Assessment Report

P376 'Utilising a Baselining Methodology to set Physical Notifications for Settlement of Applicable Balancing Services'

P376 seeks to allow the expected flows at Supplier Volume Allocation (SVA) Metering Systems participating in the Balancing Mechanism (BM) to be calculated using an approved Baselining Methodology. The new Settlement Expected Volume calculated from the baseline values will be decoupled from the Physical Notification used by the National Electricity Transmission System Operator (NETSO) for dispatch. It will be used in Settlement to calculate Non-Delivery Charges, allowing balancing service providers to be more accurately recompensed for their actual change from normal usage and the impact this change has on the system, thus enabling greater participation.

The P376 Workgroup recommends **approval** of P376

The P376 Workgroup **does** believe P376 impacts the European Balancing Guideline (EBGL) Article 18 terms and conditions related to balancing held within the BSC

This Modification is expected to impact:

- Virtual Lead Parties (VLPs)
- Suppliers
- Half Hourly Data Aggregators (HHDAs)
- Elexon as Balancing and Settlement Code Company (BSCCo)
- NETSO

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Phase

- Initial Written Assessment
- Definition Procedure
- Assessment Procedure
- Report Phase
- Implementation

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Contents

1	Summary	3
2	Why Change?	4
3	Solution	7
4	Impacts & Costs	19
5	Implementation	24
6	Workgroup's Discussions	25
7	Workgroup's Conclusions	33
8	Recommendations	35
Appendix 1: High level process diagram of P376 solution		36
Appendix 2: Example – Creating a baseline		37
Appendix 3: Baseline Analysis		39
Appendix 4: Workgroup Details		42
Appendix 5: Glossary & References		47

About This Document

Not sure where to start? We suggest reading the following sections:

- Have 5 mins? Read section 1
- Have 15 mins? Read sections 1 and 7
- Have 30 mins? Read all except section 6
- Have longer? Read all sections and the annexes and attachments

This document is the P376 Workgroup's Assessment Report to the BSC Panel. Elexon will present this report to the Panel at its meeting on 11 March 2021. The Panel will consider the Workgroup's recommendations, and will agree an initial view on whether this change should be made. It will then consult on this view before making its final recommendation to the Authority on 13 May 2021.

There are three parts to this document:

- This is the main document. It provides details of the solution, impacts, costs, benefits/drawbacks and proposed implementation approach. It also summarises the Workgroup's key views on the areas set by the Panel in its Terms of Reference, and contains details of the Workgroup's membership and full Terms of Reference.
- Attachment A contains the draft redlined changes to the BSC for the P376 Proposed Solution.
- Attachment B contains the full responses received to the Workgroup's Assessment Procedure Consultation.
- Attachment C contains the P376 Business Requirements
- Attachment D contains the initial draft of the Baselining Methodology Document that will be finalised in the Implementation Phase if P376 is approved.

Contact
Matthew Woolliscroft

020 7380 4165

BSC.change@elexon.co.uk

Matthew.woolliscroft@elexon.co.uk



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1 Summary

Why Change?

Where a Virtual Lead Party (VLP) controls an asset which shares a network connection with other assets (demand or generation) whose output is outside of their control and they are not able to forecast, it can be challenging for the VLP to provide accurate Physical Notifications (PNs). Inaccurate PNs may lead to inaccurate Settlement, with VLPs or customers not being paid fully for delivery even if they have responded as requested. In terms of the BSC, the VLP may incur Non-Delivery Charges.

The P376 Proposer contends that this requirement to provide accurate forecasts for Metering System Identifier (MSID) Pairs that are being used to provide a balancing service presents an unnecessary barrier to participation in cases where they do not have visibility of all assets that share that network connection. This view was supported by the P344 'Project TERRE implementation into GB market arrangements' and Issue 71 'Introduction of a baselining methodology as an alternative to Physical Notifications' Workgroups.

Solution

P376 proposes to introduce Baselining Methodologies, which use recent historic data to provide an estimate of the energy flows that would be expected at a Boundary Point under normal circumstances. This baseline value can be used in the Settlement calculations in place of the Final Physical Notification (FPN) for determining whether a balancing service has been fully delivered as instructed. As a result, P376 will decouple the value of the PN used by the National Electricity Transmission System Operator (NETSO) for dispatch from the value used in Settlement calculations by the BSC.

Impacts & Costs

The central implementation costs for P376 are approximately £1.6M with a lead time of around one year. We do not anticipate any mandatory Supplier or VLP costs, as Parties that do not wish to use the P376 solution can continue providing balancing services under the existing arrangements. Half Hourly Data Aggregators (HHDAs) will be required to provide MSID Pair Metered Data to allow central systems to calculate baseline values where the Supplier or VLP has chosen to use the P376 solution.

The ongoing central cost to deliver the P376 solution is expected to be ~£100k per year.

Implementation

The Workgroup recommends an Implementation Date of:

- 25 February 2023 as part of the February 2023 BSC Release if the Authority decision is received on or before 1 October 2021.

Recommendation

The Workgroup unanimously believes that P376 better facilitates Applicable BSC Objectives (b), (c) and (e) and so should be **approved**.

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2 Why Change?

What is the issue?

The P344 'Project TERRE' Workgroup noted that the requirement to provide a Physical Notification (PN) ahead of Gate Closure may be problematic for customers and independent aggregators registered as Virtual Lead Parties (VLPs). Challenges can arise where the asset they control (and whose output they can forecast accurately) shares a network connection with other assets (demand or generation) whose output is outside of their control. Inaccurate PNs may lead to inaccurate Settlement, with customers not being paid fully for delivery even if they had responded as requested. In terms of the BSC, the VLP may incur Non-Delivery Charges despite having delivered as instructed.

For example, a wastewater treatment site may have significant pumping load that must run when needed as well as a Combined Heat and Power (CHP) generator. The site may be able to modulate the CHP output in response to an instruction in the Balancing Mechanism (BM), but an unrelated step change in the pumping load could negate, or double, the CHP output as seen at the Boundary Point. In the P344 solution, the VLP would need to know the pumping change was going to happen and reflect that in the PN. This can be difficult as the VLP often only has access to the schedule for the asset providing balancing services. Also, the Boundary Point Metering System is the responsibility of the Supplier, and therefore an independent VLP often does not have access to the Metered Data at the boundary.

If the VLP creates an inaccurate PN, they could be liable for Non-Delivery Charges on balancing services volumes that were actually delivered, or conversely, avoid Non-Delivery Charges they should be due to pay for failures to deliver which happen to be masked by changes in consumption by the independent loads. An example of such a site is given in Figure 1 below.

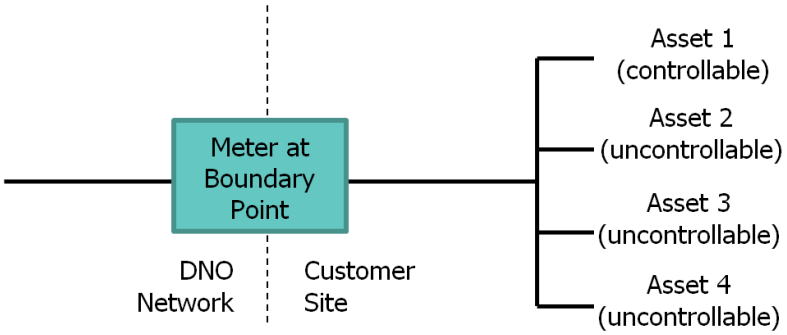


Figure 1: A site with controllable and uncontrollable assets

The aforementioned issues could create a barrier to entry for certain customer sites and hence the participation of Demand Response in the BM and Replacement Reserve (RR) may not be optimised.

What are Final Physical Notifications?

Participants are required by the Grid Code to submit Physical Notifications for their generating and large consumption BM Units to the NETSO ahead of Gate Closure. These notifications are used by the NETSO to help establish the actions necessary to balance the system. At Gate Closure, the most recent Physical Notification becomes the Final Physical Notification (FPN). As signatories to the Grid Code, Suppliers and Generators are required to provide accurate FPNs. The Wider Access arrangements delivered by P344 place similar

What is Demand Response?

Demand Response provides an opportunity for consumers to play a significant role in the operation of the electricity grid by reducing or shifting their electricity usage during peak periods in response to time-based rates or other forms of financial incentives.

What are Secondary BM Units?

Secondary BM Units are registered by VLPs who use them to deliver balancing services, but are not responsible for Energy Imbalances (except where they arise from failure to deliver a balancing service). Each of the Supplier Volume Allocation (SVA) Metering Systems in a Secondary BM Unit must also be included in a Supplier BM Unit.

What are Physical Notifications?

Physical Notifications are defined in the Grid Code as data that describes the best estimate of the expected input or output of Active Power of a BM Unit.

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requirements on VLPs. FPNs act as a baseline for participants submitting Bids and Offers to deviate from their BM Unit's FPN. It is therefore in BM participants' interest to provide accurate FPNs. FPNs are not used to calculate participants' imbalance positions.

FPNs have been noted as a problem for VLPs

The potentially complex composition of consumer sites and assets within the sites can make it difficult for VLPs to post accurate FPNs. While the P344 Workgroup acknowledged this issue, it was agreed that it could not be addressed within that Modification due to the limited timescale necessary to ensure compliance with the EBGL.

As noted earlier, an inaccurate PN may lead to incorrect Trading Charges. It could also create problems for the NETSO in Balancing the System efficiently as the submission of the PN informs the NETSO of what a site will be doing and changes the site will make. This Modification will not change the PN used by NETSO for dispatch as this would require a Grid Code Modification to be raised.

Project TERRE and wider BM participation for independent aggregators and customers

Elexon raised Issue 71 'Introduction of a baselining methodology as an alternative to Physical Notifications' on 15 June 2018. This Modification P376 'Utilising a Baselining Methodology to set Physical Notifications' builds on the back of this Issue and P344.

P344 aligned the BSC with the European Balancing Project TERRE (Trans European Replacement Reserves Exchange) requirements. It also delivered provisions to enable wider market access, allowing customers (or independent aggregators) to participate in TERRE and the BM independently of their electricity Supplier by becoming a VLP and registering a 'Secondary BM Unit'. This solution allows balancing-related activities to be separated out from imbalance-related activities, where previously the BSC required a single Party to be responsible for both.

- Imbalance-related activities broadly correspond to the role of 'Balance Responsible Party' (BRP) as defined in the Electricity Balancing Guideline (EBGL). These activities remain the responsibility of the customer's Supplier. BSC processes that relate to this role include:
    - Contract Notification;
    - responsibility for all Energy Imbalances relating to the customer (with the exception of those arising from non-delivery of a balancing action by the independent aggregator, which the Supplier is protected from through a process of imbalance adjustment); and
    - accounting for Residual Cashflow Reallocation Cashflow (RCRC).
- Balancing-related activities broadly correspond to the role of 'Balancing Service Provider' (BSP) as defined in the EBGL. The P344 solution allows these activities to be undertaken by a VLP, which may be the customer themselves or an independent aggregator. BSC processes that relate to this role include:
    - the calculation of Bid and Offer Volumes for each BM Unit;
    - the payment of the Bid and Offer Volumes to BSC Parties; and

What are Contract Notifications?

Trading Parties are required to notify Elexon of the volume of electricity they have contracted for ahead of time (before the start of the Settlement Period). Any difference between a Party's metered and contracted positions (once adjusted for balancing actions) is known as its Energy Imbalance. This is Settled through the Imbalance Settlement process.

What is RCRC?

For all Settlement Periods, the Total residual Cashflow (TRC) is calculated as being the sum of all energy imbalance charges across all parties and accounts. This value represents the total amount of money to be redistributed (or collected) via the Residual Cashflow Reallocation Cashflow (RCRC).

What are BOAs?

When Balancing the System, NETSO will accept Bids and Offers from Parties, instructing them to deviate from their FPN. These instructions are known as Bid Offer Acceptances (BOAs).

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- the recovery of the costs of balancing from the NETSO.

Physical Notification requirement of TERRE

The P344 solution is intended to facilitate participation in the BM and TERRE by a wider range of industry Market Participants, including customers and independent aggregators (in the BSC Role of Virtual Lead Party). It is envisaged that the existing BM Settlement arrangements will remain unchanged. Balancing service providers that want to participate in the BM must indicate at what megawatt (MW) level they expect their BM Unit to be for each Settlement Period. This is known in the Grid Code as a PN. At Gate Closure, this MW level is finalised and sent to Settlement where it is termed the BM Unit's Final Physical Notification (FPN) and acts as a baseline for any future deviation instructions from NETSO.

P375

A related Approved Modification Proposal, P375 'Settlement of Secondary BM Units using metering behind the site Boundary Point', will allow Operational Metering Data to be used for Settlement. Under that proposal, the PN submitted will relate to that Operational Meter. This will allow more accurate PNs to be submitted as the Party will not have to forecast the consumption of uncontrollable assets on the site that are not included in the Operational Meter's measurements. P375 has been approved by Ofgem for implementation on 23 June 2022.

There may be cases where it is not practicable to install Operational Metering at a location which separates the controllable asset from all other on-site Generation or Demand. In some cases, this may be due to cost or network topology issues. In others, the VLP may control some aspects of an asset, while other aspects of the operation of the same asset remain outside of its control and its ability to forecast. In such cases, another solution is required to aid the submission of accurate PNs for Settlement. Therefore, although the defects are related, the different solutions will not independently fully solve the defect for various subsets of customers.

The P376 Proposer and Workgroup believe that the benefit of the P376 solution can be maximised by aligning the solution with P375 to allow baselining methodologies to applied to asset level metering.

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3 Solution

Proposed solution

P376 proposes to introduce Baselining Methodologies, which use recent historic data to provide an estimate of the energy flows that would be expected at a Boundary Point under normal circumstances. Such methodologies are commonly used to measure the volumes delivered through Demand Response in other markets.

This baseline value can be used in the Settlement calculations in place of the FPN for determining whether a balancing service has been fully delivered as instructed. It can also be used to calculate the Delivered Volume at each MSID Pair (rather than relying on the VLP to determine the Delivered Volume, which is the current solution introduced by Modification P344).

Baselining Methodologies use actual Metered Data to produce an estimate of what energy flows would be expected if a site was operating normally. This value can be used as the benchmark to assess whether deviations required as part of a balancing service have been fully delivered.

P376 notes that not all sites will be suitable to use a Baselining Methodology; some sites may not follow any normal behaviour patterns or may be too variable for a Baselining Methodology to provide a useful estimate. The use of the P376 solution will be optional, with Parties not wishing to use the solution being unaffected by this Modification.

P376 will decouple the value used in Settlement calculations (the Settlement Expected Volume (SEV)) from the FPN used by the NETSO to dispatch balancing services. For clarity, all Parties that wish to provide balancing services will continue to provide Physical Notifications to the NETSO in accordance with the Grid Code. P376 seeks to change only the source of data used in Settlement calculations.

The P376 solution will be available to Suppliers with an Additional BM Unit (ABMU) and VLPs with a Secondary BM Unit (SBMU). Eligible Parties will be able to register MSID Pairs to use the baselining solution. When doing so, the Party will select which particular methodology will be used to calculate baseline values for that MSID Pair. P376 will introduce one default Baselining Methodology, but Parties will be able to use standard BSC governance processes to propose additions and revisions to the approved Baselining Methodologies. These will be subject to approval by the BSC Panel, backed by supporting analysis.

Baselining Methodologies

Approved Baselining Methodologies will be maintained in a new BSC Configurable Item. As well as details of approved Baselining Methodologies, the Configurable Item will describe the process of maintaining and administering the baselining solution introduced under P376. P376 will implement a default Baselining Methodology, with the BSC Governance processes (along with supporting analysis from Elexon) being used to review/amend approved methodologies.

As historic data taken from Working Days and Non-Working Days are unlikely to be comparable, each approved baseline methodology will be a combination of two algorithms: one which will be applied to Working Day Settlement Periods and one that will be applied on weekends and public holidays.

What are Delivered Volumes?

The Delivered Volume is the change in a customer's demand or generation (at a specific MSID Pair in a specific Settlement Period) delivered in response to an instruction from a VLP. Delivered Volumes are used in Settlement to adjust the Imbalance position of the customer's Supplier (so that their Energy Imbalance Charge is unaffected by the instruction given to their customer by the VLP).

What is an MSID Pair?

An MSID Pair is an Import Metering System (for recording demand at a Boundary Point), and the associated Export Metering System (for recording generation), if there is one.

A customer who doesn't generate electricity doesn't need an Export Metering System, in which case the MSID Pair will consist of an Import Metering System only.

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Default Baselining Methodology

Working Day:

The default baseline methodology for Working Days is sometimes referred to as the '10 in 10' methodology.

How is data selected?

The methodology looks backwards up to 60 days to select the 10 most recent eligible days. Eligible days are considered as:

- Of the same type (i.e. a Working Day); and
- Not an Event Day.

An Event Day is a day where the Metered Data does not represent typical energy flows at the Boundary Point Metering System, for reasons such as a balancing service having been provided, a site shutdown, etc.

What if there aren't sufficient eligible days?

Where the data range contains less than 10, but more than 5 eligible days, the default methodology will use all the available eligible days.

Where less than 5 eligible days are found, the MSID Pair will not be able to use a baselining solution.

How are baselines calculated?

The default baseline methodology will take the 5-10 days of data it has selected and average the data, weighted equally, to generate a Settlement Period by Settlement Period profile curve.

Non-Working Day:

The default baseline methodology for weekends is sometimes referred to the 'middle 2 of 4' methodology.

How is data selected?

The methodology looks backwards up to 60 days to select the 4 most recent eligible days. Eligible days are considered as:

- Of the same type (i.e. a Non-Working Day); and
- Not an Event Day.

The methodology will discard the days with the highest and lowest Metered Volumes from the selected 4 days to leave the two 'middle' days.

What if there aren't sufficient eligible days?

Where less than 4 eligible days are found, the MSID Pair will not be able to use a baselining solution.

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How are baselines calculated?

The default baseline methodology will take the remaining 2 days of data it has selected and average the data, weighted equally, to generate a Settlement Period by Settlement Period profile curve.

In Day Adjustments

The above calculation is used to create the profile shape for a day based on data from previous days, but will not account fully for variations in factors such as weather and temperature. For this reason, In Day Adjustments are used to provide an offset to minimise the error.

The default In Day Adjustment will consider actual Metered Data over the three hour period up until Gate Closure (one hour before the relevant Settlement Period). This will be compared to the calculated values and an additive adjustment applied to ensure that the profile created by the baseline best matches real data for the run up to the Settlement Period.

Where an MSID Pair is dispatched multiple times on the same day, it will not be possible to calculate a second In Day Adjustment, as the data will have been 'contaminated' by the first dispatch. Therefore the initial In Day Adjustment will also be applied to the profile shape for any subsequent dispatches.

A worked example of the default baseline methodology is provided in Appendix 2.

Registration

Eligible Parties who wish to use the P376 solution will be able to register an MSID Pair for the baselining solution via an online interface.

When registering an MSID Pair, the Party must first set the associated BM Unit to be a **Baselined BM Unit**. This will indicate to the Settlement Administration Agent (SAA) that it should not use the value of the FPN in any calculations, but instead will receive a separate value from the Supplier Volume Administration Agent (SVAA) to use as the baseline in calculations. This value will replace the FPN in Settlement calculations and will be known as the **Settlement Expected Value (SEV)**. When a Party registers an MSID Pair for baselining, it will be prompted to ensure that relevant BM Units are correctly flagged for the changes to be effective.

Parties will be able to review and amend the registration details of their MSID Pairs (i.e. whether or not they will use the baselining solution) at any time and with daily granularity. The registered status of an MSID Pair or BM Unit for any services dispatched on a Settlement Day is whatever status it had at midnight immediately before the Settlement Day.

When a Party registers an MSID Pair for baselining, it will also be required to select which approved Baselining Methodology will be applied to that MSID Pair.

Not all MSID Pairs in a Baselined BM Unit may be suitable for using the baselining solution. Parties will need to monitor MSID Pairs in a Baselined BM Unit to ensure that the appropriate statuses are selected for each, which will be fixed at midnight for the following Settlement Day. The Party will select from the three statuses:

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- **Baselined** – MSID Pairs that will have their forecasted volumes determined using a Baselining Methodology.
- **Included in Party Submission** – MSID Pairs in a Baselined BM Unit that will not have their forecast volumes determined using a Baselining Methodology. Instead Parties will submit an aggregate forecast of energy flows for these MSID Pairs.
- **Inactive** – MSID Pairs in a Baselined BM Unit that will not be used to provide any balancing services and whose volumes will not be used in the calculation of Non-Delivery Charges or Delivered Volumes. Inactive MSID Pairs will not be able to have Delivered Volumes assigned against them.

The Inactive status is not relevant to MSID Pairs in Supplier BM Units (which must always be included in imbalance settlement), and is therefore only available for MSID Pairs in Secondary BM Units.

Where a new MSID Pair is registered in an SBMU by a VLP as a Baselined MSID Pair and the HHDA does not provide sufficient data for a baseline value to be calculated, then the of the MSID Pair will be treated as Inactive until the SVAA has received enough data to calculate baseline values. This will be notified to the VLP who will be able to decide whether they are able and would prefer to use the MSID Pair and include it in the Party Submitted Expected Volume for the site.

Party Submissions

The P376 solution recognises that not all sites are suitable for baselining, and so for some sites it would be more accurate for the responsible Party to forecast the expected energy flows at the Boundary Point in any given Settlement Period (as it currently does with the FPN). However, it would create inefficiencies if VLPs were required to maintain separate SBMUs for Baselined and non-Baselined MSID Pairs (in addition to separating by GSP Group and any other relevant factors). In addition, because it would limit aggregation benefits, such fragmentation would be likely to reduce the total volume offered. It is therefore not desirable to require the entirety of a BM Unit to use the P376 solution (or not use the P376 solution).

To avoid this, P376 allows a subset of MSID Pairs in a BM Unit to use the baselining solution.

All Parties, regardless of whether they are required to submit a Party Submitted Expected Volume to SVAA or not, will still be required to submit accurate Physical Notifications to the NETSO for dispatch purposes under the existing processes. P376 only proposes changes to how Delivered Volumes and Non-Delivery Charges are calculated under the BSC. It will not affect any Grid Code requirements.

Example

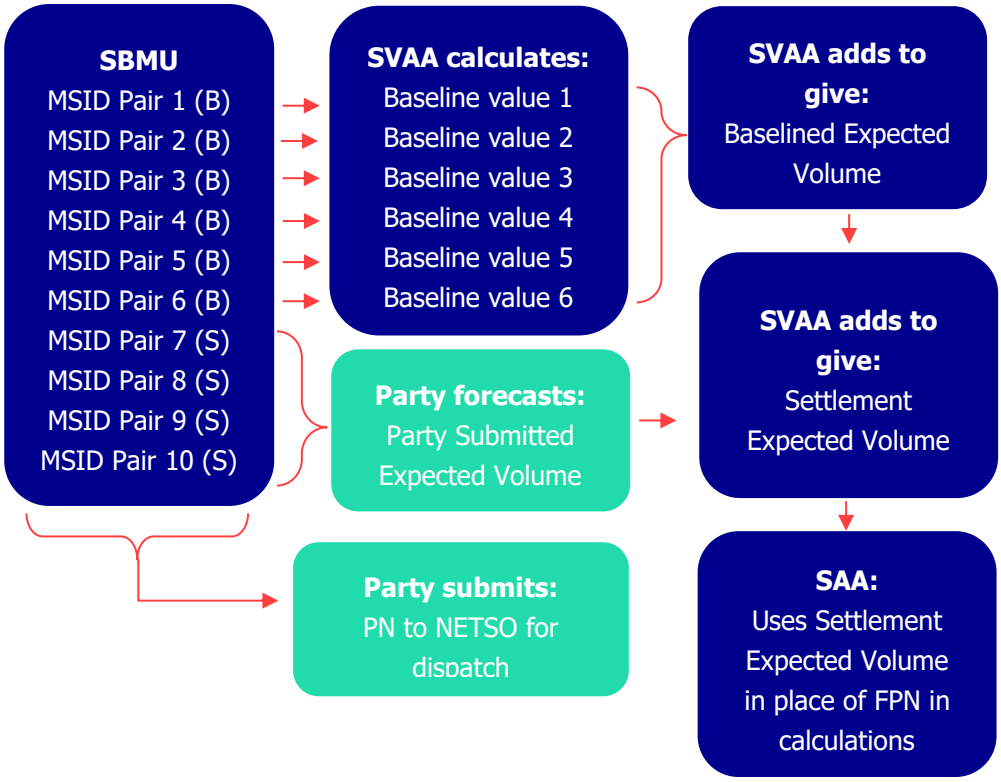
An SBMU has 10 MSID Pairs registered in it. The VLP has identified that six of these sites are suitable to use the baseline methodology and has registered them as Baselined MSID Pairs (B), and the SBMU as a Baselined BM Unit. The four remaining MSID Pairs are not suitable and so the VLP has registered them as 'included in Party submission' (S).

The six Baselined MSID Pairs will have their MSID Baseline Values calculated by SVAA using data provided by the HHDA. These are added together to determine the Baselined

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Expected Volume. For the four remaining MSID Pairs, the VLP will submit to SVAA an aggregate forecast of their expected volumes in the Party Submitted Expected Volume. The SVAA will add the Party Submitted Expected Volume (for these four MSID Pairs) to the BM Unit Baseline Volume (for the six Baselined MSID Pairs) to give the total BM Unit Expected Volume.

The VLP submits a PN to the NETSO with its best forecast of energy flows for the whole BM Unit.



Inactive sites

Some sites may be known to be exhibiting abnormal behaviour. This could be for various reasons, including planned downtime or commissioning of new equipment. As a Baselining Methodology would not be able to account for this behaviour, leaving these MSID Pairs in the algorithm could skew the data, causing inaccuracies. This is counter to the intent of P376 which seeks to ensure the data used in Settlement is as accurate as possible so that Parties are correctly recompensed for any services they provide.

Allowing a status of 'Inactive' to be associated with an MSID Pair will allow any volumes associated with that MSID Pair to be discounted when calculating the Period Metered Volume, and resultant Non-Delivery Charges. This will ensure that MSID Pairs that are not exhibiting typical behaviour and are not being used to provide any balancing services will not contaminate the data of other MSID Pairs in a Secondary BM Unit. If this solution element was not included, then a Party would need to deregister the problem MSID Pair from its BM Unit for the duration and reregister it afterwards, which could be a lengthy and inefficient process.

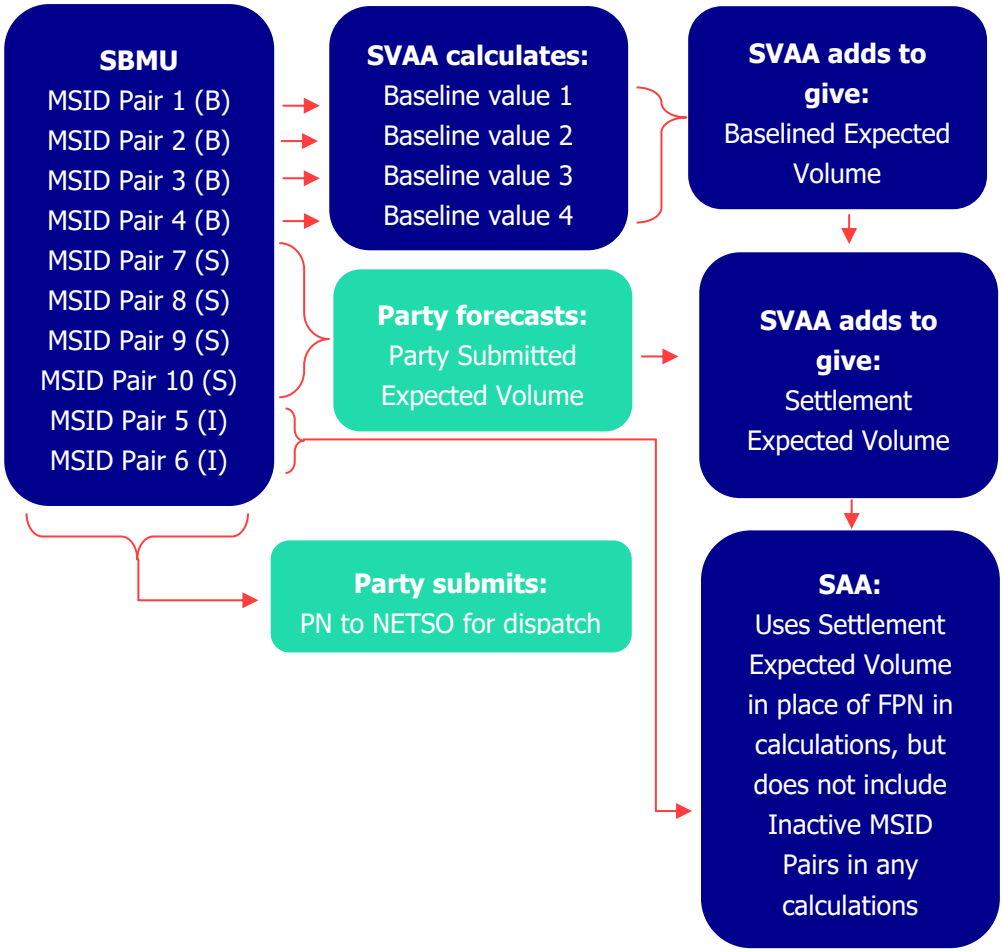
The P376 solution can be used both by Suppliers with additional BM Units which they are using to provide balancing services and by VLPs with Secondary BM Units which are providing balancing services. However, only MSID Pairs in a Secondary BM Unit will be able to be set to inactive. This is because a VLP with a Secondary BM Unit is only responsible for providing balancing services, whereas a Supplier with an Additional BM Unit is also responsible for any imbalance. If MSID Pairs in an Additional BM Unit had volumes discounted from Settlement calculations (as a result of being made Inactive), then this

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would lead to the imbalance allocated to the Supplier being incorrect. P376 seeks to ensure that calculation of Non-Delivery Charges for balancing services are as accurate as possible without affecting how imbalance is calculated.

Example:

The controllable assets in MSID Pairs 5 and 6 are going to have planned downtime and will not be used to provide any balancing services. The rest of those sites may operate normally, but the VLP is unable to forecast this. The VLP registers the sites that won't be used to provide balancing services as Inactive (I).



Baseline calculations

Where the Lead Party of a BM Unit has elected to use the P376 baseline solution, for each MSID Pair the SVAA will construct a baseline volume (from historic meter data) for each Settlement Period. The baseline calculated for each MSID will be known as the **MSID Baseline Value**. The MSID Baseline Value for each MSID Pair in a BM Unit that is using the P376 solution will be summed to create the **BM Unit Baseline Volume** for that BM Unit.

This BM Unit Baseline Volume will be added to the Party Submitted Expected Volume for the relevant BM Unit to determine the **Settlement Expected Volume** – that is the total aggregate energy flows we would expect for all MSID Pairs in a BM Unit per Settlement Period. This Settlement Expected Volume will serve as a baseline for determining the quantity of balancing services delivered by a Party and will replace the value of the FPN in the Settlement calculations for Non-Delivery Charges.

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Obtaining data to apply baselining techniques

To be able to calculate baseline values, BSC Systems will need to receive historic data at the MSID Pair level. Each Baselining Methodology will have minimum and maximum data requirements. The default Baselining Methodology requires between 5 and 60 days of data to be able to calculate baseline values.

Upon registration of an MSID Pair for baselining, the SVAA will instruct the Half Hourly Data Aggregator (HHDA) to send historic data for that MSID Pair to be used in Baselining Methodology calculations.

Where the HHDA is not able to provide the requested amount of data, it will provide what is available, and notify that additional data could not be provided. If there is sufficient data for the methodology to function, then the MSID Pair will begin having baseline values calculated for it.

If there is not sufficient data, then it will not be possible to calculate baseline values, and the MSID Pair will not be able to use the P376 solution. If the MSID Pair was already registered in the BM Unit, then the status of the MSID Pair will automatically revert such that any volumes are to be accounted for in the Party Submitted Expected Volume. If the MSID Pair is a new registration by a VLP to an SBMU, then where insufficient data is available to calculate a baseline value for the MSID, it will be treated as Inactive until sufficient data is available, and cannot be used to provide balancing services. The VLP will be notified where this is the case.

After this initial request for data, HHDAs will provide up-to-date data on an ongoing basis as they perform each Volume Allocation Run (in accordance with the Settlement Calendar).

If there is unexpectedly insufficient data for a baseline value to be calculated, then the baselining methodology will fail and it will not be possible to accurately compare metered volumes with expected volumes to determine what instructed volumes have been delivered. The Proposer believes that the fairest way for this situation to be handled is to assume that these sites have not delivered. This will be achieved by setting the baseline volume for any MSID Pair that unexpectedly has insufficient data to equal the Metered Volume. As a consequence, if these sites were used to deliver instructed volumes, they will not be counted and the Party may incur Non-Delivery Charges. However, this is expected to be rare and there are no preferable alternative approaches.

Excluding data that is not representative of typical behaviour

Baselining Methodologies are intended to estimate what the site would do on a typical day, in the absence of a dispatch.

Where an MSID Pair has been used to provide a balancing service, Metered Data associated with that MSID Pair is contaminated and cannot be considered to be showing typical behaviour. Hence this data should not be used in baseline calculations if possible, as it would reduce the accuracy. Similarly, if the site is known to be behaving atypically for some other reason on a particular day, the accuracy of the baseline estimate of typical behaviour can be improved by excluding that day's data.

How Event Days are treated may vary between different methodologies. There are two situations in which Event Days should be declared:

- An MSID Pair has been used to provide a balancing service; or

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- A site has exhibited other abnormal behaviour. Allowed reasons for this will be defined in the new Baselining Methodology Document. Initially this will be limited to:
    - Disconnection;
    - Plant equipment failure; and
    - Site outage.

It is expected that the responsible Party should be able to provide auditable evidence that a nominated Event Day meets one of these criteria.

When a Party uses an MSID Pair to provide a balancing service, the responsible Party will notify the SVAA of the relevant MSID Pairs and the SVAA will create an Event Day for that MSID Pair. This will be a flag associated with the MSID Pair signifying that data associated with that MSID Pair on that day is not typical of normal operations.

An Event Day flag will be associated with data for all Settlement Periods on the relevant day. This is partly for simplicity, but also because a balancing service may be provided by time-shifting consumption (e.g. reducing demand in the period where a service is required, and increasing later in the day so that the total consumption is the same) which could lead to contaminated data being used unless the whole day is excluded.

Provision of balancing services is expected to be the primary reason for creating Event Days, but Parties will be able to nominate them in other situations where an MSID Pair has not recorded typical usage for the reasons set out in the Baselining Methodology Document.

The deadline for a Party to declare an Event Day will be 30 Working Days after that day. As such, Event Days will not change any settlement calculations after the R1 Reconciliation Run, which will give confidence to industry that their imbalance charges won't unexpectedly change. It also allows sufficient time for Parties using the P376 solution to review quality Metered Data and investigate whether a day should reasonably considered an Event Day.

The treatment of Event Days may differ for different Baselining Methodologies. The default Baselining Methodology proposed for P376 will entirely exclude Event Days from its selection criteria, and fail to produce a result if there are insufficient non-Event Days. Some methodologies used in other jurisdictions take a different approach, in which they will always produce a result, but will use data from Event Days to do so if necessary.

Assuring robustness of Event Days

The P376 Workgroup expressed concern that Event Days could be used to manipulate an MSID Pair's baseline. The Proposer disagreed with this view, noting that the In Day Adjustment would ensure that the Baselined Expected Volumes were reflective of actual Metered Volumes in the run up to a balancing service being provided, but agreed that Elexon's assurance team should monitor risks to settlement in line with its usual processes and make recommendations to the Performance Assurance Board (PAB) to deploy techniques as appropriate.

Submission of Event Days can be added as a Risk Factor for Settlement Risk 025 'Balancing Services provided by Virtual Lead Parties allow error to enter Settlement, such that the energy volumes required for Settlement are incorrect or missing'. This will enable

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any irregularities to be identified as part of SR025 and appropriate rectification action to be taken in a timely manner.

Determining delivered volumes

MSID Pairs registered in a VLP's SBMU will already be registered in a Supplier's BM Unit, with the Supplier being responsible for any imbalance. To ensure that the Supplier's imbalance position is adjusted to account for any volumes delivered through a balancing action by the VLP, BSC Central Systems need to know what volumes have been delivered.

The P344 solution requires HHDAs to provide Metered Volumes for MSID Pairs that have been used to provide a balancing service. VLPs are required to submit Half Hourly Delivered Volume data to the SVAA for MSID Pairs associated with SBMUs. In addition to this, SVAA also receives BM Unit Delivered Volumes. It compares the aggregate MSID Pair Delivered Volumes with the BM Unit Delivered volumes and, where necessary, pro ratas the MSID Pair delivered volumes to match. The SVAA uses the Delivered Volume data and the Metered Volume data to adjust the Supplier's imbalance position accordingly. This is so that the actions of the VLP do not affect the imbalance position of the Supplier.

P376 proposes to simplify and automate this process where an MSID Pair is using the baselining solution, removing any discretion on the VLP's part. It will take the Metered Data provided by HHDAs and compare this to the MSID Baseline Value to determine what volumes have been delivered through a balancing service. This will replace the MSID Pair Delivered Volume submitted by VLPs under the current process and will be subject to the same pro rata process. As such, where a VLP has registered an MSID Pair as a Baselined MSID Pair, they will not be required to submit Delivered Volumes for these sites. For clarity, where a VLP has a mix of Baselined and non-Baselined MSID Pairs, the requirement to submit Delivered Volumes for those non-Baselined sites will remain.

Assurance techniques

We have identified two key areas of the solution that may require techniques to provide assurance that the P376 solution is operating fairly and effectively. These are:

- that the values created by baseline methodologies are an accurate representation of typical energy flows at MSIDs that are using the solution; and
- that where Parties are providing Party Submitted Expected Volumes to the SVAA, they are creating these values in a robust manner that is consistent with the Grid Code requirements for constructing Physical Notifications, and that they represent a reliable estimate of typical energy flows for the BM Unit.

To provide assurance for these two areas, we will create two new Material Error Monitoring reports.

Assurance for the baseline values

This report will compare the baseline value created in every Settlement Period where a balancing service has not been provided (i.e. the site has operated under normal circumstances) and compare this to the actual Metered Volume for the site. Where the baseline calculation is working effectively, we would expect these two values to be broadly the same.



What is Material Error Monitoring?

Material Error Monitoring provides assurance to Panel committees and other market participants that a Performance Assurance Party's contribution to the error is quantified and the impact of such errors is established.

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For the purpose of providing assurance, where an Event Day or dispatch has not occurred, the central systems will calculate an In Day Adjustment on a Settlement Period basis. That is, the calculated baseline for each Settlement Period will have an In Day Adjustment applied as though the resource was being dispatched starting with that Settlement Period (i.e. for period 30, the In Day Adjustment for the Default Baselining Methodology would consider Metered Data from periods 22-27).

Assurance for Party Submitted Expected Volumes

FPNs submitted under the Grid Code are required to be accurate reflections of what the Party expects to happen and created in line with 'good industry practice'. Since our Party submissions will not fall under the remit of the Grid Code, we need to define the same standards of data integrity. As the registered statuses will identify which MSID Pairs in a Baselined BM Unit the Party Submitted Expected Volume relates to, we will be able to compare the Metered Data for just these MSID Pairs with the value submitted by the Party. It is expected that the total Metered Data and the submitted volume for each Settlement Period will be broadly the same where no balancing services dispatches or other Event Days have been notified. Submissions that consistently fall outside of this range will be further investigated.

Alignment with P375

Following the approval of P375, which will introduce the concept of asset level metering into the BSC, the Proposer and the Workgroup recognise that for the full benefit of P376 to be realised, the P376 baselining solution should be also applicable to Asset Metering System Identifier (AMSID) Pairs.

The intent of asset level metering is to provide more granular data to cut out the 'noise' created by other non-controllable assets that share the network connection with the controllable asset being used to provide a balancing service. It may not always be possible to install asset metering in such a way that the controllable asset can be totally isolated. In these cases the P375 and P376 solutions can work together, to reduce the 'noise' created by other assets, and apply baselining methodologies to the remainder.

Treatment of sites that have multiple network connections and asset metering

Some sites may have multiple boundary MSID Pairs that are registered to different Suppliers. Where asset level metering is used on one of these sites, there needs to be a method for apportioning any delivered volumes between the two boundary Meters so that Suppliers imbalance positions can be correctly adjusted. To do this, each Boundary Point MSID Pair will have a baseline value calculated, representing the flows that would be expected had no balancing service been provided. These values will be used to determine the ratio in which the change in energy flows from the site is split between the network connections. The same ratio will be used to adjust the positions of the Boundary Point MSID Pairs for any Delivered Volumes calculated at the Asset Meter.

Benefits

P376 seeks to enable a greater range of participants to provide balancing services to the NETSO. By using Baselining Methodologies to estimate the expected energy flows at MSID

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Pairs, it removes the financial penalty that a Party may face (through Non-Delivery Charges) where it can successfully deliver the balancing service, but is not able to accurately forecast expected energy flows. P376 will improve the accuracy of Settlement Calculations and ensure that providers of balancing services are correctly paid for the service they provide. This will encourage greater participation and increase the variety of services that the NETSO has access to in order to balance the Transmission System.

Legal text

P376 will require changes to:

- Section F 'Modification Procedures';
- Section K ' Classification and Registration of Metering Systems and BM Units';
- Section S ' Supplier Volume Allocation';
- Annex S-2 'Supplier Volume Allocation Rules';
- Section T 'Trading Charges';
- Annex X-1 ' General Glossary'; and
- Annex X-2 'Technical Glossary'.

The draft changes to the BSC for the solution can be found in Attachment A.

P376 will also create a new BSC Configurable Item, the Baselining Methodology Document. This will be drafted and approved as part of the Implementation Phase.

Are there any (other) alternative solutions?

A consultation respondent suggested that an alternative solution to P376 was to improve the relationship between VLPs and HHDCs so that HHDCs could provide baseline volumes for sites. They commented that HHDCs were experienced in data handling and many used baseline processes already to help with data estimation. HHDCs' knowledge of a site would also allow more bespoke processes to be used and improve the accuracy of data. They also believed a decentralised approach could be quicker to adapt and more flexible

The Proposer noted the suggestion, but commented that the objective nature of P376 methodologies provides for transparency and allows assurance techniques to be easily applied. They believed that the benefit of the centralised P376 solution was that it could use data that was not available before Gate Closure. They were not sure how confidence in a subjective HHDC-led solution could be similarly provided. The Proposer and the Workgroup understood the rationale for the alternative solution, but did not believe it had sufficient merit to be worth exploring further.

EBGL Impacts

The Workgroup believes that P376 **does** impact the EBGL Article 18 Terms and Conditions as it will require changes to parts of Section K, Section S and Section T, which constitute the EBGL Article 18 Terms and Conditions. Additionally, new paragraphs S12, S13 and S14 introduced by P376 will extend the EBGL Article 18 mapping, which will be reflected in annex F-2.

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The Workgroup believes that P376 is consistent with the EBGL objectives as it:

- fosters effective competition by removing barriers to providing balancing services; and;
- enhances efficiency of balancing by increasing the variety of participants that can provide balancing services.

Self-Governance

As P376 impacts on the EBGL Article 18 Terms and Conditions, it cannot be progressed as a Self-Governance Modification.

Additionally the Workgroup believe that P376 will materially affect competition by removing a barrier to entry for consumers to participate in the provision of balancing services through TERRE and the BM, and so P376 **should not** be progressed as a Self-Governance Modification.

What are the Self-Governance Criteria?

A Modification that, if implemented:
(a) does not involve any amendments whether in whole or in part to the EBGL Article 18 terms and conditions except to the extent required to correct an error in the EBGL Article 18 terms and conditions or as a result of a factual change, including but not limited to:
(i) correcting minor typographical errors;
(ii) correcting formatting and consistency errors, such as paragraph numbering; or
(iii) updating out of date references to other documents or paragraphs;

(b) is unlikely to have a material effect on:
(i) existing or future electricity consumers; and
(ii) competition in the generation, distribution, or supply of electricity or any commercial activities connected with the generation, distribution, or supply of electricity; and
(iii) the operation of the national electricity transmission system; and
(iv) matters relating to sustainable development, safety or security of supply, or the management of market or network emergencies; and
(v) the Code's governance procedures or modification procedures; and

(c) is unlikely to discriminate between different classes of Parties.

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4 Impacts & Costs

Estimated Implementation Costs of P376

The indicative cost to implement the solution is expected to be in the region of £1.4M - £1.8M, with an estimated lead time of around one year. This assessment is based on making changes to the legacy SAA systems. However, these systems are due to be replaced before P376 is delivered. P376 will therefore be developed on the Settlement Solution Azure platform. We expect that this development will be easier than on the legacy system and, perhaps more importantly, the necessary integrations with the Data and Calculations Platform will be less complex as we can make use of Application Programming Interfaces to exchange data rather than having to use a legacy integration layer to transport and convert files for SAA to load.

The P376 solution is optional: Parties who do not wish to make use of the new provisions will be able to continue providing balancing services under the existing arrangements uninterrupted. We therefore do not expect Parties to incur any mandatory implementation costs unless they actively choose to use the new provisions.

HHDAs may need to amend some of their systems and processes to provide SVAA with MSID Pair Metered Data to allow the baseline calculations to be run. HHDAs are already required to provide some MSID Pair Metered Data for balancing service provision under the P344 solution, but P376 additionally requires an initial transfer of historic data when a Supplier or VLP first uses baselining for a Metering System.

Where they choose to use the solution, Suppliers with an ABMU who are providing balancing services, and VLPs with an SBMU, will be required to monitor and amend the statuses of any MSID Pairs in a Baselined BM Unit. This will be done through the Participant Management Platform, though they may choose to also integrate this with their own internal systems.

Implementation cost			
Organisation	Item	Implementation	Comment
Elexon	Systems	£1.4M - £1.8M	
	Documents	~£1k	
Industry	Systems & processes	TBC	Will be confirmed through this Consultation. We do not anticipate any substantial mandatory industry costs.
	Total	~£1.6M	

Estimated ongoing cost of P376

The ongoing central cost of running the P376 solution is expected to be in the region of £80,000 - £120,000 per annum.

As the P376 solution is optional, Parties who do not wish to make use of the new provisions will be able to continue providing balancing services under the existing arrangements uninterrupted. We therefore do not expect Parties to incur any ongoing costs unless they actively choose to use the new provisions.

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HHDAs may need to amend some of their systems and processes to provide SVAA with MSID Pair Metered Data to allow the baseline calculations to be run. However, HHDAs are already required to provide some MSID Pair Metered Data for balancing service provision under the P344 solution.

Ongoing cost		
Organisation	Ongoing	Comment
Elexon	£80k - £120k	System costs
Industry	TBC	Will be confirmed through this Consultation. We do not anticipate any substantial mandatory industry costs.
Total	~£100k	

P376 estimated benefits

A report by Charles River Associates produced for Ofgem in April 2017 titled 'An assessment of the economic value of demand-side participation in the Balancing Mechanism and an evaluation of options to improve access' looked at the benefits that could be realised by removing barriers to providing Demand Side Response in independent aggregators. The report estimated potential benefits of £100m - £530m per year in 2020 rising to £140m - £580m per year by 2030.

The Workgroup realised that not all of the Aggregators using the P344 solution would use the P376 option, but even if a fraction of VLPs make use of the P376 to provide balancing services using assets that would otherwise be unable to, then the estimated benefit for industry could still be in the millions per year.

Respondents to the Assessment Procedure Consultation confirmed that the current arrangements presented a barrier to providing balancing services to the NETSO and that they approval of P376 would improve their ability to engage with the BM. Two respondents representing VLPs commented that if P376 was approved, many of the sites they would register would be new sites that they had not previously been able to use to provide balancing services in the BM.

P376 impacts

Impact on BSC Parties and Party Agents	
Party/Party Agent	Impact
Supplier using an ABMU to provide balancing services	If these Parties elect to use the P376 solution, they will need to monitor and maintain the statuses of MSID Pairs in a Baselined BM Unit. As a result of P376 the calculation of Non-Delivery Charges will use a new Settlement Expected Volume in place of the FPN in Settlement calculations. This will alter the amount they are charged in Non-Delivery Charges to be more reflective of the actual service provided.
VLP with an SMBU	
HHDA	HHDAs will be required to provide historic Metered Data for MSID Pairs that have elected to use the P376 solution.

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Impact on the NETSO
The PNs used for dispatch will be decoupled from the value used in the Settlement calculations. This will not lead to a direct impact on NETSO.

Impact on BSCCo	
Area of Elexon	Impact
Performance Assurance	The use of a Baselining Methodology will provide assurance that accurate PNs are being used for Settlement.
Participant Management	Parties using the P376 solution will need to be able to manage the BM Units and MSID Pairs they have registered.

Impact on BSC Settlement Risks
P376 will impact Settlement Risk 025 'Balancing Services provided by Virtual Lead Parties allow error to enter Settlement, such that the energy volumes required for Settlement are incorrect or missing'. It seeks to ensure that the volumes attributed to VLPs and Suppliers proving balancing services are correct, to prevent inaccurate calculation of Delivered Volumes and Non-Delivery Charges. P376 will add a specific risk factor to SR025, to enable Elexon to validate that Parties are nominating event days in line with good practice.

Impact on BSC Systems and process	
BSC System/Process	Impact
Settlement Administration Agent	The SAA will amend how Non-Delivery Charges are calculated if the BM Unit is flagged as a Baselined BM Unit.
Supplier Volume Allocation Agent	SVAA will receive historic Metered Data from HHDAs and Event Day nominations from Lead Parties, and use these to calculate MSID Baseline Values for Baselined MSID Pairs. It will receive Party Submitted Expected Volumes and use these to calculate the total Settlement Expected Volume for the BM Unit.
Participant Management Platform	PMP will be amended to include a flag to identify Baselined BM Units and allow the selection and maintenance of the statuses of MSID Pairs using the P376 solution. The PMP will hold a register of Baselining Methodologies that can be selected.
Central Registration Agent	The CRA will hold details of BM Units with a baseline flag in its database.

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Impact on BSC Agent/service provider contractual arrangements	
BSC Agent/service provider contract	Impact
SAA	SAA will receive Settlement Expected Volumes from SVAA and use these in Settlement calculations in place of the FPN. It will discount MSID Pairs registered as Inactive from Settlement calculations.
SVAA	SVAA will receive data from HHDAs and Lead Parties and calculate MSID Baseline Values according to the appropriate methodology. It will receive Party Submitted Expected Volumes from Lead Parties and determine the total BM Unit Settlement Expected Volume.
CRA	CRA will be required to maintain registration details of and BM Units that a Party has registered to use the P376 solution.

Impact on Code	
Code Section	Impact
Section F 'Modification Procedures'	Changes are required to allow Parties to use a Baselining Methodology to calculate PNs for Settlement. The draft redlining can be found in Attachment A.
Section K 'Classification and registration of Metering Systems and BM Units'	
Section S 'Supplier Volume Allocation'	
Annex S-2 'Supplier Volume Allocation Rules'	
Section T 'Trading Charges'	
Annex X-1 'General Glossary'	
Annex X-2 'Technical Glossary'	

Impact on EBGL Article 18 terms and conditions
P376 does impact on the EBGL Article 18 Terms and Conditions held within the BSC. The Workgroup believe that P376 is consistent with the EBGL Objectives as it seeks to increase competition and remove barriers to providing balancing services. Additionally new paragraphs, S12, S13 and S14, introduced by P376 will extend the EBGL Article 18 mapping, which will be reflected in annex F-2.

Impact on Code Subsidiary Documents	
CSD	Impact
BSCP602 'SVA Metering System Register'	BSCP602 will be amended to provide details for the registration and maintenance of Baselined MSID Pairs
New Baselining Methodology Document	A new document will be created to provide detail on the mechanics and application of Baselining Methodologies and any associated assurance techniques.

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Impact on Core Industry Documents and other documents	
Document	Impact
Ancillary Services Agreements	No impact identified. However P376 will enable greater participation in TERRE and other balancing services.

Impact on a Significant Code Review (SCR) or other significant industry change projects
Neither Elexon nor the Proposer believe this Modification impacts any on-going SCR. Elexon submitted P376 to the Authority to request SCR exemption on 5 December 2018. The Authority confirmed this on 12 December 2018.

Impact on Consumers
Consumers will be better able to participate in the BM and TERRE as P376 will remove barriers to entry relating to the ability to submit an accurate PN. As a result of greater competition to provide balancing services, the cost of balancing the system is likely to be reduced for end consumers.

Impact on the Environment	
This Modification is consistent with the net zero target as it will diversify the range of non-traditional balancing service providers that the NETSO can call upon to balance the Transmission System.	

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5 Implementation

Recommended Implementation Date

The Workgroup recommends an Implementation Date for P376 of:

- 25 February 2023 as part of the February 2023 BSC Release if the Authority decision is received on or before 1 October 2021.

The central system changes needed to deliver P376 have an estimated lead time of one year. We therefore believe that at least one year should be allowed between a decision being received and the Implementation Date to allow resources to be mobilised and the solution to be fully delivered.

Elexon has been continuing to work with its service providers to understand when P376 can be delivered with the rest of the change pipeline in such a way that does not risk a successful delivery (considering P375 delivery in June 2022 and the potential for P402 delivery in February 2022). Elexon acknowledged that the Workgroup (supported by industry) wishes for the earliest Implementation Date achievable, without the risk of such a large industry change being delayed at a later date. Elexon believes this date to be 23 February 2023 as proposed in this Modification.

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Assessing the impact at the boundary

The Workgroup noted that historically some complex sites have been restricted from providing balancing services to NETSO because they are unable to accurately forecast the change to the volume seen at the Boundary Point that their actions would cause. It would be unfair for end users to pay for balancing actions that have no impact on the Total System, as there would be no benefit to customers. However, the Workgroup noted that there may be occasions where actions taken behind the Meter do benefit the Total System even though they are not visible as a change in the flow recorded by the Boundary Point Metering System.

For example, there may be scenarios when under normal operations a site's demand would increase, such as at the start of the working day. A balancing service could be delivered by reducing net demand on the site – either using the same assets that would normally increase their demand, or independent ones. If a dispatch happened to coincide with the normal time of the demand increase, the net result may be that consumption remains steady, rather than any visible reduction. However, had the service not been provided then the demand seen by the Total System would have increased, so it can be argued that the system has benefitted, in comparison to the 'normal' situation in which no service was provided.

The Workgroup concluded that baselining would allow balancing actions to be provided by deviating from 'normal' operations rather than from a fixed point, which some VLPs may struggle to calculate.

Ensuring robustness

The Workgroup noted that there had been some instances of gaming in other markets, but the Proposer noted that these are quite old and that baseline methodologies used now had been updated to prevent such behaviour. Additionally, ongoing assessment of baseline accuracy can be done using relative root mean squared analysis or similar.

The Workgroup noted that it would be in the best interest of the Party to make sure it was using a baseline that produced accurate forecasts to ensure it was accurately recompensed for any balancing services it provided. The Proposer noted that so long as a Baselining Methodology creates unbiased values (as the proposed methodology does), then registering an inappropriate site would be risky for the Party concerned: they should expect to lose more through Non-Delivery Charges from negative baseline errors than they gain from positive baseline errors.

Decoupling of PNs

The Workgroup noted the unless a complementary change was made under the Grid Code, the use of a Baselining Methodology to set the values used in the Settlement calculations would lead to it being decoupled from FPNs. The Workgroup considered whether an FPN would be needed at all for dispatch, with the alternative of a delta being used, with the instructed data being fed into the Settlement process.

NETSO confirmed that PNs used for dispatch must represent GSP Group flows, with the data captured at the Boundary Point. It confirmed that they should be as accurate as possible as they are used as the baseline for dispatch. Members believed that the FPN was

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procedural and that NETSO should be more concerned with the delta able to be provided. Any changes to the Grid Code requirements are outside the scope of P376 and would require a Grid Code Modification.

Some Workgroup members believed that by not using FPNs in the calculation of Non-Delivered Volumes, it would enable changes to let participants submit more accurate FPNs to NETSO. The rationale was that there would be no need for the figure to relate to Boundary Points of all elements of a BM Unit and so could focus on the assets able to deliver a service. A Workgroup member expressed concern on the decoupling and believed that this could create an information imbalance between the FPN and the value used in Settlement. The Proposer disagreed that this was a material concern and noted that available margins were not indicated by the FPN, and so did not believe this would influence trading.

The Workgroup noted that in the scenario where a Baselined BM Unit contained no Baselined or Inactive MSID Pairs, then the Party Submitted Expected Volume was essentially equivalent to the PN provided to the NETSO. It was concerned that this situation could arise and requested that the legal text be amended to clarify that in this scenario the expectation would be that the two values should be equivalent. Elexon noted that this requirement could restrict the positioning of operational metering used by the NETSO. The Workgroup were split on whether this was an intended consequence and some members believed operational metering and settlement metering should be closely aligned, to better measure the effect at the boundary. The Proposer believed that the situation would be rare and only temporary and could impact the quality of data available to the ESO when balancing the system. The Workgroups concluded that the drafting shouldn't be changed and that Elexon would work with new VLPs to provide context and understanding.

Baseline methodology characteristics

The Workgroup considered a number of Baselining Methodologies used in markets around the world, to determine what methods would best suit a process used under the BSC. In doing so, it assessed the robustness and accuracy of calculated values against the complexity to derive and administer, believing that it was important that any prescribed methodology should be easily understood by customers to aid engagement in the process.

Members noted that some baseline methodologies were designed for programmes that only feature demand reduction and tend to only be dispatched on high demand days, and so preferentially use data from high demand days to estimate the profile shape. While balancing services are often dispatched to reduce demand or increase generation, this is not always the case and so the Workgroup decided that a neutral baseline – equally applicable to demand increase services – would be preferable.

The Workgroup believed it would be preferable for Parties to have visibility of the calculated values at MSID level. This would allow anomalies to be identified. The Workgroup preferred a simple calculation based on historic data rather than regression, as it makes it easier for Parties to replicate the calculation and so improves transparency and confidence.

The Workgroup noted that the new Baselining Methodology Document would be drafted and approved as part of the Implementation Phase, as is usual with Modifications, but some members believed that it would be hard to fully assess P376 without visibility of this. We created an initial draft of the new Baselining Methodology Document, which was

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attached to the Assessment Procedure Consultation, allow respondents to review P376 with full context. This new document will be finalised and approved in the Implementation Phase if P376 is approved.

Analysis

The Workgroup considered analysis undertaken in other energy markets that allow Baselining Methodologies to be used. In particular, the KEMA investigation into baselines demonstrated that the accuracy of baselines was good and would not risk the integrity of the Settlement calculations. Some Workgroup members noted that the nature of the GB market meant that it often operated slightly differently to other markets. To allay these concerns, Elexon agreed to replicate some of the analysis presented in these reports using GB data.

Elexon issued a Request for Information to obtain GB data which it analysed for the Workgroup. Elexon's sample size was considerably smaller than those considered by other reports, but its findings were broadly comparable, suggesting that Baselining Methodologies could be reasonably applied to the GB market.

You can find a summary of Elexon's analysis in Appendix 3.

Some Workgroup members questioned whether there should be an allowable accuracy that MSID Pairs must satisfy in order to use the P376 solution. The Proposer noted that analysis had shown that Baselining Methodologies were unbiased – i.e. they make errors equally in both directions – and so if a Party tried to use them for unsuitable sites, they would incur considerable risk of Non-Delivery Charges. They believed that this was sufficient deterrent from registering unsuitable sites.

Applicability of Baselining Methodologies

The Workgroup considered whether a baseline should apply to all sites in a BM Unit. The Proposer did not believe that all sites would suit a baseline, and that in some cases a submitted PN would be more accurate. There is no limit to the number of SBMUs that can be registered, so it would be possible to split a portfolio into baselined and non-baselined sites in this way. However this may introduce barriers in terms of cost, and the smaller scale of aggregation could reduce the total offered volumes. The Workgroup concluded that a BM Unit should be able to contain a mix of baselined and non-baselined sites, with this decision being for the registrant to make.

The Workgroup noted that Baselining Methodologies were most applicable to demand sites, including those that may have a small amount of generation. Some members were concerned that in periods of low demand a site may temporarily become a net exporter, and questioned whether this would present any issues. The P376 Proposer did not believe that there would need to different treatment of importing and exporting sites from a baselining perspective. As the baseline methodology is designed to predict typical behaviour, it shouldn't matter if a site flips between importing and exporting.

Granularity of calculations

The Workgroup considered whether baseline values should be calculated at asset or BM Unit level. The consensus was that for most cases it would be better done at MSID Pair level. This would allow the typical behaviour to be reflected in the baseline values. Sites

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would be aggregated to create a BM Unit level Settlement Expected Volume for use in any Settlement calculations.

The NETSO Representative commented that in an ideal world it would receive data at GSP, rather than GSP Group, level to aid balancing the system effectively, but that this requirement was not progressed under P344 as it was not clear that VLPs would be able to provide this granularity.

One member commented that in some instances it would be better to create a baseline at BM Unit level. The example given was of a bank of EV chargers, where the behaviour of each individual charger may be erratic, but as a group would provide a more predictable profile.

Where an asset is dispatched twice on the same day, there may be a need for Settlement Period level data so this can be properly identified. Additionally, any data from after the first dispatch could be considered contaminated, and so any In Day Adjustment would need to be done using data from before the first dispatch.

Location of methodology

The Workgroup considered that it would be best to set out the baseline principles in the BSC, with any approved methodologies sitting in a subsidiary document. This would allow the methodologies to be periodically reviewed and adjusted without requiring a new Modification. This approach also allows for multiple methodologies to be used to suit different sites. The P376 solution prescribes that the approved Baselining Methodologies and details for use are contained in the Baselining Methodology Document.

Baseline calculations

The Workgroup considered when a baseline should be calculated and whether the values would be allowed to change post gate closure to improve accuracy as more up to date data could be used. Data used in Settlement calculations is 16 Working Days old, and so creating baselines after a Settlement Period would allow more recent data to be used. Some members expressed concern that if the value was allowed to change after a Settlement Period, then it could potentially open up gaming opportunities. Some members countered this and commented that, given the calculation of a baseline value would be transparent and objective, then as long as the decision to use a Baselining Methodology was fixed prior to delivery, this would not introduce any gaming opportunities.

A Workgroup member expressed concern that using data that was not known until after a Settlement Period could change the imbalance price and hence distort market signals.

Event Day creation

The Workgroup noted that Elexon would only have BM Unit level data for Delivered Volumes and so if creation of Event Days was automated then this would be for all sites in a BM Unit regardless of whether they had actually been used to deliver volumes.

The Workgroup agreed that it should be the responsibility of Parties to nominate Event Days, with an explanation. It noted that it was in the Party's interest to ensure the baseline is as accurate as possible, so as to ensure correct payments. Some members expressed concern that false Event Days could be nominated by a Party to manipulate its

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baseline. The Proposer did not believe that this was a major concern and noted that the limited look back periods of Baselining Methodologies would prevent any long term gain, and that the application of an In Day Adjustment would ensure that the baseline value closely matched real-time volumes prior to a dispatch. Members also expressed concern at allowing Parties to declare Event Days significantly after the event, as this could have consequential impacts on Settlement calculations for other Parties.

The Workgroup sought to ensure that the declaration of Event Days could not be used as a gaming opportunity. They noted that the fragmented nature of the GB market meant that no central body had sight of all dispatch instructions, and that it therefore made sense to make it Parties' responsibility to declare event days.

To ensure robustness, the Proposer suggested that Event Days be split into two categories: those resulting from a dispatch and those for other reasons. They commented that any dispatch would have an auditable paper trail and so these Event Days could be verified. For other Event Days – resulting from abnormal behaviour other than a dispatch – the solution should include clear guidance on what could constitute an Event Day and any Party nominating an event day should be able to provide evidence if requested.

The Workgroup considered whether the primary Supplier should be informed when an Event Day is notified against one of its MSID Pairs. The Workgroup was split on whether this would provide any benefit, with some members questioning whether the Supplier would be adequately resourced to monitor this or empowered to take any action as a result. The Workgroup also considered whether there should be limits on the number of allowed Event Days, but concluded that this may be overly restrictive and could prevent notification of legitimate Event Days.

The Workgroup expressed different views on timings for when an Event Day should be notified. Some members preferred allowing a narrow window. They commented that if an Event Day had the potential to amend the baseline, then it would affect the values used in Settlement calculations, which could have consequential impacts in the imbalance charges of other market participants. They believed it was undesirable to allow these to change much after the initial Settlement Runs. The Proposer preferred a longer window. They noted that abnormal behaviour cannot always be identified until good quality data could be reviewed, and time is needed to investigate and gather evidence of what was happening on the site.

Timing

The Workgroup noted that the timing of PNs submitted to NETSO would remain unchanged. They noted that the Party Submitted Expected Volume would also need to be received by this time. The Proposer noted that requiring submissions by Gate Closure would prevent a Party manipulating its baseline ahead of dispatch. The Workgroup agreed that it was not in the scope of P376 to alter the timing of data required under the Grid Code (the FPN submission), but considered that as long as the calculation method was determined by this time, the actual values could be calculated after the event, but in time for use in the Settlement calculations.

Dormant/inactive sites

Allowing sites to be set to dormant in an SBMU would allow these volumes to be discounted from a VLP's portfolio. For example, where a site did not have sufficient data to

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create a baseline, it could be discounted from Delivered Volumes so as not to contaminate data from other sites. Additionally, if it was known that a site would be exhibiting atypical behaviour, such as a site shutdown, and would not be used to provide balancing services, a VLP may want to deregister and reregister the site from their Secondary BM Unit, which can be a lengthy process. This concept provides an alternative to that.

One member believed that this would leave the Supplier open to any imbalance caused by a deviation from its expected usage. Others did not think there was any additional risk on the Supplier than was usual, as sites would rarely use exactly what was forecast by the Supplier.

The Workgroup determined that the concept of Inactive sites was preferable to dormant sites as the MSID Pair would still be live in the Supplier's BM Unit as usual – it just wouldn't be used to provide any balancing services.

Elexon's impact assessment showed that the functionality to allow an MSID Pair to be set to Inactive, and for its Metered Volumes to be ignored in the calculation of the Secondary BM Unit's Metered Volumes, accounted for approximately 20% of the cost to deliver the P376 solution. The Workgroup questioned whether it would be easier to simplify the process of deregistering and reregistering MSID Pairs from an SMBU. The Proposer believed that if this could be sufficiently speeded up, then there would be no need for an MSID Pair to be made Inactive. As the registration of MSID Pairs to an SBMU requires multiple BSC Agents to cross-reference details, we do not believe that this is a viable alternative to an Inactive status. Additionally, the P344 solution requires that SMBU details registered with the NETSO are the same as those registered under the BSC.

Some Workgroup members argued that these 'problem' MSID Pairs should be taken out of the baselining process and accounted for in the Party's Party Submitted Expected Volume. However as noted in the P376 defect, the Party may be unable to accurately forecast energy flows for these sites. If this is the case, inaccurate data may feed into the Period Metered Volumes, resulting in inaccurate payments.

Unintended consequences

Some Workgroup members expressed concern that after delivering a balancing service, an asset may not immediately return the state it would have been if it had not provided a service, and questioned whether this would present an issue. Elexon noted that as the Baselining Methodology was concerned with predicting typical behaviour over the period where a service was being provided, this could be considered outside the scope of P376. Additionally, by providing a balancing service an asset may simply delay its demand to later in the day (or to the next day).

Registrations

The Workgroup considered whether there should be any testing conducted to ensure suitability of a Baselining Methodology when a party registered to use the solution.

The Workgroup noted that when new sites were registered there would be insufficient data to calculate baseline values initially, and so there would need to be a method to obtain data which may result in a holding period. The Workgroup thought that there should be an active input from the Party to start including the site in the baseline solution once sufficient data was available. This would ensure the Party was in control and informed.

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The Workgroup did not believe it was appropriate to require sites to undergo accuracy checks before being registered as this could cause significant delays. It also believed it was in the interest of the Party to ensure a baseline produced accurate values. It thought that ongoing checks would be a more effective tool.

The Workgroup noted that it is necessary to have a method to deal with cases where a new MSID Pair was added to an SBMU as a Baselined MSID Pair, but sufficient data was not yet available. The Proposer's recommendation was that the MSID Pair would not be registered in this case, so that the responsible Party could then choose what to do with it. The Proposer sought to avoid the situation of a VLP being expected to predict energy flows for a site for which it was not able to. The Workgroup did not disagree with this approach. Elexon suggested that in the case of a VLP registering a new site, it would be more efficient for the new site to be treated as Inactive by central systems until such a time as a baseline value could be calculated.

Determining Delivered Volumes

The Workgroup considered whether MSID Pairs should have Delivered Volumes calculated by the SVAA to replace the self-declaration by VLPs. The Proposer believed that objective calculations done by the SVAA would be preferable to the existing practice. Other Workgroup members agreed and expressed concern at allowing a VLP to choose how Delivered Volumes were calculated. They believed that if an MSID Pair was registered for baselining then the SVAA should determine Delivered Volumes.

Some Workgroup members expressed concern that the prorating of Delivered Volumes calculated by a Baselining Methodology had the potential to distort volumes and could lead to a scenario where an MSID Pair had volumes assigned to it that it was not capable of delivering. Elexon advised the existing P344 solution used prorating of submitted Delivered Volumes to align values with the total BM Unit Delivered Volume. As such it did not see that this was unique to, or would be exacerbated by, the P376 solution.

Assurance methods

The Workgroup considered whether there should be a prescribed course of action for any identified issues. Elexon suggested that a notification to the Panel, who would make a determination on any other action, was proportional and consistent with the treatment of other Defaults under the BSC.

Some Workgroup members suggested that a new Settlement Risk should be created for the P376 solution. Elexon advised that SR025 specifically looked at VLP activities, and commented that it may be more efficient to include P376 elements as Risk Factors in SR025 rather than creating a new risk, which the Workgroup agreed to. This would include P376 activities in the scope of the Performance Assurance Framework and enable rectification action to be taken where appropriate.

Comparison to P375

One Workgroup member noted that P375 and P376 approach the same problem – of Parties not being able to accurately forecast total energy flows at a Boundary Point – from different perspectives. They believed that while P376 would be beneficial against the BSC baseline, it was not better than the solution which would be delivered by P375. They

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therefore believed that P376 should only be used where it was not possible to apply the P375 solution. The Proposer believed that the two solutions would work complementarily. They agreed that more granular metering was desirable in reducing risk, but believed baselining would still add significant value. For example, a VLP may be confident of their ability to deliver a particular size change in consumption volume when needed, without having full control of the assets concerned. They noted that even where granular metering was installed, the Party would need to forecast energy flows, and the baseline would provide an objective way of doing this. The Proposer also believed that the implementation of Baselining Methodologies had the potential to enable future innovation. For example, Baselines could be used as an assurance tool for the P375 solution.

Role of Supplier Agents

A consultation respondent suggested that an alternative solution to P376 was to improve the relationship between VLPs and HHDCs so that HHDCs could provide baseline volumes for sites. They commented that HHDCs were experienced in data handling and many used baseline processes already to help with data estimation. HHDCs knowledge of a site would also allow more bespoke processes to be used and improve the accuracy of data. They also believed a decentralised approach could be quicker to adapt and more flexible

The Proposer noted the suggestion. But noted that this solution would be possible without P376. They believed that the benefit of the centralised P376 solution was that post Gate Closure data could be used. The Proposer also commented that the objective nature of P376 allowed for transparency and for assurance techniques to be easily applied. They were not sure how confidence in a subjective HHDC lead solution could be similarly provided.

The Proposer and the Workgroup understood the rationale for the alternative solution, but did not believe there was sufficient to further explore.

Alternative Solution to align P375 and P376

The Workgroup noted that P375 and P376 were separate Modifications and could be delivered independently of each other. However, to maximise the benefit that could be realised, it was desirable to allow Baselining Methodologies to be applied to asset metering (as introduced by P375). BSC governance does not allow a Modification to be contingent on another in-flight Modification. As such this alignment work would need to be done under a subsequent Modification. Not all Workgroup members saw the need for this alignment work, as they believed that it should be a case of Parties using either solution rather than both.

Approval of P375

At its final meeting the Workgroup agreed that if P375 was approved before the P376 Assessment Report was published, that the solution should be amended to align P376 with P375 as described above. Following the final Workgroup meeting the Authority approved P375 for implementation on 24 June 2022. In line with the Workgroup's discussions, we have therefore amended the P376 Proposed solution to align it with the approved P375 solution and allow baselining methodologies to be applied to asset level metering. The attached P376 redlining is drafted on top of the approved P375 redlining.

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7 Workgroup's Conclusions

Following consideration of the Assessment Procedure Consultation responses, the Workgroup unanimously believes that the P376 solution is better than the current BSC baseline and initially believe that it should be approved. The Workgroup believes that the proposed solution will open up access to non-traditional balancing service providers for the benefit of the industry.

The Workgroup noted Elexon's service provider impact assessment and agreed with the recommended Implementation Date of 23 February 2023, and believes that despite the cost to deliver P376, there is likely to be a net benefit from P376, which it hopes to confirm through this consultation.

Views on the Applicable BSC Objectives

Does P376 better facilitate the Applicable BSC Objectives?		
Obj	Proposer's Views	Other Workgroup Members' Views
(a)	• Neutral	• Neutral *(unanimous)*
(b)	• **Positive**	• **Positive** *(unanimous)*
(c)	• **Positive**	• **Positive** *(unanimous)*
(d)	• Neutral	• Neutral *(unanimous)*
(e)	• **Positive**	• **Positive** *(unanimous)*
(f)	• Neutral	• Neutral *(unanimous)*
(g)	• Neutral	• Neutral *(unanimous)*

Applicable BSC Objective (b)

The Workgroup unanimously agrees with the Proposer that this Modification will have a positive impact on Applicable BSC Objective (b) as it removes a barrier to entry for VLPs and customers for the provision of balancing services. This will increase the options available to NETSO when balancing the system, thus leading to more efficient and economic balancing actions being procured.

Applicable BSC Objective (c)

The Workgroup unanimously agrees with the Proposer that there is also a positive impact on Objective (c) because the change encourages more participation in the market, which increases competition. The Workgroup note that the solution should be implemented in a cost-effective manner to preserve the benefits of the increased competition.

Applicable BSC Objective (e)

The Workgroup unanimously agrees with the Proposer that there is also a positive impact on Objective (e) because the TERRE solution must allow for the participation of customers (or independent aggregators acting on their behalf) in RR. The proposed change will remove a barrier to entry for additional customers to participate in RR.

What are the Applicable BSC Objectives?

(a) The efficient discharge by the Transmission Company of the obligations imposed upon it by the Transmission Licence

(b) The efficient, economic and co-ordinated operation of the National Electricity Transmission System

(c) Promoting effective competition in the generation and supply of electricity and (so far as consistent therewith) promoting such competition in the sale and purchase of electricity

(d) Promoting efficiency in the implementation of the balancing and settlement arrangements

(e) Compliance with the Electricity Regulation and any relevant legally binding decision of the European Commission and/or the Agency [for the Co-operation of Energy Regulators]

(f) Implementing and administrating the arrangements for the operation of contracts for difference and arrangements that facilitate the operation of a capacity market pursuant to EMR legislation

(g) Compliance with the Transmission Losses Principle

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EBGL Impacts

The Workgroup unanimously believes that P376 **does** impact the EBGL Article 18 Terms and Conditions as it will require changes to parts of Section K, Section S and Section T, which constitute the EBGL Article 18 Terms and Conditions. Additionally new paragraphs, S12, S13 and S14, introduced by P376 will extend the EBGL Article 18 mapping, which will be reflected in annex F-2.

The Workgroup believes that P376 is consistent with the EBGL objectives as it:

- fosters effective competition by removing barriers to providing balancing services; and;
- enhances efficiency of balancing by increasing the variety of participants that can provide balancing services.

Self-Governance

As P376 impacts on the EBGL Article 18 Terms and Conditions, it cannot be progressed as a Self-Governance Modification.

Additionally the Workgroup unanimously believe that P376 will materially affect competition by removing a barrier to entry for consumers to participate in the provision of balancing services through TERRE and the BM, and so P376 **should not** be progressed as a Self-Governance Modification.

Implementation Date

The Workgroup unanimously recommend an Implementation Date of:

- 25 February 2023 as part of the February 2023 BSC Release if the Authority decision is received on or before 1 October 2021.

The Workgroup (supported by industry) wishes for the earliest Implementation Date achievable, without the risk of such a large industry change being delayed at a later date. Elexon believes this date to be 23 February 2023 as proposed in this Modification.

Legal Text

The Workgroup unanimously believe that the redlined legal text changes in Attachment A will deliver the intent of P376.

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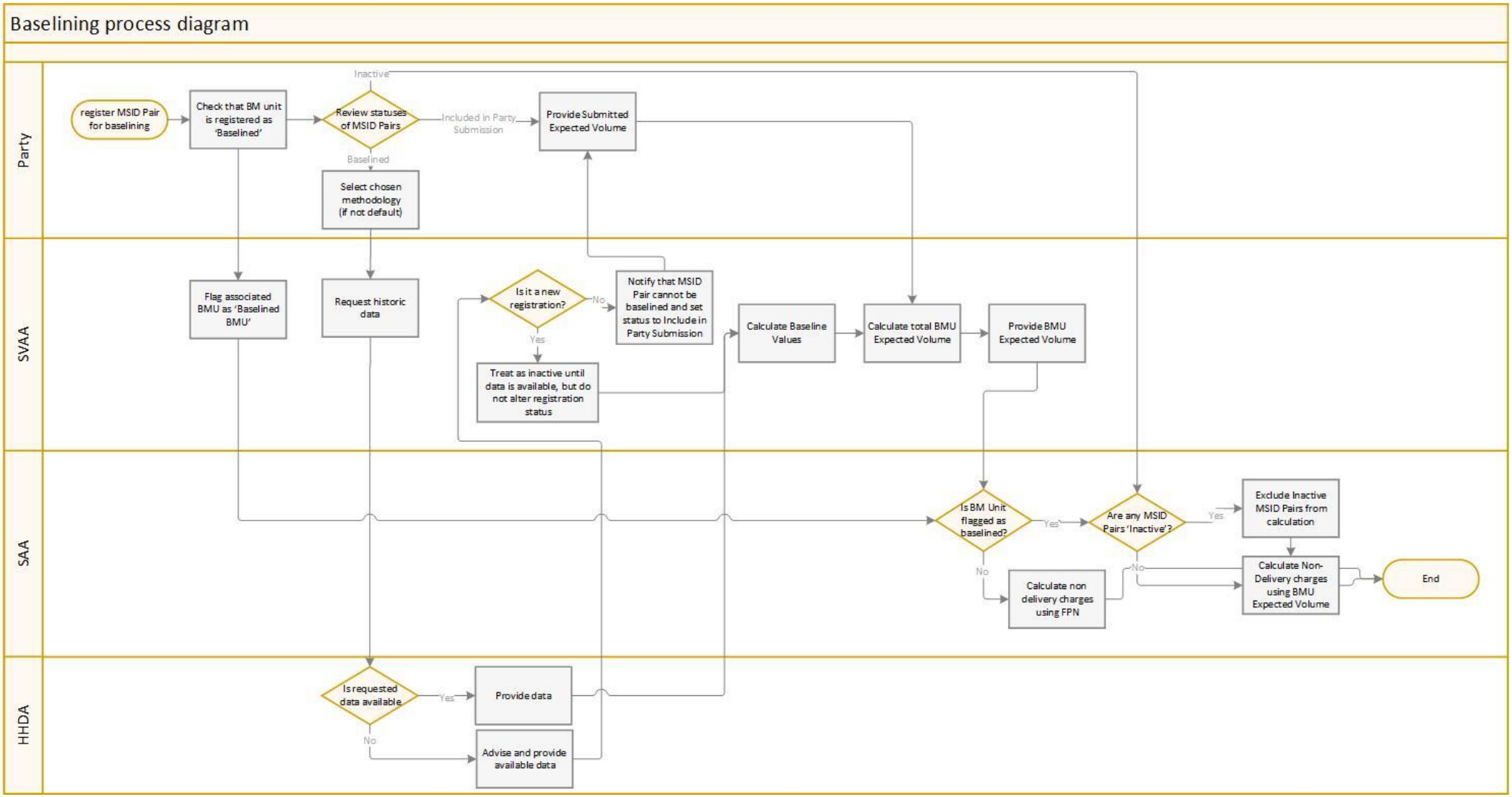
8 Recommendations

The P376 Workgroup invites the Panel to:

- **AGREE** that P376:
    - **DOES** better facilitate Applicable BSC Objective (b);
    - **DOES** better facilitate Applicable BSC Objective (c); and
    - **DOES** better facilitate Applicable BSC Objective (e);
- **AGREE** an initial recommendation that P376 should be **approved**;
- **AGREE** that P376 **DOES** impact the EBGL Article 18 terms and conditions held within the BSC;
- **AGREE** the impact on the EBGL objectives;
- **AGREE** an initial Implementation Date of:
    - 25 February 2023 as part of the February 2023 BSC Release if an Authority decision is received on or before 1 October 2021.
- **AGREE** the draft legal text;
- **AGREE** an initial view that P376 should not be treated as a Self-Governance Modification;
- **AGREE** that P376 is submitted to the Report Phase; and
- **NOTE** that Elexon will issue the P376 draft Modification Report (including the draft BSC legal text) for a one month consultation and will present the results to the Panel at its meeting on 13 May 2021.

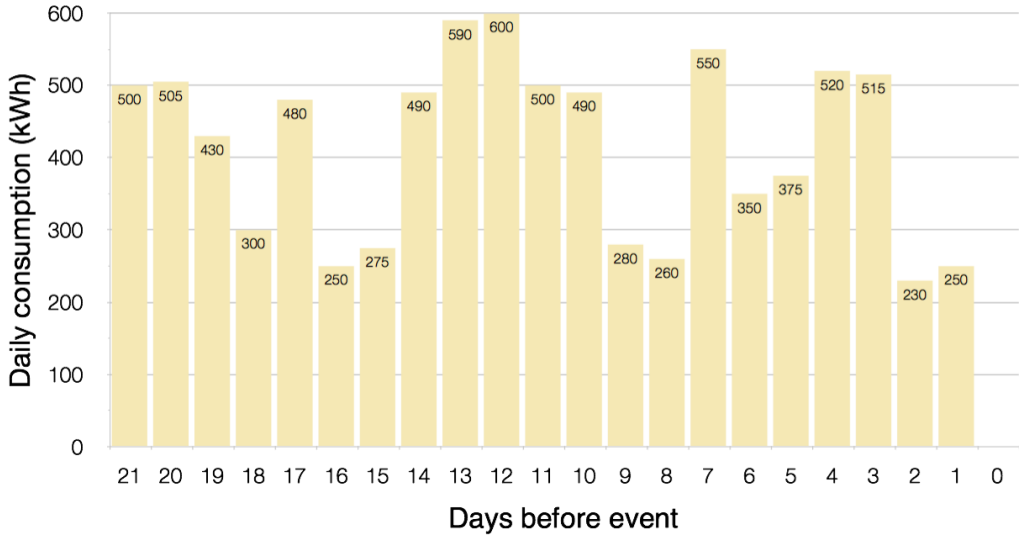
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Appendix 1: High level process diagram of P376 solution

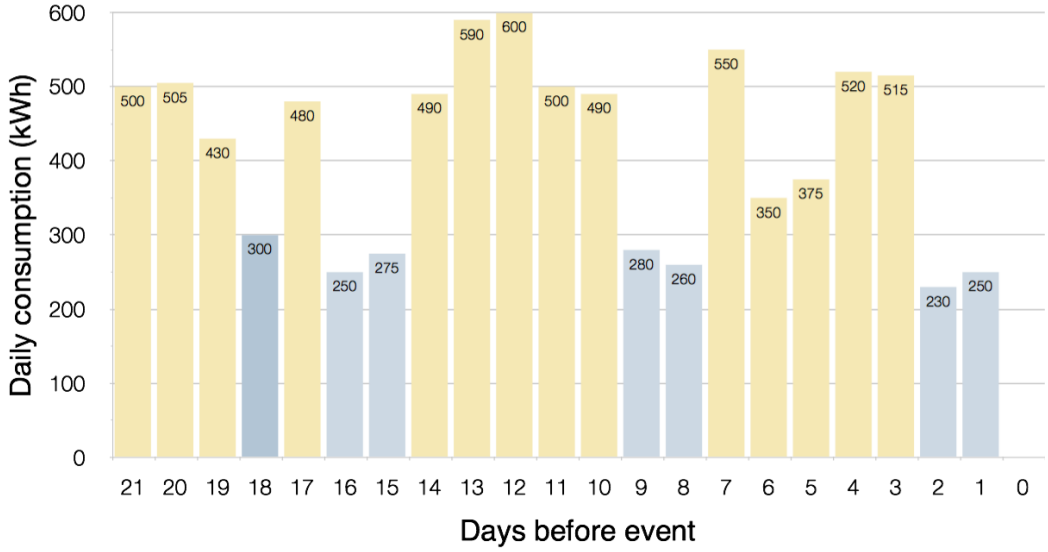


Appendix 2: Example – Creating a baseline

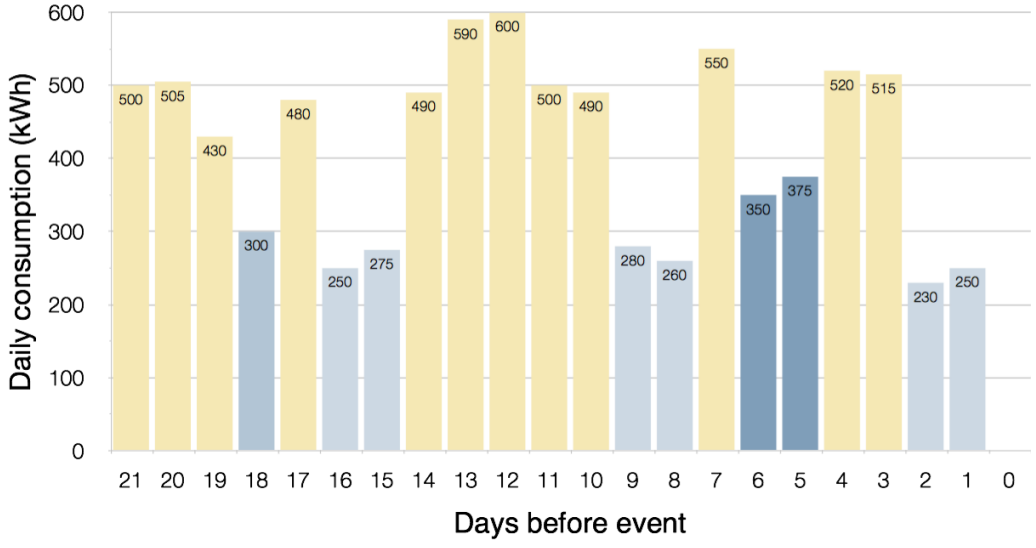
1. The Baselining Methodology looks back at recent historic data. The default methodology introduced by P376 will look back 60 days, but we have used 20 days in this example.



2. The Baselining Methodology excludes days that are not of a similar type (weekends and public holidays in blue in this example).

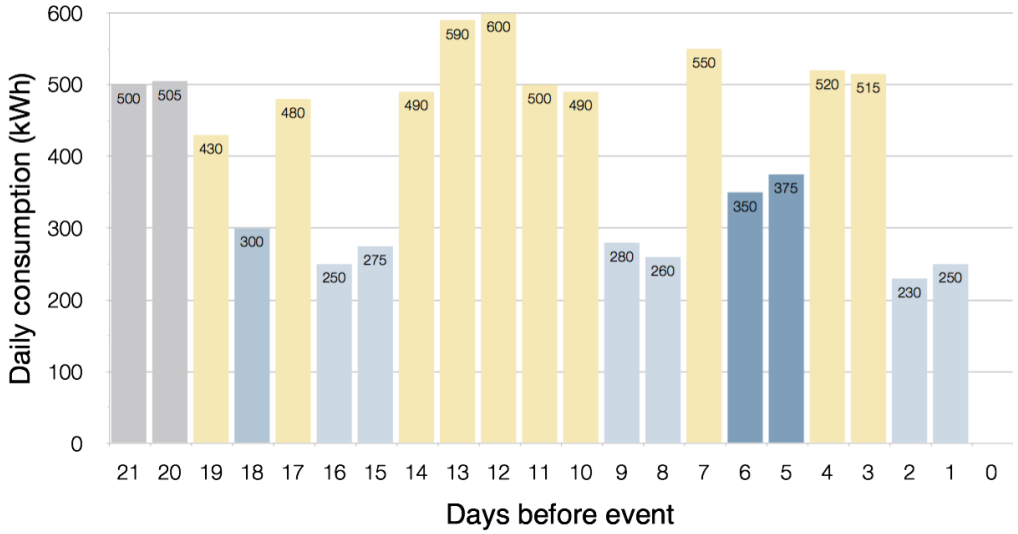


3. The Baselining Methodology excludes data from days that have been marked as Event Days (darker blue).



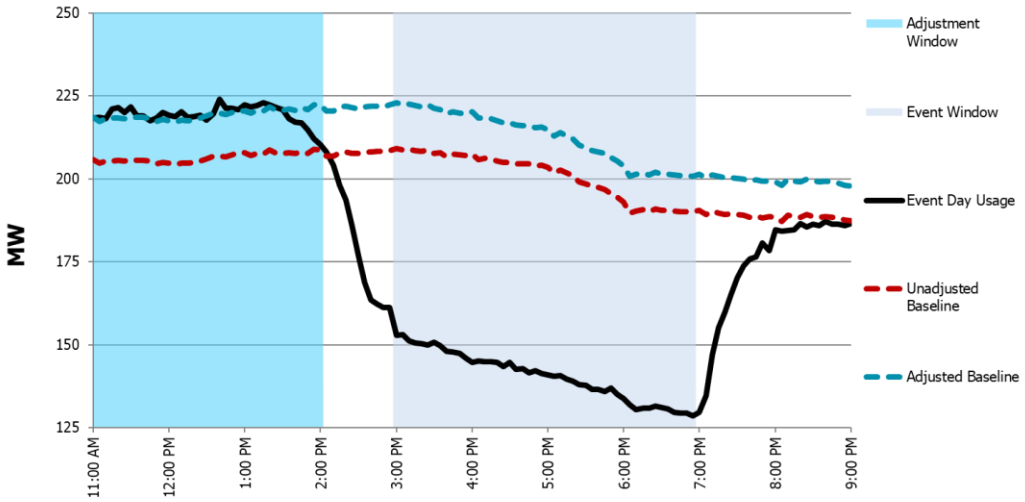
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4. The Baselining Methodology selects the 10 most recent days from the qualifying data available (the remaining yellow columns).



5. The Baselining Methodology processes the selected data according to its algorithm. For the default Baselining Methodology, the 10 selected days will be averaged equally on Settlement Period basis to give a baseline profile curve.

6. The In Day Adjustment compares the average baseline value to the average Metered Volume in the hours prior to the site being dispatched. This creates a difference that is added to the baseline profile curve to ensure that it is representative of operations just ahead of being dispatched.



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Appendix 3: Baseline Analysis

Elexon, at the time of undertaking the analysis, did not routinely receive disaggregated data from Half Hourly Data Aggregators. Therefore demand data was requested from industry via a Request for Information. Demand data was received from a number of parties, totalling over 100 sites.

Method

3 Baselining Methodologies were used as part of the analysis.

- Middle 4 of 6;
- 10 in 10; and
- Highest 4 out of 5 days.

These are standard methodologies utilised by other System Operators throughout the world when calculating baseline values. They also align with the methodologies used by KEMA in their assessment of baseline methodologies for PJM.

Using actual demand data within the baseline methodologies a comparison was made between the forecast the baseline methodology had for a settlement period compared to the actual Metered Volumes for that Settlement Period. This was done for all Working Days. Separate methodologies are required for Non-Working days.

A mean of the difference was calculated for each MSID, as well as the Root Mean Squared Error (RMSE). RMSE is the standard deviation of the residuals (prediction errors). Residuals are a measure of how far from the regression line data points are; *RMSE* is a measure of how spread out these residuals are. In other words, it tells you how concentrated the data is around the line of best fit. RMSE cannot be used to compare sites of different sizes, so we then calculated the Relative Root Mean Squared Error (RRMSE), by dividing the RMSE by the mean, resulting in a dimensionless quantity.

The RRMSE was also used by KEMA in their report to analyse the accuracy of various baseline methodologies so is a useful comparative tool.

Conclusions

Our analysis shows that sites in our study are more variable than the sites used in KEMA's study. This could be down to a number of different factors such as sample size and types of sites within the sample. However we can conclude that for a number of sites the baseline methodology can accurately forecast demand to very fine margins when compared to actuals. It also shows that baselining is not suitable for certain sites which are highly variable. A key result is that the bias of the methodologies is extremely close to zero. This means that the methodologies used do not consistently over forecast or under forecast. This is crucial so as to prevent a Party from benefitting from any errors: if they were to use baselines for some unsuitable MSID Pairs, they would suffer Non-Delivery Charges as frequently as they had any errors in their favour.

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Data findings

This table shows the RRMSE results for each site under each baseline methodology.

Site	High 4 of 5	10 of 10	Middle 4 of 6
126	0.02	0.02	0.02
125	0.03	0.03	0.03
28	0.04	0.04	0.04
53	0.04	0.06	0.04
32	0.05	0.05	0.05
54	0.05	0.11	0.11
31	0.06	0.07	0.06
37	0.06	0.06	0.06
38	0.06	0.06	0.07
41	0.07	0.08	0.08
121	0.07	0.06	0.07
117	0.08	0.08	0.08
44	0.08	0.09	0.08
25	0.10	0.09	0.10
34	0.10	0.11	0.10
33	0.10	0.11	0.10
29	0.10	0.10	0.10
4	0.11	0.10	0.11
68	0.11	0.12	0.11
10	0.11	0.10	0.11
98	0.11	0.11	0.11
24	0.11	0.10	0.11
50	0.11	0.11	0.11
129	0.12	0.12	0.12
80	0.12	0.13	0.12
124	0.13	0.12	0.13
48	0.13	0.13	0.13
60	0.13	0.13	0.13
127	0.13	0.13	0.14
122	0.13	0.13	0.14
83	0.14	0.15	0.14
43	0.14	0.14	0.14
27	0.15	0.15	0.15
66	0.15	0.15	0.15

Site	High 4 of 5	10 of 10	Middle 4 of 6
70	0.15	0.15	0.15
30	0.15	0.15	0.15
55	0.16	0.14	0.17
42	0.16	0.17	0.16
26	0.16	0.18	0.17
106	0.17	0.19	0.18
16	0.17	0.17	0.17
81	0.17	0.18	0.17
63	0.18	0.16	0.19
90	0.18	0.21	0.19
123	0.19	0.18	0.19
113	0.19	0.19	0.19
73	0.19	0.18	0.19
62	0.19	0.17	0.21
49	0.19	0.20	0.21
35	0.19	0.18	0.19
128	0.19	0.17	0.20
13	0.20	0.19	0.20
115	0.21	0.20	0.21
65	0.21	0.18	0.22
61	0.23	0.20	0.23
118	0.23	0.23	0.24
120	0.24	0.22	0.24
58	0.24	0.21	0.26
95	0.24	0.24	0.25
119	0.24	0.24	0.26
64	0.24	0.20	0.26
86	0.24	0.22	0.26
52	0.25	0.28	0.27
47	0.26	0.22	0.28
84	0.26	0.21	0.27
69	0.26	0.25	0.26
56	0.26	0.23	0.28
59	0.27	0.24	0.28

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Site	High 4 of 5	10 of 10	Middle 4 of 6
46	0.27	0.23	0.27
78	0.27	0.26	0.29
112	0.27	0.30	0.26
77	0.27	0.24	0.28
17	0.27	0.26	0.28
57	0.28	0.27	0.28
87	0.28	0.27	0.28
71	0.29	0.24	0.30
72	0.29	0.25	0.30
67	0.29	0.25	0.30
8	0.29	0.28	0.29
85	0.29	0.26	0.31
103	0.30	0.28	0.30
9	0.30	0.30	0.32
51	0.30	0.27	0.32
6	0.31	0.31	0.32
74	0.31	0.28	0.33
76	0.32	0.26	0.34
7	0.32	0.30	0.32
79	0.35	0.30	0.37
18	0.35	0.26	0.27
89	0.35	0.31	0.35
82	0.36	0.29	0.38
130	0.37	0.34	0.38
75	0.40	0.36	0.42
12	0.46	0.42	0.45
114	0.48	0.57	0.50
116	0.49	0.45	0.48
45	0.49	0.41	0.49
99	0.73	0.78	0.75
100	0.89	0.97	0.90
1	1.07	1.09	1.09
23	1.76	1.54	1.80

Data Summary	High 4 of 5	10 of 10	Middle 4 of 6
Average RRMSE	0.24	0.23	0.25
90th Percentile RRMSE	0.19	0.18	0.19
Bias	0.01%	0.01%	0.01%

Comparison

Analysis comparison (median RRMSE)			
Baseline	High 4 of 5	10 of 10	Middle 4 of 6
KEMA	0.08	0.07	0.08
P376	0.19	0.19	0.21

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Appendix 4: Workgroup Details

Workgroup's Terms of Reference

Specific areas set by the BSC Panel in the P376 Terms of Reference	Conclusion
How will the Baseline PN be created and by whom?	By the SVAA using an approved Baselining Methodology as selected in advance by the Party providing balancing services.
Can the Baselining Methodology be used for other purposes other than providing the PN for Settlement purposes?	This Modification limits the scope to how expected Metered Volumes are used in the Settlement Calculations, in particular the calculation of Non-Delivery Charges. However, the Workgroup note that similar changes to the Grid Code could improve the quality of data used by the NETSO to dispatch assets.
Consider how the new service will be funded? i.e. should only those who benefit from this service pay for the service?	The expected annual service fee is ~£100k. We believe this can reasonably by absorbed into other BSC Costs and charges.
Which Parties will be allowed to use a Baselining Methodology for their PN used in Settlement?	VLPs with an SBMU and Suppliers with an ABMU are best suited to using Baselining Methodologies. Baseline methodologies are most suitable where there is either just controllable demand or a mix of demand and generation at a site. The unbiased nature of the preferred methodology means it is in the Party's interest to only use the Baselining Methodology where it will provide more accurate data than the Party could predict.
Will there be one Baselining Methodology or will there be different methodologies aligned to Technology type. If so how will this work in practice?	There will be one default Baselining Methodology to start with (consisting of a Working Day and Non-Working Day methodology). Parties will be able to apply to the Panel to approve other methodologies.
What is the association with P375 and how would they both work together if Ofgem approved both Modifications?	P375 and P376 can be delivered independently. However, to maximise the benefit to industry, if both Modifications are approved, they should be aligned. During the P376 Assessment Procedure, P375 was approved by the Authority, and so the Proposed solution was amended to align with the approved P375 solution.
What kind of data would be published for Final Physical Notifications (FPNs) at the Boundary Point and how this data interacts with National Grid ESO's dataflows and systems.	The P376 solution will not impact how FPNs are submitted and published. It seeks to replace the use of FPNs in Settlement calculations with a value calculated via Baselining Methodology. No impact on NETSO systems has been identified.

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Specific areas set by the BSC Panel in the P376 Terms of Reference	Conclusion
What changes are needed to BSC documents, systems and processes to support P376 and what are the related costs and lead times?	The cost to implement P376 into BSC Systems is estimated £1.4M - £1.8M. The lead time is approximately 50 weeks.
Are there any Alternative Modifications?	The Workgroup considered a solution where the HHDC would be central to calculating baseline values, However they concluded that the objective and transparent nature of the Proposed solution would be easier to assure and so provide confidence in.
Should P376 be progressed as a Self-Governance Modification?	P376 should not be a Self-Governance Modification.
Does P376 better facilitate the Applicable BSC Objectives than the current baseline?	The Workgroup believes that P376 will better facilitate Objectives (b), (c) and (e).
Does P376 impact the EBGL provisions held within the BSC, and if so, what is the impact on the EBGL Objectives?	P346 does impact the EBGL provisions. We believe it is consistent with the EBGL Objectives as it will increase competition and remove barriers to providing balancing services

Assessment Procedure timetable

P376 Assessment Timetable	
Event	Date
Panel submits P376 to Assessment Procedure	13 December 2018
Workgroup Meeting 1	25 January 2019
Workgroup Meeting 2	18 March 2019
Workgroup meeting 3	3 June 2019
Workgroup meeting 4	14 August 2019
Request for Information Issued	23 September 2019
Workgroup Meeting 5	10 December 2019
Workgroup Meeting 6	14 September 2020
Workgroup Meeting 6 – wrap up and initial voting	2 October 2020
Workgroup meeting 7	6 November 2020
Workgroup meeting 8	30 November 2020
Assessment Procedure Consultation	13 January 2021 – 2 February 2021
Workgroup Meeting 9	15 February 2021
Panel considers Workgroup's Assessment Report	11 March 2021
Report Phase Consultation and EBGL Change process	18 March 2021 – 18 April 2021
Panel Considers Draft Modification Report	13 May 2021

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P376 Assessment Timetable	
Event	Date
Final Modification Report sent to Authority	20 May 2021

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Workgroup membership and attendance

P376 Workgroup Attendance											
Name	Organisation	25 Jan '19	18 Mar '19	3 Jun '19	14 Aug '19	10 Dec '19	14 Sep '20	2 Oct '20[1]	6 Nov '20	30 Nov '20	15 Feb '21
Members											
Paul Troughton	Enel X UK Limited *(Proposer)*	✓	✓	✓	✓	✓	☎	☎	☎	☎	☎
Alastair Martin	Flexitricity Limited	×	✓	×	×	×	☎	×	×	×	×
Alessandra De Zottis	Sembcorp Utilities (UK) Limited	✓	✓	×	×	×	☎	×	×	☎	☎
Andy Colley	SSE Energy Supply Limited	☎	✓	×	☎	☎	×	☎	☎	☎	☎
Bill Reed	RWE Supply and Trading GmbH	✓	✓	✓	×	✓	☎	☎	☎	☎	×
Chris Proudfoot	Centrica Energy Limited	×	✓	✓	×	×	×	×	×	×	×
Conor Maher McWilliams	OVO Electricity Limited	✓	×	✓	×	×	×	×	×	×	×
David Graves	Quorum Development Limited	✓	✓	✓	✓	×	×	×	×	×	×
Dermot Hearty	Salient Systems	×	×	×	×	×	×	×	×	×	☎
Grahame Neale	National Grid ESO	✓	✓	✓	✓	×	☎	☎	☎	×	☎
Jack Abbott	Centrica Energy Limited	✓	×	✓	×	×	×	×	×	×	×
Lauren Jauss	RWE Supply and Trading GmbH	×	×	×	×	×	×	×	×	×	☎
Lisa Waters	Waters Wye Associates	✓	×	☎	×	×	☎	×	×	×	☎
Paul Farmer	Shell Energy Europe Limited	×	×	✓	✓	×	×	×	×	×	×

[1] Workgroup meeting 6 mop up session

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P376 Workgroup Attendance											
Name	Organisation	25 Jan '19	18 Mar '19	3 Jun '19	14 Aug '19	10 Dec '19	14 Sep '20	2 Oct '20[1]	6 Nov '20	30 Nov '20	15 Feb '21
Rick Parfett	Association for Decentralised Energy	✓	✓	✓	✓	✓	☎	☎	☎	☎	☎
Saskia Barker	Flexitricity Limited	✓	×	×	×	×	×	×	×	×	×
Sebastian Blake	Open Energi	×	×	×	×	×	×	☎	☎	☎	×
Valts Grintals	Kaluzza	×	×	×	×	×	☎	☎	☎	×	×
Attendees											
Douglas Alexander	Elexon *(Chair)*	✓	×	×	×	×	×	×	×	×	×
Lawrence Jones	Elexon *(Chair)*	×	✓	✓	✓	✓	×	×	×	×	×
Elliott Harper	Elexon *(Chair)*	×	×	×	×	×	☎	☎	☎	☎	☎
Matthew Woolliscroft	Elexon *(Lead Analyst)*	✓	✓	✓	✓	✓	☎	☎	☎	☎	☎
Damian Clough	Elexon *(Design Authority)*	✓	✓	✓	✓	✓	☎	☎	☎	☎	×
John Lucas	Elexon *(Design Authority)*	×	×	×	×	×	×	×	×	☎	☎
Aditi Tulpule	Elexon *(Lead Lawyer)*	×	×	×	✓	×	×	×	×	☎	☎
Oli Meggitt	Elexon (Subject Matter Expert)	×	×	×	×	×	×	×	×	×	☎
David Beaumont	Ofgem	✓	✓	×	×	×	×	×	×	×	×
Kirsten Nazareth	Ofgem	✓	✓	×	×	×	×	×	×	×	×
James Hill	Ofgem	×	×	×	×	×	☎	☎	☎	☎	☎

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Appendix 5: Glossary & References

Acronyms

Acronyms used in this document are listed in the table below.

Acronyms	
Acronym	Definition
NETSO	National Electricity Transmission System Operator *(National Grid ESO)*
EBGL	Electricity Balancing Guideline *(EU Code)*
PN	Physical Notification
VLP	Virtual Lead Party
CHP	Combined Heat and Power
BM	Balancing Mechanism
RR	Replacement Reserve *(balancing product type)*
FPN	Final Physical Notification
TERRE	Trans European Replacement Reserve Exchange *(balancing product)*
BRP	Balance Responsible Party
RCRC	Residual Cashflow Reallocation Cashflow
BSP	Balancing Service Provider
MW	Megawatt
ABMU	Additional BM Unit
SBMU	Secondary BM Unit
MSID	Metering System Identifier
SAA	Settlement Administration Agent *(Central BSC Agent)*
SVAA	Supplier Volume Allocation Agent *(Central BSC Agent)*
SEV	Settlement Expected Volume
HHDA	Half Hourly Data Aggregator *(Supplier Agent)*
AMSID	Asset Metering System Identifier
PAF	Performance Assurance Framework
PMP	Participant Management Platform
CRA	Central Registration Agent *(Central BSC Agent)*
CSD	Code Subsidiary Document
BSCP	Balancing and Settlement Code Procedure
SCR	Significant Code Review
GSP	Grid Supply Point

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New defined Terms for P376

Defined Terms that P376 would introduce are listed in the table below.

New Defined Terms		
Term	Acronym	Meaning
Baselined BM Unit		A BM Unit containing at least one MSID Pair registered for baselining.
Baselined MSID Pair		An MSID Pair for which the Lead Party requires SVAA to apply Baselining Methodology for the calculation of the MSID Baseline Value per Settlement Period (save where such an MSID Pair has been identified as Inactive).
Baselined Expected Volume	BEV	The sum of MSID Baseline Values in a BM Unit having accounted for losses.
Baselining Methodology		An algorithm that takes recent historic data to forecast expected quantities of Active Energy.
Baselining Methodology Document		A new Document that the Panel shall establish to containing the Methodologies that have been approved to calculate MSID Baseline Values.
Event Day		A Settlement Day affected by any of the circumstances listed in Appendix A of the Baselining Methodology Document, about which the Lead Party has notified SVAA in accordance with BSC Procedure BSCP602.
'Inactive'		An MSID Pair for which actual and expected volumes will not be allocated to a Secondary BM Unit.
In Day Adjustment		Defined in the Baselining Methodology Document as an additive adjustment to the baseline, used to adjust its level to more closely match outturn demand on the given Settlement Day.
MSID Baseline Value	MBV	The value calculated by the Baselining Methodology to represent expected quantities of Active Energy and/or Exported from or to that MSID Pair.
Party Submitted Expected Volume	PSEV	The Lead Party's best estimate of the total expected quantities of Active Energy Imported and/or Exported from or to all MSID Pairs registered in the BM Unit that are neither Baselined MSID Pairs nor Inactive.
Settlement Expected Volume	SEV	The sum of the Party Submitted Expected Volume and the Baseline Expected Volume.

External links

A summary of all hyperlinks used in this document are listed in the table below.

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All external documents and URL links listed are correct as of the date of this document.

External Links		
Page(s)	Description	URL
4	P344 on the BSC Website	https://www.elexon.co.uk/mod-proposal/p344
5	Issue 73 on the BSC Website	https://www.elexon.co.uk/smg-issue/issue-71/
35	P376 on the BSC Website	https://www.elexon.co.uk/mod-proposal/p376
3	Issue 71 on the BSC Website	https://www.elexon.co.uk/smg-issue/issue-71/
5	Electricity Balancing Guideline on the ENTSO-E Website	https://www.entsoe.eu/network_codes/eb/
6	P375 on the BSC Website	https://www.elexon.co.uk/mod-proposal/p375
18	BSC Sections on the BSC Website	https://www.elexon.co.uk/bsc-and-codes/balancing-settlement-code/
18	BSCPs on the BSC Website	https://www.elexon.co.uk/bsc-and-codes/bsc-related-documents/bscps/
22	An assessment of the economic value of demand-side participation in the Balancing Mechanism and an evaluation of options to improve access	https://www.ofgem.gov.uk/system/files/docs/2017/07/an_assessment_of_the_economic_value_of_demand-side_participation_in_the_balancing_mechanism_and_an_evaluation_of_options_to_improve_access.pdf
23	KEMA analysis into Baseline Methodologies on the Australian Energy Market Operator website	https://www.aemo.com.au/-/media/files/pdf/baseline_consumption_methodology_phase_2_report_oct13.pdf
40	KEMA analysis into Baseline Methodologies for PJM	https://www.pjm.com/-/media/markets-ops/demand-response/pjm-analysis-of-dr-baseline-methods-full-report.ashx?la=en

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