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Guidance Note

The Electricity Trading Arrangements: A Beginner's Guide

Have you ever asked yourself one, or all, of the following?

- How is electricity traded?
- What's Imbalance Settlement?
- What are Bids and Offers?
- How do Generators and Suppliers fit into this model?
- What's ELEXON's role in this?
- What do all those acronyms mean?

If so, this is the document for you. It provides a detailed look at the Trading Arrangements for electricity which covers what you need to know. The rules that govern electricity trading are covered in the **Balancing and Settlement Code (BSC)**. Where more information on a topic is available, we've added links to documents that can provide more details.

This is a large document and we don't recommend reading it all in one sitting so we've split it into bite-sized sections:

We start with an **Introduction** that provides an overview of the trading arrangements, followed by a section that goes into **more detail**. We then move on to how **Imbalance Settlement** is carried out and the differences between the **Central (CVA)** and **Supply (SVA)** sides of the market. We finish off with a look at how **Payment and Credit** are managed.

What parts should I read?

We recommend that you start off with the **Introduction** and then decide how much more detail you want to go in to. The **more detail** section should be your next stop. After these two sections you might want to take a break before you tackle the rest of the document.

Once you've read and understood the **imbalance settlement** section you'll have a good working knowledge of the trading arrangements.

The **SVA** section refers to the Supply side of settlement. If you're a large Generator or a Non-Physical Trader you may want to skip over this section as it mainly applies to Suppliers and Embedded Generators.

The final section on **Payment and Credit** is particularly relevant if you're interested or involved in the financial side of electricity trading.

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Helpful Information

We've tried to explain all the terms we use in this document, but we've also added a **Glossary** at the back for reference.

1. Introduction

At a high level, the electricity market in Great Britain allows:

- Customers (like you and I) to choose the supplier of their choice;
- Suppliers to buy electricity to meet the demands of their customers from the generator(s) of their choice; and
- Organisations without a physical demand for electricity, or any means of generating electricity (e.g. Banks), to trade electricity. These are known as Non Physical Traders.

Suppliers, Generators and Non Physical Traders are all referred to as Parties in the BSC and throughout this document.

Electricity is generated, transported, delivered and used continuously in real-time, and supply must always match demand as electricity cannot be stored. Although the generation, transportation, delivery and usage of electricity is continuous, for the purposes of trading and settlement[1] electricity is considered to be generated, transported, delivered and used in half hour chunks called Settlement Periods.

For each half hour, those with demand for electricity and / or those with customers with demand for electricity (e.g. Suppliers) will assess in advance what the demand will be. They'll then contract with Generator(s) for that volume of electricity. Contracts can be struck up to an hour before the Settlement Period which the contract is for (this cut-off is known as Gate Closure and contracts can't be struck after this time). In the half hour itself, Generators are expected to generate and **deliver** their contracted volume of electricity and Suppliers are expected to **use** their contracted volume of electricity.

However, in the half hour (in real-time) some or all of the following can happen:

- Suppliers may have forecasted their electricity requirements incorrectly;
- A Generator may be unable to generate the contracted amount; or
- There may be problems with transporting electricity.

This means there's a requirement for real-time management to ensure that supply matches demand and to address any issues with transportation and delivery. This is the role of the System Operator (National Grid).

Generators with additional capacity (i.e. those that have not contracted for the full volume that they can generate in any half hour) can make that additional volume available to the System Operator and can set the price they wish to receive for that additional volume. Similarly, a Generator can state that it will reduce the volume being generated, and can set a price for reducing their generation.

Suppliers that are flexible enough can offer to reduce their demand to make additional volumes of electricity available to the System Operator and can set the price they wish to receive for that additional volume. Similarly, flexible suppliers can say to the System Operator that it will increase demand for a set price.

These are called **Bids and Offers**.

An Offer is a proposal to **increase generation** or **reduce demand**, and a Bid is a proposal to **reduce generation** or **increase demand**.

The System Operator will, in real-time, and as required, match supply and demand in each half an hour by accepting Bids or Offers depending on whether they need to increase or reduce electricity generation to meet demand.

[1] i.e. determining the amount of electricity used / generated and arranging payment for it.

Afterwards, metered volumes are collected for the half hour from Generators and Suppliers, and compared against their contracted volumes (which are adjusted for any Bids or Offers accepted). All Parties have their contracted volumes compared to determine whether the volumes they bought and sold match. Where the contracted volumes don't match the metered volumes, the following applies:

1. Where a Supplier has used more electricity than they contracted for, they must buy additional electricity from the grid to meet the amount used;
2. Where a Generator has generated less than they were contracted to, they must buy additional electricity from the grid to meet their contracted levels;

And vice-versa:

1. Where a Supplier has contracted for more electricity than they used, the Supplier must sell that additional electricity to the grid;
2. Where a Generator has generated more electricity than they were contracted for, then they must sell that additional electricity to the grid.

These differences are referred to as **imbalances**, and **settlement** is the process of calculating the volumes of imbalance and the prices to be paid for these imbalances. Settlement also works out other related charges and payments.

As more accurate data comes into Settlement we repeat the calculations on four occasions, spaced across 14 months, providing a more accurate picture of Settlement each time.

Imbalances are settled centrally, via a set of systems called the BSC Central Systems which are designed to perform this role. Imbalance settlement is a closed system for the money paid in and out, i.e.:

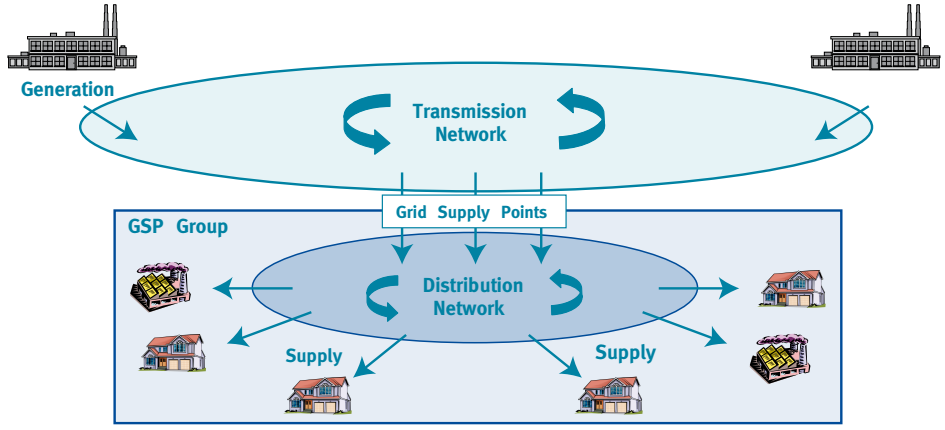
- Any surplus cash is redistributed amongst all Parties; and
- Any deficit is charged proportionally to all Parties.

Where any Party does not meet its imbalance charges (i.e. defaults on payment) for whatever reason, all the Parties pick up the cost proportionally. We have arrangements in place to prevent Parties from picking up the tab of a payment default. We estimate your imbalance exposure on a continuous basis and translate it to a monetary value. You're required to lodge credit in excess of this monetary value, so that should you default, the money owed can be recovered from the credit you've lodged rather than from other Parties. This 'credit cover' protects other Parties if you default.

2.The Trading arrangements in more detail

How is electricity transported?

You need to understand how electricity is transported to understand how it's traded and settled. The diagram below shows how the transportation network is split into two; the very high voltage Transmission Network (called the Transmission System) and the lower voltage Distribution Networks.



Transmission and Distribution Networks

Summary

The Transmission System is a very high voltage network that transports electricity throughout Great Britain – think of this as the 'national motorway transport system' for electricity. Large generation and demand are connected to the Transmission Network. The Transmission System is owned and operated by National Grid.

The Distribution Network comprises a series of lower voltage networks. Think of these as 'dual carriageways and A- and B-roads'. These align with 14 specific geographical areas where electricity is transported from the Transmission System to domestic premises, businesses and factories. Smaller scale generation (mainly renewable energy such as wind farms) is connected to the Distribution Network, these are called Embedded Generators. Each of these 14 areas is owned and operated by a Distribution Network Operator (DNO) – also known as a Licensed Distribution System Operator (LDSO).

Detail

The Transmission System has large generation (such as nuclear, gas powered or coal fired power stations) connected to it, and these Generators deliver electricity directly onto the Transmission System. Large industrial demand (such as steelworks and refineries) can also be connected to the Transmission System, and take electricity directly from the Transmission System.

The main purpose of the Transmission System is to deliver generation to the distribution networks. The connection between the Transmission and Distribution Systems is known as a 'Grid Supply Point'. For this reason, each Distribution System is referred to as a GSP Group.

Smaller generation (such as combined heat and power, wind turbines, solar power) is usually connected to the Distribution Network (rather than the Transmission Network), mainly as a consequence of the low volume output (relative to larger conventional types of generation), and the location of such (small scale) generation. This type of generation is referred to as Embedded Generation, as it is connected to, and **embedded** within the Distribution Network.

As explained above, the Distribution Network delivers electricity to domestic premises, small businesses and factories, i.e. mainly lower volume users. The Distribution Network is split into 14 areas within Great Britain, which correspond to discrete geographical areas (see diagram below). Although each Distribution Network is a separate geographical area, they aren't separate electrical systems. This means electricity can flow between areas, and metering is placed at the boundaries of the areas so that these volumes can be measured.

GSP Group	GSP Group Name
_A	Eastern
_B	East Midlands
_C	London
_D	Merseyside and North Wales
_E	Midlands
_F	Northern
_G	North Western
_H	Southern
_J	Southern Eastern
_K	South Wales
_L	South Western
_M	Yorkshire
_N	South Scotland
_P	North Scotland

The 14 GSP Groups

The British Transmission Network can also import and export electricity from and to other countries through dedicated lines called Interconnectors. There are currently two Interconnectors: France to Great Britain and Ireland to Great Britain.

The Retail Market

The retail market is the market for the sale and purchase of electricity between consumers of electricity (customers) and retailers of electricity (referred to as Suppliers). The current trading arrangements allow individual consumers of electricity (domestic premises, small businesses, large businesses etc.) – to choose the company (the Supplier) that sells them their electricity, i.e. it's a competitive market.

The retail market is a dynamic market, as customers can change their supplier as often as they wish.

The Wholesale Market

The wholesale market is the market for the sale and purchase of electricity between Suppliers (to meet the demands of their customers) and Generators of electricity. The current trading arrangements in the wholesale market allow Suppliers to buy the electricity they need to meet their customer's needs from the generating company of their choice, i.e. this is also a competitive market.

Competition is achieved through unrestricted bilateral contract trading, i.e. Suppliers buy electricity they need to meet the demand of their customers at a price they are willing to pay. Generators sell electricity at a price they are willing to receive for it, with the final price reached by negotiation or exchange trading..

Interaction between the wholesale and retail markets

What are Balancing Mechanism Units (BMUs)?

Throughout our documentation you'll see references to BM Units or BMUs; BMUs are the units used to represent all energy export and import in Settlement. There are specific BMUs assigned to each Party and we sum up their volumes and contracts, for each Party, when we carry out the Settlement calculations. **Click here** for an overview of what BM Units are and the different kinds that exist.

How is Electricity Traded?

Generators sell generation to Suppliers who need the generation to meet the demand of their customers. However, it is not only Generators and Suppliers who can contract for and trade electricity. There is a type of participant referred to as a Non Physical Trader that can also enter into contracts to buy and sell electricity.

A Non Physical Trader doesn't have any generation to sell or any customers to satisfy the demand of, and is therefore trading electricity for profit. The Non Physical Trader will buy electricity from a Generator at a negotiated price, and will sell it on to a Supplier, aiming for a higher price than it was paid for to make a profit. Most Non Physical Traders try to sell exactly what they have bought, this is referred to as not taking a physical position.

Suppliers and Generators also try to match their demand and generation, respectively, to their contract levels so that they do not have a surplus or deficit of electricity. This is one

of the key objectives of the trading arrangements in encouraging all participants to have contracts covering all of their generation and/or demand.

In practice, the following can happen:

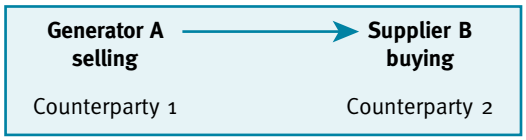
- Non Physical Traders may buy more or less energy then they have sold;
- Generators may physically produce more or less energy than they have sold; and
- Suppliers (through customer demand) may physically consume more or less energy than they have purchased.

These surpluses and deficits are referred to as **imbalances**, and the main purpose of the trading arrangements is to measure these imbalances and to determine the price at which the imbalance energy is to be settled at.

Generally, trading between participants takes a relatively standard form. An amount of energy is agreed for delivery over a specified period at some point in the future, at a certain price per unit (MWh) delivered. Contracts can be struck well ahead of delivery, sometimes years, right down to an hour ahead of delivery, when contracts are frozen (referred to as Gate Closure, explored in the next section). Each Party to a contract is referred to as a 'counterparty'.

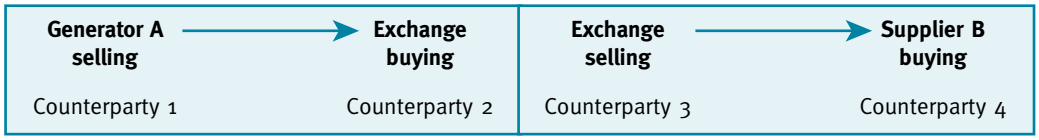
Contracts can be agreed between Parties and these are referred to as Over the Counter (OTC) contracts; illustrated below:

Over the Counter contract



Electricity can also be traded on a power exchange. Think of the power exchange as a shop for electricity, where sellers sell to the exchange and buyers buy from the exchange. This is all done anonymously so the buyer doesn't know which seller it is buying from and the seller will not know who has bought. Usually, the exchange does not seek to hold a physical position, i.e. it will always try and match sales to purchases.

Exchange Trading



Electricity is usually traded a long time in advance to cover the basic minimum amount needed to match demand. This is often referred to as 'baseload'. This tends to be contracted for bilaterally via OTC contracts, as it is usually the same amount of electricity for each half hour, day in day out. Power exchanges tend to be used to add 'shape' to the baseload volumes, i.e. 'fine tuning' baseload to meet the expected demand on a specific day. Therefore this 'shape' tends to be traded closer to the delivery time when the conditions at the point of delivery are better known, for example, the potential weather conditions on a day and/ or the television schedules (e.g. a particularly riveting episode of Eastenders may increase demand).

Settlement Periods and Gate Closure

What are Settlement Periods?

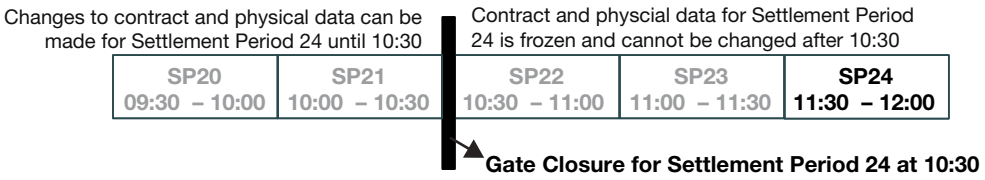
Electricity is traded in half hour 'chunks'. These half hour chunks are referred to as Settlement Periods. Each day (Settlement Day) is split into 48 Settlement Periods, with Settlement Period 1 equivalent to 00:00 to 00:30, Settlement Period 2 to 00:30 to 01:00, Settlement Period 3 to 01:00 to 01:30 and so on, through to Settlement Period 47 (23:00 to 23:30) and Settlement Period 48 (23:30 to 00:00). Settlement Periods always refer to **local time** (whether this is GMT or BST).

Each Settlement Period is settled in isolation from the Settlement Periods around it. This means that all information used in the settlement calculations must be at Settlement Period level which includes metered data, contract data, and physical data.

What is Gate Closure?

The trading arrangements are designed so that at some point before real-time, contracts are frozen/finalised, i.e. at a certain point it is no longer possible to change contracted volumes for a half hour (Settlement Period).

The point of time that the freeze / finalisation occurs for a Settlement Period is called Gate Closure. After Gate Closure, forward looking data for the Settlement Period, such as physical information to the System Operator and contract volumes, cannot be changed. Gate Closure is currently set **one hour** ahead of the Settlement Period which is illustrated below:



Gate Closure for a Settlement Period

The reason for having this freeze / data finalisation at Gate Closure, before real-time delivery, is so that Generators[2] can finalise their physical outputs, with their contracted volumes in mind, and notify their expected output for each Settlement Period to the System Operator (National Grid).

The System Operator has its forecast of demand for the Settlement Period, which it compares against the physical data submitted by the Generators. This data is used to determine whether there is likely to be a surplus or deficit of electricity in the Settlement Period. This helps the System Operator to plan how it is going to match generation to demand. There is more detail on this in the following section.

After Gate Closure, Parties are expected to adhere to the physical data submitted to the System Operator and to the contracted volumes submitted before Gate Closure. They should only deviate from this position at the instruction of the System Operator.

How do I notify contracts?

Once bilateral contracts are agreed, they need to be notified to the Central Systems so these volumes can be factored into the imbalance calculations.

Bilateral contracts are notified via contract notifications to our Central Systems.

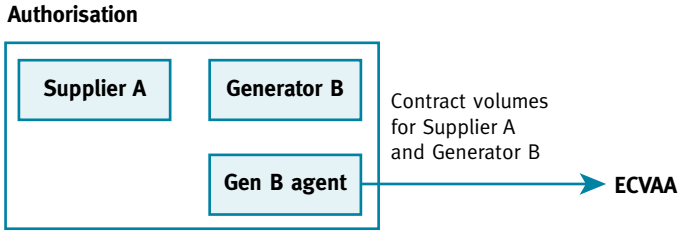
Contract notifications are a sensitive area of the trading arrangements as they determine your imbalance exposure. Errors or incorrectly notified contract volumes can have a large financial impact, so great care must be taken to get systems and processes in place to ensure that you can notify correctly. The trading arrangements are deliberately designed so that the responsibility for correctly notifying sits with Parties, and we assume that any notifications we receive are correct.

[2] Suppliers also provide finalised information relating to their expected demand for a Settlement Period. However, this is mainly used for the System Operator's national demand forecast.

You're required to submit your contract volumes via a Notification Agent. To ensure that a Notification Agent is 'allowed' to submit contract volumes on your behalf, you must 'authorise' the Notification Agent within the Central Systems so that we only accept notifications from authorised agents. This minimises the potential for malicious or erroneous notifications to be made by an agent.

The Notification Agent is usually one of the counterparties of the contract, but can be an independent Notification Agent, if you've provided them with authorisation. Where contract volumes are traded over an exchange, the exchange has an in-house Notification Agent function. As part of the sign-up process for using the exchange (and a prerequisite for use), you must authorise the exchange to act as a Notification Agent on your behalf.

For most contracts, two Parties nominate one Notification Agent to notify on their behalf. These Parties will authorise the notification agent they have nominated. This agent can submit contract notifications for these Parties for as long as the authorisation stands. The Parties can time limit the authorisation, and can terminate it at any time. In the following diagram, Supplier A has bought electricity from Generator B, and they have nominated Generator B's Notification Agent to submit contract notifications on their behalf:



Notification Authorisation

You can have more than one agent authorised for submitting notifications against the same pair of Parties. Each requires a separate authorisation, but there is no limit to the number of agents that can be authorised to notify on behalf of two Parties.

Contract notifications for a Settlement Period must be received by Gate Closure. You can change the contract volumes that we hold for you right up to Gate Closure by overwriting previously notified volumes with new ones, or adding to previously notified volumes.

Contract volumes can be notified for any period of time, from an individual Settlement Period, to an 'evergreen' notification (one with no end date, so the notified volumes are the same for every Settlement Period included in the notification, for every day into the future). Where a notification covers more than one day, the contract volumes will be the same for every Settlement Period included in the notification, for every day in the date range specified.

We provide the following reports and system to assist you in determining the contract volumes we hold:

- **Acceptance Feedback Reports:** tell you that the contract has been received and processed;
- **Rejection Feedback Reports:** tell you that a contract has been rejected and why;
- **Daily Notification Report:** received at the end of the day which shows all of your contracts for that day;
- **Forward Contract Report:** provided at specified times during the day and shows you the contracts that you hold for today and the next seven days; and
- **The ECVAA Web service:** this allows you to view your contracts in a user-friendly format. It can also be used by Notification Agents to amend existing, or submit new contracts.

You're responsible for ensuring your contract volumes submitted are correct. Where errors are discovered in the volumes submitted, you can either amend them (before Gate Closure), or, where Gate Closure has passed, accept the consequences of the error.

We're responsible for ensuring that our Central Systems are always available. If there is any maintenance required, we'll notify you at least seven days in advance. If there is an unplanned outage that prevents you from submitting contracts, you'll be able to submit these contracts post-event.

Imbalance Settlement: How does it work?

Parties with demand, contract ahead of time for a volume of generation to meet their demand. Generation is delivered to contracted levels and the demand is met. Those that don't deliver their contracted levels are penalised for non-delivery under the terms of the contract. If you underestimate your demand, you are short of electricity, and those that overestimated would have a surplus.

However, for the reasons below, electricity can't be traded or contracted for like a 'normal' commodity. Electricity is delivered onto the Transmission System in real-time by Generators. Once it is on the system it is taken 'indiscriminately' by demand, i.e. generation goes where the system needs it to go, rather than directly to (and only to) the customers of the Supplier that contracted for it.

Also:

- Electricity can't be stored, and must be generated, delivered and consumed instantaneously and continuously in real-time;
- Delivery of electricity can be impacted by system constraints (i.e. using the motorway analogy, a traffic-jam may require generation to be stopped in one area and increased somewhere else to get round the jam and ensure delivery of electricity);
- Electricity isn't delivered directly from the generator to the contracted demand. If you're a Supplier and you've contracted with a generator, there is no direct feed of electricity from them to your customers. The generator puts electricity on to the Grid and your customers take it off;
- Electricity is not metered in real-time, so delivery and demand, via metered volumes, must be identified after the event; and
- Demand is not fixed ahead of time. It is dynamic and responds to external factors such as the weather, so it is easy to get the required level of demand wrong and over- or under-estimate.

These factors mean that there are two related processes needed:

1. The System Operator needs to balance the system, i.e. match supply to demand and alleviate transport constraints, and;
2. Imbalance settlement to ensure that electricity volumes over or under contracted for are settled.

We'll cover these two points in the next section.

3. Imbalance Settlement

How is the System balanced?

The System Operator's role is to balance the system in real-time, ensuring that supply meets demand at all times, and alleviates any transmission or delivery issues on the Transmission System (the high voltage network).

The System Operator has a range of services to assist in balancing the system, and will try to balance the system in the most efficient and economic manner possible.

When a balancing action is taken, the following must be considered:

- The cost of calling upon this balancing service;
- The systems technical limitations (i.e. can this generation/demand be dispatched/taken from where it's needed?) and;

- Is the plant able to ramp up quickly enough to meet the requirement?

The System Operator looks at all the balancing services that can meet these requirements, and selects the cheapest option. For example if a quick reaction is required, a pumped storage hydroelectric plant may be called upon as it can ramp up quickly to full output. This may be the case even if there are other cheaper options available, because they can't ramp up as quickly and meet the requirements.

These balancing actions / services fall into three categories:

- **Ancillary and Commercial Services:** This includes Reactive Power, Frequency Response, Black Start and Reserve Services. **Click here** for more details on these services.

  In most cases, the System Operator will contract for these in advance, by dealing directly with the Party.

  These services are considered system balancing services, i.e. services used to alleviate transportation issues, or transmission system problems (rather than to meet the energy differences between supply and demand).

- **Contract Notifications Ahead of Gate Closure:** The System Operator can buy and sell electricity ahead of Gate Closure (like a standard contract notification). Depending on whether there is likely to be a shortage of electricity or a surplus, it may choose to contract with Parties for the electricity it believes is needed ahead of Gate Closure.

  There is a special kind of contract called a Pre-Gate Closure BM Unit Transaction (PGBT) which provides electricity in a profiled way across the Settlement Period (i.e. specifying the volumes it wants on a minute by minute basis across the Settlement Period). For more details, **click here**.

  The above are for system balancing purposes. The volumes and costs are provided into Settlement to reflect this differentiation. This data is referred to as **Balancing Services Adjustment Data (BSAD)** and feeds into working out the prices for Imbalance Settlement.

- **Bid – Offer Acceptances:**

  Bid – Offer Acceptances are instructions from the System Operator to a specific BM Unit to increase generation / reduce demand (Offer) or to reduce generation / increase demand (Bid). To remember the difference, it's easiest to relate them to an auction: a **Bid** is when you're buying electricity (increasing demand or decreasing generation) and an **Offer** is when you're selling electricity (increasing generation or decreasing demand).

  Bid – Offer Acceptances are only made after Gate Closure for a Settlement Period. This system of Bids and Offers is called the **Balancing Mechanism**.

  If you want your Bid – Offer Acceptances to be considered, your BM Units are obliged to submit physical information to the System Operator ahead of Gate Closure. You must submit the expected generation or demand for a Settlement Period. This is called a **Physical Notification**. At Gate Closure this becomes the **Final Physical Notification (FPN)**.

  You must also submit **Bid – Offer Data**. This indicates that your BM Unit can move away from its FPN after Gate Closure in return for payment. Bid – Offer Data is a set of prices and volumes, sometimes referred to as a Bid – Offer ladder.

How do Bids and Offers work?

An Offer Price indicates the price you want **to be paid** per MWh for an increase in generation or a decrease in demand, and a Bid Price indicates the price you're willing to pay per MWh for a decrease in generation or an increase in demand.

We'll use the example of a Generator to explain why it's this way round:

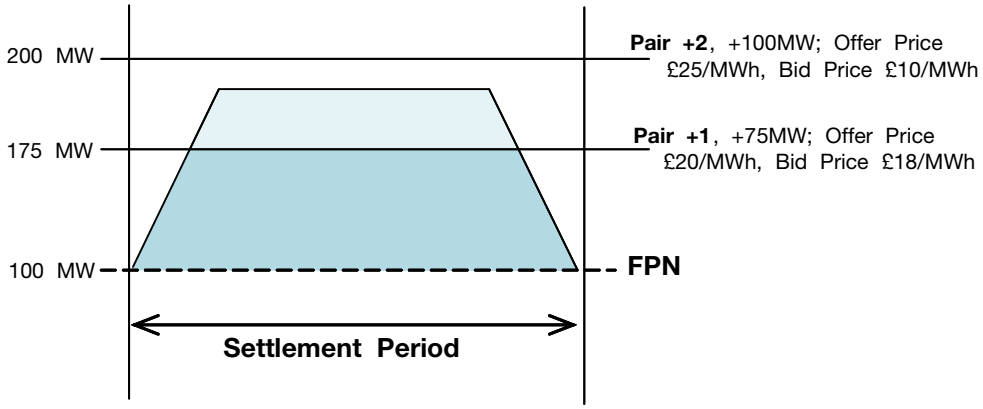
A Generator is paid for increasing generation (Offer) as there is a fuel cost for increasing output and the Offer Price should cover this cost.

A Generator pays for decreasing generation (Bid) due to the fuel cost savings received.

A Bid-Offer Acceptance will take you away from your contracted position but will not affect your Settlement position, as Settlement takes Bids and Offers into account.

An example Acceptance

When the System Operator wants to make a Bid – Offer Acceptance on your BM Unit, it will contact you directly. The Acceptance information is a set of 'spot points', which represent the change in output away from FPN, i.e. the output level (in MW) to move to, and the time the System Operator wants the BM Unit to be at this level.



Example Bid – Offer Acceptance

The System Operator will typically always issue an Acceptance which returns to FPN at the end, this ensures that you're not exposed to imbalance, in the next Settlement Period, for delivering the Bid – Offer Acceptance.

Why are there two prices?

Let's look at 'Pair +1' in the diagram above.

The Offer price is what the System Operator must pay (per MWh) to increase generation within this band. The associated Bid price can be seen as an 'undo' option. If the Offer has already been accepted, this is the price National Grid will be paid per MWh to undo the acceptance. There's usually a difference between the two, which ensures that if your Bid or Offer is accepted and then undone, you'll still have made a profit.

What data do we use in Settlement?

Settlement calculations are performed for each Settlement Period of every day. We use data from various sources to determine a set of trading charges. Although the calculations are performed for each Settlement Period in a day (00:00 to 00:00), the calculation results are 'rolled' up to be charged at a daily level.

To perform the settlement calculations (to see how much each Party owes/ is owed), we need the following information:

1. **Information from the System Operator;**

   The System Operator provides the following information about the actions it has taken to balance supply and demand:

- The Final Physical Notification (FPN) for each BM Unit that provided one (this is an indication of how much you intend to generate/consume for each half hour);
- The Bid – Offer Data for all BM Units: the Bids and Offers and associated prices submitted;
- Bid – Offer Acceptance data: details of the Bids and Offers Accepted by the System Operator; and
- Balancing Services Adjustment Data: **click here** for details on how BSAD is calculated.

2. **Metered volumes**

   We have data to calculate the metered volumes for all BM Units, except Interconnector BM Units.

   Metered volumes for Interconnector BM Units are derived by the Interconnector Administrator[3] for each Interconnector.

3. **Registration data**

   We hold registration data for all Parties, such as your BM Unit information. We also need to know who owns which BM Unit to ensure the correct Party is charged.

4. **Contract Notifications**

   We aggregate all the contract notifications received and determine the contract volumes to be applied to each Party.

5. **Market Index Data from Market Index Data Providers**

   Part of the Energy Imbalance Price calculation uses data from power exchanges. Information on the costs and volumes of contracts traded close to Gate Closure (currently two to three days out) is provided by the forwards and spot markets. This data is called Market Index Data and power exchanges are classed as Market Index Data Providers.

We use all of the above data to calculate the Settlement charges for each Party.

How are the Settlement Calculations carried out?

We use the data above to determine a set of daily trading charges for each Party. **Click here** for a breakdown of all these charges and how they are calculated.

For all of these charges, a positive charge represents a **payment to** the Party, and a negative charge represents a **payment from** the Party.

The results of these settlement calculations are published in the Settlement Report provided to each Party after each settlement run. The settlement report contains the information that you would need to 're-run' the calculations and verify your trading charges.

How do we calculate the imbalance prices?

Click here for a detailed explanation of how we carry out the pricing calculation, the parameters involved and what data feeds into the calculation. One price is based on the accepted Bids and Offers, whilst the other is based on Market Index Data

How do we calculate Energy Imbalance Volumes for Parties?

Your imbalance position is simply your metered volumes compared to the contracted volumes. The contracted volumes are adjusted for any accepted Bids and Offers or delivery of Balancing Services.

An imbalance volume is a surplus or deficit of your metered volume that was not contracted for.

The Energy Imbalance Prices are designed so that you're motivated to forward contract and cover your generation/demand. This is a financial incentive for you to adhere to the physical information you've provided to the system operator (FPNs) and the contracts you've notified.

Here's how we calculate your Energy Imbalance:

1. First we calculate your energy volume by adding up the metered volumes for each BM Unit per Settlement Period. We adjust this for any losses that occur in transporting the electricity (**click here** for more details on Transmission Losses);
2. We then calculate the volume delivered as balancing services (e.g. Bids and Offers) for each BM Unit and sum these volumes over all BM Units for the Settlement Period;

[3] The Interconnector Administrator apportions the metered volume flowing over the interconnector to those Parties that are contracting for it.

3. We already hold your contract information to be used in the calculation; and

4. The final sum is:

Energy Imbalance Volume = Energy – (Balancing Services + Contracts)

This results in a positive or negative volume of imbalance.

A negative imbalance volume means that you've under-contracted and are therefore short of energy. A positive imbalance volume means that you've over-contracted and are therefore long on energy.

We calculate the imbalance volumes for all Parties, for every half hour.

How do we calculate the Imbalance Cashflows?

Once we know your imbalance positions, we can calculate your cashflows by using the following calculation:

Energy Imbalance Cashflow = Imbalance Volume x Imbalance Price

- If you've used more electricity than you contracted for, then you have to buy additional electricity from the system and you're charged at System Buy Price.
- If you've generated more electricity than you contracted for, you have to sell the additional electricity to the system, and you're paid at System Sell Price.

The table below should make it clearer:

	Supplier	**Generator**
System Sell Price (SSP)	Paid if you under-consume	Paid if you over-generate
System Buy Price (SBP)	Pay if you over-consume	Pay if you under-generate

How system prices are allocated

We sum up your charges per day, add VAT charges and then invoice you for these charges (you get paid if your imbalance is negative).

What Settlement information do we publish?

A large amount of information relating to the electricity market is published on **www.bmreports.com**, which is updated in real time and contains everything from pricing to forecast data.

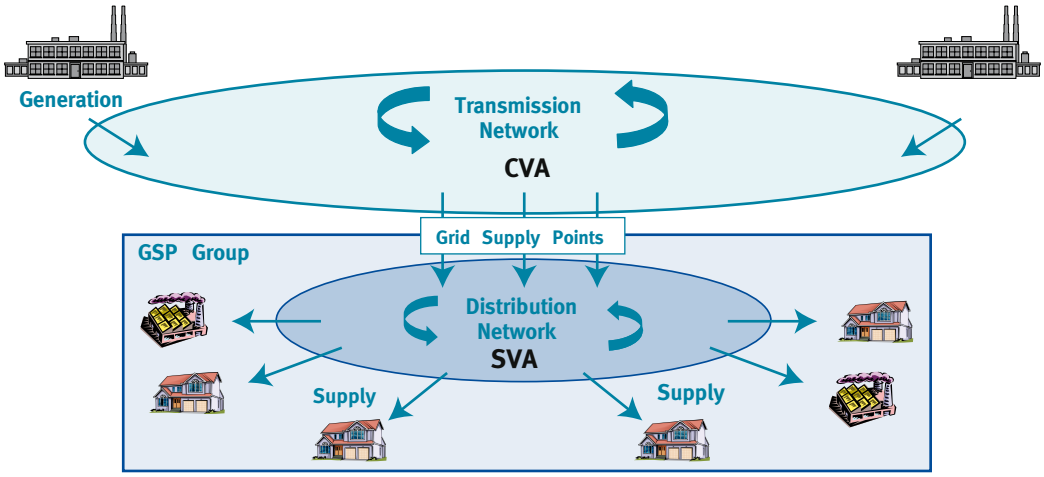
The information provided is as comprehensive as possible to ensure that you have sufficient information to inform your decisions, short and long term, such as contracting strategies, operating strategies, risk management etc.

If there are any operational notices, e.g. unplanned outages, changes to parameters involved in the pricing calculation etc., then we'll publish them on the **BSC Portal**.

4. Supply (SVA) and connected to the Grid (CVA)

What's the difference?

Any BM Unit that is connected to the Transmission Network (e.g. a large coal plant or a steel works) is part of the CVA market. BM Units connected to the Distribution Networks (e.g. a Supplier's customers in that area or an Embedded Generator) are normally part of the SVA market. This is illustrated below:



CVA and SVA

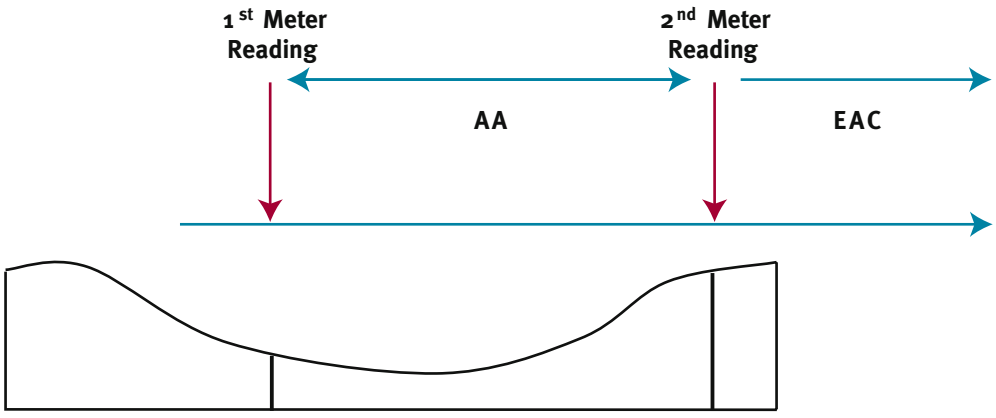
All CVA sites are half-hourly metered. This data is collected every half hour and feeds directly into the Settlement Calculations. All SVA data also goes into Settlement, but through a more indirect route.

We're unable to provide actual half-hourly metered data for all SVA sites, as not all SVA sites are half-hourly metered. The vast majority of SVA sites have non half-hourly (NHH) meters and are read less frequently; for example a domestic residence (your home) may have its meters read only once or twice a year.

Sites with higher consumption must be metered half-hourly, whilst sites that fall below this threshold (this includes most houses) have no such requirement upon them so are usually non half-hourly (NHH) metered.

How is NHH Consumption Measured and Estimated?

Even though NHH meters are read less frequently, a value for each half hour is needed to enter into Settlement. Where actual data is available, this is called an Annualised Advance (AA), and where no metered data is available we calculate an estimated actual consumption (EAC).



An AA and an EAC

In the above example there's an AA (actual data) between the two meter readings, but this is a cumulative volume and not split by half-hour which is required for Settlement). To split this data into half-hour chunks we need to 'profile' the meter's consumption into half hours.

Profiling

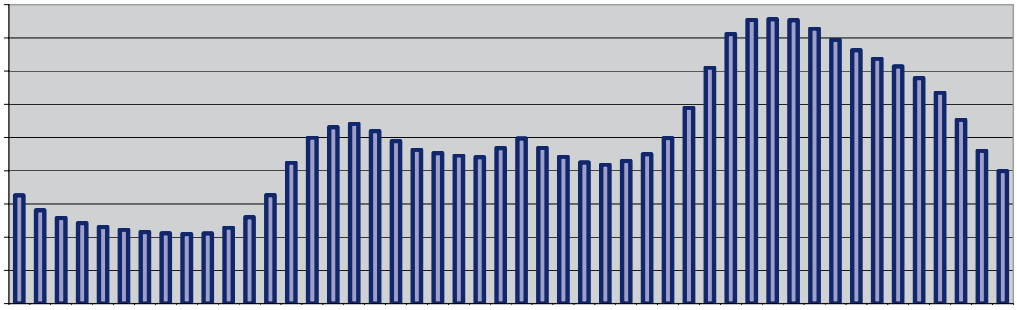
All NHH meters are classified into one of eight Profile Classes. Profile Classes 1 and 2 are for domestic premises and classes 3 to 8 are for non-domestic premises. We place sites into a Profile class according to its pattern of electricity usage and the type of meter that's installed.

We create Profiles for each of these Profile Classes by randomly selecting sites and installing half-hourly meters at these sites. This data is seen as representative of all meters in this Profile Class.

The profile for a meter is used to estimate what a meter would have consumed for any given half-hour for a year. This value is presented as a fraction of yearly consumption and is called a Profile Coefficient. It is then multiplied by the yearly consumption (using EACs and AAs) to provide a volume for that half-hour. As these are yearly fractions, the Daily Profile Coefficients for a year should add up to 1 for each meter.

Put simply, how much electricity is consumed in this half hour, when compared to the consumption for the whole year?

This volume is put forward as the meter's actual (if derived from an AA) or estimated (if derived from an EAC) volume for that half-hour and is entered into Settlement.



An example of the yearly Profile for a Profile Class 1 meter

How does this data get into Settlement?

Every NHH meter in Great Britain is the responsibility of a Supplier – the company that sends you your electricity bill. This Supplier appoints various Supplier Agents to install a meter and collect this data and process it into Settlement. The three Supplier Agents that need to be assigned for each meter are:

- The Meter Operator (MOA) installs and maintains the meter;
- The Data Collector (DC) retrieves this data and calculates the EACs and AAs; and
- The Data Aggregator (DA) sums up the volumes (EACs and AAs) for each Supplier. The DA sends this information into Central Systems.

A Supplier Agent can be all three of the roles above and can also be a subsidiary part of the Supplier's company.

We apply the Profiles to the readings and provide the half-hourly consumption for each meter. This is grouped by Supplier and split into the 14 geographical areas (GSP groups).

Does it all add up?

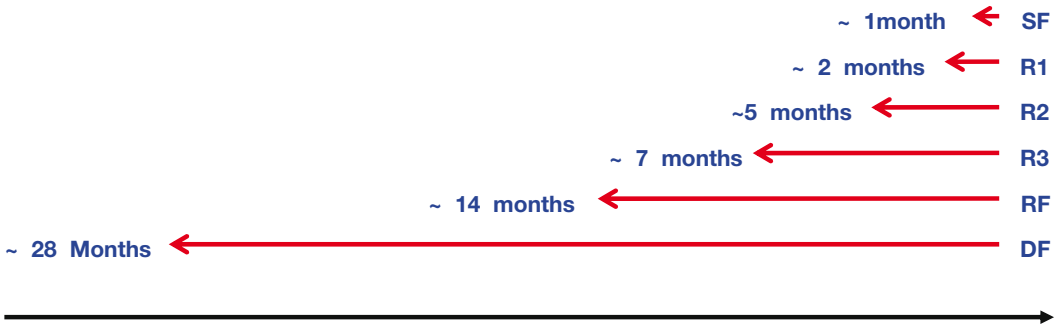
As a lot of Supplier data is estimated there can be discrepancies. We meter all the electricity that flows into a GSP Group so this value is accurate. However, the consumption data is estimated and doesn't usually match up.

To make sure that all this electricity is accounted for, we adjust all the NHH meters' consumptions up or down as required. The number we have to multiply them by is called the GSP Group Correction Factor or GCF for short. **Click here** for an explanation of how it's calculated.

5. Payment and Credit

When do Parties pay/get paid?

Settlement Runs are carried out in line with the **Settlement Calendar**. The figure below provides an approximation of how long after real-time (known as the Settlement Date) each run is carried out.



The timing of Settlement Runs in relation to the Settlement Date

These runs can only occur on Working Days and there is a separate run for each Settlement Date. Parties either pay or are paid for their imbalances resulting from these runs.

In addition to the runs above, an Interim Information (II) Run is also run at five Working Days after the Settlement Date. The II Run is for information only and no Parties are charged/credited after this run. This run uses all the data we have so far, so SVA data is based on estimated data.

After the SF Run (and all later runs), invoices are generated and sent out to all Parties. The payment date for the SF run is always 29 calendar days after the Settlement Date in question.

What's the purpose of Reconciliation Runs?

Nearly all half-hourly meters (measured every half-hour) will have accurate data before SF but the domestic meters are only read, at most, twice a year. For all non half-hourly meters that have not been read before SF (the vast majority), the volumes are estimated and entered into Settlement. As time passes, the actual volumes will start to come in and replace the estimates. This results in a more accurate picture of Settlement at each Reconciliation Run.

There are four Reconciliation Runs (R1, R2, R3 and RF) and these Runs provide a continually clearer picture of Settlement at spaced dates after the Settlement Date. The target is for all Suppliers to have read 97% of meters by RF. The Reconciliation Runs should be thought of as improving the accuracy of Settlement each time. We generate invoices and Settlement Reports for each Run.

If any volumes at RF are still under dispute then another run can be carried out when the corrected data has been received. Any Party can raise a Dispute but it's the decision of the **Trading Disputes Committee** as to whether this Run goes ahead.

Why Lodge Credit?

The initial Settlement Run (SF) needs to be paid 29 days after the actual Settlement Date (when the flow of electricity actually took place). This means that, hypothetically, you could rack up debts for 29 days and when payment is due, declare that you're unable to pay / declare bankruptcy. If this happens, all other Parties need to make up for this payment.

To prevent this from happening, all Parties must lodge enough funds to cover their potential indebtedness for this 29 day period (known as Credit Cover). **Click here** to find out how we calculate your indebtedness and how much credit cover you need to lodge.

6. Glossary

Confused by the terms we use in this document? Here's a list of them and what they mean:

Term	Definition
Annualised Advance (AA)	An actual metered volume obtained from a non half hourly meter.
Balancing and Settlement Code (BSC)	The Code, whose rules govern the electricity settlement and trading arrangements.
Bid	An indication that you are willing to decrease generation or increase demand for a set price.
Bid-Offer acceptance	An acceptance of a Bid or Offer by the System Operator.
Central Volume Allocation (CVA)	The transmission network and all generation and demand directly connected to it.
Contract Notifications	An agreement to purchase or sell electricity, which has been submitted to our Central Systems.
Counterparty	One of the two Parties of a contract notification.
Credit Cover	The amount lodged with us by a Party to cover its potential indebtedness. This covers the 29 days until payment is due.
Customers	The end users of electricity (e.g. you and I).
Distribution Network	One of 14 low voltage networks that transport electricity locally.
Energy Imbalance Cashflow	The monies owed by/to a Party. Calculate by multiplying Energy Imbalance Price by Energy Imbalance Volume.
Energy Imbalance Price	The Price paid by/to a Party for each MWh of Energy Imbalance Volume. Charged at either System Sell or System Buy Price.
Energy Imbalance Volume	The difference in energy between your contracted and actual demand/generation.
Estimated Annual Consumption (EAC)	An estimated metered volume for a non half hourly meter.
Final Physical Notification (FPN)	An indication of your generation/demand submitted to the System Operator.
Gate Closure	The time, for each half hour, after which no contracts may be submitted or altered. Currently set at one hour.
Generators	Companies, or power plants, that produce electricity that they then sell.
Grid Supply Point (GSP) Group	One of 14 discrete geographical areas that the distribution network is split into.
Imbalance	The difference between your contracted and your actual trading position.
Interconnectors	Connections between two separate transmission networks (e.g. France and GB).
Market Index Data (Provider)	Short term trading data from a Power exchange, provided by a Market Index Data Provider.
Non half hourly (NHH)	Usually refers to meters that are measured less often than once every half hour, possibly once or twice a year.
Non-physical Traders (NPTs)	Companies that trade electricity but have neither customers nor generation.

Term	Definition
Offer	An indication that you are willing to increase generation or decrease demand for a set price.
Parties	Any company that has signed up to the Balancing and Settlement Code (BSC).
Profile Class	Eight classes that all non half hourly meters are placed into, dependant on their consumption pattern and the metering equipment.
Profiling	The use of cumulative and estimated consumption data to estimate the consumption for each half hour.
Settlement	The process of working out the amount of electricity used / generated and arranging payment for it.
Settlement Run	A calculation or re-calculation of Settlement at various points after the actual date. There are 6 Settlement Runs (II, SF, R1, R2, R3, RF and DF).
Supplier Volume Allocation (SVA)	The distribution network and all generation and demand connected to it.
Suppliers	Companies that purchase electricity to meet the demands of their customers.
System Operator	The company responsible for ensuring demand meets generation at all time throughout Great Britain. National Grid is the System Operator.
Transmission Network	The high voltage grid for delivering electricity throughout GB.