



Connecting UK business customers
with the wholesale energy market

Issue 2 in a series of
thought pieces aimed at
businesses with onsite
energy generation

An EnDCo White Paper

The Balancing Mechanism

Why it's a risky hire-wire act for onsite power generators



In this EnDCo white paper, we review developments in the UK electricity Balancing Mechanism, focusing on two key questions:

- Is participating in the Balancing Mechanism a feasible revenue-earning option for generators and demand-side providers under the rules as they currently stand?
and
- What changes in the operation of the Balancing Mechanism are being proposed and will they achieve the goal of wider participation?

Executive Summary

- The market for onsite power generation available through the UK Balancing Mechanism is estimated to be worth £500 million.
- The Balancing Mechanism provides a very attractive offer for operators of large-scale onsite power generation assets with payments occasionally as high as £3,000 per MWh and frequently around £2,500 per MWh.
- However, for businesses that rely on their own generated power capacity to run operations, the Balancing Mechanism could prove to be restrictive with onerous penalties for non-delivery.
- The mechanism works well for businesses with excess generating capacity which can be flexible when diverting power to the National Grid without affecting their own operations.
- EnDCo is advising 'caveat venditor' (seller beware) before committing to the Balancing Mechanism under current rules.
- In the next 18 months the Balancing Mechanism will change, with new rules making it easier in principle for smaller players to participate, but much work remains to be done and the practical impact of these changes is hard to predict.
- The way 'System' or 'Cash Out' prices are currently calculated will change in November 2018, making forecasting of revenue streams extremely difficult when deciding whether to enter the Balancing Mechanism.
- Continuing developments in battery storage technology will further complicate business planning around selling the surplus capacity of onsite generation.
- Independent businesses with onsite power generation currently supply National Grid with 14% of UK generation capacity.

Introduction – The £500 million energy pot

The Balancing Mechanism (BM), which has been in operation almost as long as the UK's competitive energy market, is rapidly becoming a hot topic for businesses with any kind of electricity generating capacity.

With payments available that are sometimes as high as £3,000 per MWh, it is potentially a very attractive new revenue stream for any organisation that has invested in onsite generation capacity and would like to see a more positive return on investment.

Indeed, a number of independent Ofgem-licensed electricity suppliers and aggregators¹ are making seductive siren calls in their marketing, aimed at the burgeoning number of businesses which have their own embedded generation and which can offer 'demand side' response. Currently, 14 per cent of the UK's electricity generating capacity comes from companies other than the Major Power Producers (MPPs) including so called 'auto generators' (commercial enterprises with their own electricity generating plant)².

The National Grid estimates that the BM gives it access to a potential portfolio of energy generation worth in excess of £500 million in terms of instant 'on demand' power. At first glance any business with its own generating capacity is going to want to be part of that market. Speaking at the Power Responsive conference early in 2018, Cathy McClay, head of commercial electricity at the National Grid, described the BM as "the ultimate flexibility market".



So the question is, can business access this £500 million prize pot and if so what risks, if any, are there in going for this prize?

At EnDCo, which is itself an Ofgem-licensed energy supplier, the advice is that of caution. It is not so much a case of *caveat emptor* (buyer beware) but *caveat venditor* (seller beware). This is because the BM offer, as presently structured by the National Grid, can be an exceptionally good deal for companies with very large power plants and excess capacity beyond their own power consumption needs. However, it could prove to be an unwelcome and costly option for smaller generators that cannot be so flexible in switching supply to the National Grid at short notice without affecting their own operations. Furthermore, with planned changes to the way 'System' or 'Cash Out' prices

are calculated due to come into force in November 2018, forecasting revenues from a commitment to BM is both extremely complex and challenging. In addition, continuing developments in battery storage technology will further complicate business planning around the selling of surplus capacity from onsite generation.

¹ An Aggregator is any organization or individual that brings retail energy customers together as a group with the objective of obtaining better prices, service, or other benefits when acquiring energy or related services.

² Source: Digest of United Kingdom Energy Statistics (DUKES) 2017.

So, what exactly is the BM?

The UK has a free energy market that is open to competition in generation and supply. A 'balancing mechanism' was introduced in 2001 as part of new trading arrangements, agreed by the Government and the regulator. Within it, each participating power generator makes a 'bid/offer' that reflects what they are willing to be paid – or to pay – to be taken off or moved onto the network.

The commercial arrangements surrounding the UK electricity market are amongst the most rapidly developing anywhere in the world. Its competitive nature, coupled with a genuine national drive to tackle the so-called "trilemma" surrounding cost and security of supply alongside environmental impact, leads to constant innovation and new opportunities for both customers and market participants alike.

This is why the BM is such a hot topic of conversation. Although it has been in operation for almost as long as the competitive market has been in existence, the BM has recently come to the fore as a result of various market changes - not least of which has been the burgeoning world of decentralised

generation (largely renewable) and demand-side response.

This paper explores the BM in some depth, and seeks to explain how participation can indeed offer the lucrative revenue enhancing opportunities that a number of new (and not so new) suppliers and service providers are claiming. However, and perhaps more importantly, it also makes the point that this "attractive proposition" is in fact not one that is suitable for all operators of embedded generation or demand-side response, but rather is a very niche play that can sensibly be made by only a limited range of organisations.

It explains how care must be taken to avoid being seduced by the lure of very occasional payments of £3,000 MWh or more, whilst sacrificing the benefits associated with a structured trading or hedging strategy.

The advice concerning the need to "look before leaping" has stood the test of time for a reason and is particularly relevant to the brave new world being advertised as available via the Balancing Mechanism."

Background

As the System Operator (SO), the National Grid meets firm (i.e. predictable) balancing needs by calling on contracted balancing services while the less predictable requirements arising between Gate Closure (one hour before each settlement period) and real time are covered by calling on flexible generation under the BM.

In theory, providers of demand-side response (e.g. consumers cutting back on consumption) are also allowed to participate in the BM, but in practice the BM has so far been almost exclusively the preserve of the large transmission-network connected generators.

We should take a closer look at developments affecting the BM because, while it has by and large successfully fulfilled its remit both to enable the SO to achieve continuous balance between supply and demand and to ensure that the UK System is operated within a number of defined limits, the electricity world is changing in some fundamental ways and the BM needs to adapt accordingly.

What is Balancing & Imbalance?

Since the privatisation of the UK's electricity industry in the late 1980s, it has become accepted that electricity is a commodity that can be traded just like any other. In energy terms, this would include crude oil, natural gas, coal, etc.

However, there is one fundamental difference between electricity and the other traded energy commodities, this being the simple fact that electricity cannot yet be stored economically in large quantities and, consequently, electricity generation output must always match (or balance) in real time the demand for power.

It is this requirement for the UK's national electricity system to be "balanced" at all times that gives rise to what is known as the imbalance cash-out arrangements, and within these confines the concept of "imbalance". The responsibility for managing this real-world situation lies with the National Grid and, as in all things, there are costs associated with doing so which are paid by market participants in relation to their contribution to the imbalance issue.

The Balancing Mechanism



The growth in renewable generation is leading to less synchronous generation on the System, meaning that power generation output is less easily centrally controlled. Renewable generation is also often intermittent by nature and generally embedded within the lower voltage distribution networks. All these factors mean that UK System needs are becoming less predictable and more volatile and the National Grid recognises and accepts the need for change.

In addition, as the System decentralises there is growing pressure to make the BM more accessible to smaller, decentralised generation and to “crack the nut” of achieving meaningful levels of demand-side participation in the BM.

Ofgem, as industry regulator, remains

keen to promote a more competitive, open market for the provision of balancing services – both contracted and via the BM.

How feasible is participation in the BM at the moment?

First, we look more closely at active participation in the BM under current rules by asking some key questions.

Should generators, particularly larger independent generators, look at the BM as a significant potential source of additional revenue?

The costs of balancing the system as a whole add up to just over £1 billion per annum in expenditure by the National Grid. Within this total, it is estimated that approximately half is already spent each year on contracted balancing services in the form of frequency response, fast reserve, black start etc.

The other £500 million is spent via the BM and, as previously stated, prices in the BM can reach very high levels. So, there is a substantial market at potentially lucrative prices for participants that can offer the kind of generation support that the system

needs close to real time – particularly at times of system stress.

However, the financial returns for participating in the BM need to be looked at more closely. While it is true that the potential returns can be high, just how realistic is it to expect that such returns can be achieved?

At the outset, it should be remembered that the BM operates as an auction in which there is no guarantee of bids being accepted. ‘Auction risk’ therefore needs to be factored into any assessment of potential returns to BM participation.

The highest prices in the BM are paid to generating plant that can respond most quickly to the network’s needs at times of maximum system stress. There is only a limited amount of plant which falls into this category and it is likely that such plant has not only been constructed specifically to meet such needs but also, because it is not used for most hours in the year, requires very high prices when it does run to cover its fixed costs.

For example, only certain types of combustion turbine with access to a diesel generator can provide black-start capability. Hydro plant such as pumped storage can also provide this

What are System Prices?

Electricity imbalance ‘Cash Out’ arrangements, also known as ‘Spill’ or ‘System’ prices, are a key part of the wholesale power market.

Whilst individual market participants are able to buy or sell power to satisfy their requirements under entirely voluntary contractual arrangements, at a UK-system level the National Grid has a responsibility to ensure that there is an overall balance between supply and demand in real time.

These potentially conflicting goals are reconciled via the imbalance Cash Out arrangements. Through this mechanism, market participants are incentivised to keep their own individual supply/demand arrangements in balance because if they are not, they are then obliged to buy or sell power to make up the difference at so-called System Prices, which are intended to penalise unbalanced positions.

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service. Another example is the provision of fast reserve which requires the capability to ramp up generation by a certain minimum volume of power output in a specific time period. This type of plant is designed from the outset to be able to offer this service to the system.

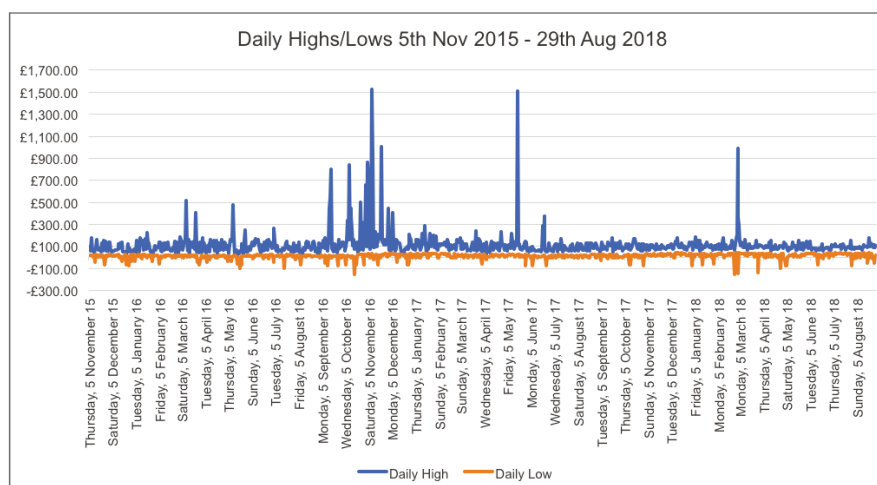
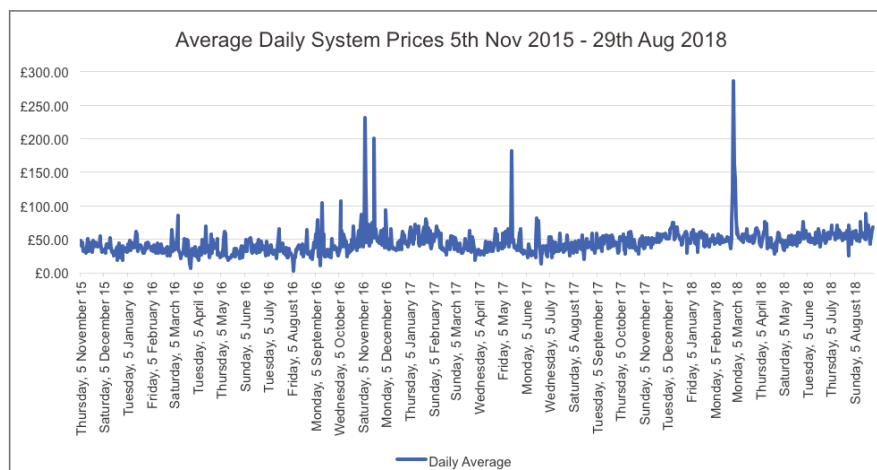
For most generating plant which may have some flexibility and spare capacity when the system might need it, it is much more likely that BM returns would fall into line with, at best, the average 'System' or 'Cash Out' prices that can be earned.

So, what is the average price in the BM?

System or Cash Out prices are derived via a complex formula directly from the costs of balancing actions taken by the National Grid in each half hour settlement period. Admittedly, the calculation formula takes account of accepted bid-offers into the BM as well as the costs of non-BM contracted balancing services so there is not a direct read-across from BM prices to System Prices.

Nevertheless, there is likely to be a good correlation between the two sets of prices. Moreover, System Prices are currently derived by taking the cost of the most expensive 50MWh of balancing actions in each half hour period, suggesting that System Prices are at the high end of what can be earned in the BM. This will change in November 2018 to the so-called PAR 1 measure which will use the costs of the most expensive 1 MWh of balancing action taken.

In considering whether or not to participate in the BM under current rules, therefore, generators should take System Prices as the best guide to what can generally be earned in the BM.



What is PAR?

PAR is the "Price Average Reference".

This average price is calculated based on the volume of electricity, as taken from the sources available to the National Grid (in descending price order), available for use to facilitate "balancing" in real time and thus included in the calculation of the System Price.

Historically the PAR volume has always been the most expensive 500 MWh of available electricity, but effective November 2015 this changed to the most expensive 50 MWh.

In November 2018 it reduces further to the single most expensive 1MWh.

What are the arguments against participation in the BM?

Complying with the current operational and communication requirements of participation in BM carries a significant cost outlay both in terms of upfront investment and running costs.

The prevailing operational conditions for participation in the BM are onerous. A full list of what the National Grid requires if a generator wishes to participate in the BM can be found in the documents Balancing Code No.1 (Pre-Gate Closure Process)/BC1 and Balancing Code No.2 (Post Gate Closure Process)/BC2.

These documents are part of the Grid Code which all generators are required to sign and cover communications, procedures for the submission and receipt of data, submission of data relating to physical operation of BM units, making bid-offers into BM, provision of ancillary services and emergency circumstances.

Besides the operating parameters with which BM participants must comply, there are also stringent conditions attached to the communication links between participants and the National Grid.

An annex to the General Conditions of the Grid Code refers to a document called Communication Standards for Electronic Data Communication Facilities and Automatic Logging Devices. Compliance with these standards is a condition of approval of requests for connections into the Grid's Wide Area Network (WAN). The standards cover the physical means of implementing communication circuits



and associated routing, protocol and security arrangements.

Due to the nature of the UK System's requirements for generation support in the mechanism, BM unit generation needs to be flexible with plant dynamic characteristics capable of reacting quickly to the Grid's instructions and with enough spare capacity to produce sufficient volumes of generation. While some generators may have the inherent flexibility needed to participate in the BM in a meaningful way, many embedded generators are linked closely to the operation of a parallel industrial process such as waste-to-energy or production of an energy-intensive product like aluminium or cement.

These industrial processes are typically the main *raison d'être* for the whole operation and usually the reason why the generating capability was built in the first place. In these circumstances, use of that capability to participate in the BM is more than likely to conflict with the core operations of the facility and to lead to "the tail wagging the dog". Within the constraints imposed by the priority attached to management of the company's core industrial processes, there is often scope to pursue a power trading strategy which maximises returns to any investment in onsite

generating capacity. Onsite generators can, for example, enter into wholesale market contracts for the sale of surplus generation, contract for the import of power when onsite consumption exceeds generation, or sell and/or buy on the spot market to take advantage of short-term surpluses and cover short-term deficits. There are a range of such options for industrial processors with onsite generation.

How far could participation in the BM play a part in such a strategy?

In principle, and perhaps for some of the very largest companies, it seems that both strategies could co-exist. In practice, given the requirements imposed by National Grid and the costs of BM participation, it seems likely that for most independent generators involvement in the BM is not a viable option and indeed would compromise other more profitable market-based power trading strategies.

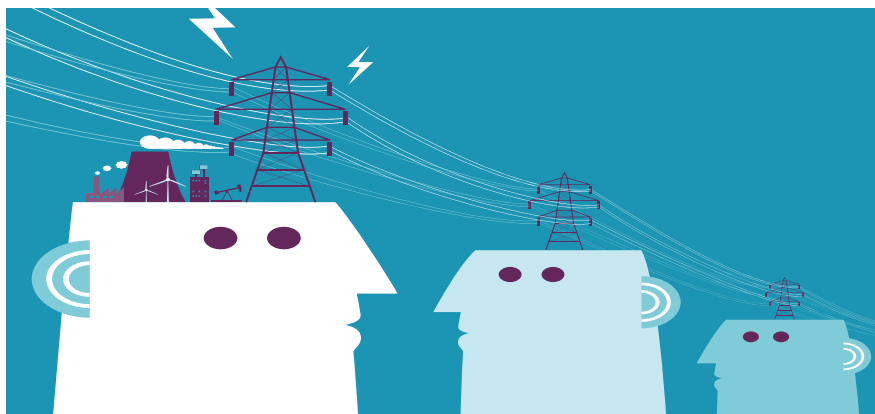
For the same reasons, given above in relation to larger generators, participation in the BM is not a viable option either for smaller, independent generators or small providers of demand-side response.

What BM changes are proposed and what effect will they have?

In the summer of 2018, National Grid published a document called the "Wider Access to the Balancing Mechanism Roadmap"³ which sets out in detail the rationale for changing the way the BM works and the steps required to achieve the desired changes. This document emphasises that there need to be improvements and streamlining in the pre-qualification requirements for participation in the BM, data submission procedures, communications and dispatch processes. This will be a complex undertaking requiring changes to contracts, codes and business processes to achieve wider participation while continuing to ensure the integrity and optimisation of the balancing regime.

In addition, new forms of BM participation are proposed. An indication of what is going to happen can be found in the Second Assessment Procedure Consultation for the BSC Code Modification P344. This code change is the UK vehicle to incorporate the requirements of Project Terre [Trans-European Replacement Reserves Exchange] and there is a deadline of December 2019 for its implementation under EU single energy market legislation.

Whether and to what extent the UK remains part of the single European energy market is unclear post-Brexit – but the intention of P344 is to allow customers and independent aggregators to participate in the submission of bids from embedded generators and demand-side providers in the form of balancing reserve products into the BM.



This goal is likely to remain in place regardless of Brexit complications, with all existing barriers to participation in the BM to be removed and delivery of balancing products to be wholly independent of electricity suppliers (PPA providers).

In reality, the main impact of Project Terre is more likely to be felt, if at all, in demand-side participation rather than independent generation since the independent aggregators will seek to replicate their existing demand-focused business models by aggregating small chunks of demand so as to overcome the high fixed costs of BM participation, whereas the independent generators will face the same physical and commercial constraints as before even if the rules change.

In making these changes, a significant area of debate has been the sharing of customer information between incumbent electricity suppliers and new entrants such as aggregators. Suppliers have said that receipt of new entrant BM submissions is needed to ensure that customers are accurately billed, whereas aggregators see this as a potential surrender of commercially valuable information. The final version of P344 has come down in favour of

mandatory information sharing, but this is an issue that will probably resurface if suppliers' ultimate control of the interface with customers is seen as having a dampening effect on competition.

In addition, while P344 covers the modifications needed to free up access to the BM, the changes which the SO will need to implement in order to bring the Grid Code into line with Project Terre are not yet agreed. The technical requirements for participating in the BM will be modified so as to be compatible with the EU's System Operator Guidelines although these will still need to satisfy the National Grid's need for flexibility and quick response by participants.

Given the very specific and onerous requirements of near-to-real-time balancing activities, it remains to be seen whether the proposed changes will actually result in substantively wider participation in the BM.

While the BM should, in theory, open up to a whole new class of potential participants, what proportion of these will actually have the flexibility and focus required to take part must be a matter for doubt.

³ National Grid Publication: Wider Access to the Balancing Mechanism Roadmap: www.nationalgrid.com/sites/default/files/documents/Wider_BM_Access_Roadmap_FINAL.pdf

What does all this mean for embedded/small independent generators?

At the moment, participation in the BM is not a viable proposition for most embedded and small independent generators. This is because the requirements of the National Grid are incompatible with the operating features of power generation assets designed principally for baseload operation and because the costs – both fixed and variable – of BM participation outweigh any potential benefits.

This is doubly true when the opportunity costs of BM participation are considered. In the case of onsite generators linked to an industrial process, compliance with BM instructions would threaten the priority attached to core industrial operations and undermine the fundamental commercial strategy of the company. The other opportunity cost incurred is due to the incompatibility of BM participation with other market-driven and power-trading strategies (PPA's).

Whether this balance of calculation remains true in the future is a matter of live debate. As noted above, there is a stated desire on the part of industry regulators to open up the balancing market in general and the BM in particular to smaller generators and demand-side providers. There is also significant work being done to turn this aspiration into reality.

It remains to be seen whether these developments will lead to significant new commercial opportunities for embedded and small independent generators. For the moment it is EnDCo's view that players would be well advised to maintain a watching brief from a respectable distance.

Conclusion

- Participation in the BM is not a viable proposition for most embedded and small independent generators.
- Businesses considering participation in the BM need to be mindful of the impact it will have on its own operations and the capacity of its own power generation in this respect.
- It must be recognised that the BM operates as an auction in which there is no guarantee of bids being accepted. 'Auction risk' therefore needs to be factored into any assessment of potential returns via BM participation.
- A decision to enter the BM must factor in any lost opportunity cost incurred due to the incompatibility of BM participation with other market-driven and power-trading strategies (PPA's).
- Businesses planning to invest in new onsite power generation plant should consider if it is economic to build in surplus power capacity in order to participate in the BM.
- Businesses need to be aware that the way 'System' or 'Cash Out' prices are currently calculated will change in November 2018, which will make forecasting and business planning for a commitment to the BM even more complex and challenging.
- The BM can offer rich pickings for companies with surplus onsite electricity generation capacity, provided they also have the flexibility to commit fully to the mechanism.



About the author

Les Abbie, Chief Executive Officer of EnDCo, has worked in the energy industry for 28 years. He advised on the privatisation of the England & Wales electricity market, and subsequently on industry privatisation and restructuring in many countries. He was involved in setting up the APX in the late 1990s. Since 2004, he has been responsible for setting up and developing EnDCo as a UK Electricity Supplier.

Managers of businesses that both generate and consume electricity wishing to know more about the developments within the Balancing Mechanism or about imbalance management can contact Les Abbie by email (les.abbie@endco.co.uk) or at the contact details below:

EnDCo is an independent licensed electricity supplier providing direct and transparent access to the wholesale electricity markets both for business energy consumers and generators. It has a track record of delivering measurable benefits to a wide range of companies in the industrial and commercial sectors. **EnDCo** is the trading name of **EPG Energy Limited**.

EPG Energy Limited, Hurst House, 131-133 New London Road, Chelmsford, Essex CM2 0QT
Telephone: +44 (0)1245 254 910 Fax: +44 (0)1245 492 705 Email: info@endco.co.uk www.endco.co.uk



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