

Consultation on the Proposed Export Limit Requirements for Distributed Solar Generating Plants in South Australia

Enphase Energy Aust. Pty Ltd. Submission

Project	SA DEM Consultations - July 2020
File name	SA DEM Response 2 V1.02 08072020
Revision	V1.02
Authors	David Minchin & Ryan Turner
Date	8/7/2020

Index

1.	Introduction	3
2.	Existing Technology Options Available	3
3.	Remote Control Considerations	4
4.	Implementation Time Frame	5
A.1	About Enphase	6
B.1	Enphase Australia Technical Support Staff	7

1.0 Introduction

Enphase Energy would like to thank the South Australian Department of Energy and Mining for the opportunity to provide technical feedback on the proposed adoption of remote connection and disconnection to the power grid in South Australia.

South Australia is globally recognised as a leader in the adoption of alternative energy as the focal point of its energy plan accelerates towards a net 100% generation capacity. The bipartisan support of this development for nearly 20 years has seen the transition from what was once considered a curiosity to a commercially viable generation platform.

It is appreciated that Alternative Energy generation can now regularly make or exceed 100% of SA's consumption under favourable sun and wind conditions. Over 500 MW of solar generation can be exported during peak periods when household consumption is low. The amount of power exported can change rapidly according to weather (cloud) conditions resulting in a dynamic energy source. With the load base changing, this now presents challenges to grid stability and the provision of generation capacity via the NEM or locally.

Enphase Energy are in full agreement with the proposal to provide dynamic power export limiting (PEL) to stabilise and maintain the integrity of the grid in South Australia. We see this as the next step to better integrate PV generation through the incorporation of smart technology.

2.0 Existing Technology Options Available

The provision of power export limiting has been a capability of Enphase Energy systems for some time. All Enphase Energy installations in Australia that use our current Envoy S central controller, that has both production and generation current detection (CT's), has PEL ability. As Enphase Energy systems are connected online to the Enlighten cloud-based system full remote control is available to change PEL parameters if required to work towards a true dynamic response.

Dynamic power export limiting can be implemented by either using existing capabilities or utilising emerging standards and supporting technology. These differ according to the reaction time and the granularity of power control.

Option 1. Using existing Demand Response Modes (DRM) steps

The current inverter standard AS/NZS4777.2:2015 specifies in clause 6.2 Inverter demand response modes (DRM's) for the remote control of PV inverters. DRM 0 is mandatory for all inverters with DRM 1 to 8 as further (optional) control modes to remotely enable 25/50/75% consumption and generation levels. It would be feasible for the 25% steps to be used as the basis of a dynamic PEL system with a "slow loop response" time (typically 15 – 20 minutes) to smooth the reaction. Full remote control would be available via DRM control.

Option 2. Adopting Emerging Technology and standards from other countries.

Globally, technologies are currently in development to provide this function for standards such as IEEE 2030.5 “Standard for Smart Energy Profile Application Protocol”, JET GR0002-1-11 Section 16.0 ECHONET or the framework in IEC 14543-4-3 and IEC 62934. Enphase Energy recommends that guidance be taken from these standards as these will have direct influence on the direction of Australian standards. IEEE 2030.5 is seen as the front runner.

For Australia, the current AS/NZS4777.2 update has not incorporated changes to embrace the changes being adopted overseas. This will form part of a future update, until such time it may be difficult to provide general certification of product. Alternatively, product could be approved to specification as is currently done for the SA battery scheme.

An Enphase Energy system can be connected via an API for high level control to not only achieve dynamic export limiting control but a wider range of functions. A number of Enphase systems in South Australia and Victoria are connected to deX and, with the consent of owners, enable near-instant visibility of their system to the appropriate grid operators. Set initially up as a trial, connection to deX is now advancing through other states as a path to participate in future grid services. For more information on deX visit

https://dex.energy/case_study/case-study-enphase/

Enphase Energy has been an active participant in the development of the DER Visibility and Monitoring Best practice Guide (included as an attachment to this submission). The DER guide provides the next step in remote visibility and control that would be ideal for adoption in South Australia.

3.0 Remote Control Considerations

All Enphase Energy systems are connected online and monitored via our Enlighten cloud-based software. There are over 1.1 million systems on this platform in over 100 countries around the world. Whilst this network is proprietary to Enphase compatible systems, it does provide the means to control not only systems post implementation but also systems already installed should they elect to be part of this requirement.

As any Enphase Energy system is essentially a software-based solution, we have the capability to integrate with other systems via an API. We would be happy to discuss further what could be implemented based on what has already been adopted in Australia or overseas.

4.0 Implementation time frame

All Enphase Energy hardware available in Australia has the capability to meet the proposed requirements. The time frame required then would be determined by which system is implemented in South Australia.

Should that follow IEEE 2030.5 guidelines, we already have the capability and approvals in place so meeting a January 2020 guideline would then be reliant on any local changes to that specification. Again, we would welcome further discussion around the specific requirements once set.

A.1 About Enphase Energy

Enphase Australia Pty Ltd is a member company of Enphase Energy, Inc. based in Silicon Valley, California, USA.

Enphase is a provider of energy management hardware and software solutions. It is engaged in designing, developing, manufacturing, and selling microinverter systems for the solar photovoltaic and battery storage industry. Enphase invented semiconductor-based microinverters in 2008 to convert direct current (DC) electricity to alternating current (AC) electricity directly at the PV module (solar panel). Enphase is now the world's largest manufacturer of microinverters, the USA is the largest market where Enphase is installed in ~41% of all systems (2019).

In Australia, Enphase is based in Melbourne with staff located in all mainland states. Enphase runs an online technical support centre in Melbourne that is linked into other global centres to provide 24/7 support. Enphase New Zealand is the global hardware design and testing hub for Enphase employing of 75 Engineers and technicians in Christchurch.

An Enphase AC coupled microinverter system differs from the classic DC coupled string inverter systems found in most installations. An Enphase system consists of several parts rather than a single inverter: Enphase microinverters at each solar panel, an Envoy gateway and Enlighten cloud-based software. Optionally an Enphase battery system can be installed to form a single platform of solar and battery storage that can be controlled remotely.

Enphase microinverters provide power conversion at the individual solar module level by a digital architecture that incorporates custom application specific integrated circuits (ASIC), specialized power electronics devices, and an embedded software subsystem. Envoy bi-directional communications gateway collects and sends data to Enlighten software. Enlighten cloud-based software provides the capabilities to remotely monitor, manage, and maintain an individual system or a fleet of systems.

AC coupled Enphase systems provide significant safety advantages over classic DC coupled systems. Rather than running dangerous high DC voltages (up to 600 Volts) to a remote inverter that requires special protection from DC arcs that can lead to fire, Enphase directly converts low voltage DC to normal AC right at the panel. Enphase invented the rapid shutdown system that is now mandatory in the USA. This system enables first responders to shut the entire system from one switch in a meter board so they can conduct search and rescue safely without fear of contact from high voltage DC from an unstable roof.

B.1 Enphase Energy Australian Engineering and Technical Support

Andrew Mitchell – Product Line Manager

With 12 years of experience in the solar industry Andrew has managed projects and products that have delivered pioneering solutions from 300W portable power packs, to multi megawatt micro grid solutions. His work throughout the APAC region has given allowed him to develop perspective from all stakeholders such as consumers, installers, designers, manufacturers, and network operators.

David Minchin: Standards & Homologation Engineer

“David is based in Adelaide and provides standards support and product homologation for Enphase Energy in the Asia/Pacific region. He is an active member of EL005 Storage, EL042 Alternative Energy and EL064 Microgrid Standards committees. Most recently David was engaged to formulate the test reports in the new AS/NZS4777.2 standard for new requirements including the VDRT test that is the subject of this consultation. Prior work includes managing Clean Energy Regulator (CER) inspections across Australia and engagement to perform CER special analysis. David has +30 years of experience in solar/storage in both commercial and engineering roles.”

Duncan Macgregor - APAC Product Trainer & Field Applications Engineer

“As a CEC accredited solar designer installer, and active member of the renewable energy industry for over 18 years, Duncan Macgregor brings a wealth of industry knowledge to his role as Enphase Energy Product Trainer and Field Applications Engineer for the Asia-Pacific region. Duncan’s in-depth field experience in design and installation supports the installation community in both large and small scale solar, on and off grid battery storage systems”.

Ryan Turner: Field Applications Engineer

“Ryan provides pre and post installation support for all Enphase projects in the APAC region. He is a fully accredited CEC design engineer. Ryan specialises in supporting the larger, more complex commercial and industrial projects, as well as storage integration. Prior work includes technical support/advisor for Fronius Australia and Building Energy consultant at Arup. Ryan also has an undergraduate degree in Mechanical Engineering and a master’s degree in Renewable Energy and sustainability from the University of Nottingham, UK.”

Wilf Johnston: General Manager APAC

“Wilf has worked in the Australian solar industry for over 11 years, beginning with leadership of the engineering and commercial project team with SunPower Corporation, then later as the General Manager of Energy Matters and Flex. At Flex he introduced an innovative IOT platform focused on delivering energy insights and control to end customers. Wilf holds degrees in Engineering and Commerce from the University of Western Australia and has been a key contributor to industry associations including the Smart Energy Council. At the Clean Energy Council, Wilf was a founding member of both the Utility Solar Directorate and the Distributed Energy Leadership Forum, which provides policy direction to the organisation as a whole”.

Supply Chain:

AC Solar Warehouse is a leading Australian wholesaler of solar energy and energy storage equipment. The business employs 10 professional electrical engineers and are industry recognised experts in the deployment of microinverter technologies. AC Solar Warehouse has an administration office in Queensland and distribution centres in Brisbane, Sydney, Melbourne, Adelaide, Perth and Auckland, providing same or next day service to more than 6000 solar installers around Australia.

Grant Behrendorff: Managing Director

“Grant Behrendorff is an Electrical Fitter/Mechanic, Electrical Engineering Technologist and CEC accredited solar system designer and installer. He has been involved in the electrical industry in Australia for 35 years and in the solar industry for 23 of these. Grant has held technical, management, leadership and governance roles in the utility, not-for-profit, consulting and commercial sectors and was independent Chair of the Alice Springs Solar Cities Consortium for 7 years from its inception to conclusion in 2013. This project was responsible for some of the most iconic and ground-breaking solar installations in Australia at the time, based a wide range of solar technologies. Grant was awarded the Engineers Australia National Engineering Technologist of the Year in 2007 in recognition of his work in the solar power sector. Grant is Managing Director AC Solar Warehouse, and is non-executive Chair of Alice Springs based engineering consultancy firm Ekistica Pty. Ltd.”

David Smyth: Director and Principal Engineer

“David Smyth is a qualified electrician with a Bachelor of Electrical Engineering with Honours. David is a Registered Professional Engineer of Queensland, a Member of Engineers Australia and Clean Energy Council and accredited for design and installation. David has been working with solar technologies since 1996; firstly designing remote area power supplies for cattle properties and National Park Ranger stations and later working on the design and installation of some of the earliest domestic and commercial solar grid connected systems in Queensland. David was Principal Engineer Generation at Ergon Energy for over 7 years where he was responsible for the management of 33 power stations, including wind, biomass, geothermal and solar farms. David is Director and Principal Engineer of AC Solar Warehouse”