ASIA-PACIFIC
SOLAR RESEARCH CONFERENCE

Policy Options to Support DER Integration

Lessons from the $1.3bn Solar Homes Program in Victoria, Australia

N.N. Lal[1,2]

[1]*Visiting Fellow, ANU College of Engineering, Canberra, Australia*
[2]*Manager, Solar Technology, Victorian Department of Environment, Land, Water and Planning, Melbourne, Australia*
E-mail: niraj.lal@anu.edu.au, niraj.lal@delwp.vic.gov.au

Electricity prices in Australia have risen at nearly four times the rate of CPI over the past decade, and national CO_2 emissions have increased every year for the past five years (ACCC 2018, DEE 2018). In this context, governments across Australia and the Asia-Pacific region more broadly are exploring options to concurrently reduce electricity prices and carbon emissions. Policy options range from conducting reverse auctions for large-scale renewable energy generation projects – aimed at reducing the wholesale electricity prices, to supporting the adoption of residential solar photovoltaic (PV) and battery installations – aimed at directly reducing retail electricity costs borne by households.

This paper discusses the Victorian Government's recently announced $1.3bn 10-year Solar Homes Program to support the installation of 770,000 solar PV, hot water and battery systems towards 40% penetration across the state. It outlines the opportunities presented by such programs to support smart-inverter standards and distributed-energy-resource (DER) orchestration frameworks that can help facilitate the transition towards a more secure, reliable, affordable and equitable electricity grid with high (>60%) DER penetration expected in the coming decade.

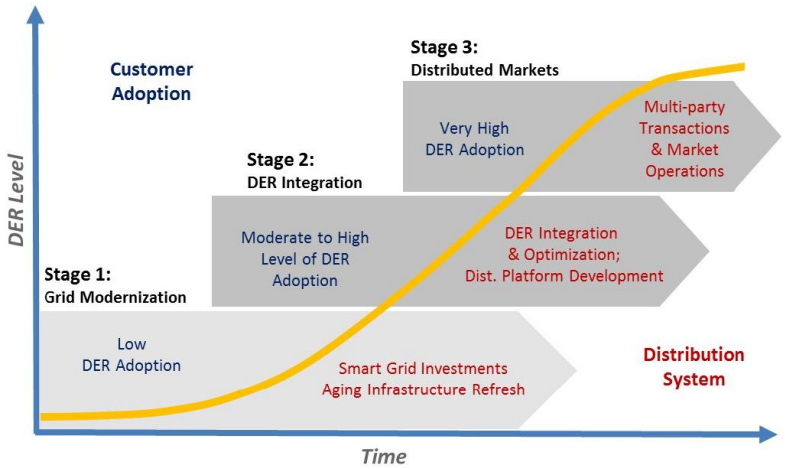

Figure 1 Distribution system evolution for Distributed Energy Resources (de Martini et al. 2015).

Victoria currently has the most emissions-intensive electricity generation portfolio in Australia with more than 75% of electricity generated coming from brown coal alone (DEE 2019). Victorian PV penetration is approximately 16% of houses with total installed capacity of 1.7GW and is perhaps at Stage 2 of the DER evolution process outlined by de Martini et al in 2015, with a growing need for greater integration and optimisation of DER. Whilst below the national PV penetration rate of 19%, parts of Victoria are already experiencing voltage excursions on the low-voltage (LV) network (Stringer et al. 2017), with a growing number of customers being completely refused export due to network constraints. The reasons for this are many and varied, and due in part to the original design of the

network for outward power flows and historical nominal LV network voltages of 240V across Australia. High penetration of distributed PV generation without appropriate disturbance ride-through settings also poses threats to system security and frequency control already being experienced in South and Western Australia, presenting some of the first large-scale examples in the world of PV impact to system security.

The regulation of DER interaction with the grid in Australia exists under the national framework of the National Electricity Laws, the National Electricity Objectives, the National Electricity Market Rules and Australian Standards. Reforms to these regulatory frameworks often take several years, and whilst there is a significant body of work to expedite and revise this framework (including from the regulators themselves), there exists an opportunity for state governments in Australia to support the transition towards a high-DER future in advance of these reforms.

Drawing on lessons from reform programs including those of the California Public Utilities Commission, Hawaiian Public Utilities Commission, UK Office for Gas and Electricity Markets, the German Energiewende and the South Australia Power Network, this presentation outlines the status of policy efforts in Victoria to support high DER penetration with a focus on those recently achieved through the Solar Homes Program. This includes the recent mandating of Volt-VAr and Volt-Watt response mode capability under Australian Standard 4777.2 for all PV inverters supported by the Solar Homes program, a requirement developed in close consultation with regulated distribution businesses in Victoria that has spurred distributors to update their Model Standing Offers to all customers in Victoria (not just those receiving a rebated system). This single policy measure has led to savings of tens of millions of dollars in network-augmentation forecasts over the forward estimates, reduced the likelihood of curtailment of solar PV export for new connections, and facilitated higher future penetration of PV on the LV network across Victoria with other state jurisdictions following suit.

We will also discuss the program's 'smart-battery' assessment criteria with AEMO's Virtual Powerplant Demonstration Program, policy interactions with proposed standards reform to AS 4777.2 including disturbance-ride-through settings outlined in IEEE 1547 and advanced communication protocols outlined in IEEE 2030.5, and possible policy settings for the establishment of Approved Aggregator, VPP, and/or DER-Orchestration Programs.

Finally, the presentation will review and explore interactions between bureaucracy, academia and industry during the policy development process, and discuss where researchers can provide influence and expertise in the development of policy that can support the transition towards a secure, reliable, affordable and equitable grid with high DER penetration.

References

ACCC Electricity supply and prices enquiry, 2018 https://www.accc.gov.au/regulated-infrastructure/energy/electricity-supply-prices-inquiry/final-report

Aust. Dept Environment and Energy 2018, National Greenhouse Gas Inventory Update https://www.environment.gov.au/system/files/resources/e2b0a880-74b9-436b-9ddd-941a74d81fad/files/nggi-quarterly-update-june-2018.pdf

Aust. Dept Environment and Energy 2019, Australian Energy Statistics https://www.energy.gov.au/sites/default/files/2019_aes_table_o_march_2019.pdf

Australian Energy Council, 2019 Solar Report https://www.energycouncil.com.au/media/15358/australian-energy-council-solar-report_-january-2019.pdf

de Martini, Kristov, Distribution Systems in a High Distributed Energy Resources Future, California Future Electric Utility Regulation, 2015

Stringer, Bruce, MacGill, Data driven exploration of voltage conditions in the Low Voltage network for sites with distributed solar PV, Asia-Pacific Solar Research Conference, 2017