GREEN Grid

Future Proofing New Zealand's Electricity Supply

Using DGHost™ to Determine Hosting Capacities for Low Voltage Networks

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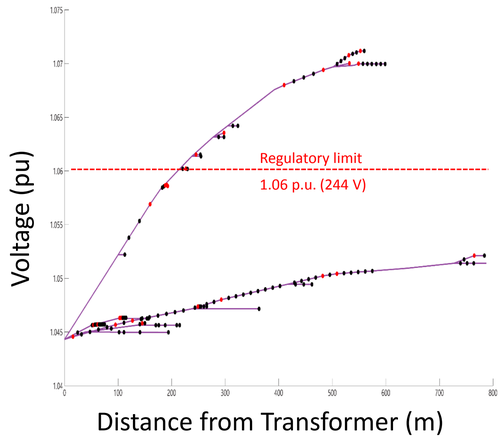
June 2017

The Challenge: Increasing amounts of Distributed Generation (DG) can compromise Low Voltage Networks

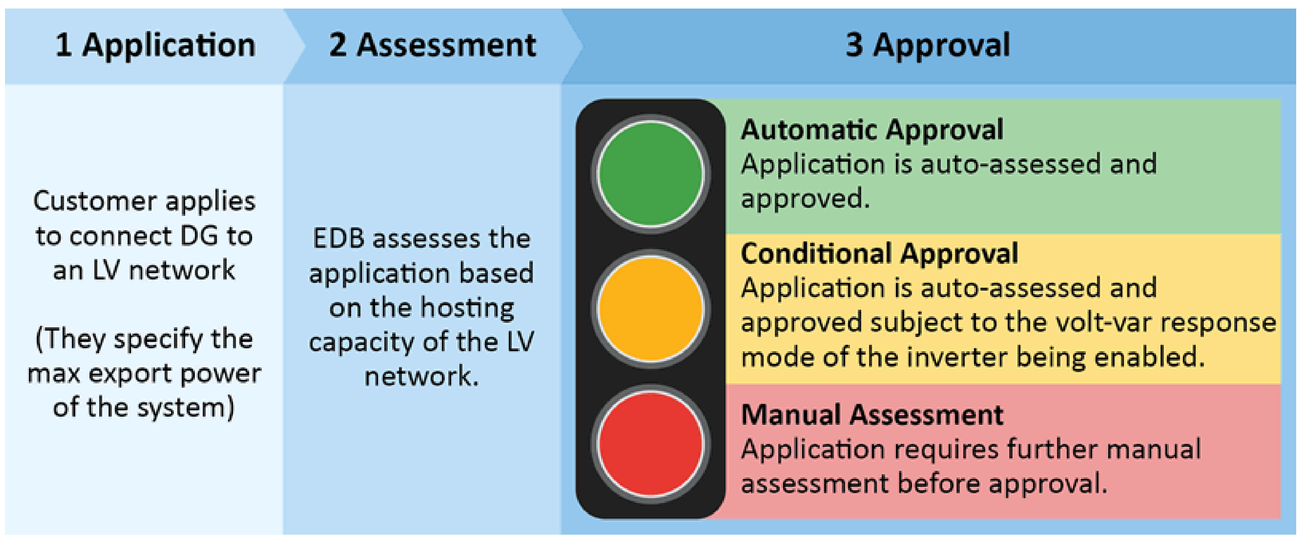
- Increased DG connections can lead to network congestion i.e. voltage rise along feeders as shown in the figure to the right, or overloading of network equipment such as conductors and transformers
- Low voltage networks have different capacities for supporting DG
- The ability to determine hosting capacities for LV networks can assist Electricity Distribution Businesses (EDBs) manage increasing applications for DG
- Ideally full power-flow simulations would be undertaken to calculate the hosting capacities of each LV network, however this requires full network information which is not always easily available



Voltage along an LV feeder showing voltage rise owing to high amounts of DG.

The DGHost™ Service

The DGHost™ service, developed by the EPECentre, is a commercial service that provides third parties the opportunity to determine approximate hosting capacities for their low voltage networks. It requires a minimal number of input parameters, thereby making the determination of hosting capacity straightforward. DGHost™ provides network-specific hosting capacity thresholds that can be used to implement the EEA Guideline for the Connection of Small-Scale Inverter Based Distributed Generation as shown in the figure to the right.

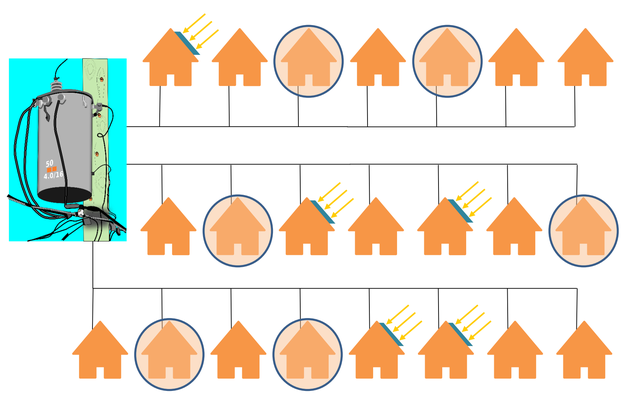


"Traffic light" DG application process as specified in the EEA Guideline for the Connection of Small-Scale Inverter Based Distributed Generation (draft).

DGHost™ Inputs

Spreadsheet format including:

- Basic network parameters:
  - *Transformer Rating*
  - *Number of ICPs*
  - *Maximum Feeder Impedance*
- Long-term DG Penetration Levels:
  - *Four long-term DG penetration levels (to inform on different penetration scenarios)*
- Optional Network Parameters:
  - *Reduced neutral conductors*
  - *Single-phase transformer (three-phase is the default)*



Example LV Network

Household with DG

Potential DG Household

Transformer:	100 kVA
Number of ICPs:	22
Max Feeder Impedance:	0.18Ω
Long-term DG penetration:	50%

DGHost™

H1 = 3kW, H2 = 8kW,
where H1 & H2 are the hosting capacity thresholds for a DG system with no volt-var capability and 60% volt-var respectively

DGHost™ Outputs

- Maximum of 24 hosting capacities per network
- Maximum of four penetrations
- Three levels of DG inverter volt-var* response
  - No volt-var response (0%)
  - Maximum of 30% reactive power consumed
  - Maximum of 60% reactive power consumed
- Conservative and Median results (25th and 50th percentiles of the distribution)

*DG inverter voltage response modes such as volt-var are defined in AS/NZ 4777.2:2015 and NZ appropriate settings are defined in the EEA Guideline for the Connection of Small-Scale Inverter Based Distributed Generation. In this mode, an inverter detecting a high voltage at its output, acts to consume reactive power in order to lower the voltage.

How do I access the DGHost™ Service?

Contact the EPECentre at dghost@epecentre.ac.nz.

Primary Funder
Ministry of Business, Innovation & Employment

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