ideal for a product targeting peak consumption. However, it is worth noting not all customers are suited to a virtual battery product (based on household consumption patterns and smaller PV system sizes) and not all customers will reduce their peak consumption. Other customer product structures and constructs should be considered for future community batteries.

Explore new tariff structures

It has been demonstrated that a new retail servicing model that virtually connects individual household solar PV systems can be achieved. However, the trial has shown there are challenges in providing a sustainable tariff and as such there are benefits of further exploring tariff structures for community storage. Greater exploration of tariff structures should be considered to encourage efficient use of the system, with a focus on determining how new tariffs can optimise customer participation and provide customer benefits against regulated single tariff structures.

It is unfortunate that due to the high costs of maintaining the PDS tariff, the trial could not become a permanent offering to Alkimos Beach and/or additionally Alkimos Vista customers. This is something that future trials could look to resolve, to find the right balance between managing costs and customer benefits.

A Way Forward

The ABEST trial concluded in May 2021. The CESS and infrastructure remain a Synergy asset onsite and will continue to support the community and WA energy system. The intended purpose of the battery post trial is to optimise network support and other value stream efficiencies such as WEM arbitrage. It will also contribute to further DER and VPP technology learnings.

Lendlease and Development WA are considering new and alternative new energy efficiency trials, such as an all-electric home for Alkimos Beach households.

Since 2018, Synergy along with project partner WPC is trialling a community-based, virtual electricity storage solution called PowerBank.

Now, in its third phase, there are a total of 12 community batteries in Perth metropolitan and regional suburbs participating in the PowerBank 3 trial. The trial allows for the integration of a utility scale battery into an already established major metropolitan network and leverages many of the learnings from the ABEST trial.

Synergy is committed to working with its industry peers and stakeholders to explore new energy solutions. With a focus on embracing emerging and innovative energy technologies, Synergy has a number of trials underway to help find solutions to network issues, and to build its capability to adapt and scale operations in line with the rapidly changing customer and market demand. By providing affordable, reliable energy and offering a broad range of products and services, Synergy is dedicated to continuing its journey to lead Western Australians to an intelligent energy future.

A photograph of three people, two men and one woman, standing on a beach. They are all wearing wetsuits. The man on the left is older with white hair, the woman in the middle has long brown hair, and the man on the right is younger with curly brown hair. They are all smiling and looking towards the right. The background shows the ocean and a cloudy sky. A large teal diagonal graphic element is on the right side of the image.

**Synergy is creating
energy solutions for all
Western Australians for an
intelligent energy future**

