Thames Haven: Connect & Manage Derogation Report

This report considers the incremental impact of a temporary derogation against requirements contained within the NETS Security and Quality of Supply Standards (NETS SQSS) as a consequence of the connection of the above named generation project to the National Electricity Transmission System, under the Connect & Manage Arrangements, in advance of Wider Transmission Reinforcement Works being completed.

Note on assessment of incremental constraint costs:

The assessment of incremental constraint costs contained in this derogation report is based upon the contracted connection background at the time the assessment was undertaken. The contracted background will change to the extent that new projects apply for connection or existing contracted projects delay, revise their Transmission Entry Capacity or terminate. Changes to the contracted background may change the level of incremental constraint costs from that assessment contained within this and other derogation reports. Once issued, the derogation reports will not be updated to reflect changes in the contracted connection background used in the calculations.

For updated information on the aggregated costs and benefits of the Connect and Manage regime, please see the latest quarterly Connect and Manage report on the National Grid website.

http://www.nationalgrid.com/uk/Electricity/Codes/gbsqsscode/ConnectManageDocs/

Seven Year Statement boundary information:

- An overview of the Seven Year Statement boundaries and study zones that may be referred to in derogation reports can be found in SYS Appendix A, Fig. A.1.5 (on a geographical basis) and Fig. A.4.4 (on a schematic basis):

http://www.nationalgrid.com/NR/rdonlyres/FA14F11A-3A49-4C98-9661-A0BCC85FA56E/41468/NETSSYS2010AppendixA.pdf

Carbon benefit assumptions:

The carbon benefit assessment contained in this derogation report is based on the following assumptions:

- Load factors assumed: offshore wind = 35%; onshore wind = 30%
- DECC medium-term advice for carbon price (table 3) and emissions factors (table 1) applied (positive marginal carbon impact by displacing gas generation) = 0.39 T_CO2/MWh

http://www.decc.gov.uk/assets/decc/Statistics/analysis_group/81-iag-toolkit-tables-1-29.xls

Part 1: Technical Description of Non Compliance

Relevant Paragraph(s) of NETS Security and Quality of Supply Standard	Cause	Part of System Affected	Initial Conditions		Interim Operational Solution	Long Term Solution, to include brief description of access requirements.	Derogation Expiry Date
			System Intact	Circuit Outage			
NETS SQSS Chapter 2- Generation Connection Criteria. - 2.10.8	Thermal	Kingsnorth-Grain 400kV local group	Double circuit loss into Kingsnorth/ grain group, inclusive of Barking-Northfleet East circuits	Successive two circuit loss into Kingsnorth/ grain group, inclusive of Barking-Northfleet East circuits.	Use of commercially-agreed intertrips.	Completion of new Thames Crossing construction and new QBs near Kingsnorth and Gravesend.	This derogation will apply for the period between connection of the Thames Haven Power Station and the completion of reinforcement work. This period is from October 2014 to 2023 based upon current project plans.

Thames Haven power is an 840MW CCGT connecting near Coryton, Essex. This connection is via a loop-in of the Rayleigh - Tilbury circuits into a new Mucking Flats substation in 31st October 2014.

Connection of this additional generation, commensurate with significant new and existing generation in the area, gives rise to fault level issues. This requires a 4-way split operating arrangement at Tilbury to be adopted. This running arrangement requires commercial intertrips to manage thermal exports.

Wider derogation: Part 1: Technical Description of Non Compliance

Relevant Paragraph(s) of NETS Security and Quality of Supply Standard	Cause	Part of System Affected	Initial Conditions		Interim Operational Solution	Long Term Solution, to include brief description of access requirements.	Derogation Expiry Date
			System Intact	Circuit Outage			
Design of the Main Interconnected Transmission System- 4.6	Thermal and voltage performance	Thames Estuary export boundary (B15) Greater London import boundary (B14)	Various B15 and B16 boundary circuits respectively	N/A.	Extensive use of Customer choice intertrips and reactive compensation reinforcement to increase interim capacity	Completion of all 400kV uprating, reconductoring and reconfiguration work between 2014 and 2023 in the Thames Estuary	This derogation will apply for the period between connection of the Thames Haven Power Station and the completion of wider reinforcements. This period is from October 2014 to 2023 based upon current project plans.

Additional reactive compensation is required to manage the period between 2015-and 2023 until the enduring reinforcements can be completed. Extensive further commercial intertripping is required to provide wider system capacity over the period with a significantly increased risk of pre-fault constraint during planned access to achieve NETS SQSS compliance. Reconductoring work between West Ham and Barking is to be accelerated. All existing and planned generation within the B14 planned boundary will be impacted by this derogation and increased intertrip utilisation will result from this connection.

Stability derogation: Part 1: Technical Description of Non Compliance

Relevant Paragraph(s) of NETS Security and Quality of Supply Standard	Cause	Part of System Affected	Initial Conditions		Interim Operational Solution	Long Term Solution, to include brief description of access requirements.	Derogation Expiry Date
			System Intact	Circuit Outage			
Generation Connection Criteria Paragraph 2.10.10	System Instability	Thames Haven and Coryton Generation.	Tilbury-Barking/ Littlebrook circuits.	N/A	Customer choice intertripping of Thames Haven Power	New overhead line between Bramford and Twinstead.	This derogation will apply for the period between connection of the Thames Haven Power Station and the completion of the Bramford Twinstead line. This period is from October 2014 to October 2016 based upon current project plans.

The Thames Haven connection, in conjunction with other contracted generation in the area, leads to fault level issues on equipment at Tilbury 400kV substation, causing an already two-way split substation to be run 4-way split to manage fault levels at Tilbury and in the wider Thames Estuary area.

Following the adoption of a the 4 way split the Tilbury/ Coryton generation group is connected via 4 circuits to the wider network; the Tilbury - Barking/Littlebrook double circuit of approximately 25km into central london, and the Pelham/ Bramford route of over 100km distance.

The NETS SQSS (2.10.10) states that following a double circuit fault there should be no system instability. Against a 60% demand, off peak background, the loss of the Tilbury – Barking - Littlebrook circuits leads to insufficient damping on existing Coryton and new Thames Haven generation.

In the short term this non compliance is to be managed using a customer choice intertrip. The enduring solution is a new overhead line between Bramford and a current junction point between Rayleigh/ Braintree and Pelham routes known as Twinstead. On completion 4 circuits running west and south west of Bramford will be made available by this work- a Bramford-Pelham double circuit and a Bramford- Rayleigh/Braintree double circuit.

Part 2: Expected Consequence of Non-Compliance

Value of Carbon Benefit (£k)	2014/15:	0
	2015/16:	0
	2016/17:	0
	2017/18:	0
	2018/19:	0
	2019/20:	0
	2020/21:	0
	2021/22:	0
	2022/23:	0
	Total:	**0**
Summary of proposed System Operator actions to manage non-compliance	Thames Haven and Damhead Creek both connect to the same geographic area of the transmission system (Thames Estuary) and the impact of these connections have been assessed together to ensure interactions between the generation and the required works for each are captured correctly. Costs have thus been calculated on a combined basis and then split out to reflect the costs incurred on a connection by connection basis. The interim operation solution identified in the derogation report is of widespread use of customer choice and commercial intertrips. The assessment assumes that customer choice intertrips can only be used to resolve local stability issues while commercial intertrips are used to manage wider constraint issues. Commercial intertrips, up to a maximum volume, have been used in the Central case. Volumes beyond 1800MW are to be managed by restricting conventional generation pre-fault. Prices assumed for commercial intertrips are based on those received via tenders during 2009/10/11. Prices to restrict generation are in line with those observed currently to restrict conventional generation. Under outage conditions a further 500MW must be restricted to secure post fault conditions in addition to the volume restricted during intact conditions.	
Estimated range of costs to manage non compliance (£k)		**Central Case (£k):**
	2014/15:	8,627.03
	2015/16:	31,164.67
	2016/17:	4,759.20
	2017/18:	4,476.25
	2018/19:	5,133.06
	2019/20:	7,488.88

	2020/21: 7,713.54 2021/22: 7,944.95 2022/23: 6,871.88 **Total: 83,694.40**
Description of risk due to network non compliance	If intertrips services are not available, the full volume of generation must be restricted pre-fault. There is sufficient generation within Zone15 to manage the potential constraints without taking actions on inflexible or renewable generation.