GB FREQUENCY HVDC FREQUENCY RESPONSE PARAMTERS
HVDC CONNECTIONS (TITLE II)

HVDC Article	Requirement	Range		Suggested GB Value		Comments	Policy Req'd? (e.g. Non-compatibility to be defined)	Code Change req'd?
11	Frequency Range	47 – 47.5Hz	60 seconds	47 – 47.5Hz	60 seconds	Mandatory requirement	?	Yes
		47.5 – 48.5Hz	TSO defined (but longer than RfG and DCC and DC PPm's (ie 90 minutes plus)	47.5 – 48.5Hz	100 minutes	Wider ranges and longer minimum operating times may be agreed Work group to discuss	?	Yes
		48.5 – 49.0Hz	TSO defined (but longer than RfG and DCC and DC PPm's (ie 90 minutes plus)	48.5 – 49.0Hz	100 minutes	Wider ranges and longer minimum operating times may be agreed Work group to discuss	?	Yes
		49.0 – 51.0 Hz	Unlimited	49.0 – 51.0 Hz	Unlimited	As per GB Code		No
		51.0 – 51.5Hz	TSO defined (but longer than RfG and DCC and DC PPm's (ie 90 minutes plus)	51.0 – 51.5Hz	100 minutes	Wider ranges and longer minimum operating times may be agreed Work group to discuss	?	Yes
		51.5Hz - 52	TSO defined (but longer	51.5Hz - 52	20minutes	Wider ranges and longer	?	Yes

			than DC PPm's (ie 15 minutes plus)			minimum operating times may be agreed Work group to discuss		
12	ROCOF	-2.5 to +2.5Hz/s	Measured over the previous 1 second	-2.5 to +2.5Hz/s	Measured over the previous 1 second	Mandatory requirement	?	Yes
13(1)(a)(i)	Active Power Controlability Maximum and Minimum Power Step Size for Transmitting Active Power	TSO specified		Max Step Size = 1MW Min Step Size = 1MW		Workgroup to discuss MW transfer should be controllable to the nearest whole MW	?	Yes
13(1)(a)(ii)	Minimum HVDC Active Power Transmission capacity for each direction below which active power transmission is not requested	TSO specified		Workgroup to discuss – believed to be part of data submission as part of trading in wholesale market / TSOG?		Workgroup to discuss MW transfer should be controllable to the nearest whole MW	?	Yes
13(1)(a)(iii)	The maximum delay within which the	TSO specified		2 minutes – as per BC2		Workgroup to agree	No	No

	HVDC System shall be capable of adjusting the transmitted active power upon receipt of request from the relevant TSO					
13(1)(b)	Capability of modifying transmitted Active Power infeed in case of disturbances into one or more AC networks	TSO specified	Covered by Fault Ride Through – additional text to be added for HVDC and delays greater than 10ms	Workgroup to agree	Yes	Yes
13(1)(c)	Active Power Reversal	TSO specified	Would be required only on a site specific basis and would be specified in the Bilateral Agreement. General Grid Code Mod to refer to the requirement and time delay	Workgroup to agree	?	Yes – General words required in relation to Power Reversal
13(1)(d)	Ability to modify transmitted active power for the purpose of cross boarder balancing	Not specified	Covered by CC.6.3.7 through the requirement to have a load controller and the Balancing Codes	Workgroup to agree	No	No?

13(2)	Ramp Rate Limit adjustment	Not specified		Ramp Rate Limits covered under BC1.A.1.1 Adjustment of Ramp Rates below the limits of BC1.A.1.1 are permissible – see BC1			No	No
13(3)	Automatic Remedial Action	TSO specified		Other than the current requirements under the Balancing Codes any other requirements would be specified under the Bilateral Agreement			No	Yes – Only by reference to additional requirements being specified in the Bilateral
14	Synthetic Inertia	TSO specified		Not required – see FFCI requirements Option 1			No	No
15	FSM, LFSM-O, LFSM-U							
Annex II(A)(1)	FSM	Deadband	0 ±500mHz	Deadband	0	As per RfG See Insensitivity	No	No
		Droop S1(u)	Minimum 0.1%	DroopS1 (u)	3 – 5%	As per current Grid Code	No	No
		Droop S2(d)	Minimum 0.1%	DroopS2 (d)	3 – 5%	As per current Grid Code for upward regulation	No	Yes – Current Grid Code does not make this clear
		Insensitivity	Maximum 30mHz	Insensitivity	15mHz	As per current Grid Code for Deadband	No	Yes – Introduce term insensitivity as per RfG
Annex II(A)(1)(d)		Maximum admissible	0.5 seconds	Maximum admissible	0.5 seconds	RfG for non synchronous	Yes	Yes

		delay t1		delay t1		plant set to 1s		
		Maximum admissible activation Time t2	30 seconds	Maximum admissible activation Time t2	10 seconds	As per RfG and current Grid Code practice	No	No
Annex II(B)(1)	LFSM-O	Frequency Threshold f1	50.2 – 50.5Hz	Frequency Threshold f1	50.4Hz	As per current Grid Code	No	No
		Droop S3	0.1% upwards	Droop S2	10% or less	As per current Grid Code	No	No
		Initial activation time	TSO specified	Initial activation time	<2s	As per RfG	No	Yes
		Full activation time	TSO specified	Full activation time	10s	As per current Grid Code	No	Yes
Annex II(c)(1)	LFSM-U	Frequency Threshold f2	49.8 – 49.5Hz	Frequency Threshold f2	49.5Hz	As per current RfG	No	Yes
		Droop S4	0.1% upwards	Droop S4	10%	As per RfG	No	Yes
		Initial activation time	TSO specified	Initial activation time	<2s	As per RfG	No	Yes
		Full activation time	TSO specified	Full activation time	To be determined – plant Dependent	Discuss with Working Group	Yes	Yes
16	Frequency Control	Modulation of Active Power in relation to Frequency	TSO specified	Modulation of Active Power in relation to Frequency	As per CC.6.3.6 of Grid Code	Discuss with Working Group	No	No

		Changes		Changes				
17	Maximum Loss of Active Power	TSO specified		Loss of Active Power	1800MW	As per SQSS discuss with Workgroup	No	No
37	Black Start	TSO specified		Black Start	Specified in Bilateral Agreement in the same way as Generation	As per current Grid Code and Bilateral Agreement	No	No