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EEA Asset Management Forum

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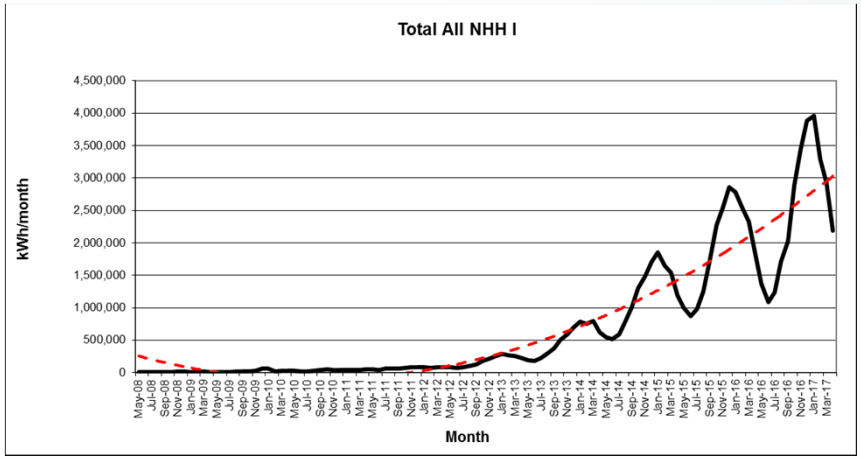
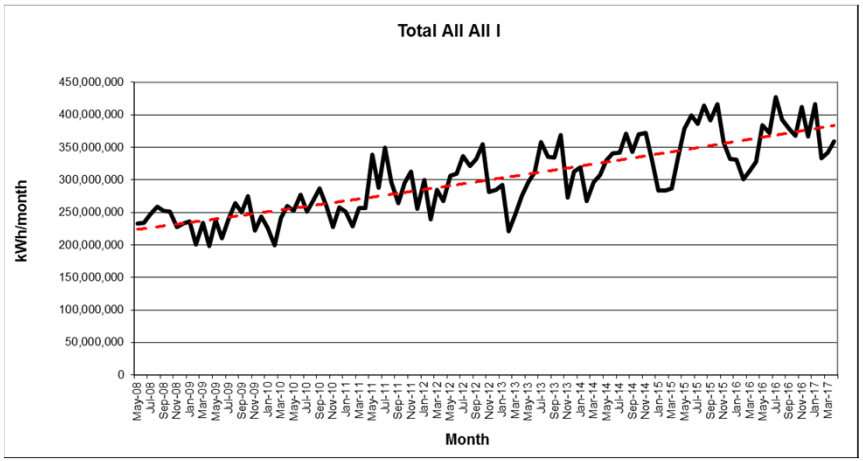
COMPETITION • RELIABILITY • EFFICIENCY

EMBEDDED GENERATION TRENDS





Embedded generation at 30 April 2017			
Fuel type	ICP identifiers	Installed capacity in MW	% of total capacity
Solar	13,800	52,538	4.20%
Liquid fuel	126	104,257	8.33%
Fresh water	95	288,244	23.04%
Wind	79	264,345	21.13%
Other	39	119,808	9.58%
Natural gas	12	95,902	7.66%
Undefined	12	3,352	0.27%
Industrial processes	9	137.700	11.01%
Geothermal	7	175.800	14.05%
Bio-mass	6	9.250	0.74%
Tidal	1	0.003	0.00%
Total	14,186	1251.199	

- Market systems record all embedded generation
- Part 6 of the Code regulates “distributed generation” connection requirements
- The Code requires all electricity conveyed to be measured (unless generation is gifted)
- Batteries as a fuel type (ESDs) will be consulted on

WHO IS A DISTRIBUTED GENERATOR?

- A person that meets the definition of a participant under section 7(1)(g) of the Act and is "distributed generation" under the Code

Section 7 of the Electricity Industry Act 2010

(1) The following are industry participants for the purposes of this Act:

(a) a generator:

.....

(g) a person, other than a generator, who generates electricity that is fed into a network:

Part 1 of the Code definitions

***distributed generation** means **generating plant** that is **connected**, or proposed to be **connected**, but does not include—*

*(a) **generating plant connected** and operated by a **distributor** for the purpose of maintaining or restoring the provision of **electricity** to part or all of the **distributor's distribution network**.....*

*(b) **generating plant** that is only momentarily **synchronised** with the **distribution network** for the purpose of switching operations to start or stop the **generating plant***

generating plant** means equipment collectively used for generating **electricity

DG includes batteries and EVs that generate

BATTERIES

- DG includes batteries and installations, should follow the Part 6 process
- Batteries consume and generate electricity at different times, electricity flow should be accounted for in the settlement process
- Electrical installation connected batteries should already have
  - an ICP identifier (network POC)
  - a Code compliant meter
  - a trader for the ICP identifier
- Network connected batteries should have
  - an ICP identifier
  - Code compliant metering
  - a trader

DG HOSTING CAPACITY

- EEA released “Guideline for the connection of small-scale inverter based distributed generation”, introduces the concept of hosting capacity for SSDG
  - however Part 6 of the Code refers to export congestion and not hosting capacity

    export congestion *means a situation in which a* ***distribution network*** *is unable to accept* ***electricity*** *exported from a* ***distributed generation connection*** *because the injection of an additional unit of* ***electricity*** *into the* ***distribution network*** *would—*

    (a) directly cause a component in the ***network*** *to operate beyond the component's rated maximum capacity; or*

    (b) give rise to an unacceptably high level of voltage at the ***point of connection*** *between the* ***distribution network*** *and the* ***distributed generation***

- Part 6 - integration of hosting capacity in lieu of export congestion is a project on the proposed 2017/2018 Authority work program

ELECTRIC VEHICLE CHARGERS

- 5 May 2016, Government announced its Electric Vehicles Programme which includes a target of doubling the number of electric vehicles in New Zealand every year to reach approximately 64,000 by 2021
  (http://www.transport.govt.nz/ourwork/climatechange/electric-vehicles/)

- National guidance for public electric vehicle charging infrastructure issued by NZTA
  (http://www.nzta.govt.nz/planning-and-investment/planning/planning-for-electric-vehicles)

- The Authority also released a memo on Code requirements for public electric vehicle chargers on 7 April 2016 http://www.ea.govt.nz/dmsdocument/20598

ELECTRIC VEHICLE CHARGING STATIONS MEMO

- If charger connected directly to a distributor's network
  - must be connected and energised in accordance with the requirements of the Code
  - must have a trader recorded in the registry for that ICP identifier
    - if the charger output is sold to a consumer, the trader is a "retailer" and must register with the Authority
    - if the charger output is gifted to a consumer, the person operating the charger is "a person who buys electricity from the clearing manager" and must register with the Authority
  - must have a metering installation that complies with the requirements of the Code

- If charger connected within a consumer installation
  - is metered by the existing ICP metering and traded by the trader for the existing ICP
  - if the charger output is
    - sold to a consumer, the person operating the charger is a retailer and must register with the Authority
    - gifted to a consumer, the person operating the charger is not a participant
    - used by a consumer, the person operating the charger is not a participant

ELECTRIC VEHICLE CHARGERS

- Uncontrolled, an in home charger can essentially double the peak demand of a house
- If chargers are clustered within an area the consequence **may**
  - without controlled charging, overload service transformers, and street circuits
  - depending on network design capacity and configuration, create power quality problems including, but not limited to,
    - increased network losses
    - under-voltage conditions
    - phase unbalances
    - voltage and current harmonics
- There may be distribution grid challenges that need to be addressed

ELECTRIC VEHICLE CHARGERS

- Powerco has carried out an electric vehicle in home charger study
  - Purpose - to draw out potential outcomes to understand the future with more confidence
  - Model used a simplified, low-diversity case to illustrate the risk of uncontrolled EV charging
  - Assumes similar charging behaviours and ‘fuel’ consumption parameters for all customers

- Study aimed at illustrating one potential outcome to highlight a need for more industry innovation and collaboration to mitigate risk
  - modelling showed evening peaks on feeders can be raised “significantly” with as little as 10 to 20 per cent EV penetration in a street
  - it is likely that some parts of the country and its networks could have far higher EV take-up
  - simply shifting the time of charging to off-peak periods may “potentially create a secondary peak later in the evening”

QUICK SURVEY OF ELECTRIC VEHICLES

Manufacture	Battery capacity kWh	Approx charger capacity kW	Approx time to fully charge Hours
Renault Fluence Z.E.	22	3.5	6.2
Kia Soul	27	6.6	4
Mercedes B Class	28	10	2.8
Nissan leaf	30	3.6	8.3
BMW I3	33.4	11	3
Ford Focus	33.5	6.6	5
Nissan leaf retrofit	60	7.2	8.3
Tesla S	70	7.2	9.7
Tesla S	90	10	9

HOSTING CAPACITY OF IN HOME ELECTRIC VEHICLE CHARGERS

- Higher capacity in home chargers for higher capacity EVs
  - higher capacity batteries may encourage higher capacity in home chargers
  - distributors and retailers will not have visibility of what capacity chargers are connected to electrical installations

- Questions for consideration and discussion
  - rectifier and inverters (i.e. generation from an electric vehicle battery) is also DG and will need to follow the Part 6 process. How is this communicated?
  - is electric vehicle charger hosting capacity an issue that should be considered?
  - are controls required on in home electric vehicle chargers?
  - will pricing signals encourage appropriate charging behaviour by customers
  - should a Part 6 application process exist for EV chargers above a certain capacity so that distributors are aware and have control over power quality, phasing and the connected load applied to distributors networks?

CODE DEFINITION CHANGES

- Revoke definitions of ‘connection’ and ‘disconnection’ so these words have their ordinary meanings, consistent with other legislation
- Revoke definitions of ‘electrically connecting’ and ‘temporary energisation’
- Amend definition of ‘commissioning’ and ‘decommissioning’, to include the commissioning and decommissioning of an ‘asset’ and a ‘point of connection’
- Replace ‘energisation’ with ‘electrically connect’
- Replace ‘de-energisation’ with ‘electrically disconnect’
- Replace ‘connected’ and ‘energised’ with ‘electrically connected’
- Replace ‘disconnected’ and ‘de-energised’ with ‘electrically disconnected’
- Replace ‘disestablished’, ‘electrically isolated’, and ‘interconnect’ with, respectively, ‘decommissioned’, ‘electrical conductors’, ‘electrical separation’ and ‘connect’
- Clarify that ‘electrically unsafe’ has the meaning given to it in the Electricity (Safety) Regulations.
- Refer to http://www.ea.govt.nz/development/work-programme/operational-efficiencies/code-review-programme/

THINGS TO BE AWARE OF

- There has been a review of distributor web content required by Part 6
- ENA has released “Pricing guidelines for electricity distributors”
- ENA has published each distributors road map for introducing efficient pricing
- Authority will shortly consult on
  - EIEP alignment with ENA “Pricing guidelines for electricity distributors”
  - changes to EIEPs
  - options to register content code structures
  - additions to embedded generator fuel types in the registry
- Consultation open on Initiatives to reduce inefficient barriers to development and use of evolving technologies and business models across the supply chain

  (closes 11 Jul 2017)
- Default Distribution Arrangements decision being finalised
- Consultation on operational Code amendments is being worked on