SP Distribution plc

and

XXX

AGREEMENT FOR CONNECTION TO THE DISTRIBUTION SYSTEM
(Where the customer has generating plant and uses the Distribution System for selling electricity or exporting energy)

AGREEMENT FOR CONNECTION TO THE DISTRIBUTION SYSTEM

BETWEEN:

(1) **SP DISTRIBUTION plc** a company registered in Scotland with the registered number SC189125 whose registered office is at 320 St Vincent Street, Glasgow, G2 5AD (**"the Company"**)

(2) XXX a company registered in XXX with the registered number XXX whose registered office is at XXX (**"the Customer"**)

WHEREAS:-

A The Company is authorised by a licence granted under the Act to carry on the business of the distribution of electricity and under the terms of that licence is required (except in certain circumstances specified in that licence) to offer to enter into an agreement for connection to the Distribution System by any person requesting the same, subject to payment by the Customer of an appropriate charge.

B The Customer has made such request to the Company for Connection.

NOW THEREFORE the Parties **HAVE AGREED AND DO HEREBY AGREE** as follows:

1. The Company agrees to the Connection of the Customer's Installation to the Company's Distribution System on the terms and conditions of this Bespoke Connection Agreement.

2. Subject to the express provisions of this Bespoke Connection Agreement, Section 3 of the National Terms of Connection (the "**Applicable NTC Section**") will apply as if it was set out in this Bespoke Connection Agreement, and as if references in the Applicable NTC Section to "this agreement" or to "this Agreement" were to this Bespoke Connection Agreement.

3. The National Terms of Connection are available in writing from the Energy Networks Association, 4 More London Riverside, London SE1 2AU, or from the website at www.connectionterms.co.uk.

4. The Customer's attention is drawn specifically to the Applicable NTC Section, and the Customer confirms that it has read and fully understands the Applicable NTC Section.

5. Expressions used in this Bespoke Connection Agreement shall have the same meanings as is given to them in the Applicable NTC Section.

6. Details of the Premises, the Connection Points, the technical characteristics of the Connection Points and other matters are set out in the appendices to this Bespoke Connection Agreement.

7. Both parties agree to comply with and be bound by the provisions of the Appendices to this Bespoke Connection Agreement.

8. The Parties may agree variations to this Bespoke Connection Agreement, which variations must be recorded in writing and signed by an authorised representative of each Party.

Each Party shall negotiate in good faith the terms of any variation proposed by the other. If any variation has not been agreed within 1 month of its being proposed, either Party may refer the matter to the Authority for resolution pursuant to section 23 of the Act. The Parties shall give effect to any such determination, and shall enter into any agreement as shall be necessary to give effect to any such determination.

9. Address for notices

(a) for the Company:	(b) for the Customer:
Distribution Policy Manager SP Distribution plc Scottish Power HQ 320 St Vincent Street Glasgow G2 5AD	XXX

IN WITNESS WHEREOF these typewritten presents on this and the 3 preceding pages, together with the Conditions and the Appendices annexed hereto are executed as follows:

SIGNED at ..... on the ..... day of .....201...
for and on behalf of the **Company**

by .....
Director / Authorised Signatory

SIGNED at ..... on the ..... day of .....201...
for and on behalf of the **Company**

by .....
Director / Authorised Signatory

SIGNED at ..... on the ..... day of .....201...
for and on behalf of the **Customer**

by ..... duly
authorised on their behalf before the witness hereto
subscribing whose name and address are
appended to their signature:-

.....

Witness : .....

Name : .....

Address : .....

.....

.....

THESE ARE THE APPENDICES REFERRED TO IN THE FOREGOING AGREEMENT BETWEEN THE COMPANY AND THE CUSTOMER

APPENDIX 1 - GENERAL PARTICULARS OF THE CONNECTION

1. CONNECTION CHARGES

These comprise the Connection Charges and (if applicable) the Use of System Charges:

Connection Charge	**The total charge for the Company's Works as specified in the Offer Letter, dated XX XXX 200X, is £X,XXX,XXX (X million, X hundred and X thousand pounds) plus VAT at the appropriate rate.** The connection charge must be paid in full before the connection of the Customer's Installation can be made and energised. The initial Connection Charge may be subject to review in the manner set out in the Offer Letter for the connection made to and accepted by the Customer.
Use of System Charges	Such charges will be calculated in accordance with the Company's Statement of Use of System Charges for the time being in force and issued pursuant to Condition 14 of the Electricity Distribution Licence. So far as Use of System Charges are concerned, where another person is paying the charges for the import or export from the site, the Customer shall not be liable for such charges.

2. LOSS ADJUSTMENT FACTOR

The Customer acknowledges and accepts that in signing this Agreement a site-specific loss adjustment factor is being requested from the Company. The Company shall calculate the site-specific loss adjustment factor in accordance with its Methodology Statement for Use of System Charges. It is a condition of the connection of the Customer's Installation that a site-specific loss adjustment factor is in place.

3. SUPPLY CHARACTERISTICS

Except as set out in paragraph 2 below, the characteristics of the connection(s) shall be as follows:

(a) Characteristics of supply:

(i) Number of Phases	[enter number]
(ii) Current	[alternating current]
(iii) Voltage	[Enter Statutory Voltage kV ± 6% / +10%/-6%]
(iv) Frequency	[50 Hertz ± 1%]

(b) Connection Point(s): either

(i) where connection is provided from the Company's final cut-out fuse, isolator, switch, metering switch fuse, HV metering unit or metering

circuit breaker, unless otherwise stated in this Bespoke Connection Agreement the Connection Points are the outgoing terminals of the Company's final cut-out fuse, isolator, switch, metering switch fuse or metering circuit breaker, or

(ii) where the Company's electric lines connect directly to a Customer's intake isolator, switch, metering switch fuse or metering circuit breaker, unless otherwise stated in this Bespoke Connection Agreement the Connection Points are the incoming terminals of the Customer's intake isolator, switch, metering switch fuse or metering circuit breaker,

and, for the avoidance of doubt, the Connection Points may be remote from the Customer's Installation where third party electric lines and/or electric plant provide the intermediate electrical connection from the Company's Distribution System to the Customer's Installation.

4. DETAILS OF PREMISES

(a)	Address	[SITE ADDRESS HERE]
	Import MPAN	[IMPORT MPAN HERE]
	Export MPAN	[EXPORT MPAN HERE]
(b)	Commencement Date	[DD/MM/YYYY]
(c)	Maximum Import Capacity	XXX kVA With effect from : DD/MM/YYYY
	Maximum Export Capacity	XXX kVA With effect from : DD/MM/YYYY

5. POWER FACTOR

The parties agree:

When importing:
[The Customer shall at all times maintain the Power Factor of any supply of electricity taken by the Customer at or as near to unity as practicable and in any case between unity and 0.9 Power Factor lagging.]

When exporting:
[The Customer shall at all times maintain the Voltage of any supply of electricity supplied by the Customer at or as near to 1.0 per unit (or other voltage specified by the Company within the range of 0.95 pu to 1.05 pu) as practicable as long as this does not require the MVAR output to exceed the range shown in Figure 1 in Schedule 3. The Customer shall comply at its own expense with such requirements as the Company may make to ensure that the required Power Factor is available.]

6. SPECIAL AUTOMATIC FACILITIES

An emergency trip facility connected to the Company's metering [33,000] volt switchgear for use by the Customer. The emergency trip facility will be installed at an agreed location within the Customer's area of the Substation building.

7. COMMUNICATIONS EQUIPMENT AND DATA REQUIREMENTS

The following will be provided by the Customer at each Connection Point for input to the Company's communications system.

[Analogues

- Total generated MW per Connection Point
- MW, MVAr, Amps, Volts (kV) and frequency (0.01Hz precision) per Connection Point
- Anemometer reading of wind speed and wind direction for any turbine or cluster of turbines]

[Indications

- Double point circuit breaker indication contacts (i.e. one open, one closed) shall be provided for the Customer's main XXX33,000 / 11,000 XXXX volt circuit breaker on the Customer's installation.]

8. GENERATING PLANT

GENERATING UNIT DATA	**UNIT**	
QAS Reference		
Number of identical units to which this data applies	No	XXX
Prime Mover	Text	XXX
Electrical Machine type	Text	XXX
Machine Rating	kVA kW	XXX
Rated terminal voltage	V	XXX
Rated Power factor at machine terminals	---	XXX
Maximum Generation (per unit)	kW	XXX
Minimum Generation (per unit)	kW	XXX
GENERATOR TRANSFORMER DATA	**UNIT**	XXX
Rated Capacity	MVA	XXX
Positive sequence reactance (% on rated MVA)	%	XXX

9. SCHEDULE OF SHORT CIRCUIT INFEEDS

SOURCE	Three Phase Short-Circuit Current (Amperes)		Maximum Zero Sequence Fault Level (MVA)
	Max. Generating Plant	Min. Generating Plant	
XXX Substation (Connection Point)	XXX	XXX	XXX

The three phase short circuit currents presented in the above table are calculated to indicate the fault infeed from the Distribution System at the Connection Point when the XXX generation is NOT connected

CIRCUIT DIAGRAM

[attach circuit diagram]

APPENDIX 2 - TECHNICAL CONDITIONS

Part 1 – Site Specific Technical Conditions

Constraints

The Customer has requested and accepted a single connection for the Customer's Installation (including the Generating Plant) to the Distribution System such that the Customer's Connection Point is fed via a single 33,000 volt circuit breaker. The Customer has also requested a connection that is subject to the constraints contained in this Agreement.

In the event that the Company has (under the provisions of any other agreement or legislation or arrangement of any kind) to make a payment in respect of any restriction, outage or constraint to the Customer (or to any other person and the Customer, directly or indirectly, receives any such payment or part of it) then the Customer shall refund the same to the Company.

Network Unavailability Rebates

The Customer has requested and accepted an independent, unfirm connection to the Distribution System and as such the network unavailability rebate will be zero. Details of the Company's policy regarding rebates can be found in the Company's Methodology Statement detailing the Basis of Use of System Charges of the Electricity Distribution Licence, as published from time to time.

Compliance with Standards

It is a condition of Connection that the Customer's Installation will not have a detrimental effect on the stability of the Distribution System and will not cause voltage steps, harmonics or other disturbances outside the values laid down in the Grid Code and the Engineering Recommendations: G5/4-1 – "Limits for Harmonic in the UK Electricity Supply System"; P28 – " Planning Limits for Voltage Fluctuations caused by Industrial, Commercial and Domestic Equipment in the UK" and P29 – "Planning Limits for Voltage Unbalance in the UK".

Load Testing of Connection Circuit Protection

Immediately following the Connection of the Customer's Installation, the Customer shall make available a significant percentage of the Authorised Entry Capacity, to be determined by the Company, for the purpose of proving the stability of the new protection system. The commissioning load for this Connection will be a minimum of XXXXXX amps at 33,000 volts.

Fault Ride Through Capability

It is a condition of Connection that the Customer's Installation can ride through transient faults on the transmission system and the Distribution System without affecting the security and quality of supply to existing customers. To ensure these requirements are met, it is normal industry practice to carry out system studies to determine the effect of connecting the Customer's Installation to the Distribution System. These studies have not been carried out due to the Customer's failure to provide a comprehensive static and dynamic model of the Customer's Installation. Should additional works be required to enable the Customer's Installation to conform to the standards specified above, it will be the Customer's responsibility to fund the whole cost of any additional cost and expenses that the Company may incur as a result.

Technical Requirements for the Operation of Synchronous Generating Units, Non-Synchronous Generating Units and Power Park Modules

The Customer shall adhere to the following technical requirements.

1. PROTECTION

1.1. PROTECTION FOR 33,000 VOLT CIRCUITS * (DELETE AS NECESSARY)

For multi-phase and earth faults the main protection, which initiates fault clearance by a switching device, shall operate in less than 100 milliseconds. This is to achieve a total fault clearance time from fault inception to arc extinction of 200 milliseconds. On feeder circuits the target for the maximum clearance time of back-up protection that initiates fault clearance by a switching device shall be 750 milliseconds.

1.2 Protection for 11,000 volt Circuits * (delete as necessary)

For multi-phase and earth faults, the main protection, which initiates fault clearance by a switching device, shall operate in less than 500 milliseconds. This is to achieve a total fault clearance time from fault inception to arc extinction of less than 600 milliseconds. On feeder circuits the target for the maximum clearance time of back-up protection that initiates fault clearance by a switching device shall be less than 1,500 milliseconds.

2. GENERATING UNITS AND POWER PARK MODULES

2.1. PLANT PERFORMANCE REQUIREMENTS

2.1.1. ACTIVE AND REACTIVE POWER CAPABILITY

(a) All Synchronous Generating Units must be capable of supplying Rated Active Power (MW) at any point between the limits 0.85 Power Factor lagging and 0.95 Power Factor leading at the Synchronous Generating Unit terminals. For the avoidance of doubt, a Generating Unit operating at a lagging power factor delivers Reactive Power into the System. The short circuit ratio of Synchronous Generating Units shall be not less than 0.5.

(b) All Non-Synchronous Generating Units and Power Park Modules must be capable of supplying Rated Active Power (MW) at any point between the limits 0.95 lead to 0.95 lag at the Connection Point. For the avoidance of doubt, a Generating Unit operating at a lagging power factor delivers Reactive Power into the System.

With all plant in service, the minimum reactive power capability, under steady state voltage conditions, is shown in Figure 1. Power Park Modules may reduce active power in order to achieve the required reactive power output, as long is this active power reduction is achieved within 5 seconds by the control system of the Power Park Module or Power Park Unit.

(i) Point A is equivalent (in MVAr) to 0.95 leading power factor at rated MW output.
(ii) Point B is equivalent (in MVAr) to 0.95 lagging power factor at rated MW output.
(iii) Point C is equivalent (in MVAr) to -5% of rated MW output.
(iv) Point D is equivalent (in MVAr) to 5% of rated MW output.

(v) Point E is equivalent (in MVAr) to -12% of rated MW output.

(vi) The values of C & D are fixed.

(vii) The values of A, B & E will be reduced based on the number of individual units running.

(viii)

(ix) Within Zone 1 (A1, A2, E1, B2, B1) the Generator will control to voltage set-point instructions from the Company.

(x) Within Zone 2 (C1, C2, D2, D1) operation is at the discretion of the Generator. Operation out-with the rectangle (Zone 2) is acceptable if still controlling to the voltage set point described in Part viii.

(xi) Generating Unit controls shall be designed to ensure a smooth transition between Zones 1 & 2, and vice versa.

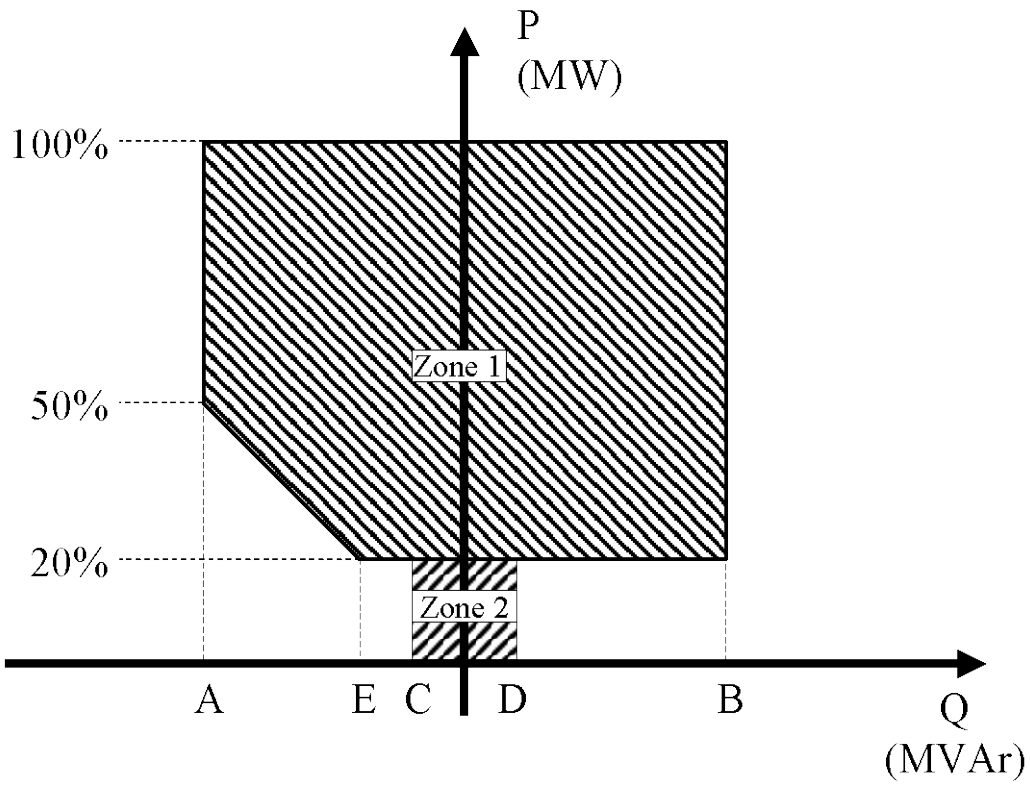

Figure 1

(c) Generating Unit must be capable of continuously supplying its rated Active Power output at the Generating Unit terminals within the System Frequency range 49.5 Hz to 50.5 Hz. Any decrease of Active Power output occurring in the frequency range 49.5 Hz to 47 Hz should be linear with frequency, such that if the system frequency drops to 47 Hz the active power output does not decrease by more than 5%.

For the avoidance of doubt, in the case of a Generating Unit or Power Park Module using an intermittent power source where the mechanical power input will not be constant over time, the requirement is that the Active Power output shall be independent of System Frequency and should not drop with System Frequency by greater than the amount specified above.

(d) The Active Power output at the Generating Unit terminals under steady state conditions should not be affected by voltage changes in the normal operating range of the distribution system (±6%).

The Reactive Power output of a Synchronous Generating Unit under steady state conditions should be fully available within the range ±5% of nominal system voltage at the Connection Point.

The Reactive Power output of a Non-Synchronous Generating Unit or Power Park Module under steady state conditions is illustrated by the rectangle in Figure 2 (assuming the Connection Point voltage is within ±5%). Operation within the shaded triangles will not be required.

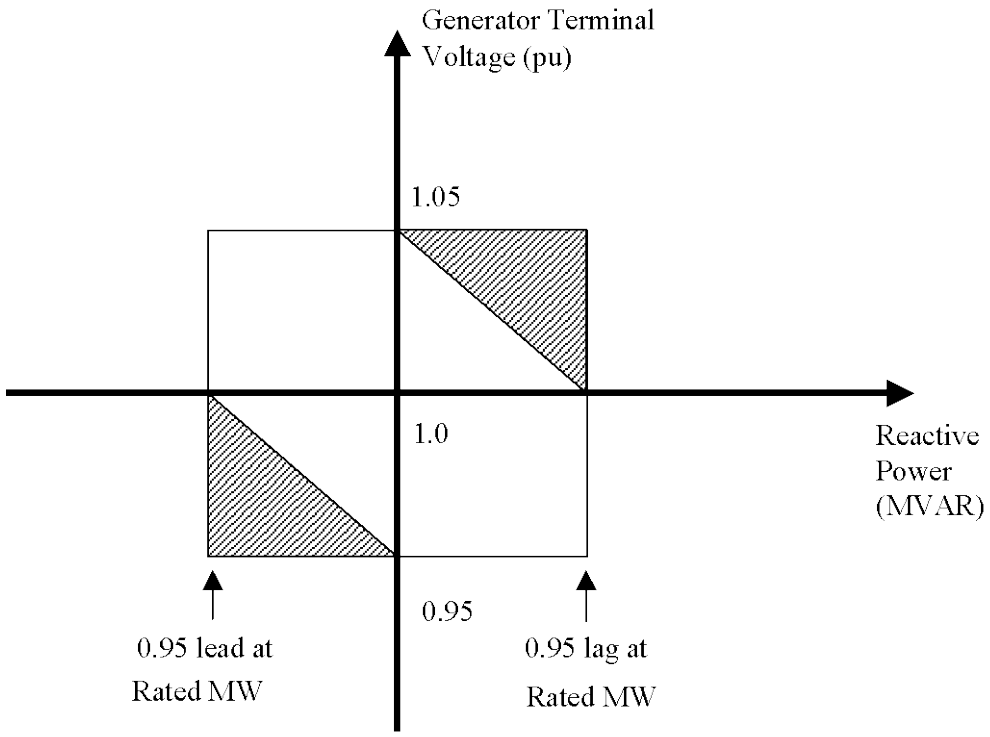

Figure 2

2.1.2. ACTIVE POWER RAMP RATE LIMIT AT START-UP

Power Park Modules must restrict their active power ramp rate when starting, except when the start is a result of wind speed reaching the minimum cut in speed of the turbine. A re-start to full power shall take a minimum of 15 minutes. This may be achieved by starting all Power Park Units and linearly ramping up the active power output over 15 minutes, or by sequential starting of the Power Park Units over a 15 minute period (i.e. a Power Park Module with 16 units can start one unit every minute). If sequential starting is adopted, there is no restriction on the ramp rate of individual turbines (turbines may be connected and taken to full output as rapidly as desired). If less than 100% output is available, the start up time may be reduced in proportion (i.e. start up to 33% output should take a minimum of 5 minutes). The ramp rate limit shall not apply to Power Park Modules with an installed capacity below 10MW.

2.2. FAULT RIDE THROUGH

(a) Each Generating Unit or Power Park Module and any constituent Power Park Unit shall remain transiently stable and connected to the System without tripping of any Generating Unit or Power Park Module or constituent Power Park Unit, for a close-up solid three-phase short circuit fault or any unbalanced short circuit fault on the

Transmission System operating at Supergrid Voltage for a total fault clearance time of up to 140ms. A three-phase or unbalanced earthed fault results in zero voltage on the faulted phase(s) at the point of fault. Following fault clearance, recovery of the Supergrid Voltage to 90% may take longer than 140ms**.**

(b) During the period of the fault as detailed in 2.2(a) each Generating Unit or Power Park Module shall generate maximum reactive current without exceeding the transient rating limit of the Generating Unit or Power Park Module and any constituent element.

(c) In addition to meeting the conditions specified in 2.2(a), each Non-Synchronous Generating Unit or Power Park Module and any constituent element thereof will be required to withstand, without tripping, the negative phase sequence loading incurred by clearance of a close-up phase-to-phase fault, by System Back-Up Protection on the Transmission System operating at Supergrid Voltages.

(d) In the case of a Power Park Module, the requirements do not apply when the Power Park Module is operating at less than 5% of its Rated MW or during very high wind speed conditions when more than 50% of the wind turbine generator units in a Power Park Module have been shut down or disconnected under an emergency shutdown sequence to protect Customer's Plant and Apparatus. If the Connection Point voltage is less than 15% on one or more phases during a fault, the fault ride-through requirements will not apply. Fault infeed from the Power Park Module may be ignored when determining the voltage at the Connection Point.

2.3. VOLTAGE AND REACTIVE POWER CONTROL

(a) A continuously acting automatic voltage control system is required to control the Generating Unit voltage without instability over the entire operating range of the Generating Unit. If a digital controller is utilised, the term 'continuously-acting' shall require terminal voltage measurements to an accuracy of better than 0.1%, and a maximum time between samples of 50ms. In the case of a Power Park Module, voltage control may be at the Generating Unit terminals, an appropriate intermediate busbar or the Connection Point.

(b) On-load control of Reactive Power is required on Generating Units or Power Park Modules. This will normally be achieved by tapping the generating unit transformer (if available) or by varying the set point of the voltage control system.

2.3.1. OVERALL VOLTAGE CONTROL SYSTEM CHARACTERISTICS

The overall voltage control system shall include elements, which provide a limited bandwidth output. The bandwidth limiting must be consistent with the speed of response requirements and ensure that the highest frequency of response cannot excite torsional oscillations on other plant connected to the network. A bandwidth of 0-5 Hz would be judged to be acceptable for this application. All other control systems employed within the Power Park Module should also meet this requirement.

Power Park Modules shall provide voltage control at an appropriate point for the control technique employed. If individual controllers are provided on each generating unit, control should be at the generating unit terminals. If additional plant is used to provide voltage control (e.g. an SVC or STATCOM), then control should be at the monitored

busbar, normally the local busbar to which the device is connected, or a remote busbar such as the Connection Point.

2.3.2. VOLTAGE CONTROL AT THE GENERATING UNIT TERMINALS

2.3.2.1. Steady State Performance Requirements

The generating unit shall be required to provide continuous steady state control of the voltage at the generating unit terminals.

The generating unit terminal voltage control system should be able to operate to a target voltage of between 0.95pu to 1.05pu with a minimum resolution of 0.01pu.

Operation over the full capability of the generating unit shall result in a maximum error between the terminal voltage and the setpoint of 1.0%.

2.3.2.2. Transient Voltage Control

The voltage control system is required to respond to changes in generating unit terminal voltage (either minor variations, steps or major variations). For a step change in voltage at the generating unit terminals the generating unit shall be capable of achieving 90% of the steady state change in reactive power in a time not exceeding 1 second. The settling time shall be less than 2 seconds, with all voltage oscillations being less than 5% of the new steady state voltage beyond this time.

2.3.3. VOLTAGE CONTROL AT THE CONNECTION POINT

2.3.3.1. Steady State Performance Requirements

The Power Park Module shall be required to provide continuous steady state control of the voltage at the Connection Point with a slope characteristic as defined in Figure 3.

The voltage control system should be able to operate to a target voltage of between 0.95pu to 1.05pu with a minimum resolution of 0.01pu.

The slope characteristic of the voltage control system shall be adjustable over the range 2% to 10% (with a minimum resolution of 1%). The initial slope setting will be 4%.

The Company may request an alternative slope setting within the defined range of 2% to 10%. On receiving such a request, the Customer shall implement the required setting.

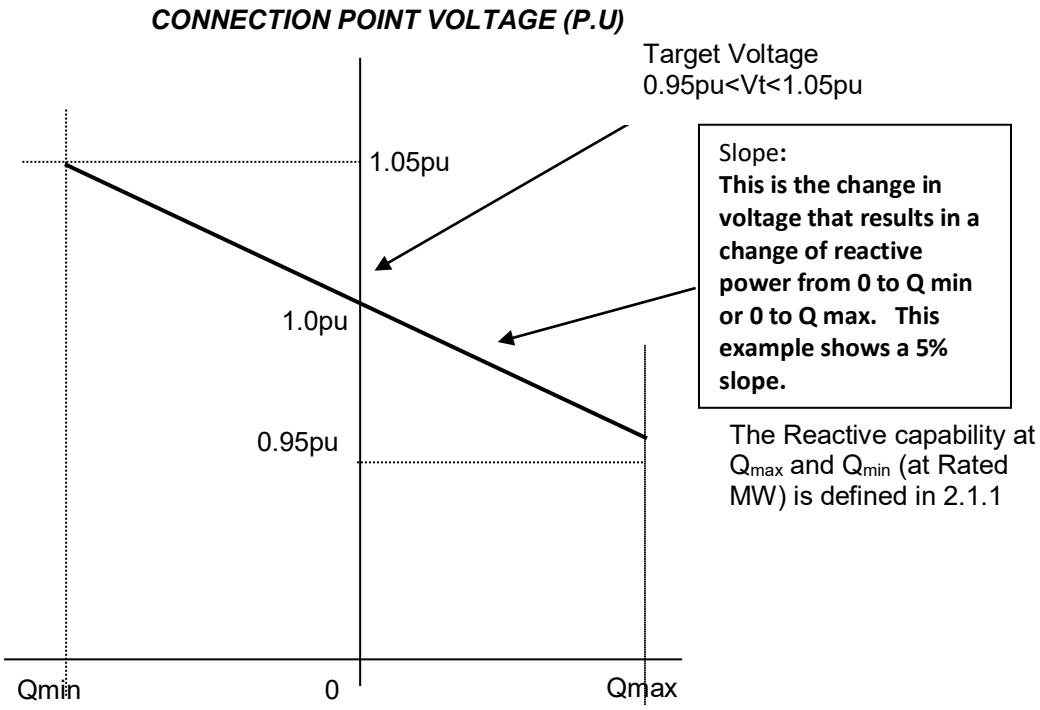

Figure 3

For deviations in Connection Point voltage below 95% of nominal, the Power Park Module shall be required to generate maximum reactive current. For deviations in Connection Point voltage in excess of 105% the Power Park Module shall be required to absorb maximum reactive current.

2.3.3.2.Transient Voltage Control

The Power Park Module voltage control system is required to respond to changes in Connection Point voltage (either minor variations, steps or major variations). For a step change in voltage at the Connection Point, the Power Park Module shall be capable of achieving 90% of the change in reactive power in a time not exceeding 1 second. The settling time shall be less than 2 seconds, with all voltage oscillations being less than 5% of the new steady state voltage beyond this time.

As a measure of the transient performance of the automatic voltage control system, the Customer will be required to undertake studies and witnessed testing. The testing requirements shall be discussed and agreed with The Company in the post offer period.

2.3.4. VOLTAGE CONTROL AT AN INTERMEDIATE BUSBAR

If the Customer opts to control the voltage at an intermediate busbar then similar requirements as defined in Section 2.3.3 shall apply although the exact settings would need to be discussed and agreed with The Company in the post offer period.

2.4. REACTIVE POWER LIMITERS

The Customer shall ensure that the voltage control system is stable when the Reactive Power limits are reached.

2.5. POWER SYSTEM STABILISERS

Synchronous Generating Units may be fitted with Power System Stabilisers designed to damp oscillations between the unit and the system. Where stabilisers are fitted, settings shall be agreed with The Company before the stabilisers are switched into service.

Part 2 - Communication Channels and Authorised Persons

Communication Channels	
For the Company:	For the Customer:
Operations Control Centre (OCC) SP Distribution Plc Scottish Power HQ 320 St Vincent Street Glasgow G2 5AD Tel: 0800 092 9290 Fax:	XXX
Authorised Persons:	
For the Company:	For the Customer:
As above	XXX