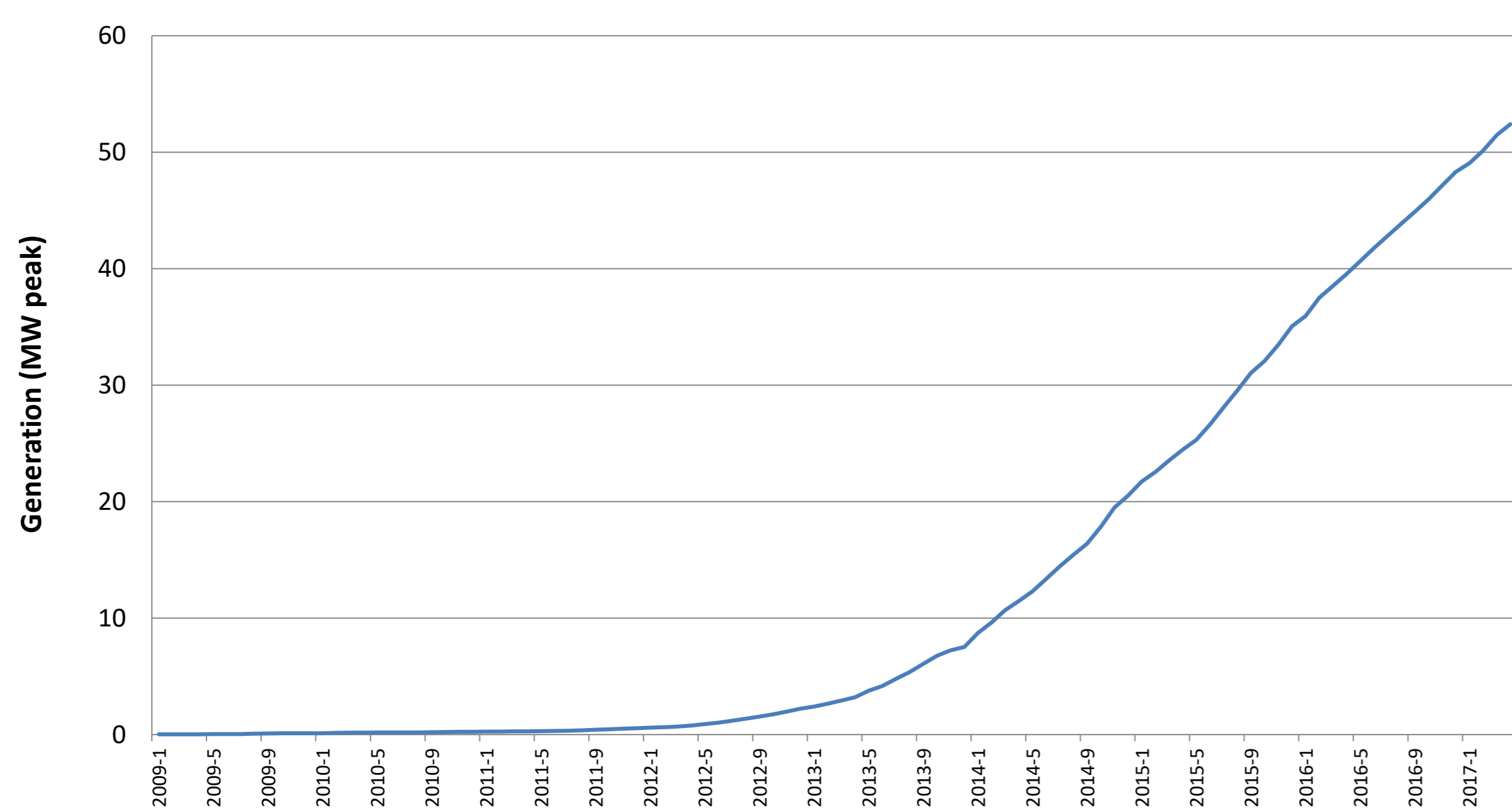


Introduction



Small-scale distributed generation (DG) in New Zealand, particularly photovoltaic (PV) generation, has been growing steadily over the past few years. In the last year alone to 30 April 2017, installed PV generation of all capacities grew by a factor of about 1.3 to reach 52 MW. Approximately 90% (47 MW) of this installed PV capacity is made up of small-scale, single phase grid-tied systems with ratings below 10 kW. This corresponds, on average, to approximately 300 new PV systems being installed each month within low voltage (LV) distribution networks.



New Zealand PV uptake showing cumulative capacity

Issues to address

Traditionally, the flow of power in electricity distribution networks has been largely unidirectional. However, DG introduces reverse power flows into the LV network when the power produced by DG systems is greater than what can be consumed locally. The introduction of reverse power flows can negatively impact the electricity network, causing issues such as over-voltage, and overloading of conductors & transformers. As such, each DG connection application received by electricity distribution businesses (EDBs) needs to be considered for its impact on the electricity network. The resourcing demand imposed by larger numbers of connection applications, and the difficulty of technical assessment, are likely to increase substantially as DG uptake intensifies.

The Guideline project and status

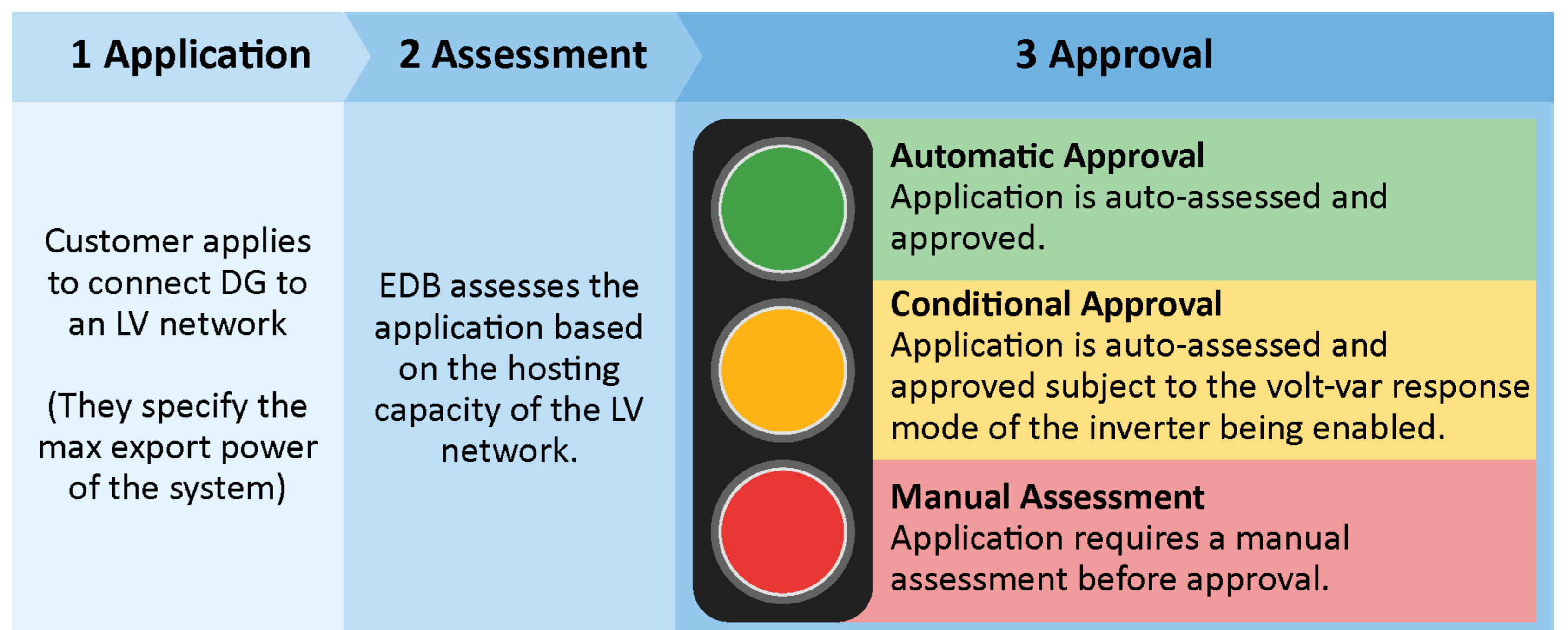
These issues prompted the EPECentre via its GREEN Grid programme, with the assistance of the electricity industry based Network Analysis Group (NAG), to develop a small-scale inverter based DG connection guideline for New Zealand EDBs. This has been developed on behalf of the Electricity Engineers' Association (EEA) specifically for the connection of inverter energy systems (IES) of 10 kW or less.

The Guideline was published as a consultation draft by the EEA in May 2016. Substantial feedback was received and has now been incorporated into an as yet unpublished final guide. Two significant regulatory issues were identified, and publication of the new draft is awaiting resolution of these issues by the regulators concerned. In the meantime, EDBs are encouraged to use the published EEA consultation draft.

Guideline Contents

- Traffic light system for streamlining DG connection applications**

DG connection applications are categorized into a three tier *traffic light system*, which reflects the likely impact of the distributed generator exporting into the LV network. The tier which an application falls into is determined by looking at the LV network's DG *hosting capacity*. To determine hosting capacity (where full LV network information is not available), the EPECentre has developed an approximation method, which uses simplified inputs, called *DGHost™*.

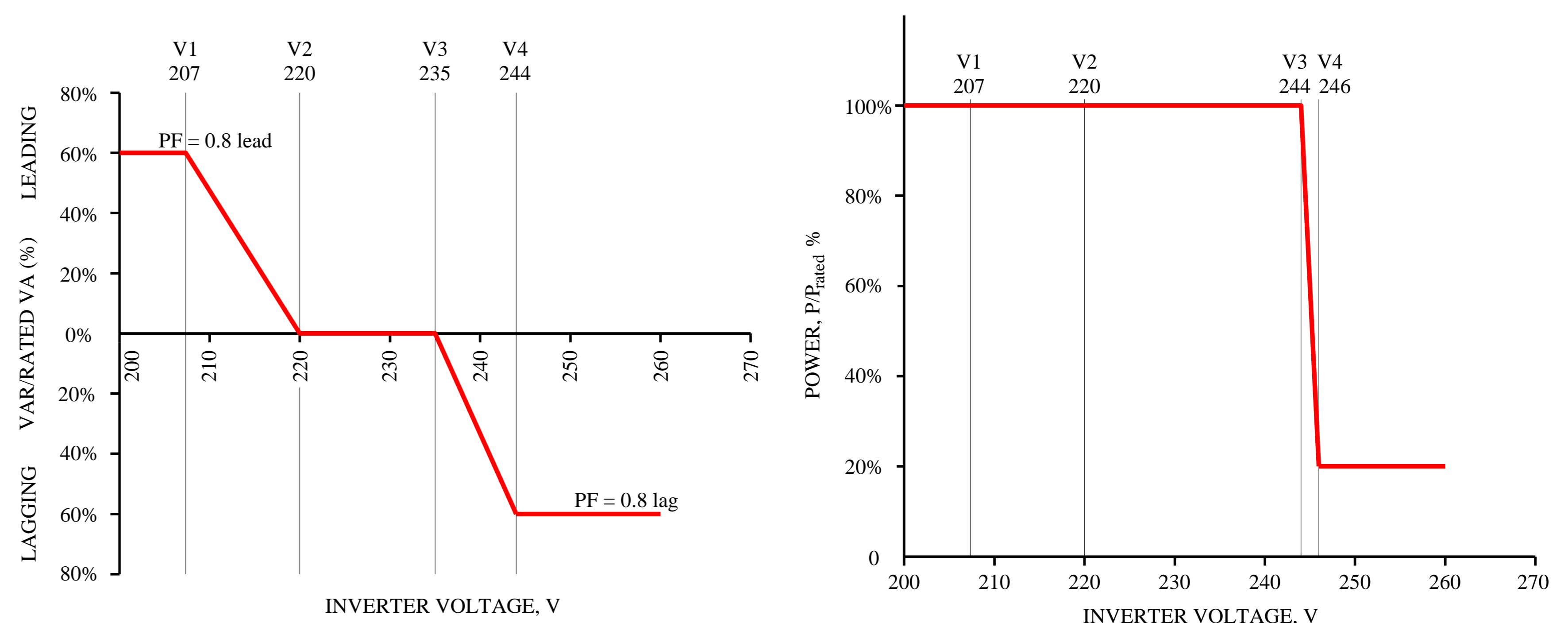


- A simple method for evaluating LV network congestion**

Enables the degree of export congestion for every network to be determined, allowing potentially congested networks to be flagged for closer inspection.

- Technical requirements**

Covers key requirements for installation and inverter, including safety & protection, and recommended inverter settings for NZ.



Curves for the NZ inverter volt-var (left) and volt-watt (right) response modes designed by EPECentre/Network Analysis Group

- Pro forma DG application form**

For EDBs to adopt and adapt as they wish.

Acknowledgements

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