Consultation on the Proposed Low Load Responses – Distributed Photovoltaic Generation Management in Western Australia

Enphase Energy Aust. Pty Ltd. Submission

Project	WA Low Load Responses – Distributed Photovoltaic Generation Management
File name	WA DPGM Response V1.02 20102021
Revision	V1.02
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Date	20/10/2021

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1.0 Introduction

Enphase Energy would like to thank the Western Australian Government for the opportunity to provide technical feedback on the proposed adoption of Distributed Photovoltaic Generation Management (DPVGM) in Western Australia (WA).

WA has a high penetration of rooftop solar, which is set to increase as the world moves away from fossil fuels and looks to clean alternative energy solutions. 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 across the whole of Australia.

It is appreciated that Alternative Energy generation will soon be able to regularly make or exceed 100% of Australia's energy needs, under favourable sun and wind conditions. Over 18 GW of solar generation can be exported across Australia 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 SWIS and nationally on the NEM.

Enphase Energy are in full agreeance with the proposal to provide Distributed Photovoltaic Generation Management (DPVGM) to remote disconnection, and eventually dynamically power export limiting (PEL), to stabilise and maintain the integrity of the SWIS. Enphase realises that DER control is the next step to better integrate PV generation through the incorporation of smart technology, which is fundamental to the future of DER integration. The implementation of a suitable DPVGM solution will provide a pathway for increased capabilities and value to be realised over time (such as flexible exports and VPP participation).

This incremental approach has been taken in South Australia, via the Smarter Homes program and provides a clear foundation for Western Australia. IEEE2030.5 and the CSIP AUS implementation guide is currently under consideration for direct adoption by Standards Australia. If successful, then this approach should be adopted as we have seen in South Australia, with the vision to move to a dynamic operating envelope.

2.0 Existing Technology Options Available

The provision of remote disconnection and power export limiting (PEL) has been a capability of Enphase Energy systems for some time. All Enphase Energy installations in Australia that use our current Envoy-S gateway control device, 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, and remote disconnection can be implemented by either using existing capabilities or utilising emerging standards and supporting technology. These differ according to the reaction time and the required 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, Open-ADR 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 and Open-ADR are seen as the front runners for Australia.

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 South Australian Battery Scheme. Standards Australia is currently reviewing and seeking to adopt the CSIP-AUS in the form of a technical handbook, which is being used as the basis for the Flexible Exports program being deployed by SA Power Networks.

To meet immediate needs locally, Enphase has partnered with GreenSync to provide a solution for the requirements in South Australian Government's Smarter Homes Program. GreenSync's deX platform provides the required capabilities for registration, control and reporting of the fleet of relevant Enphase systems via an integration to Enphase's API.

Enphase and GreenSync's partnership have demonstrated that it is possible to achieve extremely high reliability in registration and control of Enphase systems with:

- Over 99% of all relevant installed Enphase systems registered, and available for control through GreenSync's deX platform.
- A 99.9% control success rate (as measured in the most recent operational fleet test).

Enphase continues to work with GreenSync to design and build functionality into the Enphase API and deX integration to unlock additional value and services for Enphase customers, including telemetry and flexible exports for South Australia as well as other stats developing this functionality

3.0 Remote Control Considerations

All Enphase Energy systems are connected online and monitored via our Enlighten cloud-based software. There are over 1.4 million systems on this platform in over 130 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 of a regulatory change, but also systems already installed should they need to be part of this requirement. The partner API implementation is also available for Enphase partners to remotely control systems via APIs and is currently being used for the Smarter Homes program in South Australia.

As any Enphase Energy system is essentially a software-based solution, we have the capability to integrate with other systems via an API. We have implemented functionality to achieve dynamic export limiting function via API as well as a disconnection of the PV system to ensure the production goes to 0 W within minutes. Enphase is happy to discuss in further details what could be implemented based on what has already been adopted in South Australia and overseas.

4.0 Implementation time frame

All Enphase Energy hardware available in Australia has the capability to meet the proposed requirements. South Australia has already proven that DPV Management is already possible therefore a timeline for implementation in February 2022 WA is easily achievable.

If WA were to replicate the approach taken in SA with Synergy operating as the Authorised Agent, there are no additional changes required so the February 2022 deadline can be met. Any deviations from the South Australian approach, such as additional functionality and requirements, may result in delays for implementation for Enphase and other OEMs.

With respect to the opportunity for flexible exports, Enphase has a commitment to meet the July 2022 deadline in South Australia for full CSIP-Aus implementation and certification. As with the DPVGM requirements, alignment with the approach for Flexible Exports in South Australia will minimise complexity and risk. Again, we would welcome further discussion around the specific requirements once set.

5.0 Answers to questions from the WA DPV Management consultation paper

QA. Are there any practical considerations Energy Policy WA should have regard for in implementing the proposed DPV Management model?

Enphase supports the DPV Management model. Practical considerations should be considered about how the parties will interact with OEMS and aggregators. Roles and responsibilities across the parties (AEMO, Western Power, Synergy, Technology Provider, OEM, Installer, Customer) should be clearly defined to ensure that the program achieves desired outcomes.

Enphase believes dual element meters are a dead-end solution and should not be considered as they do not offer any additional functionality. The future of DER is about dynamic operating and these dual element meters to cut off PV production do not support the future of dynamic operating envelopes or IEEE 2030.5 and CSIP-AUS implementation.

QB. What mechanisms should be used to provide information to consumers about DPV Management events and what form should this information take?

DPVM events should be sent to the customer via email and text, where possible advanced notice to the customer should also be provided. Customer engagement should also be performed in a similar way to SAPN, advertisement campaigns and customer and industry webinars are critical to the success of DPVGM. It is crucial to ensure there is no further negative press around DNSP's turning off customers solar systems. The messaging needs to focus on grid stability and enabling further uptake of DER systems, as well as allowing for larger capacity PV and battery systems in the future. The better we control our DER assets as a community, the more households will be able to participate.

Q3C. What sort of customer support information should be made available by Synergy to assist customers to maintain compliance with remote communication – for example, if a Wi-Fi connection needs to be re-established?

With a suitable routine fleet testing approach, Synergy will be able to understand the performance of individual DER. Over subsequent tests, this will allow for the identification of consistently non-responsive systems. Communications with customers should consider the variety of reasons that a system may be non-responsive and provide a clear pathway for resolution (whether this be via the customer, the installer, or the OEM). DER manufacturers, agents and aggregators should provide a simple guide on reconnect their DER system to the internet if the connection is lost. Households are already quick to rectify WiFi or other network problems when their on-demand video services are impacted; they will need to be equally responsive for their energy systems.

The CSIP-AUS implementation of 2030.5 provides a mechanism for failsafe management of flexible exports. This implementation defines that the fall back will be a low amount of export if communication was to be lost between onsite DER and the IEEE2030.5 server. This low amount of export will ensure that it is in the customer interest to keep the system connected. Agents, aggregators, and OEM's will be incentivised to alert customers that their system is offline and therefore affecting their potential savings from their DER system.

QD. What assistance or training might be provided for installers to help meet requirements for validation, at the point of installation, and on an ongoing basis?

All Enphase installers will be trained on how to commission our systems the usual way, and therefore meet the requirements 'out of the box'. From our experience in SA, our process is relatively simple, and the additional T&Cs are built into the Enphase cloud-based monitoring platform agreement that customers accept, allowing a transparent registration process. The only additional information we require is the NMI which will become mandatory in WA as it is in SA today. Any incorrect NMIs are followed up by Enphase to achieve 99% success rate in installed systems available for control.

To achieve this high compliance rate, it is recommended that there be a mechanism in place for the management and resolution of non-compliant systems. Depending on approach for installation closeout, this might be via the installer or via the technology provider. Expectations and responsibilities for ensuring that systems are online and controllable should be clearly defined.

QE. Energy Policy WA will assist customers and installers in providing fact sheets and other communication tools to support the changes. Do you have any suggestions for information that you would like included within these fact sheets?

The fact sheet should include:

- The reason why DPV Management is required e.g., grid stability and a high amount of DER penetration which is now as significant as a large generator (such as a gas or coal fired plant), therefore control of DER is required, this is the same for any larger generator on the grid.
- DPV management allows for increasing capacity of DER including upgrades to existing systems. Behind the meter control, once proven can open the door for further DER capacity.
- The DPV Management system will only be used when required e.g., minimum demand and high DER generation which could lead to grid instability. This is expected to be "X" times per year, where "X" is the estimate from WA energy policy studies.

QF. Do you have any other questions, or comments?

All of Enphase's other comments and questions are outlined in above sections 1-4.

Enphase would like to understand why only systems 5 kW or less are considered as part of the DPV Management program as this could effectively rule out all three-phase systems and systems that have an AC-coupled battery.

With electric vehicles and an overall trend towards all electric homes, 5kW of PV is woefully inadequate for what is needed; most systems will need to be 10kW and above to have any meaningful impact on both a household's electricity expense or carbon footprint.

From over 1.4 million systems managed by Enphase's cloud-based monitoring system worldwide, it has been shown that less impact on the grid from DER occurs when there is battery storage implemented on site. If WA was to allow an AC coupled battery storage system to be installed alongside a 5 kW PV system, the duck curve affect seen on the grid, during low demand and high PV export intervals, would reduce.

DER meters should be certified to AS/NZS 4777.2:2020 requirements as is the case in South Australia.

Replacement Inverters should also have to become part of the DPV Management program so that the existing PV systems can be brought into line with the requirements of a progressing industry that allows dynamic operating envelopes.

The key to making DPV Management a success in WA is following standardised methods that have already being implemented in South Australia. Deviating from approaches already defined (Smarter Homes for DPVGM, and CSIP-AUS for Flexible Exports) will lead to a negative outcome for DER in WA and introduce risk in the implementation of the DPVGM program.

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.”

Ryan Turner: Field Applications Engineering Manager, APAC

“Ryan leads a team of engineers who provide 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. Ryan is at the forefront of the Distributed Energy Resources industry, as an active member of the Standards Australia EL-062 Smart grids committee, as well as multiple CEC committees including the distributed energy directive, inverter working group and energy storage working group. Ryan has a master’s degree in renewable energy as well as 5 years’ experience in the Australian solar industry. Prior to Solar Ryan gained 5 years’ experience working within the building energy and sustainability sector.”

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"