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Part 6 – Network hosting capacity

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Overview

Summary of questions asked in the paper

Background

Technical issues covered in the paper and options being considered

Discussion

Summary of questions

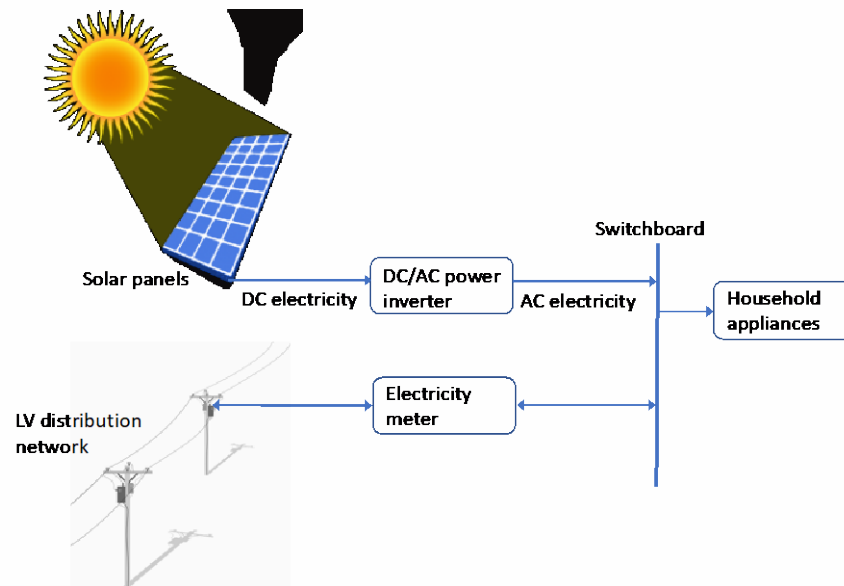
- Have we adequately outlined the issues?
- We are looking at 3 options. Are there other options we should consider?
- Is an option B approach (for inverters, set minimum equipment standards & apply default settings) the best option now?
- Re the EEA draft guide, can we simplify the recommended approach by requiring that all new inverters should support the optional power quality modes by default?
- Comments about the methodology for assessing network hosting capacity
- 10kW total vs 5kVA/phase?
- Comments about in-home EV charging

Part 6 deals with connecting DG

DG = distributed generation

Part 6 covers all DG, but our focus is small-scale

SSDG = small-scale DG — typically rooftop solar PV, LV network connected via a consumer installation, up to 10 kW capacity



SSDG systems increasingly incorporate a battery

PART 6 Development timeline

... the last decade in context

- 2007 — (?) DG Regulations
- 2010 — (?) DG Regulations moved into the Code as Part 6 (?)
- 2011/14 – (<5MW) Part 6 operational review; Part 1A process added
- 2015 — (27MW) AS/NZS 4777.2:2015 new inverter standard
- 2016 — (41MW) EEA guide developed ... request to amend Part 6
- 2017 — (55MW)
- 2018 — (70MW, 20,000 ICPs (~1%), 3.5kW/ICP) this issues paper

* installed small-scale rooftop solar PV at 31 August (EMI data)

The national grid is in good shape ...

“We found that the [grid] is an enabler: the core [grid] can accommodate significant solar PV in addition to the existing generation mix and present demand for electricity”

— from *Solar PV in New Zealand*, a Transpower discussion document published December 2017

In fact, Transpower’s research indicated that the grid could accommodate up to 2000MW of solar PV, and possibly more, with little additional cost.

The study considered grid-centric issues:

- Ensuring a balanced power system
- Power system stability
- Partly cloudy days
- Grid voltage management
- Response to sudden events

... but concluded that cost-effective mitigations exist

... So The focus here is more on Low Voltage networks

- ... aka “the *last few kilometres*”
- ... are everywhere, overhead or underground
- ... 400/230 volts +/- 6%
- ... were designed for one-way power flow
- ... not usually directly monitored by distributors
- ... increasingly “the *first few kilometres*”?

Distributors install, operate, maintain, repair, renew etc LV networks



Part 6 has ...

Requirements for distributors to publish information

Processes for obtaining approval to connect DG, if consistent with the distributor's connection and operation standards

- Part 1 – up to 10kW, any technology
- Part 1A – up to 10kW, with a standards-compliant inverter
- Part 2 – more than 10kW, any technology

Also:

- A default connection agreement
- A dispute resolution process
- Pricing principles

The paper outlines three issues

1. High levels of SSDG can lead to sustained high local voltages
2. Incorrect inverter protection settings can affect the ability of SSDG to 'ride through' faults
3. Concentrations of solar PV may lead to network congestion

Increasing incidence of in-home EV charging exacerbates the issues

We are keen to get feedback on these issues, and any other issues you think are relevant

Options to address issues

The Authority is considering a range of options:

- option A – wait, there's no urgency
- option B – amend Part 6 to require some optional features recently introduced into the inverter standard by default; and provide clarity and consistency around distributors' connection and operation standards
- option C – start again; re-think and rewrite Part 6

Relevant markets will take time to develop

Preliminary view is that option B may provide greatest net benefits but keen for stakeholder feedback

EEA request to amend part 6

EEA has developed a guide for connection of small-scale, inverter-connected DG

Focus is on coordinating SSDG operation through use of in-built inverter modes for voltage and power control

The guide's approach requires compulsory adoption of currently optional inverter features

- provides a methodology for determining congested parts networks
- AS/NZS 4777.2 volt/var and volt/watt modes in (foreseeably) congested network areas
- a 'minimum equipment standards' approach
- seeks to ensure that SSDG investors are 'good network neighbours'

TWO Other topics outlined

10kW total (Part 6) vs 5kVA/phase (AS/NZS4777)

- should we align the categories in Part 6 to the standards?

In-home EV charging

- trickle (2.4kW) vs slow (7kW) vs fast (22kW) chargers
- a peak network capacity crisis in the making?
- a problem for regulation to address?
- market mechanisms?

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