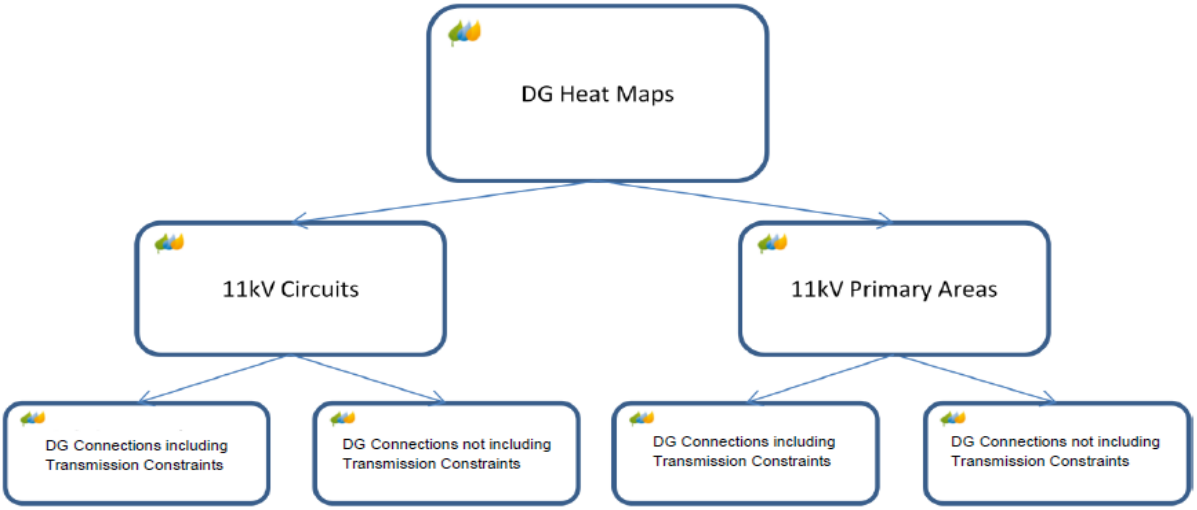
Overview

These Heat Maps have been created to empower DG customers with the relevant data to aid a better understanding of the network and assist in determining potential opportunities to connect Distributed Generation to the 11kV network in the SP Distribution Ltd. area and the SP Manweb Ltd. area.

Connection to the 11kV network poses some of the most onerous connections for what is typically a single generation site. The Heat Maps are split in to two sections, each with two sub-sections as follows;



- 11kV Circuit Categorisation considers the ability of a given circuit to facilitate the connection of Distributed Generation connections;
- 11kV Primary Area Categorisation considers the impact that additional Distributed Generation on one circuit fed from a given primary substation may have on the remaining circuits from that substation and the associated upstream 33kV network;
- The sub-sections reflect restraints on Generation connections of 1MW or greater that are imposed due to restrictions in the Transmission Network in certain areas. As such, separate Heat Maps are being progress to present the EHV network both with and without the associated constraint.

Opening the Heat Map files

The Heat Maps are saved in a ".kmz" format. These files are compatible with many mapping software packages (also known as GIS – Geographic Information Systems), such as ArcGIS, Google Earth, and others. It is the end users responsibility that compatibility and licence requirements are confirmed with the relevant software developer prior to use. These files can be made available on request, via simple email request to gettingconnected@scottishpower.com titled "DG Heat Map request" detailing Name, Address, Company Name (if applicable), email address, contact telephone number and business need for the maps. We will aim to make these available with 48 hours of the initial request, although please allow for high demand following first release or an update to the sites.

The operational data used to establish the status of the circuits was as at Q3 2014.

Categorisation

11kV Circuits

The Heat Maps show the network in an 'as is' state and demonstrate how close each circuit is to its limit for the following operational factors;

- Circuit Voltage Rise
- Available Generation Capacity
- Primary Transformer Reverse Power Flow Capability
- 11kV Fault Level
- Transmission Constraints (i.e. upstream constraints on the 132kV & above networks)

Where circuits are approaching tolerable limits, additional Distributed Generation may still be connected; however network reinforcement works may be required. Subject to the exact nature of the actual connection, all or some of the costs of these works may be apportioned between the customer and SP Energy Networks.

Category A (Green) – All operational factors are within tolerable limits and so opportunities may exist to connect additional Distributed Generation without reinforcing the network. This is likely to facilitate a DG connection of up to 500kW (subject to detailed studies).

Category B (Amber) – At least one factor is nearing its operational limit and hence, depending on the nature of the application, network reinforcement may be required. However this can only be confirmed by detailed network analysis. This is likely to facilitate a DG connection of up to 250kW (subject to detailed studies).

Category C (Red) – At least one factor is close to its operational limit and so installation of most levels of Distributed Generation and a local connection is highly unlikely. It may also require extensive reinforcement works or given the lack of a local connection, require an extensive amount of sole user assets to facilitate such a connection.

In all the instances above, the figures are indicative and subject to actual network studies. In all instances any proposed connection must be subject to a full connection analysis ensuring any subsequent offer is subject to the 'technically feasible' element of minimum scheme.

11kV Primary Areas

These incorporate factors from the 11kV Circuit Heat Maps above and also;

- 33kV Fault Level
- Percentage of Adjacent Circuits with Voltage Rise Issues

Each Primary Substation has a number of outgoing 11kV circuits. These circuits are not necessarily isolated from each other and so Voltage Rise experienced by one circuit may also impact adjacent circuits. As such, the latter factor above seeks to consider this issue where one or more of the adjacent circuits are already nearing the operating limit for Voltage Rise.

For example, a given circuit may be Category A, and a number of the remaining circuits may be Category C. This may render the 11kV Primary Area Category B due to the potential for the additional Distributed Generation to impact on the Category C circuits.

Category A (Green) – All operational factors are within tolerable limits and it is unlikely that Voltage Rise shall be an issue in adjacent circuits. Thus, further network reinforcement may not be required.

Category B (Amber) – At least one factor is nearing its operational limit and/or Voltage Rise may be an issue in adjacent circuits. Therefore network reinforcement works may be required. However this can only be confirmed by detailed network analysis.

Category C (Red) – At least one factor is close to its operational limit and/or Voltage Rise is likely to be an issue in adjacent circuits. Therefore network reinforcement works are highly likely to be required.

Use of Heat Maps

Heat Maps are indicative only and intended purely to better inform any customer that is considering a DG project. Whilst all reasonable care has been taken to ensure the accuracy of the Heat Maps and their supporting data, they are not a live system and so will not be 100% accurate in real time. Connection offers will be based on detailed network studies which are undertaken on an individual basis after receipt of a competent application. We welcome open communication with customers to discuss individual requirements. Our contact details can be found here.

The Heat Maps may not accurately reflect the current state of network and so must NOT be used as cable records. Records may be obtained by contacting Data Management, details here.

Glossary of Terms

Fault Level – This is a measure of the level of energy supplied to a fault on the network. Network plant is designed to carry a given amount of Fault Level. Distributed Generation contributes energy during fault conditions and therefore raises this Fault Level.

Transformer Reverse Power Flow Capability – When generation exceeds the local demand from a Primary Substation, the remaining power is carried through the Primary Transformer to the 33kV network for use elsewhere. These transformers are limited in the levels of power they can transform. The local demand rarely reaches zero in any part of the network and so a component of this demand is added to the transformer capability to form the capability.

Primary Area – A geographical representation of the area served by the 11kV circuits from a given Primary Substation.

Primary Substation – A substation containing the necessary plant and apparatus to connect 11kV circuits to the 33kV network.

Reverse Power Flow – The Primary Transformers can accept bi-directional power flow and so transfer additional power to the 33kV network when generation exceeds demand. However, depending on the status of the asset, the actual level of “reverse” power flow may be restricted to as low as 15% of the transformers capability.

Voltage Rise – Any generation can cause an increase in voltage in the network. We are required by legislation to maintain the network voltage within statutory limits, notably 230V +10%/-6% at a consumers 'cut-out' before the meter.

Minimum scheme – Least cost, technically feasible proposal to facilitate any new connection.

Budget Quote – A high level indicative figure, not subject o to any detailed analysis provided to aid customers with early build-up of proposed project budgets.

Formal Quote – An offer made by the DNO to the customer as the basis of formally entering contract to provide a network connection.

Feasibility Study – A study carried out on behalf of the customer to establish which options may or may not be feasible for a given development. These studies are charged at cost to the customer.