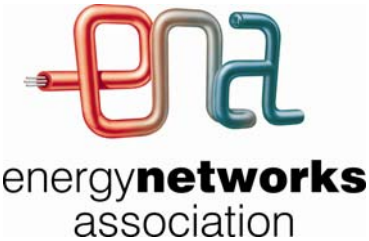

Energy Networks Association – ENA

Response to ERGEG's public consultation paper on
"Draft Guidelines for Good Practice on Electricity Grid Connection and Access"

2 June 2009

ENA - BACKGROUND

The Energy Networks Association (ENA) is the trade association for UK energy (gas and electricity) transmission and distribution licence holders and operators.

The ENA welcomes this opportunity to respond to this consultation on ERGEG's draft "*Guidelines of Good Practice on Grid Connection and Access*" and, in particular, its effective interaction with key stakeholders, such as our networks members so as to progressively move towards more compatible Grid Codes in the European Energy Market.

ENA recognises the vital importance of grid access and connection approaches throughout the EU electricity grids. For many years experts from ENA member organisations have participated with grid users and regulators in the process of developing Grid Codes in the UK and Europe. ENA recognises the need for continuous improvement and the specific role that regulators have in representing the interests of customers, while ensuring the financial sustainability of network operators.

The draft document addresses specific issues including common connection principles for generation units (including distributed generation), for consumption units and for DSOs. In addition it also attempts to address principles for the provision of voltage and frequency quality. Finally it also attempts to set out a technical framework for grid connection and access referring to general aspects; generation; consumption; DSOs etc.

The following general, editorial and significant detailed technical comments from the ENA are in response to the six key questions raised in the consultation document and on the specific issues associated with the proposed principles, and technical framework.

Q1. The Problems these GGP are trying to solve

The ENA acknowledges the efforts that ERGEG have already made in opening questions on grid connection and access conditions that should apply to all the grid users of transmission and distribution grids.

ENA also agree that the problems identified do seem to be real and increasing as the amount of interconnection and Distributed Generation (DG) increases.

1.1 - Problem Identification

Page 9 (para 4) - The problems addressed here can be solved by harmonising, to a certain extent, the rules for grid connection and access set by the Transmission Systems Operators (TSOs) for Distribution System Operators (DSOs) and generation and consumption units. This harmonisation ensures that rules for connection and access which have the greatest effect on the security of power system are consistent across all Member States.

The point is made that harmonisation may help address the issues to a 'certain extent'. We take it that there will be some form of **Cost Benefit Analysis that assesses the extent of the improvements and the costs incurred by any party.**

Reference is made to consistency across all Member States, yet later on in the document, reference is made to the need for harmonisation within synchronous areas. Harmonisation standardisation and interoperability should have regard to the economic and technical limitations of each network e.g. in Europe frequency deviations will be slight so equipment would only need to cope with small variations, whereas in some countries frequency deviations can be much larger. Harmonisation which only required equipment to cope with small frequency deviations would be impractical.

With regards to European and international standards existing procedures should be applied or adapted using existing structures (CENELEC, IEC, etc).

Q2. Do the Guidelines address the problem

The underlying problem seems to relate to the awareness that system operators have of generation plant connected to the system at any given point in time and the technical specification / performance characteristics of that generation. The draft GGP addresses information exchange and performance requirements. However we are unaware that the behaviour of demand (consumption unit) is thought to be as critical of generation, yet there seem to be quite wide ranging proposals being put forward. Are these changes justified?

There are potentially onerous requirements for generators to be able to ride through faults and for the protection systems to be discriminatory. Again these requirements are important, but there needs to be a balance as to the size of generation unit that realistically needs to comply with such requirements. In many cases the requirements apply to 'significant' generators, but in others there is no such caveat. There is possible a need to define 'significant' as those generators that the appropriate TSO / DSO consider could reasonably have a material effect.

We generally agree that improved transparency of the application process is reasonable to aim for, but increased transparency isn't necessarily linked to improved generation performance / system integration. There is a need to be mindful that improving the transparency / governance of the connection process could stifle innovative connection practices / techniques; a balance needs to be struck. In addition to the above, if the increased transparency was between all participants, there may be confidentiality issues e.g. associated with sharing details of connection requests.

Q3. Views on the description of the Roles and Responsibilities – Section 3

ENA agrees in general with all the roles and responsibilities set out in Section 3.

Additional detailed comments are provided below.

3.2 Regulators
Pg 12 ….. 3.2.3 - *'Regulators* shall have authority ……. to modify the terms and conditions for grid connection and access'

This should be limited by adding in the words 'subject to the safety, reliability and stability of the system and having regard to its economic operation'.

3.3 Transmission System Operators (TSOs)
Pg 12 ….. 3.3.1 'Conditions for grid connection'
'Grid connection' is mentioned in several contexts, sometimes referring to the Transmission network and sometimes to the Distribution Network. As TSO requirements often have an impact at the DSO level also, it is better to specify which network is being discussed i.e. '… Conditions for **Transmission** grid connection'

3.4 Distribution System Operators (DSOs)
Pg 13 ….. 3.4.2 - The requirement to make 'all necessary data …for efficient access…' could be open to interpretation. There needs to be clarity whether unlimited access to all DSO network / customer data is required or just selective data that is sufficient for a high level assessment of the connection and access to be made. There is a need to remember that some of the customer data could be considered to be confidential e.g. performance specification of generators, import / export profiles (which could be used to infer company financial performance). This potentially requires additional data to be provided over and above the Long Term Development Statements required by the UK Regulator as a condition of a UK DSO Distribution Licence. There is a corresponding requirement on the TSO in 3.3.2.

It seems reasonable that agreement models (pro-forma agreements) are publicly available.

Clarify the purpose of the data and rephrase the requirement for the System Operator (SO) to provide 'information reasonably required'

Pg 13 ….. 3.4.4 - It is not necessarily appropriate, or if it is, it is a departure from current practice and funding, for a DSO to police this issue beyond the initial connection compliance at the commissioning date. If this requirement is to be enduring, appropriate funding will have to be made available.

The DSOs shall require that all users connected to their grid meet the requirements set in the approved terms and conditions for grid connection and access.

Pg 13 ….. 3.5.2 - Agree with the requirement, but there does seem to be issues, particularly with new types of generation units, re confidential nature of the information that the DSO requires to undertake the assessments. Issues of confidentiality do need to be addressed

3.3 & 3.4 Transmission and Distribution

A critical clarification is that a new Generator **must meet the current** requirements in the Distribution and Grid Codes.

3.5 Generation Units

Pg 13 ….. 3.5.3 - This is too loosely worded. DG should only be asked to provide real time data that is needed – and only by the party that needs it.

Currently real time data is generally not required as connection designs usually are of the 'fit and forget' type. In the future there is likely to be a shift to a more active approach that would require more real time data. In our members' experience many generation customers want a connection that enables them to export without any restrictions and tend to consider actively managed connections (potentially requiring real time data) if the 'fit an forget' connection is prohibitively expensive. There are some provisions in the GB Distribution Code already in this area, but are generally related to operational planning data rather than real time data not required by DSOs.

The requirement should be qualified such that the data is made available where it is required by the TSO / DSO to run an 'economical, efficient and co-ordinated system'

3.6 – Consumption Units

The term Consumption Units might be common terminology in Europe, but it is not in the UK. Use of the term 'Unit' could be confused with kWh.

Pg 14 ….. 3.6.3 - As 3.5.3, demand connections are generally designed so that real time data is not required. The requirement should be qualified such that the data is made available where it is required by the TSO / DSO to run a 'economical, efficient and co-ordinated system'

Q4. Technical framework and general provisions for generation, consumption and DSOs – Relevance and practicality (Sections 4 & 5)

Detailed comments below identify areas of concern re the practicality of these provisions.

General Provisions

4.1 Connection Procedures

Pg 14 ….. 4.1.3 - It seems reasonable that agreement models are publicly available and published. We can see that standard connection conditions could be reviewed by Ofgem (UK Regulator), but we don't think that at the moment there is a requirement for them to be developed in consultation with Stakeholders. In the UK there may be the possibility for the remit of The Distribution Connection and Use of System Agreement (DCUSA) to be extended to do this, however standard terms could mean just that and could remove scope for bilateral negotiations on site specific arrangements.

One practical compromise could be that core terms could be reviewed by Ofgem.

Pg 14 ….. 4.1.5 **-** Agree with the requirements, but there could well be additional transparency that need to be introduced i.e. the data set to be provided for demand connections, the process for implementing modifications to the DSO system and the general connection procedures.

4.2 Connection Requirements

Pg 15 ….. 4.2.1 - Reference to (without changing the contracture arrangements) is confusing.

Pg 15 ….. 4.2.1 - As 3.4.4 – if it is necessary for licensees to discharge this, then this is a new activity and needs a cost/benefit justification for its imposition.

Pg 15 ….. 4.2.1 - There seems to be a requirement for regular tests to be carried out. At the moment, regular tests are carried out on switchgear and protection systems (including settings) by the System Operator and the generator / demand customer. There is a need to clarify if any additional tests are required e.g. system studies to revalidate the connection design assumptions. There may be a need to clarify such requirements in connection agreements.

Should clarify what these regular tests are aiming to verify and who should do them if they are over and above the maintenance / inspection requirements.

Should clarify what in particular is meant by 'the DSO shall follow this provision acting swiftly and without delay'.

Pg 15 ….. 4.2.3 – It is unclear if the compliance verification is a paper exercise or if physical testing is required. It seems to be only required at the time of connection.

Should clarify that the compliance checking is at the time of connection only and that it is verification will be dependent on data / info provided by the customer.

4.3 Information Exchange

Pg 15 ….. 4.3.1 – Should clarify who the information should be provided to eg users / prospective users.

Pg 15 ….. 4.3.1 - Requirement to comply with Power Quality requirements is not mentioned here, although referred to later in the document.

Pg 15 ….. 4.3.1 (2) - In addition to the min/max fault levels under the present system configuration (required to set protection), there is a requirement to provide the maximum design short circuit level so that the User can have the opportunity to select appropriately rated plant.

Pg 15 ….. 4.3.2 - Significant' is not a defined term; perhaps there is a need to clarify that it is up to the SO to define 'significant' in the context of is own network. There are processes in the GB Connection and Use of System Code (CUSC) to establish the 'significance / materiality' of costs.

Should clarify that it is up to the DSO or TSO to define 'significant' in the context of is own network.

Pg 15 ….. 4.3.2 - The requirement for demand and generation units to provide real time data would effectively be a new requirement for DSOs that isn't include in the present GB Distribution Code, although there does seem to be a caveat in that if its not available it needn't be provided! It is also not quite clear what 'operational security' means. There may be a requirement to clarify / capture the Distribution Code information required for a particular connection in the connection agreement.

Should qualify the requirement to provide real time data such that the data is made available where it's required by the TSO / DSO to run an 'economical, efficient and co-ordinated system'.

In line with previous comments, 'significant' should be defined by the TSO / DSO in relation to its network.

Should clarify that if data / info is reasonably required it should be provided.

Should clarify what is meant by 'operational security'.

Pg 15 ….. 4.3.3 - This is potentially a far reaching requirement that could be interpreted as a wide range of requirements from disconnection in an emergency through to the application of Design Side Management (DSM).
This sounds more like a connection requirement rather than information exchange.

Pg 15 ….. 4.3.4 - Agree with the general requirement for System Operators to define a level of 'significant' demand and generation and co-ordinate. Whist there are processes for the National Grid (TSO UK) & DSOs (UK) to consider the significance of generation units there is no corresponding requirement re demand connections, save the annual National Grid / DSO data exchange. The key requirements are to agree the 'significance' and the timing of the data exchange i.e. before or after the event.
Should clarify that in addition to agreeing 'significant' thresholds, the TSO / DSO need to agree appropriate timing of data exchange, and the best way of implementing such a requirement – e.g. via the Distribution Code or Connection Agreement.

4.4 Access Limitations
Pg 16 ….. 4.4.2 - Perhaps the concept of 'access limitations' needs further explanation, but as currently drafted, 4.4.2 would restrict customer choice to have a constrained connection if that proved to be economical to the user and acceptable to the SO, as access limitations can only be considered if there is 'no other solution available' – there nearly always is a solution, but it may not be economically viable.

Should expand further on the implications for customer choice and the possible conflicting requirements that access constrained connections can't be provided with 4.3.3, which seems to imply that constrained connections e.g. DSM can be provided.

5. Technical Framework for Grid Connection and Access

5.1 General Requirements

5.1.1 Operating Frequency
Pg 16 ….. 5.1.1.4 - 'Wider than' is a comparative term – it is not clear what the comparison is made against.
Refer to 'wider than nominal / normal'.

5.1.2 Operating Voltage
Pg 17 ….. 5.1.2.2 - 'Wider than' is a comparative term – it is not clear what the comparison is made against.
Refer to 'wider than nominal / normal'.

Pg 17 ….. 5.1.2.2 '*equipment will remain connected .. during voltage deviations.. as far as no damage to the equipment is foreseen'*

This depends on the design of the equipment – if the equipment has not been designed to cope with the voltage variations it will be damaged, and hence will not have to comply with this clause. Underlined section should be deleted.

Pg 17 ….. 5.1.2.4 - The allowed range of voltage variations, imbalance and harmonics are covered in UK by referencing the ENA Engineering Recommendations P28, P29, G5/4 respectively.

5.1.3 Protection Scheme
Pg 17 ….. 5.1.3.1 - Not clear what "respectively grids" means when used inside parentheses in this section.

Pg 17 ….. 5.1.3.1 – UK ENA Engineering Recommendations G59/75 requirements apply to generation units, but there are no equivalent requirements for demand connections. There are also no arrangements for DSO systems to be disconnected in the event of unacceptable states apart from the LFDD scheme that DSOs have in place to help prevent cascade fall in frequency. NGET have discussed voltage collapse schemes in the past..
Should change the requirement to relate to generation units only – further analysis would be needed to establish what protection would be justified.

Should qualify the requirement to apply to 'significant' units only.

Pg 17 ….. 5.1.3.2 - The general requirement for protection systems to be coordinated is reasonable, but the requirement to prevent non selective action could be taken to imply absolute discrimination is required. This would preclude the use of ROCOF / Vector Shift relays from being used on generator connections.

Should change wording to read '..to prevent non-selective activation as far as reasonably practicable'.

Pg 18 ….. 5.1.3.3 - This is a more onerous requirement than at present if it is read to mean that 'all/each' protection system shall be backed up. This is not current GB practice.

Should change wording to include a 'reasonable practicable test'.

5.2 Generation Units

5.2.1 Characteristics of Generation Unit
Pg 18 ….. 5.2.1.2 - We think that there is a balance to be struck between having a low generator reactance to assist in stability and a high reactance to limit short circuit currents. The balance will be dependent on the network.
Should change text to refer to the opposing requirements arising from generator reactance.

Pg 18 ….. 5.2.1.3 - The first sentence relates to TSO, but the second applies to TSO and DSOs. Both clauses should apply to the relevant SO. The first sentence relates to TSO, but the second applies to TSO and DSOs. Both clauses should apply to the relevant SO.

Should clarify that both clauses should apply to the relevant SO.

Pg 18 ….. 5.2.1.4 – (Generators may not be keen for a SO to define the requirements of any step up transformer).
Should clarify that the SO can only influence those parameters affecting the Total System.

Pg 18 ….. 5.2.1.5 - This should be on a justified basis, rather than a blanket approach. Might depend on definition of "significant".

Pg 18 ….. 5.2.1.5 - The fact that the PSS settings are to be agreed by the TSO implies that there will be no 'significant' generators connected to a DSO system.

Should clarify that the appropriate SO should be involved with setting PSS parameter.

Pg 18 ….. 5.2.1.6 - This is not acceptable on two counts. There needs to be a limit beyond which such considerations do not apply to DSO connected generation. Also it is not clear how re-connection after tripping is to be coordinated. This is an almost impossible task and should not be written into this requirement without full consideration of costs, benefits, and technology.

Pg 18 ….. 5.2.1.6 - Although 'as long as possible' isn't defined, this requirement seems to impose a voltage and frequency performance requirement on all generators. The UK GCRP E3C WG is looking at these possibilities at the moment for small generators.

Should clarify who decides if the 'as long as possible' criteria is satisfied.

Should qualify the requirement re 'significant generators'.

Pg 19 ….. 5.2.1.7 - This is completely unacceptable. It is not for TSOs to determine such parameters in general for distribution systems. That is a matter for the DSO. Also, short circuits do not create transient frequency events.

Pg 19 ….. 5.2.1.7 - This is a 'ride through' requirement for all generators, although given that the TSO needs to define the gradient, the implication is that it applies to TSO connected generators.

Should qualify the requirement re 'significant TSO connected generators'.

Pg 19 ….. 5.2.1.8 'Generation unit shall be designed to withstand the Mechanical stresses associated with any kind of fault'.

Delete the word 'Mechanical' – it is just as damaging? if it doesn't cope with the electrical stresses.

Pg 19 ….. 5.2.1.9 - This is not acceptable as a blanket response applying to all generators – it is not clear that this is appropriate for DSO connected generation.

Pg 19 ….. 5.2.1.10 - This is generally OK, but it should be made clear that management of voltage is the responsibility of the network operator – i.e. DSO not TSO for a distribution network.

5.2.2 Requirements for Voltage Control and Reactive Power Management.

Pg 19 ….. 5.2.2.1 - This is sensibly worded and should be applied elsewhere in the document.

Pg 19 ….. 5.2.2.1 - There is probably a need for additional transparency in the present processes.

Pg 19 ….. 5.2.2.1 - As drafted this requirement applies to all rather than just ‘significant’ generators.

Should clarify that PV mode is required for ‘significant generators’ and it is up to the DSO or SO to establish the most appropriate control for other generators.

Pg 19 ….. 5.2.2.2 - This is not justified for small generators. There needs to be a sensible cut off for the applicability of this clause.

5.2.4 House Load Operation

Pg 20 ….. 5.2.4.1 - We query the definition of “all significant”.

Should clarify whether if a generator is considered to be ‘significant’, for one requirement, it is considered to be significant for all ‘significant requirements’.

Pg 21 ….. 5.2.4.2 - Clarify if this requirement only applies if 5.2.4.1 applies.

Pg 21 ….. 5.2.4.3 - Clarify if this requirement only applies if 5.2.4.1 applies.

5.2.5 – Black Start Capability and Island Grid Operation

Pg 21 ….. 5.2.5.5 - Should the requirement be placed on generators who have contracted for island grid operation, rather than those that are capable of such operation (but where there are no contracts).

Should clarify the requirement.

Pg 21 ….. 5.2.5.5 - Is there a need for the duration of island grid operation to be specified - there could be fuel storage / availability implications.

5.2.6 Verification

Pg 21 ….. 5.2.6.1 - The phrase ‘to the largest possible extent verified by full tests’ is ambiguous.

Should clarify the requirements.

Pg 21 ….. 5.2.6.1 - The requirement to review the compliance via regular measurements is also unclear. Many of the requirements would need to be confirmed in situations other than normal operational conditions.

Should clarify the requirements for regular reviews.

Pg 21 ….. 5.2.6.1 - Content of the test is unclear’.

Should clarify the requirement.

5.3 Consumption Units

5.3.2 Requirements of Reactive Power

Pg 22 ….. 5.3.2.1 - This is a commercial matter between the TSO and the user. It goes back to the central question of what is the operative security standard, and what is the most cost effective means of achieving it. See also the conflict within the document caused by 5.3.5.1(2).

Pg 22 ….. 5.3.2.1 - Agree with the general requirement for demand to be at unity pf as far as reasonably practicable, but as drafted the requirement applies to 'all' demand users and the only test is one of 'possibility' ie no economic test.

Should caveat the requirement so that it either applies to 'significant' demand customers or to all customers 'where reasonably practicable'.

Pg 22 ….. 5.3.2.1 - This requirement as drafted applies to 'all' demand customers.

Should caveat the requirement so that it either applies to 'significant' demand customers'..

5.3.3 Interference and Electromagnetic Perturbations/Emissions

It is not clear if this is aimed at just general EMC or also includes generator stability. This should be made clear, and if not intended to cover stability, should this be explicitly covered elsewhere.

Pg 22 ….. 5.3.3.1 -The TSO / DSO is not able to manage the situation. The obligation should be with the generator / customers to make sure that they do not connect any disturbing load etc.

Should revise, to emphasise the obligation is placed on the customer.

Pg 22 ….. 5.3.3.2 - Emission limits
No mention of voltage dips or surges which are likely to be the most significant issue.

Pg 23 ….. 5.3.3.4 - As drafted, there is an obligation for the System Operator to 'separate and quantify the contribution from each installation' when assessing and controlling the disturbance levels. This doesn't align with the UK ENA G5/4 process that is focussed on the assessment at the time of application and the additional contribution to disturbance from the installation to the background levels (the current process doesn't see to establish the individual components of the background level). This process is suggested as being acceptable as a 'last resource'.

Should re-draft to clarify that the process is associated with the connection process and follows the ENA Engineering Recommendations G5/4 & P28 principles re assessment of the background.

5.3.4 Demand Response

Pg 23 ….. 5.3.4.1 - As drafted using the words 'as much as possible' the requirement could be interpreted as being unrealistically onerous, since it is nearly always 'possible', even if uneconomic.

Should redraft to change the caveat to be 'as far as reasonably practicable'.

5.3.6 Verification

Pg 24 ….. 5.3.6.2 - As drafted, the requirement only applies to the TSO – is this the intention?

5.4 Distribution System Operators (DSOs)

5.4.2 Requirements for Reactive Power

Pg 24 ….. 5.4.2.2 - What does this actually mean? And is it desirable if a DSO network is supporting the local TSO voltage? And how will the DSO voltage be managed if not by the exchange of VArs across the boundary?

Pg 24 ….. 5.4.2.2 - Agree generally that reactive power flows should be minimised as far as possible. But as drafted the requirement is that there shall be no reactive power flow. To achieve this there will be a requirement for the DSO to undertake a real time balance of the reactive power requirements of its customers, plant etc and make sure that it has sufficient compensation equipment / contracts with demand / generators to achieve a zero balance at the DSO/TSO interface. We think this is unrealistic.

Should redraft to require reactive power flows to be minimised as far as reasonably practicable.

5.4.3 Load Shedding

Redraft the requirement such that the DSO has an obligation to ‘make arrangements allowing for automatic / manual load shedding.

5.4.4 Specific Requirements for Distributed Generation

Pg 25 ….. 5.4.4.2 - As drafted this is an ambiguous requirement. There is a wide range of possible faults on the transmission systems and it seems impracticable for a DSO to ensure that all the generators connected to the system are immune to them. There are other requirements e.g. 5.4.3.1 which are more realistic.

Should delete or review the scope.

Pg 25 ….. 5.4.4.3 - This links to 5.2.1.9. This is another ‘ride through’ requirement such that DG can remain supporting the system in the event of a fault on the distribution network.

Should caveat the requirement re ‘significant TSO connected generators’ – or at least significant DSO connected generators.

Pg 25 ….. 5.4.4.3 - This is not acceptable as a blanket approach. It is for the DSO to determine if the generator should support the network.

Q5. Impact of the implementation of GGP on DSOs business and market

Pg 18 ….. 5.2.1.6 - *'shall remain connected to the network as long as possible to sustain the grid'*

This is too vague. The requirements should be 'as required by the DSO/TSO under the circumstances outlined in the appropriate Grid code'. This is essentially 'Fault ride through' and is defined in Grid code by graph.

Pg 19 ….. 5.2.2.2 '*Normal operating mode should be automatic control of voltage… power factor control shall have lower priority'*

The operating mode of the generator should be a matter for the TSO or DSO, to suit how the network operates. Constant Power Factor could be a more appropriate mode in some instances and the operating mode should not be prescribed in a regulator guide, but left to the discretion of the System Operator.

Pg 22 ….. 5.3.2.1 'Consumption units shall compensate as far as possible their consumption of reactive power'.

This proposal is unlikely to be welcomed by System Operators as it will make voltage control at night more difficult, and require large amounts of expenditure. Usually System Operators want loads to be at about 0.95PF as this leaves scope for System Operator to adjust at margin by varying voltage or switching out cables at night.

Also there are excessive costs in improving the PF beyond 0.95 as further reductions require substantial investments.

Pg 24 ….. 5.4.3.2 - *'DSO's shall design load shedding systems according to the requirements set by TSO's'*

DSOs may also wish to have load shedding scheme. Add in words underlined:
DSO's shall design load shedding systems <u>for TSO System Operators</u> according to the requirements set by TSOs'.

Pg 25 ….. 5.4.3.4 - '*Load shedding should be designed to allow distributed generation to support the system as far as possible'*

This sentence could have serious cost implications, both for System Operators and for DG. It implies that regardless of cost, and to the greatest extent possible, all the extra equipment, control and investment required by the DG and the System Operators will be made, so that in the event of relatively rare events and for short duration, DG will be able to operate.

This proposal is not practical or economic.

Proposed text: 'Load shedding should be designed to allow distributed generation to support the system as far as reasonably practicable, **and be coordinated with developments on the distribution network that will allow distributed generation to support the system to the greatest possible degree**'

Q6. Priority access for Renewables and Distributed Generation.

6.1. Connection to the Grid

6.1.1. The expansion of renewable generation will require major investment in electricity networks, since these resources are frequently installed in areas where there is no grid infrastructure (offshore) or in rural areas (onshore) where the existing grid does not have sufficient capacity to evacuate the output.

Moreover the total RES capacity installed in a particular area might substantially exceed the local needs as it is often distant from the traditional locations of consumption. Regulators should recognise the **need to reinforce networks, authorising investments on a timely basis and allocating the appropriate remuneration** (or authorizing the necessary grid tariffs) to TSOs and DSOs. Also cross border interconnection capacity needs to be significantly increased.

6.1.2. **Renewable and other generators should act on a level playing field in terms of network access and pay their share of network costs**. Such costs should be transparent and fairly distributed, computed for all generation technologies using the same criteria. Support levels for renewables will of course need to take these costs into account.

6.1.3. **An ambitious support to RES is compatible with applying the same grid access rules to renewable and conventional generation:** RES generators, as well as conventional units, should pay the cost of local grid connections. The decisions concerning grid connection must be based on security, quality or continuity of supply criteria, according to which the operator should direct the generator to the connection point with the appropriate technical characteristics such as short circuit impedance. Connection rules must also be objective and non discriminatory.

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