

November 2009

CONNECTION CONSIDERATIONS FOR DISTRIBUTED GENERATION

Western Power Distribution Company Profile:

Western Power Distribution (WPD) is responsible for electricity distribution in the South West of England and South & West Wales.

We hold two distribution licenses; in the South West we operate under the name Western Power Distribution (South West) plc and in Wales we operate under the name Western Power Distribution (South Wales) plc.

As a distribution business we own the distribution system assets including 84,000km of network and 90,000 transformers plus associated switchgear. We are responsible for:

- Maintaining the electricity network on a daily basis;
- Repairing the electricity network when faults occur;
- Reinforcing the electricity network to cope with changes in the pattern of demand;
- Extending the electricity network to connect new customers.

WPD is no longer a retailer of electricity and does not get involved in either buying or selling of electricity to the end use customers, which is the responsibility of electricity supply companies.

The Connection Process to Western Power Distribution's Network

The process for making an electricity connection varies according to the size of the generator and the impact it has on the existing distribution system. Useful general information about making a new connection to WPD's distribution system is contained within the leaflets titled 'New Connections to the Western Power Distribution Electricity Distribution System in the South West' and 'New Connections to the Western Power Distribution Electricity Distribution System in South Wales'. These leaflets can be downloaded from Western Power Distribution's web site (New Connections section) and are aimed mainly at connections for the import of electricity.

For guidance relating to the connection of small scale electricity generators (SSEG's) rated up to and including 16A per phase we have produced a separate leaflet which may also be downloaded from our website. If just one SSEG is to be installed at the property the installer must inform us about the SSEG installation within 28 days of the time of commissioning and then ensure all relevant technical details of the SSEG unit are provided within 30 days of commissioning.

For larger generators the rules are different and you must inform WPD of your intention to connect a larger generator prior to its commissioning. Further information relating to the connection of generators to the distribution system is contained within Engineering Recommendations G59/1 and G75/1. The planning and connection process need careful

consideration and can take time so it is extremely important that you contact WPD in the early development stages of a generation project to ensure that the desired connection date can be met. Sufficient time should be allocated to the development stages of a project as it can typically take 12 – 24 months from first contact with WPD to energisation of the connection (at 11,000 and 33,000 Volts). Large connections at 132,000 Volts may take longer to commission.

WPD will need to carry out technical assessments of the impact of the generation on the distribution network before a generating unit can be connected. The staged connection process for larger distributed generation is summarised over the page:-

Stage I: _____ Feasibility Study

Studies are carried out to determine the impact of the proposed generation on WPD's existing network. An indicative budget estimate is given to the customer, which will be subject to further study and a number of conditions. Note: a charge for carrying out the feasibility study may be payable in advance of it being undertaken.

Stage II: _____ Formal Connection Offer

Based on a satisfactory outcome in stage I and on instruction from the customer, detailed design work is carried out to produce a connection charge and connection offer. Further technical studies including Stability Studies (for large connections, normally over 5MW) are completed as necessary. WPD start the process to obtain any necessary planning permissions and/or consents. For larger projects, WPD will make Tender and Contract applications for necessary plant, equipment and construction works.

Stage III: _____ Project Completion & Commissioning

Following acceptance of the connection offer and subject to consents and planning permission, the project will proceed to completion and commissioning at agreed timescales. The customer has the option to carry out contestable work elements. It is possible that some small connections will not require any physical works to be carried out to WPD's network.

All costs incurred by WPD whilst assessing the system and designing the electricity connection under Stage II will be included in the connection charge made under the connection offer. The applicant may be asked to indemnify WPD against any external costs incurred to cover consultants fees for stability or other technical studies made prior to the work commencing, including any necessary application to National Grid. The indemnification amount will depend on the size, type and location of the proposed generator.

Once the connection offer is accepted the connection charge will normally be recovered in agreed stages in line with WPD's expenditure. If the project does not proceed for whatever reason, the customer/developer will be asked to settle any abortive costs. For most small connections (typically below 500kW), the process is normally condensed, with Stage I and II combined into one.

This is only a brief summary and generators should contact WPD for further details of the connection process, including information on contestable and non-contestable works (which allows the customer to carry out certain work elements before they are connected to the Distribution System).

Planning Permission and Other Consents

The types of consents and permissions required for substations, overhead lines and underground cables necessary to make a connection can be summarised as follows.

- Wayleaves/Easements: Required from private landowners where an overhead line or underground cable is to cross his or her land. Underground cables laid in the public highway only require the consent of the Local Authority.
- Local Authority Consent: Planning permission is required for new substations of a certain size. However, the substation required for the generator connection would normally be included in the planning application for the whole site. The Local and County Authority must be consulted on new overhead lines and they will make comment to the DECC.
- DECC Consent: Section 37 consent under the Electricity Act 1989 is required for most new overhead lines from The Department of Energy and Climate Change (DECC). The views of the local planning authority, local people and statutory bodies such as the Environment Agency, Countryside Agency and English Nature/Countryside Council for Wales can be brought into the decision making.
- Environmental Statement: This must be produced for new overhead lines with a voltage of 132,000 Volts or above and at lower voltages, if called for by the DECC (this is rare however).
- The Infrastructure Planning Commission: Under the 2008 Planning Act, the IPC will consider applications and grant consent for overhead lines which operate at 132kV or higher. In addition they will grant consent for generating stations >50MW on shore, and >100MW offshore.

Substations and cables constructed in certain areas (eg an SSSI or close to a watercourse), will also require the consent of the Environment Agency and English Nature/Countryside Council for Wales.

Other bodies that may have to be consulted or may wish to provide comment (especially on overhead lines) include, English Heritage/Welsh Historic Monuments Executive Agency (CADW), Campaign to Protect Rural England/Campaign for the Protection of Rural Wales, The County Archaeological Officer and local Wildlife Trusts.

Technical Considerations

The connection of distributed generation to the electricity network will, amongst other factors, affect the power flow, voltage profile and fault level* within that network. The impact of this is assessed during the early stages of a project's development. In some cases, the impact of the new generator(s) will be adverse and require either reinforcement of the electricity network or operating/output constraints to be enforced at certain times of year or during abnormal network operating conditions.

* *Fault Level: Can be viewed as the magnitude of energy, which will need to be interrupted by circuit breakers during a failure/fault on the electricity distribution system. Generating plant normally increases the fault level in the electricity distribution system.*

Connection and Use of system Charges

The customer is required to pay an initial charge for connection and then on-going use of system charges for both import and export energy. For further information regarding the principles for determining both the connection charge and use of system charges please refer to WPD's *Statement of Methodology and Basis of Charges for Connection* and WPD's *Statement of Charges for Use of WPD's Electricity Distribution System*. These Charging Statements are available to view and may be downloaded from the *Use of System Charges* area of our website.

Typical Connection Sizes & Connection Voltages

The connection voltage for a site can influence the cost of connection and in general the higher the voltage, the higher the cost and this is due to the general increase in size and insulation requirements of plant and equipment as the voltage increases. WPD's network operates at the following three phase voltages: 400V, 11kV (6.6kV in some area's), 33kV (66kV in some area's) and 132kV. As an approximate guide, the size of the generator connection and the likely connection voltage is set out on the next page. Be aware, that there will be some overlap between the voltage boundaries and that many site specific geographical and technical parameters can influence the connection voltage to be used. Occasionally in remote rural locations for example, it may be more feasible, both technically and financially, for a 3MW wind farm to be connected at 33kV, where you would normally expect this size of generation to be connected at 11kV.

Generator Size (3-phase)	Location: Urban or Rural	Typical Connection Voltage
0 – 0.25 MW	Rural	400V
0 – 0.5 MW	Urban	400V
0.25 – 4.0 MW	Rural	11,000V
0.5 – 7.0 MW	Urban	11,000V
4.0 – 20.0 MW	Rural	33,000V
7.0 – 20.0 MW	Urban	33,000V
+ 20.0 MW	Urban + Rural	132,000V

Relevant Documentation/ Essential Reading for Prospective Generators:

The Distribution Code of Licensed Distribution Network Operators of England and Wales: Section DPC7 is particularly relevant for the connection of Embedded or Distributed Generation.

Engineering Recommendation G59/1: RECOMMENDATIONS FOR THE CONNECTION OF EMBEDDED GENERATING PLANT TO THE REGIONAL ELECTRICITY COMPANIES' DISTRIBUTION SYSTEMS

Engineering Recommendation G75/1: RECOMMENDATIONS FOR THE CONNECTION OF EMBEDDED GENERATING PLANT TO PUBLIC DISTRIBUTION SYSTEMS ABOVE 20kV OR WITH OUTPUTS OVER 5MW

Engineering Recommendation G83/1:	RECOMMENDATIONS FOR THE CONNECTION OF SMALL SCALE EMBEDDED GENERATORS (UP TO 16A PER PHASE) IN PARALLEL WITH PUBLIC LOW-VOLTAGE DISTRIBUTION NETWORKS
Engineering Technical Report 113:	NOTES OF GUIDANCE FOR THE PROTECTION OF EMBEDDED GENERATING SETS UP TO 5MW FOR OPERATION IN PARALLEL WITH PES DISTRIBUTION SYSTEMS
DTI Report K/EL/00318/REP	TECHNICAL GUIDE TO THE CONNECTION OF GENERATION TO THE DISTRIBUTION NETWORK

G59/1, G75/1, G83/1 and ETR 113 are available to purchase from the Energy Networks Association, 6th Floor, Dean Bradley House, 52 Horseferry Road, London, SW1P 2AF. (Tel: 020 7706 5100). Report K/EL/00318/REP is also available via the distributed generation section of the Energy Networks website listed below.

Useful Websites and Telephone Numbers:

www.westernpower.co.uk
www.ofgem.gov.uk
www.energynetworks.org
www.energynetworks.org/distributed-generation
www.decc.gov.uk

Western Power Distribution (South West): Tel 0845 601 2989
Western Power Distribution (South Wales): Tel 0845 601 3341