Notice of Proposed Income Adjusting Event – Moyle Interconnector Fault

nationalgrid

Submitted on: 28 June 2013

About this document

This document sets out the additional costs incurred to the System Operator due to a breakdown of the Moyle interconnector between Scotland and Northern Ireland from June 2011 to February 2012 and why National Grid considers this to constitute an Income Adjusting Event in accordance with Special Condition AA5A Part 2(i), paragraph 11 of National Grid Electricity Transmission plc's Transmission Licence.

Executive Summary

1 On 26 June 2011, a fault on the Moyle Interconnector reduced its capacity to half and subsequently to zero on 24 August 2011. This fault outage continued until 19 February 2012 thereby lasting for 8 months in total. This is a significant period of time and from an historical perspective, has not been experienced since the introduction of BETTA.

2 The effect on National Electricity Transmission System (NETS) power flows of a Moyle Interconnector outage is that exports from Scotland to England over the Cheviot boundary increase with a subsequent need to take actions to maintain power flows within acceptable parameters. These actions increase the costs experienced by the System Operator and ultimately consumers.

3 As a long duration fault of an interconnector within an exporting constraint zone is an unforecastable event, and unprecedented, no provision was made within NGETs 2011-13 incentive arrangements for such a situation.

4 In the summer of 2012 National Grid raised a number of modifications to the way in which the 2011-13 incentive scheme target was calculated for constraints. Ofgem observed in its decision on these revisions that retrospective changes to the treatment of interconnector flows "*would operate to compensate NGET for an unforeseen outage across 2011/12".* Ofgem further noted that *"A mechanism already exists under Special Condition AA5A to allow the licensee to provide notice to the Authority for such unforeseen circumstances to be considered under the income adjustment event arrangements."*

5 Given that National Grid has no control over the available capacity of the Moyle interconnector, nor any provision for managing this within the incentive target, we therefore consider this to constitute an Income Adjusting Event (IAE) with respect to the 2011-13 Balancing Services Incentive Scheme (BSIS).

6 Costs for the actions taken as a direct result of the fault on the Moyle interconnector have been calculated by comparing the Balancing Mechanism and Trading actions taken exclusively to manage the Cheviot boundary with the volume of exports that would normally be expected over a fully functional Moyle interconnector. This produces a calculated cost impact of the Moyle breakdown of £29.2m.

7 National Grid had a number of contracts in place during the duration of the Moyle breakdown, however as these would have been in place regardless of the breakdown these are not included in the calculation above.

8 The subsequent level of income adjustment if the Moyle interconnector outage were to be determined by Ofgem as an IAE would be a £7.3m income to National Grid following application of the BSIS scheme 25% sharing factor to the total £29.2m cost impact.

Contents

1. Background

9 The Moyle Interconnector directly connects Scotland to Northern Ireland via a High Voltage Direct Current (HVDC) Interconnector. Typically, the Interconnector exports power from Scotland to Northern Ireland (due to lower GB prices) and has a commercial capability to export 450MW from Scotland to Northern Ireland.

10 On 26 June 2011, a fault on the Moyle Interconnector reduced its capacity to half and subsequently to zero on 24 August 2011. This fault outage continued until 19 February 2012 thereby lasting for 8 months in total. This is a significant period of time and from an historical perspective, has not been experienced since the introduction of BETTA. The effect on NETS power flows of a Moyle Interconnector outage is that exports from Scotland to England over the Cheviot boundary[1] increase as indicated in Figure 1 below.

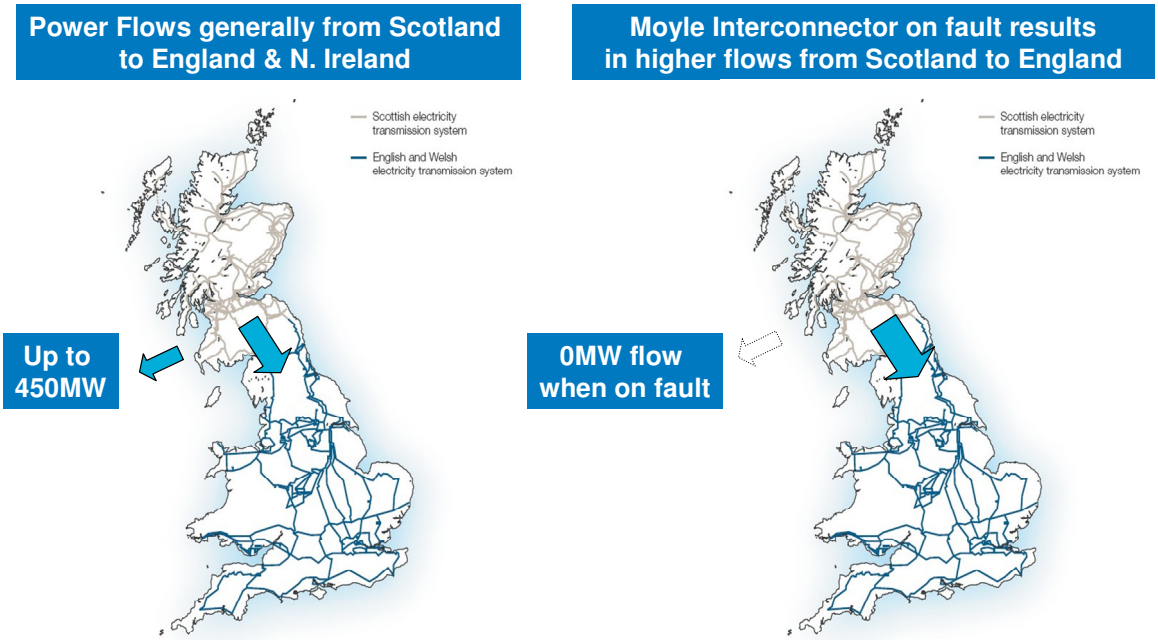

Figure 1: Overview of power flows with and without the Moyle Interconnector

11 The derogated Cheviot boundary does not have sufficient capacity to export all of the available generation from Scotland to England and hence National Grid as SO is required to routinely constrain off generation in Scotland to maintain system security. This leads to an increase in constraint costs. The maximum capability of the Cheviot boundary is around 3100MW under intact conditions and considerably less under summer planned outage conditions.

12 With the Moyle Interconnector on an unplanned fault outage, the exports that would have flowed to Northern Ireland in reality become additional exports across the Cheviot boundary which leads to a considerable increase in Scottish constraint costs.

[1] The Cheviot Boundary is the boundary between the Scotland and the England & Wales systems.

2. Provision within the BSIS Target

13 The high level principle behind the current incentive scheme is to focus the incentive on those areas that the NETSO can reasonably control and/or forecast thereby reducing scope for windfall gains or losses to the consumer.

Constraint Modelling Process

14 The Constraint cost forecast model is described in the constraint modelling methodology statement developed for the current scheme. The current model is a zonal boundary model, consisting of a number of nodes which are connected by single lines across which maximum boundary transfers are prescribed.

15 Figure 2 below illustrates the process by which a constraint cost target is determined by the model and how this target is compared with outturn costs to arrive at scheme performance.

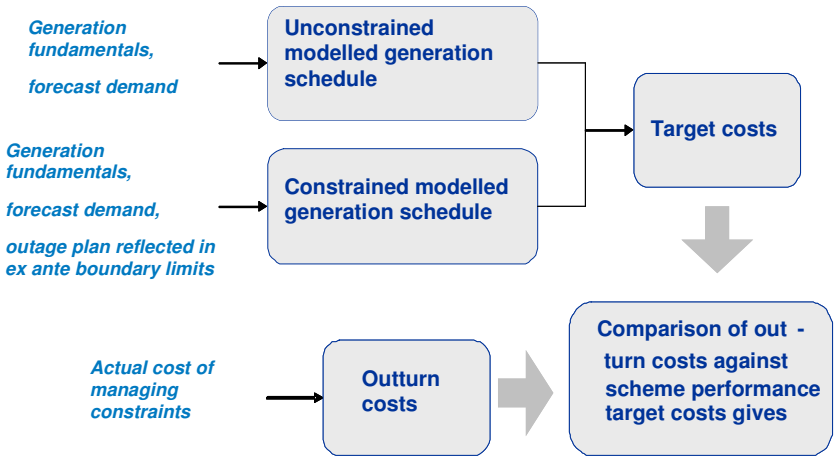

Figure 2: Overview of constraints target model calculation process

16 The high level constraint cost forecast process is:

(a) Produce an unconstrained generation and interconnector schedule based on various ex ante and ex post inputs;

(b) Apply a number of constraint boundaries to the unconstrained generation schedule. This then causes the model to resolve these constraint boundaries using ex post prices in the Balancing Mechanism (BM). This results in a constrained generation schedule being produced;

(c) This then gives power flows which are a reasonable representation of real time conditions and hence reduce potential for wind fall gains or losses; and

(d) The difference between unconstrained and constrained model runs provides a target cost which is then discounted by 41%[2] and

[2] A 41% discount factor is applied to reflect that in reality not all constraints will be resolved in the Balancing Mechanism and that tools such as constraint management contracts and intertrips can be used to create savings against Balancing Mechanism prices submitted by generators.

combined with an estimation of the costs of sterilised headroom[3] under the modelled conditions. The result is a constraint cost target against which actual costs are compared to determine our performance under the incentive scheme.

17 In order for us to be able to focus on, and reduce costs associated with, areas that we can control (and avoid potential wind fall gains or losses), it is imperative that the model is able to represent power flows and generator availability / running patterns as closely as possible. As we have experienced for the current scheme, it is also critical that the optimisation method and setup are appropriate within the Constraint model itself.

18 Within the original methodologies there was no provision for interconnectors to be unavailable. This was in line with their historic reliability. As a result there was no representation of the effects of a long term interconnector fault within the targets set through these methodologies.

19 On 14th September 2012, Ofgem approved revisions to the constraints modelling methodology which altered the way in which interconnectors were modelled. This change took effect from 14th September and was not retrospectively applied from the scheme start[4].

20 In its decision document Ofgem specifically noted the Moyle outage, and the pre-existing conditions for unexpected events, saying:

"The purpose of approving this amendment [the changes to the constraints modelling methodology] going forward is to treat interconnectors as akin to generation for the purpose of modelling constraints. However, these amendments will not be applied to the Moyle interconnector on a retrospective basis on the grounds that it would operate to compensate NGET for an unforeseen outage across 2011/12. A mechanism already exists under Special Condition AA5A to allow the licensee to provide notice to the Authority for such unforeseen circumstances to be considered under the income adjustment event arrangements."

[3] Sterilised headroom is a volume of reserve that cannot be taken into account or used for system operation because it is located behind a constraint boundary.

[4] http://www.ofgem.gov.uk/Markets/WhlMkts/EffSystemOps/SystOpIncent/Documents1/NGET%20BSIS%202011-13%20Methodology%20Amendment%20Direction%20Letter.pdf

3. Breakdown of Costs

Calculation from incurred cost

21 In order to assess the impact of the Moyle outage, the BM actions which had only been taken for management of power flows across the Cheviot boundary have been considered, i.e. actions which managed multiple boundaries were excluded. These were excluded on the basis that the non-Cheviot boundary would have resulted in the action being taken regardless.

22 Having isolated Cheviot only actions these were arranged in descending price order – most onerous first - and the volume compared to the volume that would be expected to be netted off prior to reaching the Cheviot boundary had Moyle been operating normally.

23 This gives an estimation of the actual costs incurred via BM and Trading actions as a result of the Moyle breakdown on £29.2m.

TOTAL SCOTEX COST DURING THIS PERIOD		SCOTEX COST ATTRIBUTABLE TO MOYLE DURING THIS PERIOD	
£	73,138,130	£	29,156,138

24 Details of this calculation are provided in the Appendices to this document.

25 National Grid has previously presented the impact of the Moyle Interconnector Fault on the modelled BSIS target number at a cost of £16m[5]. It is important to note that this modelled cost is different from the actual cost incurred as a result of the fault. The BSIS target cost for constraints is generated in Plexos from an underlying plant dispatch solution applied to the transmission boundary limits that were agreed at the commencement of the 2011-2013 scheme and based on an assumption of transmission availability for the period.

26 This target would have assumed that the Moyle Interconnector capacity was 450MW from GB to Northern Ireland and the plant dispatch utilised this export capacity. On occurrence of the fault, Plexos would see 450MW less demand (as Moyle no longer able to export) and provide a new plant dispatch solution. As a result, the modelled flow across the Cheviot boundary increased, giving a target cost number that was £16m higher.

27 It is important to note that as a result of the 450MW demand reduction that occurred through the Moyle Interconnector fault, Plexos derives a new plant dispatch solution that may have assumed a reduction in exports from Scottish generation sources and hence provide a lower modelled cost. In addition, the constraint boundary limits that occurred in reality will have differed from those input at start of the scheme period which will also impact on the difference between modelled and actual costs.

[5] In the July2012 document Balancing Services Incentive Scheme (BSIS) 2011-13 Methodology Amendments that National Grid published, the impact of the Moyle Interconnector fault in on target cost was assessed alongside a number of other proposed model changes. The total impact of all the proposed changes on the target cost was £118M. In order to highlight the impact of each change, the incremental impact of each model change was carried out in a step wise manner. The order in which these changes are made and subsequently run through Plexos can affect their nominal incremental impact in respect to the total optimisation. As each change is made, it changes the result of the optimisation for that given condition. Were the optimiser allowed to consider the changes concurrently the optimised solution would still provide the same total cost impact, however the impact of each change would not necessarily concur with the stepwise approach.

28 In respect to this IAE, the actual cost is based on the actual observation of generation patterns in Scotland and hence the resultant flows across the Cheviot boundary. This analysis assumed that there was a 1:1 impact on the Cheviot boundary flow i.e. there was no corresponding reduction in generation within Scotland to compensate for the reduced demand impact of the Moyle fault. Therefore the actual cost of restricting an additional 450MW was £29.2M as opposed to the increase in target cost of £16M.

4. Reasons why this is an Income Adjusting Event

29 We consider that the fault of the Moyle interconnector constitutes an Income Adjusting Event for the following reasons.

30 As with any fault outage, an interconnector fault is inherently unpredictable and a long term outage of an interconnector within a constrained zone is unusual. For instance this is the first notable instance of such since BETTA commenced in 2005.

31 In addition, the capacity made available across the Moyle interconnector is outside the control of the system operator. Similarly there is nothing that the system operator can do to affect repairs in a shorter timescale.

32 Due to the reasons above no provision was made within the incentive scheme target to reflect the costs of an interconnector breakdown.

33 The costs incurred as a result of the outage exceed the £2m materiality requirement for an income adjusting event.

34 Further, changes to interconnector treatment within the revised BSIS methodology raised by National Grid in July 2012 were not directed by Ofgem due to existing conditions for unexpected events i.e. the Income Adjusting Event mechanism.

5. Actions taken to mitigate Costs of Moyle Breakdown

35 During the outage of the Moyle interconnector close contact was kept with SONI to ascertain the status and likely return dates of the interconnector. This information was used to determine the options available in managing the costs of the outage.

36 In addition National Grid had run tenders for constraint management services within the affected area and procured services to cap generation and agree hours of intertrip arming. These contracts were either in place before the fault occurred or, in the case of those agreed after the fault, would have been signed regardless of the status of the Moyle interconnector.

37 During the Moyle outage period two tenders were run for constraints in Scotland. The first of these covered the period 13th August to 30th October (inclusive) and this tender process commenced prior to the Moyle fault[6]. All tenders received, with the exception of a capped PN at Cockenzie, were accepted.

[6] http://www.nationalgrid.com/NR/rdonlyres/4CFB07F2-FBB0-46D7-B0E0-9ABC17777DF0/51640/CombinedTCMRN0211.pdf

Power Stations Invited to Tender	Tender Entered	Tender Accepted	Reason for Rejection
Cockenzie	Yes	No	[text deleted]
Longannet	Yes	Yes	N/A
Peterhead	Yes	Yes	N/A
Hunterston	No	N/A	N/A
Torness Power	No	N/A	N/A

38 The second tender during the Moyle outage period covered the period from the 31st October 2011 to the 25th March 2012 and was run in September and October 2011. In this tender round all parties who submitted a tender were accepted, with the exception of RWE Npower[7]. This tender was set out to "all generators in Scotland", and extensive effort was placed in developing this market and successfully recruiting new providers with the result that tenders were received from Falck and RWR Npower.

Tender Received For	Tender Accepted	Reason for Rejection
Peterhead	Yes	N/A
Falck Renewables	Yes	N/A
RWE Npower Renewables	No	[text deleted]

39 No tenders were received from Scottish Power or EdF.

40 This later tender recognised that there was a need for services which could be enacted at times of high output from wind and hydro plant, particularly where coincident with high conventional plant output, and sought to procure these services. At times of lower wind output transfer levels were expected to be such that Balancing Mechanism and trading actions provided an economic method to manage the resultant power flows. By only procuring the services required, rather than a blanket service, National Grid therefore avoided unnecessary expenditure.

41 Having run a competitive tender against a defined requirement National Grid could not then approach individual parties for a bi-lateral contract and would have had to run further tender processes.

42 As can be seen from the above there were no further parties who had expressed an interest in entering in to a commercial agreement and did not have an agreement in place or were economic to progress against the alternative Balancing Mechanism or trading actions.

[7] http://www.nationalgrid.com/NR/rdonlyres/ADF2B7C0-A372-491A-AE8B-0FE562CE4FDF/51641/CombinedTCMRN0311.pdf

43 These contracts would have been put in place regardless of the Moyle fault outage and as such are not included in the costs of this Income Adjusting Event.

Appendix 1: Calculation of Cost of Moyle breakdown

Outturn Costs

National Grid maintains records of the costs of transmission constraints incorporating the costs of:

- The action itself
- The costs of replacement energy
- The costs of maintaining adequate reserves

In essence this is the same process as used for the Income Adjusting Event raised on Scottish transmission costs for 2005/6. The overall process is described in the constraint costing methodology[8] available from National Grid's website.

Due to it's location within Scotland the main transmission constraint boundary affected by the breakdown of the Moyle interconnector was the SCOTEX boundary, also known as Cheviot or B6. Costs associated with this boundary were therefore isolated from National Grid's cost records for the duration of the Moyle breakdown.

As a single action can be used to simultaneously manage multiple boundaries those actions which managed SCOTEX and another boundary were excluded on the basis that the action would still have been needed even with an infinite SCOTEX limit. Therefore we have a list of costs exclusively to manage SCOTEX during the period of the Moyle breakdown.

These actions are solely those taken within the Balancing Mechanism, i.e. Bids, or forward trades and replacement costs for each. Contract costs during this period are not included as these would have been in place regardless of the Moyle breakdown.

The additional power flow reaching the SCOTEX boundary as a result of the Moyle interconnector breakdown can be considered proportionate to the reduction in export to Ireland. As this interconnector tends to operate as an export, it is therefore possible to compare the volume of actions taken to manage SCOTEX to the reduction in Moyle transfer as a result of the fault outage.

As National Grid despatch in an economic and efficient manner more expensive actions will be taken after less expensive ones. Combined with knowledge of the applicable volume, this can be used to separate the background level of SCOTEX from that as a result of more power reaching the SCOTEX boundary due to the Moyle breakdown.

To do this the actions known to be taken for SCOTEX were arranged in descending cost order such that the most expensive actions were at the top of the list. This stack of actions was then compared to the reduction in Moyle capacity on each day and a representation of day and night transfer levels as below.

	Daytime	Overnight
26 Jun to 23 Aug	200	0
24 Aug to 17 Jan	400	200
18 Jan to 19 Feb	200	0

[8] http://www.nationalgrid.com/NR/rdonlyres/241CCBF5-18B0-4F92-B405-23F29C478A0E/49267/ConstraintCostingMethodologyv2028sep11.pdf

Daytime was taken to be settlement periods 19 to 39 inclusive; overnight is defined as not daytime.

The cost of actions falling within the “Moyle” part of the stack are then taken as being the costs directly applicable to the breakdown of the interconnector, which total some £29.2m.

TOTAL SCOTEX COST DURING THIS PERIOD	SCOTEX COST ATTRIBUTABLE TO MOYLE DURING THIS PERIOD
£ 73,138,130	£ 29,156,138

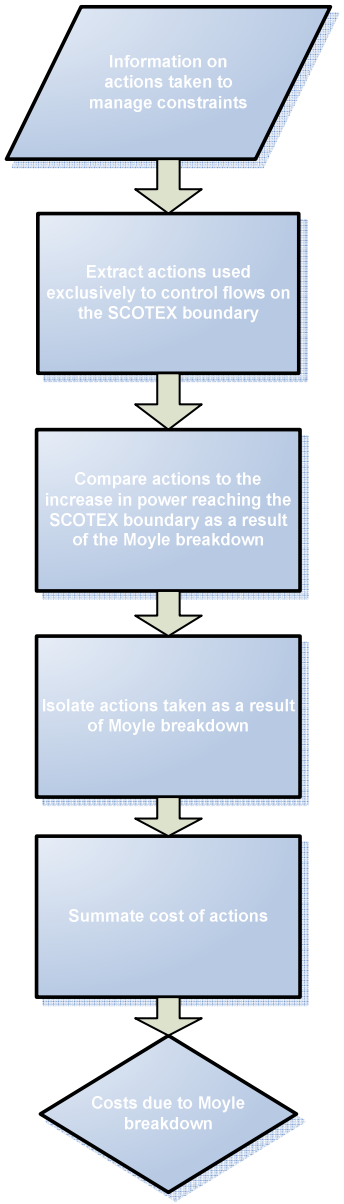

Figure 3: Costs based process

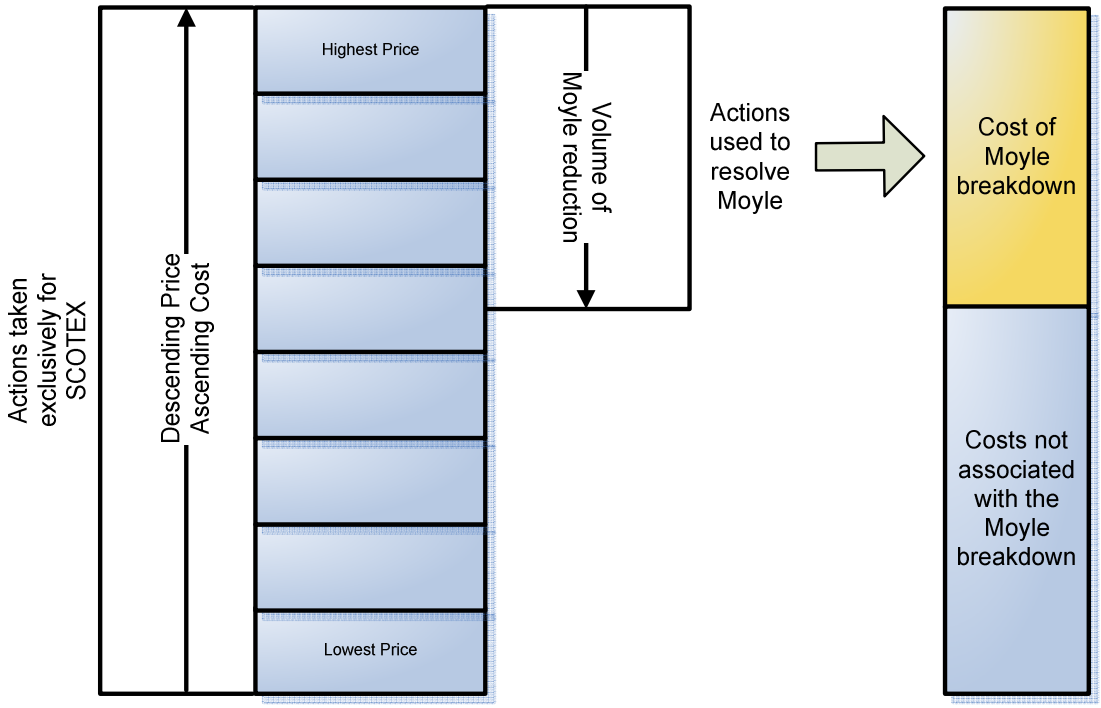

Figure 4: Diagrammatic view of cost allocation

Worked Example 1, 4th October 2011 Settlement Period 14

Step 1: Extract all constraint actions. In this half hour we have the SSENWEX2 and SCOTEX2 constraints requiring actions. The xxxx.CM BMUs are holders for the costs of replacing sterilised headroom behind the constraint boundary.

BMU_ID	Constraint Group	Bid Volume (MWh)	Price of Bid (£/MWh)	Constraint Cost (£)
TRADE A	SSENWEX2	-23	-150	4826.863
TRADE B	SSENWEX2	-23	-150	4826.863
TRADE C	SSENWEX2	-24	-150	4824.96
TRADE D	SCOTEX2	-11	-125	2055.559
TRADE E	SCOTEX2	-7.5	-125	1320.3
TRADE F	SSENWEX2	-16	-125	2816.64
TRADE G	SCOTEX2	-12	-125	2112.48
SSENWEX2.CM	SSENWEX2	0	0	98.036
SCOTEX2.CM	SCOTEX2	0	0	3903.684
BM Bid 1	SCOTEX2	-54.375	20	2167.584

Step 2: Extract the actions taken to manage just the Cheviot constraint, SCOTEX2 in this case, and sort on the price of the Bid

BMU_ID	Constraint Group	Bid Volume (MWh)	Price of Bid (£/MWh)	Constraint Cost (£)
TRADE D	SCOTEX2	-11	-125	2055.559
TRADE E	SCOTEX2	-7.5	-125	1320.3
TRADE G	SCOTEX2	-12	-125	2112.48
SCOTEX2.CM	SCOTEX2	0	0	3903.684
BM Bid 1	SCOTEX2	-54.375	20	2167.584

Step 3: Compare the bid volume to that of the Moyle outage. As this is for the 4th October this is a value of 100MWh (200MW). In doing this we put the xxxxx.CM holder to one side.

BMU_ID	Constraint Group	Bid Volume	Price of Bid (£/MWh)	Constraint Cost (£)	Volume used for Moyle (MWh)	Cost For Moyle (£)
TRADE D	SCOTEX2	-11	-125	2055.559	-11	2055.559
TRADE E	SCOTEX2	-7.5	-125	1320.3	-7.5	1320.3
TRADE G	SCOTEX2	-12	-125	2112.48	-12	2112.48
BM Bid 1	SCOTEX2	-54.375	20	2167.584	-54.375	2167.584
	TOTAL BID VOLUME:	-84.875				

Within this step the total volume of Bids taken for Scotex is less than the volume needed to replace the volume of Moyle reduction, therefore everything is included.

Step 4: To include or exclude the sterilised headroom? To determine if the sterilised headroom should be included, the total volume of actions in this half hour is compared to the Moyle reduction. If more Bids were taken than required for Moyle then it is assumed that the constraint would have been biting regardless of the status of Moyle and the sterilised headroom is not included. This is because the Moyle breakdown has not affected this cost element. In the case of this example however

the total bid volume is less than that needed for Moyle so the only reason these actions are being taken is due to the Moyle breakdown and so we should include these costs.

BMU_ID	Cost For Moyle
TRADE D	2055.559
TRADE E	1320.3
TRADE G	2112.48
BM Bid 1	2167.584
SCOTEX2.CM	3903.684
Total	11559.61

Worked Example 2, 26th June 2011 Settlement Period 21

Steps 1-2: Extract all constraint actions, in this half hour all the actions were taken for a Cheviot constraint so no further filtering is needed. Sort by Bid Price

BMU_ID	Constraint Group	Bid Volume	Price of Bid	Constraint Cost
SCOTEX2.CM	SCOTEX2	0	0	5547.141
BMU A	SCOTEX2	-88.667	32	3739.767
BMU B	SCOTEX2	-0.015	32	0.152454
TRADE A	SCOTEX2	-205	34	14035.01
BMU C	SCOTEX2	-110.625	37	4962.446
BMU D	SCOTEX2	-120	37	4461.339

Step 3: Compare Bid volumes to Moyle reduction. In this half hour this is 100MWh (200MW)

BMU_ID	Constraint Group	Bid Volume	Price of Bid	Constraint Cost	Volume Used for Moyle
SCOTEX2.CM	SCOTEX2	0	0	5547.141	0
BMU A	SCOTEX2	-88.667	32	3739.767	-88.667
BMU B	SCOTEX2	-0.015	32	0.152454	-0.015
TRADE A	SCOTEX2	-205	34	14035.01	-11.318
BMU C	SCOTEX2	-110.625	37	4962.446	0
BMU D	SCOTEX2	-120	37	4461.339	0

In this half hour the total volume exceeds that required for the Moyle reduction therefore we are only incorporating BMUs A & B and Trade A as a cost for Moyle. In addition the sterilised headroom will not be included as this cost would have been incurred regardless of the status of Moyle.

In the case of Trade A only a fraction of the volume is needed to meet the 100MWh for Moyle. The total cost for this action assigned to Moyle is proportionate to the volume used for Moyle. Here 11/205 MWh have been utilised, so 11/205 of the cost would be considered as a cost of the Moyle breakdown.

BMU_ID	Constraint Cost	Used for Moyle	Cost for Moyle
SCOTEX2.CM	5547.141	0	
BMU A	3739.767	-88.667	3739.767
BMU B	0.152454	-0.015	0.152454
TRADE A	14035.01	-11.318	774.8695
BMU C	4962.446	0	0
BMU D	4461.339	0	0