

Company	Confidential/ Anonymous	1. When Demand or Generation customers connect at LV/LVS/HV do DNOs adopt a higher standard than P2/6? Please provide your rationale	Working Group Comments
Electricity North West	Non-confidential	<p>ENWL applies its own policies and standards in addition to those standards applied through compliance with the Distribution Licence.</p> <p>For Demand connections ENWL adopts a higher standard of security than P2/6. This is mainly for network performance reasons. This is the basis of our standard connection offer to a Demand customer. However, depending on the design of the connection, the terms of the Distribution Code Guidance Note 1 may apply, and a less secure connection may be provided if this meets the requirements of the customer.</p> <p>The security requirements of P2/6 do not apply to Generation and ENWL's approach is to offer connections based on an intact (ie system normal condition) network. This is the basis of our standard connection offer to a Generation customer; however we will listen to the requirements of each potential Generation customer and proposal connection solution(s) that meets their requirements.</p>	<p>The Working Group noted that DNOs are operating to P2/6 standard or higher.</p> <p>It was also noted that DNO's responded with questions of relevance as the P2/6 Standard doesn't apply when connecting generation customers.</p> <p>The Working Group considered their reasoning behind asking this question. Members concluded that they wanted to assess the impact to network resilience when DGs connect and if more or less network reinforcement is needed.</p>
Northern Powergrid on behalf of Northern Powergrid (Northeast) Ltd and Northern Powergrid (Yorkshire) plc	Non-confidential	<p>Connections to generators do not fall within the scope of ER P2/6 and therefore the security of connections to generators are not subject to a security assessment – they are single circuit security unless the customer requires additional security, or if the generation is part of a demand site with additional security of supply (e.g. hospitals) where the site will have a security of supply related to its import capacity.</p> <p>When designing connections for demand customers, the connection to the specific customer will be designed to meet the requirements of ER P2/6 – which in most cases will require only a single circuit security at LV with redundancy being required at HV. However the design of the upstream LV and HV network may be</p>	Noted

		<p>designed to a standard in excess of the minimum set out in ER P2/6 where economically justified. By way of example, the following are extracts from the our HV and LV design Code of Practice:</p> <p><i>The distribution licences also facilitate an incentive scheme for overall network performance known as the Interruption Incentives Scheme (IIS). This scheme is a driver to reduce Customer Minutes Lost (CML) and Customer Interruptions (CI), which may incentivise investment beyond that needed to meet the requirements of Engineering Recommendation P2/6. This requirement is addressed in this Code of Practice by requiring a level of interconnection above that required by Engineering Recommendation P2/6 where this can be provided economically.</i></p> <p><i>LV systems have historically been designed to provide a security of supply above that required to meet the minimum requirements of Engineering Recommendation P2/6 where practical and economical to do so. The Interruption Incentive Scheme (IIS) and application of Guaranteed Standards (GS) both reinforce the case to continue with this approach.</i></p> <p><i>HV systems have historically been designed to provide a security of supply above that required to meet the minimum requirements of ER P2/6 where practical and economical to do so. The Interruption Incentive Scheme (IIS) and application of Guaranteed Standards both reinforce the case to continue with this approach. This section provides details of the additional security requirements that shall be provided on HV systems.</i></p> <p><i>To increase the security to an EHV to HV substation, interconnection to alternative EHV to HV substations shall be provided, where practicable and economic such that a minimum one-third of the substation's demand can be secured in the event of a second circuit outage at an EHV to HV substation equipped with two transformers.</i></p> <p><i>Where assessing the security requirements of a demand group of between 1 and 12MW i.e. Class of Supply B, whilst ER P2/6 permits 1MW of demand to remain off supply for repair time, this is considered unacceptable and provisions shall be made to secure the full demand within three hours.</i></p> <p>HV to LV substations shall also meet the requirements of ER P2/6, although the requirements are minimal where the substation demand is less than 1MW. Guidance on LV interconnection is given in the Code of Practice for the Economic Development of the LV System.</p>	
UK Power Networks	Non-confidential	In some instances, to maintain the existing level of network security and manage CIs and CMLs a level greater than P2/6 may be employed. However, distribution networks shall as a minimum be designed to comply with the security of supply	Noted

		standards, defined in the Engineering recommendation ENA ER P2/6. In the majority of cases we just cannot justify investing to a higher standard than P2/6.	
Western Power Distribution	Non-confidential	<p>Our LV and HV networks are designed to comply with P2/6. Demand connections at LV and LVS are not normally designed to a higher standard, however, we sometimes install LV link boxes (where this can be done at little extra cost) to provide a limited back-feed capability. Note, such back feed facilities are not normally capable of supporting the whole circuit or substation under maximum demand conditions.</p> <p>Our HV networks are designed to comply with P2/6. We also have a number of additional design criteria which improves the resilience of our HV networks, helps to minimise Customer Minutes Lost and Customer Interruptions and reduces Supply Restoration times, in line with OFGEM's targets.</p> <p>Note, P2/6 does not place any requirements on generation connections.</p>	Noted

Company	Confidential/ Anonymous	2. Do DNOs potentially avoid any costs under their network planning standards at the HV network level when a generator connects at the HV level?	Working Group Comments
Electricity North West	Non-confidential	<p>ENWL's policy for HV connected Generation is to consider export onto an intact network (ie system normal) only, unless the customer specifies they require a more secure connection. This means the Generation can only export onto an intact network and will be disconnected following an outage of the local HV network (ie a system abnormal condition). This may also include outages of the EHV network.</p> <p>This policy is intended to avoid reinforcements which would only be required to allow generation export under infrequent network abnormalities. But as we comply with the planning standard no costs are avoided.</p>	The Working Group noted that generally the DNOs agree with the exception of one that costs are not avoided under their network planning standards at the HV level when a generator connects at that level.

			<p>The Working Group suggests not proposing any changes at the HV level.</p> <p>It was agreed that a paragraph is needed within the consultation document to summarise responses. Another paragraph around the impact of the responses on the CP along with a statement from the Working Group. Working Group to decide if their suggestion will form part of the solution or if they wish to seek views from parties via a consultation question.</p>
Northern Powergrid on behalf of Northern Powergrid (Northeast) Ltd and Northern Powergrid (Yorkshire) plc	Non-confidential	<p>In certain, quite specific circumstances, there is the potential for a HV connected generator to avoid or defer reinforcement of the Northern Powergrid HV system. In order to assess this, the process outlined in ETR130 would be followed. That process is quite thorough and it would be reasonable to assume that there are relatively few HV generators which:</p> <ul style="list-style-type: none"> i) are connected at part of the HV system where there is a load capacity issue which might be assisted by a generation connection; and ii) Would comply with the requirements of ETR130 in terms of their ride through / re-energisation capability, availability, persistence etc. 	<p>The Working Group discussed this response and noted the following:</p> <p>due to there being small numbers and averaging charging being applied at HV levels, such instances should be ignored in the development of tariffs and as such this change proposal</p>
UK Power Networks	Non-confidential	<p>Most generation connecting is intermittent so wouldn't normally be considered as contributing to network security. We would only avoid costs if the Maximum Demand (MD) we take into account is actually lower than the real MD due to some of the load being masked by the generators' export. However, we also invest more</p>	<p>The Working Group highlighted the key points raised by respondents throughout the responses to Question 2. It was</p>

		because of generators causing fault levels to rise and having to replace plant to maintain a safe system.	agreed to extract these for inclusion into a summary paragraph for the consultation. The key points have been highlighted in yellow.
Western Power Distribution	Non-confidential	EREC P2/6 and EREP 130 allow generators to be considered when assessing Group Demand, however, the complicated assessment process and onerous conditions detailed in these documents mean that the contribution from generation is rarely utilised. Given this, generator connections do not normally reduce DNO network costs.	Noted

Company	Confidential/ Anonymous	3. Can DNOs identify the number of LVS generators with sole use substations and if so, what is the proportion that is sole use?	Working Group Comments						
Electricity North West	Non-confidential	We have identified that 14 of the 24 LVS generators (ie 58% of total LVS) have the distribution substation as a sole use asset. Of the 14 LVS generators with the distribution substation as sole use asset, 4 also have an HV line spur as sole use.	Noted						
Northern Powergrid on behalf of Northern Powergrid (Northeast) Ltd and Northern Powergrid (Yorkshire) plc	Non-confidential	<div>There are only a small number of LV Sub generators in Northern Powergrid (19 in total), with around half of these having a dedicated, sole use substation. The remainder have a dedicated feeder at a substation which is shared with other customers.</div> <table><tr><td>Breakdown of LV Sub Generators</td><td>Northern Powergrid (Northeast)</td><td>Northern Powergrid (Yorkshire)</td></tr><tr><td></td><td></td><td></td></tr></table>	Breakdown of LV Sub Generators	Northern Powergrid (Northeast)	Northern Powergrid (Yorkshire)				The Working Group noted that from four respondents only three could identify LVS connected generators. Two parties were able to identify that of the LVS connected generators on their network, just over 50% have a sole use substation. One party identified that 100% of the
Breakdown of LV Sub Generators	Northern Powergrid (Northeast)	Northern Powergrid (Yorkshire)							

		<table><tr><td>Total Customer Count</td><td>4</td><td>15</td></tr><tr><td><i>Dedicated Substation</i></td><td>2</td><td>8</td></tr><tr><td><i>Shared Substation</i></td><td>2</td><td>7</td></tr></table>	Total Customer Count	4	15	<i>Dedicated Substation</i>	2	8	<i>Shared Substation</i>	2	7	LVS connected generators on their network have a sole use substation. The Working Group noted that one party did not have the information readily available.
Total Customer Count	4	15										
<i>Dedicated Substation</i>	2	8										
<i>Shared Substation</i>	2	7										
UK Power Networks	Non-confidential	Yes we are able to identify those LVS generators with sole use substations, across all three UK Power Networks regions, the number is 100%	Noted									
Western Power Distribution	Non-confidential	This data is not readily available?	Noted									

Company	Confidential/ Anonymous	4. How do DNOs calculate the Group Demand at LV for planning purposes, particularly whether it is measured at the LV substation or as a subset of the LV network?	Working Group Comments
Electricity North West	Non-confidential	LV Group Demand is calculated for new network by summing the expected After Diversity Maximum Demand for the new load to be connected. These values have been determined and refined over many years based on experience. ADMD values are well established for different house types and sizes. For larger industrial and commercial loads import capacities are summated using defined diversity rules. For existing network measured values can be taken, with the ADMD or import capacity of any additional load being added.	Noted
Northern Powergrid on behalf of	Non-confidential	HV to LV transformers at LV substations are equipped with a maximum demand instrument. The majority of these instruments are relatively crude and need to be manually read and also reset each time that the LV network has operated in an	Noted

Northern Powergrid (Northeast) Ltd and Northern Powergrid (Yorkshire) plc		<p>abnormal feeding arrangement at a time when the load under the abnormal feeding arrangement could be greater than the load under the normal feeding arrangement. Hence the demand reading from such instruments will only provide an indication of the substation maximum demand. Where the demand on a substation is approaching the capability of the HV/LV transformer or where material additional demand is planned to be connected, a bespoke measurement (ideally for a sufficiently long period to record the maximum demand) would be made and adjusted to provide an estimate of the maximum demand at the substation. If there is material generation connected to the substation that was likely to be operating at the time of maximum demand, and the measured substation demand was close to the capability of the HV/LV transformer a bespoke assessment would be made. The assessed maximum demand at the substation would be used as the Group Demand.</p> <p>Demand measurements are usually made at the interface between the HV to LV transformer and LV distribution board. Bespoke measurements may be made at this point and on individual LV feeders as required.</p>	
UK Power Networks	Non-confidential	The largest LV transformer is 1MVA so Group Demand will always be Class A at LV.	Noted
Western Power Distribution	Non-confidential	At LV the Group Demand is calculated using WinDebut software and/or the WinDebut algorithms. The technique takes account of customer kWh consumptions, profile classes and where appropriate, their Maximum Demands. The presence of generation is normally not considered when Group Demand is calculated since the majority of LV connected generation is PV and the maximum demand generally occurs during winter evening periods.	Noted

Company	Confidential/ Anonymous	5. Please provide a short statement on how DNOs plan your LV network?	Working Group Comments
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Electricity North West	Non-confidential	<p>The network design shall be determined using the ADMD method. As a guide the following tasks will usually be required:</p> <ul style="list-style-type: none"> • Assessment of the total load to be supplied, including any premises other than domestic dwellings, eg shops, schools. • Assessment of the supply capacity of the existing network, including the high voltage system. • Determination of the number of S/Ss required. • Determination of the most suitable practical sites for the S/Ss. • Design of the LV distributors and the LV service layouts. • Determination of the cross sectional area of the distributors to obtain the most economical LV network. The cross sectional area of the distributors will usually be determined by considerations of voltage drop. However, the electrical loading or the need for protection by fuses may be the limiting factor and this shall be checked. • Determination of the correct fusing to protect all the cables. Changes to the economical design may be required to achieve correct fusing. • Checking of the design to ensure that customers are not subjected to voltage fluctuations that give rise to voltage flicker. 	Noted
Northern Powergrid on behalf of Northern Powergrid (Northeast) Ltd and Northern Powergrid (Yorkshire) plc	Non-confidential	<p>There is relatively little monitoring on the LV network, although new HV to LV substations are equipped with more sophisticated monitoring facilities and information from smart meters will provide valuable information in the future. Hence at present, the quantity and quality of the power flow information on our LV network is limited. The monitoring of power flows on our LV networks is as described in our response to question 4. Our approach to assessing the benefits from LV connected generation is broadly the same as for HV generation (see question 2), but such an assessment only takes place on an infrequent basis.</p> <p>The following information which provides a general description of Northern Powergrid's approach to planning the LV network is taken from our LTDS.</p>	Noted

		<p>System configuration</p> <p>LV systems are developed in an efficient and cost-effective manner to deliver electricity to the LV supply terminals of our connection customers whilst meeting statutory obligations. The general objective in developing LV systems is to obtain a simple and robust, minimum-overall-cost system, taking into account the initial capital investment, system losses, maintenance and operational costs over the life of the asset. Any development of an LV system should seek to improve the quality and reliability of the supply provided and to reduce potential customer minutes lost.</p> <p>The LV system is normally developed as a system of radial mains supplied from a distribution substation placed near to the load centre. LV customer connections are provided using a service termination unit on their premises, which is connected to a nearby LV main using a dedicated service cable. All customer premises typically have only one location at which all supply cables are terminated.</p> <p>System security</p> <p>The security requirements specified in Engineering Recommendation P2/6 for demand supported by LV systems are minimal. However, interconnection is provided to support the LV system of a substation fed from a tee, or of existing substations that requires regular dead-tank maintenance, if it can be achieved economically from a LV system with an independent HV source. Otherwise, interconnection is provided where opportune so to do.</p> <p>For interconnection design purposes, the cyclic rating of LV interconnecting cables and short-term overload rating of transformers is normally used, unless the interconnected load is known to have an essentially flat load curve at peak times, in which case continuous ratings is the appropriate rating to apply.</p> <p>Selection and application of plant</p> <p>Distribution substations</p>	
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UK Power Networks	Non-confidential	<p>The LV network is planned using a combination of network modelling tools including metering databases, asset databases, and in some instances on site assessment and load monitoring. In planning the LV network load growth is considered in accordance with the appropriate planning load estimate for the source primary substation.</p>	Noted
Western Power Distribution	Non-confidential	<p>When designing our LV network we assess the existing and proposed demand / generation and ensure the network satisfies thermal requirements (load and short circuit requirements), statutory voltage limits and power quality, protection and earthing requirements. The minimum cost scheme that satisfies our design policies is implemented.</p> <p>Generally we assess maximum demand conditions and also the minimum demand/maximum generation conditions.</p> <p>We use WinDebut software for LV network modelling.</p>	Noted