

Notice of Proposed Income
Adjusting Event – Smeaton
and Strathaven FMJL works

About this document

This document sets out the additional costs incurred by the System Operator as a result of the Smeaton and Strathaven FMJL works in Scotland between August 2012 and February 2013 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

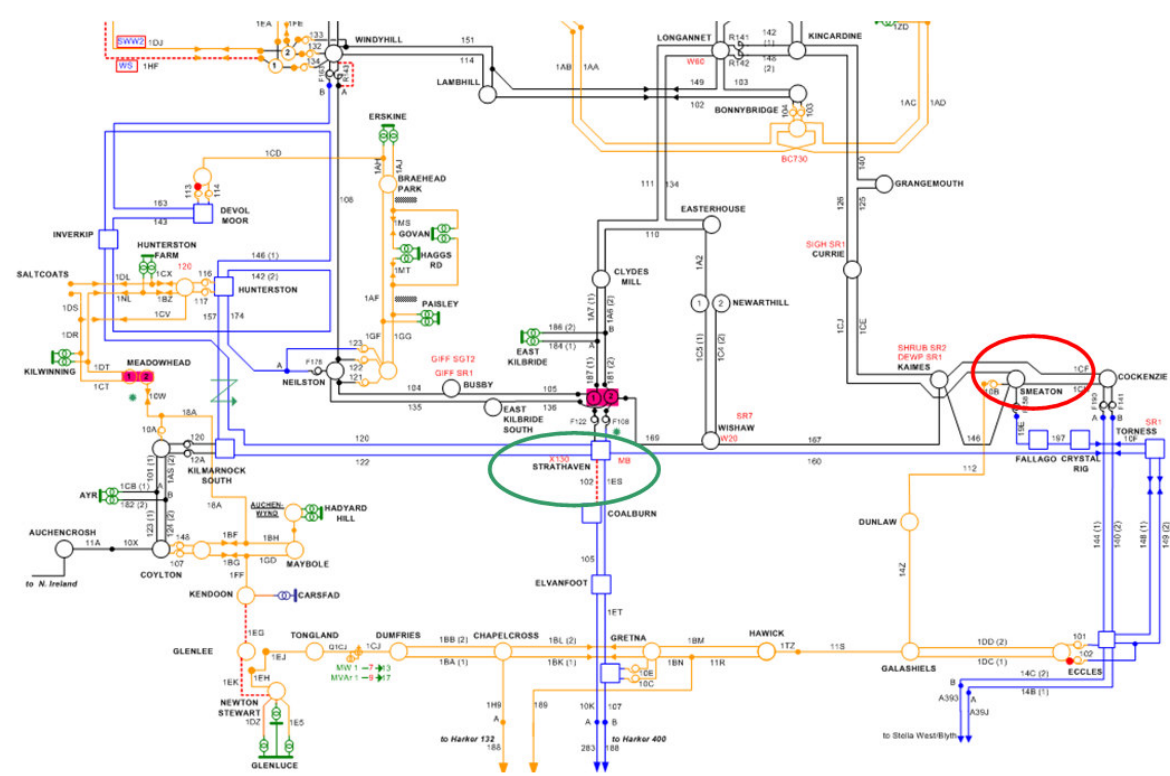
- 1 This document outlines the costs incurred to the System Operator for the outages of Smeaton and Strathaven FMJL works for the period 2nd August to 19th December 2012 and 7th January to 8th February 2013 respectively.
- 2 In July 2012 Scottish Power (SP) formally requested the Smeaton and Strathaven outages for FMJL replacement works. FMJL Current Transformers (CTs) have been identified to pose a significant safety hazard hence it was essential for this work to be carried out.
- 3 A complete shutdown of Smeaton substation was required in order to allow the replacement of FMJL CTs. The failure of these devices can propel porcelain at high speed, creating a high risk to health.
- 4 Several of the FMJL CTs are installed at both substations and Scottish Power has been working to remove and replace them with alternative designs.
- 5 The effect on the outages is that the maximum secure power flows over the Cheviot boundary (Scotland to England) reduce with a subsequent need to take actions in order to maintain power flows within acceptable parameters.
- 6 No provision was made for the cost of these outages within the Balancing Services Incentive Scheme (BSIS) because they had not been submitted by SP in the transmission outage plan prior to the start of the 2011-13 incentive scheme. For this reason they were not included in the transmission limits applicable to the methodology for calculating scheme targets and hence not reflected in National Grid's overall incentive target.
- 7 National Grid builds its transmission outage plans based on information from the Transmission owners under provisions the System Operator – Transmission Owner code. The process allows for outages to be changed and notified accordingly, which means that taking a view ahead of time is subject to an element of risk. Planned outages are an ex-ante input to the BSIS target setting model input for the 2011-13 scheme at two years ahead.
- 8 Unplanned outages have the potential to significantly impact National Grid's performance against agreed scheme targets where they persist for a significant period of time. Smeaton and Strathaven substations were available to run within the model but not available in reality causing an inaccurate target cost.
- 9 Costs for the actions taken as a direct result of the Smeaton and Strathaven FMJL works have been calculated by comparing the Balancing Mechanism, intertrip usage, Contracts and Trading actions taken exclusively to manage constraint boundaries around these substations with the volume of exports that would normally be expected with an intact transmission network. This produces a calculated cost of £25.14m for Smeaton and £3.75m for Strathaven FMJL replacement works giving a total of £28.9m.
- 10 We therefore consider that the Smeaton and Strathaven FMJL replacement works in 2012/13 constitutes an income adjusting event (IAE) which has resulted in significant costs being incurred by the SO. The subsequent level of income adjustment if these outages were to be determined by Ofgem as an IAE would be a £7.2m income to National Grid following application of the scheme 25% sharing factor.

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1. Background

- 11 In 2009 & 2010 the disruptive failure of a number of FMJL type current transformers resulted in a need to remove all of this type of equipment from the transmission network. Failure of these devices can propel porcelain at high speed, creating a high risk to health; sites where these are installed have hazard mitigation – for instance ballistic barriers – or exclusion zones around the current transformers to keep both staff and members of the public safe.
- 12 Smeaton and Strathaven substations are two of several Scottish Power sites where FMJL CTs are installed both of which are located in the southern area of Scotland and provide a through route for bulk power transfer through the eastern and western connections between Scotland and England. Smeaton is on the eastern side while Strathaven is on the western side within the power system as shown in Figure 1 below.



- 15 The safety issues of the FMJL CTs require Risk Hazard Management Zones (RHMZs) around each unit for the protection of personnel. Due to the layout of the substation and the number of FMJL CTs at Smeaton, the RHMZs have significant overlap with each other and the rest of the site. It was not possible for staff to safely undertake any inspection, maintenance or replacement works on any equipment at Smeaton. A complete shutdown of Smeaton was required in order to accomplish the replacement of the FMJL CTs whilst simultaneously ensuring safety for the staff on site undertaking the works.
- 16 Due to the designs of Smeaton and Strathaven Substation sites and the number and proximity of the FMJLs in place, ballistic barriers were not an option as the hazard zones would overlap to such an extent that it would not be possible to work safely within the site while it's energised. Therefore, the removal and replacement work required that Smeaton substation be totally de-energised while work was in progress.
- 17 The FMJL replacement works were inevitable due to the operational and safety considerations as until the works were completed the substations could not be inspected or maintained. Until the FMJL CTs are replaced any fault at Smeaton and Strathaven substations would have required an ONCOM switch-out of the entire substation to fix the fault hence exposing National Grid and ultimately the industry to significant constraint costs.
- 18 It was therefore agreed by both National Grid and Scottish Power in July 2012 that the FMJL replacement works should go ahead at both Smeaton and Strathaven substations due to the safety and operational implications stated above.
- 19 Due to Smeaton Substation unavailability, the route through the eastern 275kV network was unavailable and hence the natural flow of power between Scotland and England had to go through the western Scotland – England route.
- 20 In the event of a fault on the western Scotland – England route, the residual power flow would be via the Strathaven – Torness cable, which was at the same time down rated by SPTL hence creating a Lothian Export constraint in parallel with the Smeaton works.
- 21 During the Smeaton outage National Grid was required to ensure that the overloads on cables, in this particular case Strathaven – Torness cable were secure as failure to do so could potentially disconnect the whole of Scotland from England and Wales. This principally presents a difficult situation to operationally manage as there is a restricted range between secure levels of import and export to/from Scotland.
- 22 There is a substantial programme of planned work being carried out at Strathaven 400kV substation over the next few years in relation to the Energy Networks Strategy Group (ENSG) 2020 project. Postponing the FMJL replacement works at Strathaven 400kV substation would have a major impact on the ability to deliver the ENSG project as additional outages would be required, system risk would increase and there would be continued safety risk to personnel. Highly complex systems would also be required when carrying out maintenance at the site.

2. Provision within the BSIS Target

- 23 The high level principle behind the current incentive scheme is to focus the incentive on those areas that the SO can reasonably control and/or forecast thereby reducing scope for windfall gains or losses to the consumer. The current scheme is a 2 year scheme commencing from April 2011.

Constraint Modelling Process

- 24 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.
- 25 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.

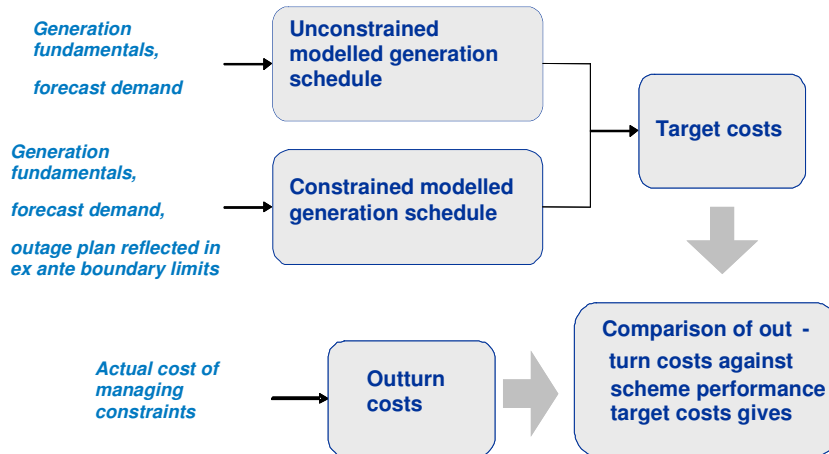


Figure 2: Overview of constraints target model calculation process

- 26 The high level constraint cost forecast process is:
- Produce an unconstrained generation and interconnector schedule based on various ex ante and ex post inputs;
 - 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;
 - 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
 - The difference between unconstrained and constrained model runs provides a target cost which is then discounted by 41%¹ and combined with an estimation of the costs of sterilised headroom² 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.

¹ 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.

² 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.

- 27 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.
- 28 Within the original year ahead outage plan for BSIS 2011-13 there was no provision for the outages at Smeaton and Strathaven for FMJL works. The FMJL works were not anticipated to be carried out within the current incentive period by Scottish Power at the start of the scheme when all planned outages were agreed and used to set the transmission limits applicable to the methodology of calculating scheme targets. As a result there is no representation of the effects of a complete shut down of Smeaton and Strathaven substations within National Grid's incentive target.

3. Breakdown of Costs

Calculation from incurred cost

- 29 In order to calculate the cost impact of the FMJL works an approach based on incurred expenditure for just the actions 'tagged' for the 'FMJL Replacement' works has been undertaken.
- 30 National Grid maintains records of the actions taken for the management of constraints taking in to account all the available information. From these only the actions specifically taken for Smeaton or Strathaven FMJL replacement have been isolated.
- 31 The reasons for a constraint are known through the planning and operational process; hence each cost can be attributed to a specific location based on the problem experienced on the transmission system. Costs can be assigned to specific outages, planning groups or boundaries and geographical regions such as Scotland, Cheviot or England and Wales.
- 32 Only constraints that have been assigned to the Smeaton and Strathaven outages have been used to calculate the actual cost impact of the FMJL works. Constraint costs associated to the FMJL works have been identified as per the 'Constraint costing methodology'. More information on the constraint costing methodology can be accessed through this link: <http://www.nationalgrid.com/NR/rdonlyres/241CCBF5-18B0-4F92-B405-23F29C478A0E/49267/ConstraintCostingMethodologyv2028sep11.pdf>
- 33 This gives an estimation of £28.9m for the actual costs incurred via BM, intertrips, contracts and trading as a result of the FMJL works at Smeaton and Strathaven from August 2012 to February 2013.

TOTAL CONSTRAINT COSTS DURING THIS PERIOD	COST ATTRIBUTABLE TO FMJL WORKS DURING THIS PERIOD
£106.16m	£28.89m

Table 1: Overview of costs during period 2nd Aug 2011 to 19th Dec 2012 and 7th Jan to 8th Feb 2013

4. Reasons why this is an Income Adjusting Event

- 34 We consider that the Smeaton and Strathaven FMJL replacement works constitute an Income Adjusting Event for the following reasons.

- 35 Smeaton and Strathaven substation outages for FMJL work were not included in the ex-ante transmission outage plan for BSIS 2011/13 because at the time Scottish Power had not submitted any requests for these outages. It was not anticipated that the FMJL replacements at Smeaton and Strathaven would be required within the 2011-13 incentive period. The impact of these outages on the transmission limits applicable to the methodology of calculating scheme targets is not reflected in National Grid's incentive scheme.
- 36 Due to the reasons above no provision was made within the incentive scheme target to reflect the costs of the over run Smeaton outage.
- 37 The costs incurred as a result of the outage exceed the £2m materiality requirement for an income adjusting event.

5. Actions taken to mitigate Costs of the FMJL replacement works at Smeaton and Strathaven

- 38 Due to the operational and safety considerations around FMJL type current transformers the outages had to proceed and cancelling was not an option. Postponing the replacement work was also not a feasible option due to the knock on effects with other planned work. Therefore the only action available were to mitigate the impacts of the outages.
- 39 In efforts to mitigate the impacts of the Smeaton outage National Grid worked closely with SPTL worked closely together to undertake a number of mitigating actions. In the early stages following this event, National Grid forecast that these actions would amount to a spend of circa £80m but was able to limit the extent of the total cost incurred significantly.
- 40 In order to optimise costs, there were a number of mitigating actions undertaken in managing this event. Firstly, SPTL constructed a temporary circuit to supply Edinburgh demand.
- 41 National Grid had also requested for extended working hours to be utilised to reduce the outage and SPTL agreed to this.
- 42 Before the start of the outages, National Grid requested that an Emergency Return to Service would be available on a through route at all times during the outages, and that the time to return to service would be as short as possible. SPTL initially agreed to this request leading to the decision by National Grid to release the outages on 11th September 2012. SPTL later advised National Grid that the Emergency Return to Service was no longer available due to technical difficulties with the compatibility of the new and old Current transformers that had not been identified earlier.
- 43 A strategy utilising short-term trades, contracts and BM actions was identified for use in the event of a fault as a through route could not be restored.
- 44 An enhanced rating was requested for the Strathaven – Torness route, although SPTL were unable to increase the rating of this circuit.
- 45 National Grid had run tenders for constraint management services within the affected area and procured services to increase generation and agree terms of contracts and hours of intertrip arming during the Smeaton outage.
- 46 The most economic way of managing the Strathaven outage is to arm intertrips with generators in Scotland in order to increase the boundary limit.

6. Appendix 1: Calculation of Cost of Smeaton substation outage

Outturn Costs

- 47 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
- 48 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 methodology³ available from National Grid's website.
- 49 The outages led to a variety of Scottish transfer constraints namely; SCOTEX, SCOTIMP, LOTHIANEX and SC-BORD boundaries. Only costs associated with these boundaries have been used to calculate the total costs incurred where the primary outage is Smeaton or Strathaven substation FMJL works.
- 50 As a single action can be used to simultaneously manage multiple boundaries only those actions which managed the aforementioned boundaries have been included as opposed to actions taken in conjunction with other boundaries or outages. This is because the action would still have been needed had these boundaries had infinite limits. Therefore we have a list of costs exclusively to manage the Smeaton and Strathaven substation FMJL works.
- 51 These actions were taken within the Balancing Mechanism, i.e. Bids, or forward trades and replacement costs for each. Intertrips and Contract costs during this period have also been included as they were required to manage the FMJL works.
- 52 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 the primary constraints from those resulting from more power reaching these boundaries due to the Smeaton and Strathaven outages.
- 53 A total of £22.8m in BM and Trading costs have been incurred to maintain power flows within an acceptable envelope during the Smeaton and Strathaven outages. On top of this contract costs of £3.9m have been incurred to ensure availability of [text deleted] generation and £2.2m through commercial intertrips with [text deleted] units. This brings the total expenditure to circa £28.9m, including the non-locational costs of replacement energy and replacement of sterilised headroom.

³ <http://www.nationalgrid.com/NR/rdonlyres/241CCBF5-18B0-4F92-B405-23F29C478A0E/49267/ConstraintCostingMethodologyv2028sep11.pdf>