Standing Issue

Balancing Mechanism Pricing Standing Issue	**Issue: 44** *(mandatory by BSCCo)*

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Description of the Issue:

Summary

This paper identifies issues with the rules for Bid-Offer Data Prices in the Balancing Mechanism that can result in inefficient pricing and/or reduced flexibility to meet the challenges of future system operation. These issues are at their most significant for multi-shaft CCGT Modules and Cascade Hydro Schemes, but also affect other Generators. It recommends that these issues are considered by a BSC Standing Modification Group.

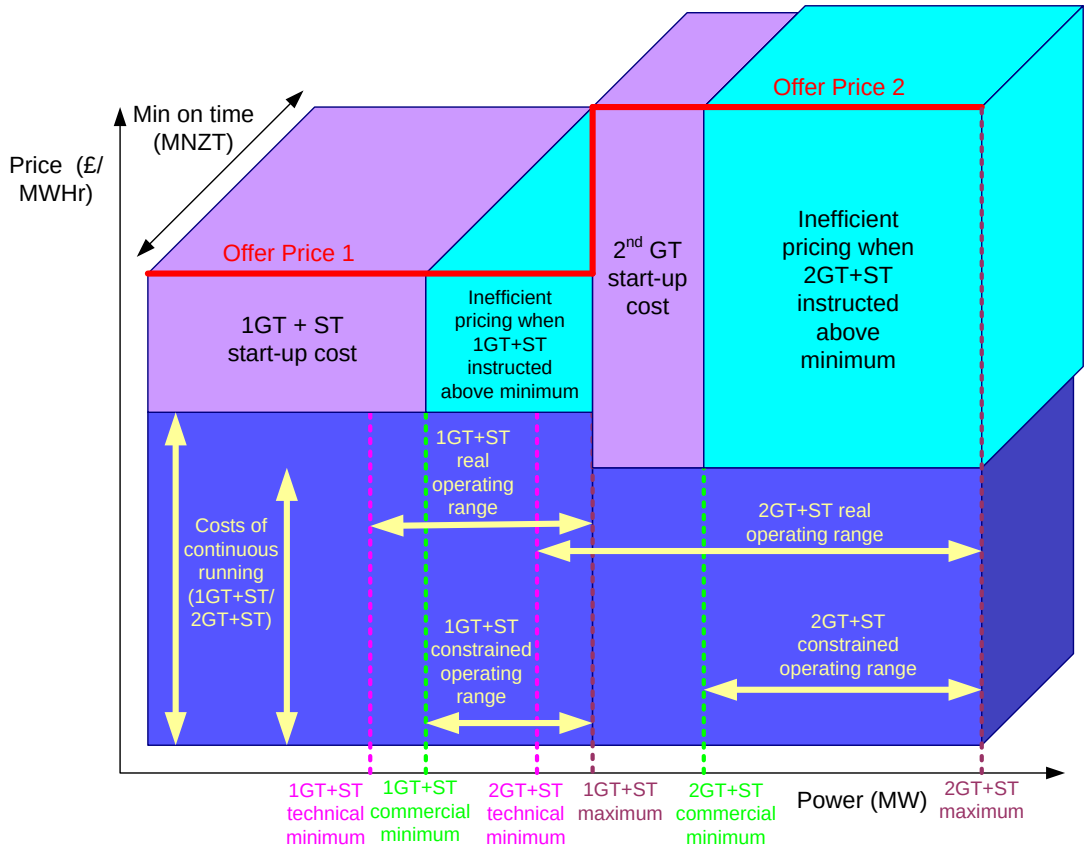
Background

The background to this issue is that multi-shaft modules (CCGT Modules and Cascade Hydro Schemes) are represented in the Balancing Mechanism as single BM Units. This modelling works as well as that for other types of BM Units when all the Generating Units in the module are on, but has real limitations in a number of situations. These include when only some of the Generating Units are on and the reminder are available to start-up and also when Generating Units are available to shutdown. The limitation is that the industry codes and associated documents do not currently provide a means of describing this capability that is consistent with other Balancing Mechanism data and can be understood by industry-standard scheduling algorithms. As in future Generating Units in CCGT Modules are expected to have a key role in continuing to meet customer demand by starting up when the output from renewables and interconnectors reduces and shutting down when it increases, then the view was that this limitation needed addressing. The majority of industry responses to National Grid's "Electricity Balancing System (EBS) System Interfaces and BMU Modelling" consultation supported this.

National Grid's Balancing Mechanism Systems that receive data from market participants, issue Bid-Offer Acceptances and publish the results to the BMRA and SAA are being replaced with the Electricity Balancing System (EBS). EBS is planned to go-live in the middle of 2013. EBS has increased capabilities in modelling of multi-shaft modules compared to the Balancing Mechanism Systems and taking this along with the industry responses to the consultation, a Multi-Shaft Modelling (MSM) subgroup was established under the Grid Code EBS Working Group to progress this issue.

Description

At the second meeting of the MSM subgroup, it was agreed that any improvements in the modelling of multi-shaft modules would be significantly less useful if the prices that could be submitted were limited to the existing single set of up to ten, monotonically-increasing, Bid-Offer Pairs per BM Unit. The view was that the rules for Bid-Offer Data Prices do not offer a means for the Generator to the recoup the costs of starting and running an additional Generating Unit without adversely impacting on the price for output above minimum generation and/or the flexibility of the unit in terms of the range between minimum and maximum generation and also the minimum on time of the unit. The following diagram seeks to illustrate the issue:



When starting up Generating Units, the Generator needs to recoup the share of the maintenance costs attributable to each start, plus the cost of running inefficiently at low output while the unit increases output. In the above diagram, the purple cuboids represent this cost and Generators can vary the dimensions of each of the sides of the cuboids to recoup their start-up costs:

1. Increase the Offer Price submitted above that represented by the "Cost of continuous running". This, however, has the downside of inefficient pricing if the unit is instructed above minimum generation.

2. Increase the minimum generation above the value of the technical minimum in order to secure a greater volume of energy at the Offer Price in order to recoup the start-up cost. Increasing the minimum generation reduces the range of output between minimum and maximum generation and reduces the unit's capability to meet variations in customer demand and output from renewables and interconnectors while remaining on.

3. Increase the "minimum on time" above the value of the technical minimum in order to secure a greater volume of energy at the Offer Price in order to recoup the start-up cost. Increasing the "minimum on time" increases the time that the unit has to continue running when National Grid may want it shutdown for reasons of system security e.g. when customer demand has reduced, or output from interconnectors and renewable generation has increased.

Note that other units, including all those that are fossil-fuelled, have similar issues to multi-shaft modules in terms of inefficient pricing when instructed above minimum generation, but without the multiple issues arising from having multiple Generating Units within a single BM Unit.

A second issue is that there is often overlap between the operating ranges of the different configurations of Generating Units within a multi-shaft module, each with their own cost structures which the single set of Bid-Offer Data Prices per BM Unit is unable to reflect. For example there is often an overlap between the top of the operating range for the 1GT+ST configuration and the bottom of the range for the 2GT+ST configuration. Operating at the same output in 2GT+ST configuration as in 1GT+ST configuration exposes the Generator to increased costs, e.g. the start-up

cost of the 2nd GT, without giving them a direct means of recouping this cost. To avoid this situation, the Generator may increase their minimum generation for the 2GT+ST configuration above the value of the technical minimum.

The view of the subgroup is that amending the BSC to resolve the two issues raised above would be consistent with the BSC objective of "promoting effective competition in the generation and supply of electricity,…"

Pricing Discussion

One of the key limitations with Bid-Offer Data Prices is that they must be monotonically increasing. This prevents Generators decreasing their Offer Prices above minimum generation to avoid inefficient pricing. This is because the linear programming techniques currently used to advise the optimal output of those units scheduled to run require the prices to be convex i.e. monotonically increasing. The algorithms used by all major suppliers of EBS-like systems (generically known as Market Management Systems) are of Mixed Integer Linear type and, for them to perform effectively, the requirement for prices to be monotonically increasing within a particular configuration of Generating Units in a module still holds, but not between different configurations of Generating Units in a module. This is because the decision to run a particular configuration is an integer or on/off decision, not a linear one.

The standard approach in electricity markets and Market Management Systems to allow Generators to recover their start-up costs is to allow them to submit a start-up price. Start-up prices are single prices which do not vary with unit output and therefore the rules relating to monotonically increasing prices are not applicable. Start-up prices were part of the pricing structure under the Pool Arrangements and were seen as part of the problem with these arrangements. However, it is the view of the subgroup that it was their use in the calculation of System Marginal Price that was the main problem, whereas there is no such calculation under NETA and BM participants are "paid as bid", rather than receiving System Marginal Price. EBS has the capability to support the submission of start-up prices.

Conclusions

This paper describes a number of issues with the pricing structure in the Balancing Mechanism. These issues adversely affect the flexibility and prices that multi-shaft modules and, to a lesser extent, other units can offer. The NETA market was designed thirteen years ago when virtually all CCGT modules ran continuously at full output, the power transfer on the interconnectors was relatively stable and generation from renewable sources was effectively non-existent. This paper concludes that there is merit in reviewing the pricing structure to ensure that it is appropriate for the future.

Recommendation

It is recommended that a BSC Standing Modification Group be established to consider the issues raised in this paper.

Details of the Proposer

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