

Flexible Exports for Solar PV

Lessons Learnt Report 1

SA Power Networks

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Glossary

Term	Definition
ARENA	Australian Renewable Energy Agency
AEMO	Australian Energy Market Operator
AEMC	Australian Energy Market Commission
AER	Australian Energy Regulator
API	Application Programming Interface
ASIP	Australian Smart Inverter Protocol
CSIP	Common Solar Inverter Profile
DER	Distributed Energy Resources
DNSP	Distributed network service provider
IEEE2030.5	IEEE Standard for Smart Energy Profile Application Protocol
IP	Intellectual Property
NEM	National Electricity Market
PV	Photovoltaics
SIRG	Solar Industries Reference Group

Acknowledgement

The “Flexible Exports for Solar PV” project (‘the Project’) is a collaboration between SA Power Networks, AusNet Services, Fronius, SMA, Solar Edge and SwitchDin. The Australian Government, through the Australian Renewable Energy Agency (ARENA), is providing \$2.09m towards to this \$4.84m project under its Advancing Renewables Program.

Disclaimer

This Project received funding from ARENA as part of ARENA’s Advancing 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 herein.

1 Introduction

On 1st July 2020 ARENA and SA Power Networks entered into an Advancing Renewables Program Funding Agreement number 2020/ARP009, under which SA Power Networks, and all collaboration partners, have obligations to consider and issue quarterly lessons learnt reports. Aurecon, the knowledge sharing partner, prepares these reports on behalf of SA Power Networks and project partners. Lessons will be captured throughout the lifecycle of the Project and are expected to cover a range of topics. These may include commercial, technology, policy, community engagement learnings and more. The intended audiences for these lessons learnt reports are:

- ARENA, AEMO, AEMC, AER - to understand the performance of distributed energy resources (DER) projects and impact on the market.
- Victorian and South Australian Governments and policy makers - to understand policy and regulatory barriers and opportunities associated with DER.
- Energy industry - to understand market opportunities associated with DER impacts and business models.

This first lessons learnt report will cover the activities at project kick off, standards development and early stages of the technical development. It is intended for those undertaking a similar project. By sharing this information, the Flexible Exports for Solar PV project aims to advance the industry's understanding of how DER, such as rooftop solar, can be managed in constrained network areas.

2 Project Overview

2.1 Project Summary

The Flexible Exports for Solar PV project ('the Project') is a demonstration project seeking to help integrate more rooftop solar into Australia's electricity network.

Most current rooftop solar systems across Australia lack the ability to intelligently control the amount of electricity exports to the network. At certain times in the year, too much electricity is generated in the middle of the day and exported back to the network. As a result, the local distribution networks in areas with high rooftop solar uptake can become congested. To avoid exceeding the technical limits of the network and manage this issue today, energy networks impose zero or near-zero energy export limits on new solar systems in congested areas.

As more Australian households install rooftop solar and network constraints increase, more new solar customers will face limits that prevent them from exporting electricity back to the network. This can create an inequitable system where early adopters of rooftop solar 'use up' the available grid capacity, and late adopters are constrained.

The aim of this Project is to provide a new option for customers connecting solar PV in areas of the network that are already at capacity, who are currently required by Distribution Network Service Providers (DNSP) to limit their systems with a permanent zero or near-zero export limit.

This new flexible option will enable customers to export energy most of the time, and only reduce exports during specific periods when the network is constrained, thus maximising export capacity for solar customers and making more cheap, renewable energy available for all electricity customers.

SA Power Networks, in collaboration with AusNet Services, three market-leading inverter vendors (Fronius, SMA and SolarEdge) and one inverter gateway provider (SwitchDin) are co-developing an end-to-end technical solution, using smart inverter technology. The system will enable customers' inverters to automatically adjust their export limits every five minutes based on a locational, dynamic limit signal provided by the DNSP. The Project will also develop a new flexible customer connection offer, and test customer understanding and acceptance during a 12-month field trial.



2.2 Project Methodology

The Project aims to accelerate the development of an Australian standards-based approach to flexible feed-in management for solar PV across the NEM (National Electricity Market). To achieve this, the project scope was designed to advance both the technical and commercial maturity of the next generation of smart inverters and develop the customer offer and customer experience of participating in a flexible exports scheme.

The high-level approach is as follows:

1. Planning and standards development

- Since there are no Australian standards established at the time of project commencement, the first phase of the Project comprises planning activities and the co-development by the partners, in consultation with industry more broadly, of the technical standard to be used to communicate flexible export limits between the DNSP and smart inverters.

2. Technical development

- Once the communication standard has been substantially agreed, the partners will implement the standard through the development of a flexible exports capability. This capacity is to be built into Australian products from Fronius and SMA, market-leading inverter manufacturers, and would enable new customers in constrained network areas to export their energy.
- The Project will also develop a 'retro-fit' option using the SwitchDin gateway device which will enable a range of existing inverters without native integrations to be converted from static to flexible export limits.

3. Customer offer development

- In parallel with the technical development, SA Power Networks and AusNet Services will develop in consultation with other DNSP's customer representatives and other industry stakeholders, a new flexible connection offer for solar customers. The offer will set out the key parameters of a customer's network connection agreement and can inform other DNSPs and industry on how to structure a Customer Offer to support the flexible exports service.

4. Field trial

- As this represents a new connection option for solar customers, the Project will seek to understand the end-to-end customer journey, from the point at which a customer is first presented with a flexible connection option in the up-front conversation with their solar installer, through the customer's choice of suitable inverter options, to the customer's experience over a full year of operation.
- Through the 12-month field trial, the project will test the viability of this kind of connection arrangement and refine the associated technologies and customer service to the point of maturity at which this can be offered as a standard service across the NEM.

3 Key Lessons

This is the first lessons learnt report for the Flexible Exports for Solar Project. The learnings in this report covers the activities at project kick off, standards development and early stages of the technical development.

The three key lessons discussed are as follow:

- **Lesson #1: Engage early with project partners and allow time for bespoke contracts to be developed to meet each partner's needs.**
 - Make provision for a long negotiation period to allow for differing legislative and regulatory frameworks, language and terminology
 - Work collaboratively with project partners to establish clear objectives, outcomes & commercial obligations
 - Bring the legal team from the different businesses in on the journey as early as possible
- **Lesson #2: Engage early with customers and industry and ensure all stakeholders are included**
 - Identify key external stakeholders and establish tailored reference groups and forums to provide a consultative mechanism gain visibility of the customer and industry perspective
 - Conduct customer research early to gain an understanding of customer perceptions
 - Consider adequate resourcing for effective stakeholder management during project planning
- **Lesson #3: Be vigilant and ready to address any potential policy and market reform changes that may impact the project**
 - Actively monitor movements in broader technical and policy matters that may impact the project - the energy industry is in a time of rapid change.
 - Work collaboratively with government and external stakeholders to understand how industry changes can impact the project or provide opportunities
 - Reassess where the project fits into the new scenario resulting from the changes, and pivot if required
 - Facilitate an open dialogue with the rest of the business and project partners to understand their priorities and constraints
 - Establish flexible teams to manage resources and timelines

The next sections provide the detail around each lesson.



3.1 Lesson #1: Engage early with project partners and allow time for bespoke contracts to be developed to meet each partner's needs.

Knowledge Category:	Legal
Knowledge Type:	Project Establishment
Technology Type:	Not applicable
State / Territory	National

Key Learning

Establishing common project objectives and the right contractual relationships can be a challenge when there are multiple organisations, each potentially having different business drivers, risk profiles and Legislative and Regulatory frameworks in which they operate.

In this Project, SA Power Networks partnered with another Australian Distribution Network Service Provider (DNSP), three international market-leading inverter vendors and an Australian inverter gateway provider. This process took considerably longer than was originally forecast, delaying commencement of the Project.

Contracting with international partners added an additional layer of complexity as those partners had legal counsels based overseas. Global companies work across time zones, work under differing Legislative and Regulatory frameworks, languages and terminology and consequently use different contracting structures.

Clarity around what is being contracted, project outcomes and commercial obligations is essential in establishing contractual agreements. This process requires substantial effort in communicating and negotiating with each project partner to come to terms with what is being provisioned under the contract. Contracting took approximately 8-9 months to negotiate; approximately 2 months longer than anticipated.

Process Undertaken by the Project

The team established clear objectives and outcomes, as part of the ARENA funding application, which helped close out contracts faster and set a strong foundation for the Project. Co-located workshops were held and further collaboration undertaken remotely to align objectives very early in the planning for the submission to ARENA.

Project partners were provided draft versions of contracts early in the process (ahead of the final submission to ARENA) for sharing with their respective legal teams, and it was expected that agreements would be finalised within a month of finalising the funding agreement with ARENA. These were based on a standard SA Power Networks supply of services contract with specific terms added to meet the obligations of the master ARENA funding agreement. This approach was taken in an effort to avoid development of a bespoke contract for this Project, minimising legal effort upfront.

Engaging legal teams in earnest occurred once the ARENA funding agreement was signed. In hindsight, this was possibly not early enough. It was only once the legal teams were engaged that it became apparent that some elements of the standard contract were either not relevant to the Project or had been misinterpreted in the context of this Project, requiring further discussion to resolve.

Bringing legal representatives from both sides to more in-depth discussion earlier may have resolved issues sooner. However, bringing the relevant people from both sides (of each organisation) was very difficult given the time zones, different priorities and leave / absences of individuals.



Considerations for future projects

For future projects intending to engage a number of overseas entities, it is important to collaborate with project partners as early as possible. Early engagement between the businesses also presents an opportunity for the Project teams as well as the legal teams to engage and discuss their understandings, concerns and expectations. The discussion can provide more clarity on what the Project is going to deliver and what is required from the Project partners. Whilst this may help to resolve the contracting terms faster, provision should be made to allow adequate time for the process to be worked through.

Furthermore, while the effort to develop bespoke contracts for each partner upfront comes with additional overhead early, it may mitigate against some of the complexities in navigating rigid or not applicable contract terms later in negotiations.



3.2 Lesson #2: Engage early with customers and industry and ensure all stakeholders are included.

Knowledge Category:	Stakeholder Engagement
Knowledge Type:	Project Planning
Technology Type:	Not applicable
State / Territory	National

Key Learning

Introduction of a flexible connection option has an impact on many stakeholders in the DER supply chain, meaning early and frequent engagement is key to successful delivery. Establishment of tailored reference groups and forums early in the Project provided an important consultative mechanism to gain early visibility on the customer and industry perspective. This enabled the Project team to incorporate stakeholder input into the development of various systems and processes that make up the flexible exports service offering.

At commencement of the Project, the end-to-end experience of a customer taking up a flexible connection offer was not clear and needed to be developed, with stakeholder input.

Effective stakeholder engagement is resource-intensive; this must be considered during project planning.

Process Undertaken by the Project

The Project identified that the solar retailers and installers are one of the most important stakeholder groups that were not well represented within existing SA Power Networks stakeholder reference groups. To fill this gap, the Solar Industry Reference Group (SIRG) was formed by inviting applications for membership from a range of solar retailers and installers through SA Power Networks' existing channels. The group meets every 4-6 weeks via Microsoft Teams in which the Project team presents on recent project developments or pressing issues to seek member input, as well as cover any topics the SIRG members wish to raise. There is a high level of engagement from the members and the Project team gained valuable constructive feedback from the discussions, as noted below

"I have been thoroughly impressed by SAPN's dedication and commitment to true engagement with industry and community..... it is evident that genuine engagement is highly valued and that SAPN is actively encouraging and taking on board feedback and recommendations arising from these forums" – Mike Stone, Clean Energy Council, Solar Industry Reference Group chair.

To date, the SIRG has been successful in steering the Project team on various topics including changes to the sales and installation process, presentation of flexible exports customer value proposition and collateral and the new flexible exports commissioning processes. Other reference groups and working groups, consisting of different parts of the industry, were also established with similar objectives in mind.

SA Power Networks' early customer engagement has occurred across three stages, primarily focussing on customer messaging. This began with internal messaging development conducted by SA Power Networks in the early stages of the Project. In the second phase NewGate Research Group was engaged to test the messaging with a group of stakeholders and provide feedback. This feedback collection formed the third phase, which was an online community forum due to COVID-19 restrictions at the time. The online community involved a small group which represented a cross section of community members. Early messaging was shared with them via the online forum and they submitted feedback via the forum and/or phone interviews. The process was resource-intensive but provided valuable insights on customer perceptions, allowing SAPN to develop a messaging strategy that will be tested through the Project field trial phase in 2021.

Although the COVID-19 pandemic had little impact on the technical aspects of the Project, it made industry and customer engagement much more challenging. The whole process was conducted virtually, which took much longer to prepare and implement. Virtual meetings require more frequent, but shorter duration interactions, due to the nature of the medium by which information is being delivered. Transitioning to and delivering this new form of engagement requires significantly more internal resources. However, from an industry engagement perspective, meeting remotely allows interstate stakeholders to participate in workshops, thereby bringing together varying perspectives to enrich the conversation.

Considerations for future projects

Early engagement with customers and industry is critical to the success of the Project. This Project engaged with key customers and industry as early as possible to:

- Identify key external stakeholders;
- Establish working groups with key stakeholders to gain feedback;
- Collaborate with the wider industry; and
- Conduct customer research early to gain an understanding of customer perceptions

Projects that impact a cross section of the industry should also consider involving reference groups in bilateral engagements so there is a sufficiently broad cross section of stakeholders with different backgrounds that the Project can draw knowledge from.

The nature of engagements, whether it be in person or virtual, will influence the approach and resource requirements. It is important to consider the objective of the engagement and whether it is more beneficial to have a broad group of stakeholders, or a more intimate group. Sharing knowledge virtually can be very effective in large groups where stakeholders from different geographic locations can attend. Smaller engagements can help build relationships and can be more effective in person.



3.3 Lesson #3: Be vigilant and ready to address any potential policy and market reform changes that may impact the project

Knowledge Category:	Regulatory
Knowledge Type:	Project Planning
Technology Type:	Not applicable
State / Territory	National

Key Learning

DER integration technology and policy is a rapidly evolving space which requires initiatives like this Project to be adaptable to changes in the landscape. One example of such a change is the South Australian (SA) Government's Smarter Homes Regulations that were introduced during an early stage of this project, diverting the resources of some partner organisations and resulting in delays to commencement of technology development activities. While these delays have impacted progress on this project, the Smarter Homes Regulations have introduced a step change in technical and industry capability to deliver smart solar systems in South Australia, including the need for remote communications, control capabilities and commissioning. which will simplify the introduction of a flexible exports connection option in the future.

Government Policies and Regulations may evolve at a rapid pace and the impact of those changes, on all project partners, must be factored into project planning and execution. It is necessary to identify those impacts quickly and adapt the Project trajectory to reach the desired outcome by alternative means. It is also important to identify and capitalise on opportunities presented during such changes.

Process Undertaken by the Project

The South Australian (SA) Government's [Smarter Homes Regulations](#) were introduced in September 2020 as part of South Australia's [Energy Solution Action Plan](#) to provide a secure transition to affordable renewable energy.

The Smarter Homes Regulations include the requirement for a remote disconnect/reconnect capability for all new solar inverters. In addition to supporting the SA Power Networks' new flexible connection option, Flexible Exports will contain all the required capabilities to meet these new regulations and may ultimately supersede the basic disconnect/reconnect requirements. Recognising this, the project partners developed an approach to deliver the minimum functionality required to ensure their existing product lines were compliant with the new regulations, while continuing planning and design activities for the flexible exports approach developed in the Project.

SA Power Networks also worked with stakeholders to implement a model for providing the services required under the Smarter Homes Regulations in a manner consistent with the planned model for the implementation of Flexible Exports; ensuring the smart DER eco-system is developed in a way in which Flexible Exports will become an extension of these initial capabilities. While the regulatory changes were initially disruptive for the project, it is expected that they will assist with the acceleration of Flexible Exports as a standard service offering.

Despite this focus, there was still some development required by each of the equipment manufacturer partners to enhance their systems ahead of the disconnect/reconnect legislation deadline on 31 December 2020. This tied up essential development resources and ultimately delayed the commencement of development activities for this project until Q4 2020. The project team managed these delays through continued communication and ultimately shifted focus to planning and design activities that did not involve the constrained software development resources.

Considerations for future projects

Changes are inevitable in this time of rapid change in the energy industry, meaning it is important for projects of a similar nature to be aware of and engage with the broader technology and policy landscape. This provides an opportunity to react quickly and avoid surprises, and to quickly identify any opportunities for synergies.

When dealing with the impacts of such a change, business impacts and priorities, including those of project partners, should also be considered. When a regulatory change has the potential to impact sales in a particular region, an organisations' focus and resourcing is going to immediately shift to meet the new regulatory requirements, rather than work on a research project that is focussed on the medium-term. Facilitating an ongoing open dialogue with the project partners and their wider businesses can help understand the extent of resourcing impacts to assist with planning and enable the project team to pivot to activities that do not involve the constrained resources.

Key takeaways from this lesson, which may be applicable to future projects, are as follows:

- Actively monitor movements in broader technical and policy matters that may impact the project or project partners - the energy industry is in a time of rapid change.
- Work collaboratively with government and external stakeholders to understand how industry changes can impact the project or provide opportunities
- Reassess where the project fits into the new scenario resulting from the changes, and pivot if required
- Facilitate an open dialogue with project partners and their broader businesses to understand their priorities and constraints
- Establish flexible teams to manage resources and timelines

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