UK GBC

The voice of our sustainable built environment

REPORT 2

RENEWABLE ENERGY PROCUREMENT

Options available in the market

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ADVANCING NET ZERO

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UKGBC PROJECT TEAM

AUTHORS
Tom Wigg
Emily Dodkin

EDITORS
Smith Mordak
Yetunde Abdul
Brooke Penman

RENEWABLE ENERGY PROCUREMENT WORKING GROUP

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ACCLARO ADVISORY
Brenda Sullivan

AMBER
Nick Proctor

AMPERSAND
Greg Borel

BURGES SALMON
Emma Andrews

BURO HAPPOLD
Ben Richardson

CBRE
Rebekah Needham

DERWENT LONDON
Samantha Carlsson

GROSVENOR
Andy Haigh

HOARE LEA
Laurence Johnson

JLL
David Mead

LANDSEC
Andy Mazzucchelli

LOW CARBON ALLIANCE
Simon Crowe

MACFARLANES
Alexander Crockford

SAVILLS
Phil Pearson

STANHOPE
Nils Rage

SYZYGY
Kirsty Berry

THE CROWN ESTATE
Kyle Gray

TURLEY
James Blake

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ADVANCING NET ZERO PROGRAMME PARTNERS

PROJECT PARTNERS

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OPTIONS AVAILABLE IN THE MARKET

SECTION 2.0
INTRODUCTION

This report is the second in a series of four guidance documents on the topic of renewable energy procurement. Reports 1 to 3 focus on the 'How', giving practical advice, recommendations, and tools to enable built environment stakeholders to make informed procurement decisions that support the electricity system's decarbonisation. Report 4 explores the 'Why', providing the rationale behind the guidance and summarising the role of the built environment in enabling a net zero carbon energy sector.

There are many routes through which built environment stakeholders can procure their electricity. The accessibility of these routes to different consumers varies substantially, and each contributes differently to decarbonising the grid. This report summarises the various procurement routes available in the market and the factors that may affect a built environment stakeholder's ability to engage in them. It also describes the range of Power Purchase Agreement (PPA) variants available and introduces relevant guidance when considering a direct contract with a renewable generator. Guidance on green gas is also transposed from the v1 guidance.

SECTION 2.1
FACTORS AFFECTING AVAILABLE PROCUREMENT ROUTES

Organisations procuring energy for real assets are varied, ranging from SMEs occupying a space in a multi-tenanted office to asset owners managing a property portfolio. These variations impact a stakeholder's ability to access the range of different procurement options available.

Some of the key factors that might affect this access to certain procurement options are summarised in Table 1, along with simple guidance which may help a stakeholder understand how their characteristics could impact the options available to them.

TABLE 1:
Summary of some of the key criteria affecting the procurement options available to corporate customers.

FACTOR	DESCRIPTION	GUIDANCE
Energy demand	Size is one of the biggest determinants of access to certain energy products. Some products require a threshold demand to make engaging a customer worthwhile. Likewise, customer influence is also linked to size. Similarly, there may be an upper limit on procurement volume for some options.	Work to understand your anticipated supply volume (based on historic meter readings or energy modelling) and engage with energy suppliers to explore how this might affect your options. For larger customers, it may be beneficial to appoint an energy consultant, broker, or procurement specialist to assess the potential for alternatives to tariffs from an energy supplier or if a combination of options might be most appropriate.
Location	On or near site options require a building's context to be suitable for siting a generator offsite – either by purchasing it or contracting it via a PPA – must consider the location's context and grid's capacity to accommodate new generation.	Appoint a consultant to advise on the suitability of any on- or near-site measures. For new offsite generators purchased or contracted via a PPA, your appointed developer should advise of any locational opportunities or constraints.
Periodicity of procurement	Some procurement options require engaging in long-term contracts of 5, 10, or up to 25 years. Therefore, the willingness of a business to commit to such timescales can influence their ability to engage with certain strategies. For example, if a tenant's lease would expire before the end of the procurement commitment.	Confirm the minimum and maximum length of any procurement commitments the building or organisation is willing to make prior to engaging with the market.
In-house expertise	Often linked with size, the larger the organisation, the more likely they will have the expertise in-house to proactively engage in the relatively complex energy market.	For smaller organisations with limited in-house expertise, it may be worthwhile to appoint a procurement specialist or broker on your behalf to best advise on how to secure the most effective option. For larger organisations, ensure your procurement team is staying abreast of legislative and market changes that may impact the procurement landscape.

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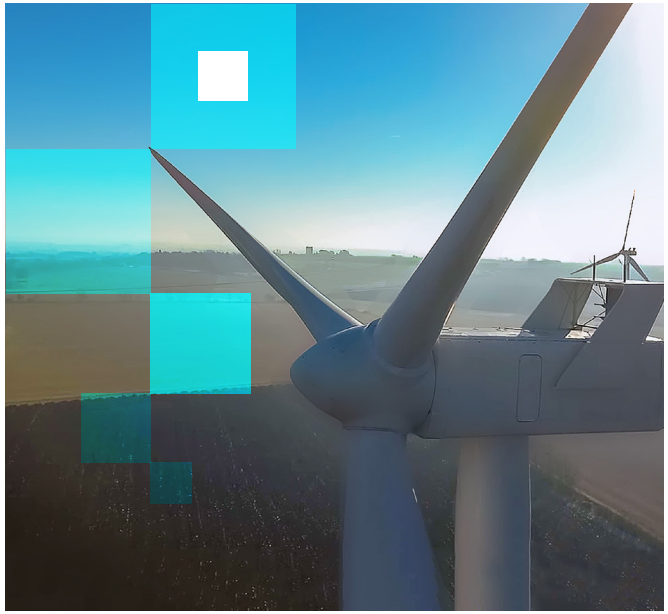


TABLE 1:
Summary of some of the key criteria affecting the procurement options available to corporate customers.

FACTOR	DESCRIPTION	GUIDANCE
Shape of demand and onsite generation/ storage	Some procurement options require a consistent/ stable demand profile, as the contract is based on a commitment to offtake a given amount of power. Similarly, the shape of the demand may need to be compatible with the generation type(s) being secured, though onsite storage can overcome some of these issues. Onsite generation is also a consideration, as the procurement route needs to accommodate any energy which may be exported. In any case, higher resolution tracking of energy consumption is likely to enable a greater range of procurement options.	Install half hourly meters on all assets and collect this consumption data. Your procurement team or an appointed energy specialist can use this information to determine the option or suite of options for a given asset or portfolio that is likely to be most cost efficient and most robustly meet the principles of this guidance, to support engagement with the market.
Corporate policies	Many organisations have corporate policies relating to energy procurement, or policies which can influence energy procurement options (e.g., modern slavery policies can impact the ability to procure electricity from certain solar farms).	Establish any red lines and engage with energy suppliers to understand how the performance of their products aligns. Suppliers may be willing to explore alternative options (e.g., supply a different supply mix) to support specific corporate policies, if required.
Credit-worthiness	Many procurement routes require a certain level of creditworthiness to engage with them. For some routes this threshold can be very high, precluding many customers which would otherwise be considered to have good credit.	If wishing to engage in a procurement route that requires a given level of creditworthiness, understanding how your organisation performs against these thresholds is the first priority. If you do not meet the given requirements, explore alternatives which may reduce the credit risk (such as basket products).
Market volatility and availability of products	In some cases, particularly in the current energy climate and with the rapid rate of change in the energy sector, the availability of some products is reduced or the products are still emerging. Irrespective of the customer, products demonstrating the desired characteristics may not be available.	Engaging in longer term contracts with some level of price security can help hedge against market volatility. Novel or emerging products will be driven by demand, and the tools in this guidance document can be used to engage proactively with the market to send coordinated demand signals for higher quality products to suppliers.

SECTION 2.2 PROCUREMENT OPTIONS AVAILABLE

Before considering the specific procurement options available, it is useful to understand the fundamental differences between the electricity purchasing models currently present in the market. These are outlined below.

Additional detail on engaging in Power Purchase Agreements (PPAs), including their variants and the pros, cons, and key considerations can be found in Section 2.3.

ELECTRICITY PURCHASING MODELS

Onsite vs offsite

This distinction refers to whether the procurement route makes use of "onsite" or "behind the meter" installations or whether the electricity will be delivered to the customer via their grid connection (from their licensed electricity supplier).

Whether onsite procurement is an attractive procurement route will depend on a number of factors, but a key consideration is whether the customer has space available to accommodate a renewable generator onsite, or there is space nearby of which a third-party generator can make use to provide a private wire connection.

A "behind the meter" solution also has the advantage of reducing the amount of electricity that the customer needs to import from the grid, meaning that the customer will not need to pay the non-commodity costs associated with electricity supplied by a licensed supplier.

Physical delivery vs virtual

Many procurement routes involve the physical delivery of power to the customer, either via a private wire connection or via import from the grid. However, some are "virtual" (i.e., the customer instead agrees a price with a generator for the power that they generate and export but continues to receive physical supply from their licensed supplier).

Bespoke/customer-led arrangement vs a standard product from a licensed electricity supplier

A number of the procurement routes set out in this section require the customer to take individual action, outside of the procurement of an electricity supply from a licensed supplier. This gives the customer more autonomy, but also requires additional resources and effort on the customer's part and can mean taking on risks and liabilities that are not part of the customer's core business.

Despite this, licensed electricity suppliers are seeing rising demand for products that align with customers' net zero objectives, and there is a growing range of tariffs and other products on the market seeking to fulfil that demand.

SUMMARY OF TYPICAL PROCUREMENT ROUTES

The following table has been substantially informed by existing guidance on corporate procurement from RE-Source [1] and summarises the most common electricity procurement routes in which a built environment stakeholder might engage.

ONSITE	OFFSITE
Self-owned onsite The renewable installation is owned by the corporate that consumes the electricity, which is generated behind the meter.	**Physical PPA** The Physical PPA model involves a physical transmission of electricity via the electricity grid, and a contract or a series of contracts between a developer and a corporate power consumer.
Leasing A third party owns the onsite installation and leases it with a fixed monthly/annual leasing fee.	**Virtual/synthetic/financial PPA** A Financial PPA is a financial derivative contract in which the price for the underlying electricity is settled with a Contract for Difference (CfD).
Onsite PPA A third party builds, owns, operates, and maintains the installation onsite. The electricity generated by the renewable energy installation is consumed by the corporate.	**Self-owned offsite** A corporate invests in and owns an offsite renewable installation, or a share of the installation, as a long-term investment.
Private-wire PPA The renewable installation is located on land adjacent or near to the power consumer (typically less than 10 km) and the two are connected via a purpose-built direct or 'private' wire.	**Multi-buyer PPA (aggregated)** Corporates can form a consortium of buyers to contract the electricity from a single large generator.
	Multi-seller PPA (multi-asset) The multi-seller PPA model has been used where an energy-intensive corporate has an energy demand greater than the output of one (or several) renewable energy installation(s).
	Storage PPA An emerging model of PPA that covers storage capacity rather than generating capacity.

Continued on next page.

TARIFFS/ENERGY SUPPLY CONTRACTS

General
A utility or electricity supplier offers customers a 'green tariff' or 'green electricity supply'. The utility has three main ways to procure the green electricity:

- The supplier owns and operates their own renewable generators to supply their customers.
- The supplier enters into a direct PPA with renewable generators, aggregating these into a green electricity supply.
- The supplier procures electricity through the wholesale market and 'greens' the electricity supply with the purchase of an equivalent number of unbundled REGOs.

The supplier's product may be made up of electricity procured through one or more of the above routes.

Standard green
A tariff or contract for which all electricity supplied is backed with REGOs (bundled or not) as a minimum.

Deep green (as defined by this guidance – see Report 1)
SA tariff or contract which:

- bundles the REGOs from any self-owned or PPA-contracted generation with the supplied power; and
- does not include power from self-owned or PPA-contracted fossil fuel generators in the tariff mix.

From a supplier who can:

- show that that they are not investing in any new fossil fuel assets;
- demonstrate that the % of their overall supply volume (including all tariffs) that is met from self-owned or PPA-contracted renewable generation is greater than the proportion of renewables in the total grid mix (41% in 2022); and either
- prove that newly constructed or repowered self-owned or PPA-contracted renewable capacity provides a net increase in their annual supply volume equivalent to the gross increase in demand from new customers procuring their green products over an appropriate time period (e.g., 5 years); or
- demonstrate that 75% of their overall supply volume (including all tariffs) is met from self-owned or PPA-contracted renewable generation with generators that were <3 years old when the supplier purchased the generator or entered into the initial PPA.

Multi-buyer supplier aggregated (basket product)
Similar to a multi-buyer PPA, but the supplier does the aggregating.

Time-matched
An emerging product where a utility or electricity supplier offers customers a tariff where their demand is matched with renewable supply at a sub-hourly level. A minimum % matching may be guaranteed.

OTHER

Unbundled energy attribute certificates (e.g., REGOs)
Corporates purchase unbundled renewable certificates equal to the amount of power consumed to 'green' their electricity consumption.

Carbon-free electricity (CFE) via time-based energy attribute certificates (T-EACs)
An emerging time-matched procurement approach predicated on enhancing renewable certificates (e.g., REGOs) to include sub-hourly time stamping (among other attributes) accompanied with improvements to GHG calculation and reporting protocols, ultimately sending demand signals driving market reform. Carbon-free matching can be based on electricity from renewable sources only, or from other clean energy sources such as nuclear power and blue hydrogen.

SECTION 2.3
POWER PURCHASE AGREEMENTS (PPAS) AND OTHER ALTERNATIVES TO GREEN TARIFFS

For most consumers, a green tariff/supply contract from an energy supplier will offer the simplest route to procuring renewable energy. However, the variability in the quality of green tariffs has been demonstrated.

Whilst higher quality green tariffs are available, securing these typically requires active engagement with an energy supplier, to source the information necessary to establish a supplier's or product's performance against the principles for quality renewable electricity procurement, outlined in Report 4. The tools to accomplish this are provided in Report 3.

A customer may wish to pursue an alternative procurement route which gives them greater autonomy over the source of their power. This section summarises alternative procurement routes and their pros, cons, and key considerations.

ONSITE

Self-owned, onsite generation

The customer builds, owns and operates their own onsite installation (for example, rooftop solar PV) which sits behind the meter. The customer consumes the electricity generated by the installation onsite (with excess typically being exported to the grid).

The customer will be responsible for the capital cost of the onsite installation. They may also build and operate the installation themself, or may enter into a contract with an EPC (engineering, procurement, and construction) contractor to build the installation and/or an O&M (operations and maintenance) contractor to operate the installation on their behalf.

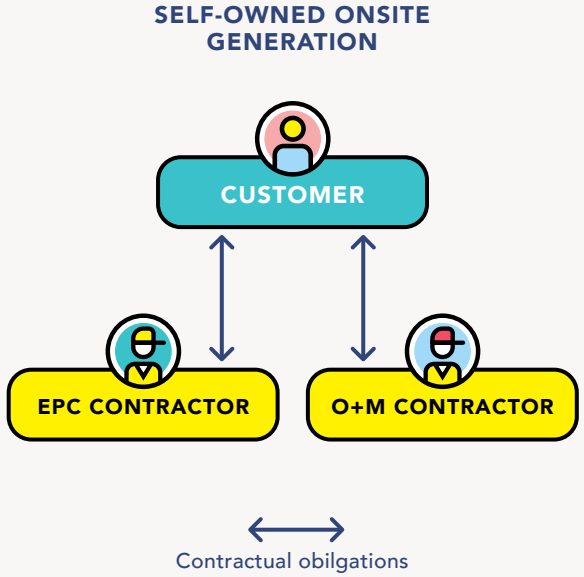


DIAGRAM 1:
Contractual obligations between parties in self-owned onsite generation.

Onsite or private wire PPA

A third party builds, owns, operates, and maintains the installation either:

1. onsite; or
2. at a nearby site, with the installation being connected to the customer's site via a purpose-built cable (or 'private wire'). The site must be close enough to make a private wire technically feasible.

The electricity generated by the installation is consumed by the customer on site (with excess typically being exported to the grid).

The customer can choose to retain the REGOs themself, and hold these in an account on the Renewables and CHP Register with Ofgem, or they can ask the generator hold them in their account and retire them on the customer's behalf.

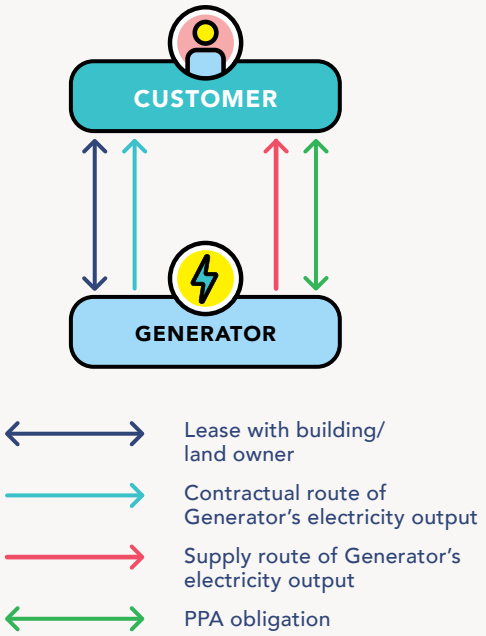


DIAGRAM 2:
The contractual route, supply route and PPA obligations between parties in onsite private wire PPA.

OFFSITE

Corporate Power Purchase Agreements (PPAs)

A corporate PPA is a contract into which a generator and a customer enter, allowing the customer to have a direct purchasing relationship with a generator without needing a direct physical connection to the generation plant (such as under a private wire arrangement). It may take the form of a traditional PPA or be a type of contract for difference. A corporate PPA brings electricity consumers and generators together irrespective of location.

'Corporate PPA' is used as a generic term that covers different contract structures. In terms of approach, the two common structures in the market are:

1. Back-to-back PPA

A back-to-back structure where the customer enters into a PPA with the generator and purchases the electricity (and associated benefits, including REGOs) directly from the generator. The customer then enters into a back-to-back arrangement with their licensed supplier who purchases the electricity from the customer and then sleeves this into the customer's supply contract.

The customer can choose to retain the REGOs themself (and hold these in an account on the Renewables and CHP Register with Ofgem) or can ask their licensed supplier to hold them in their account and retire them on the customer's behalf (in which case the licensed supplier should be obligated not to use them for their own fuel mix disclosure).

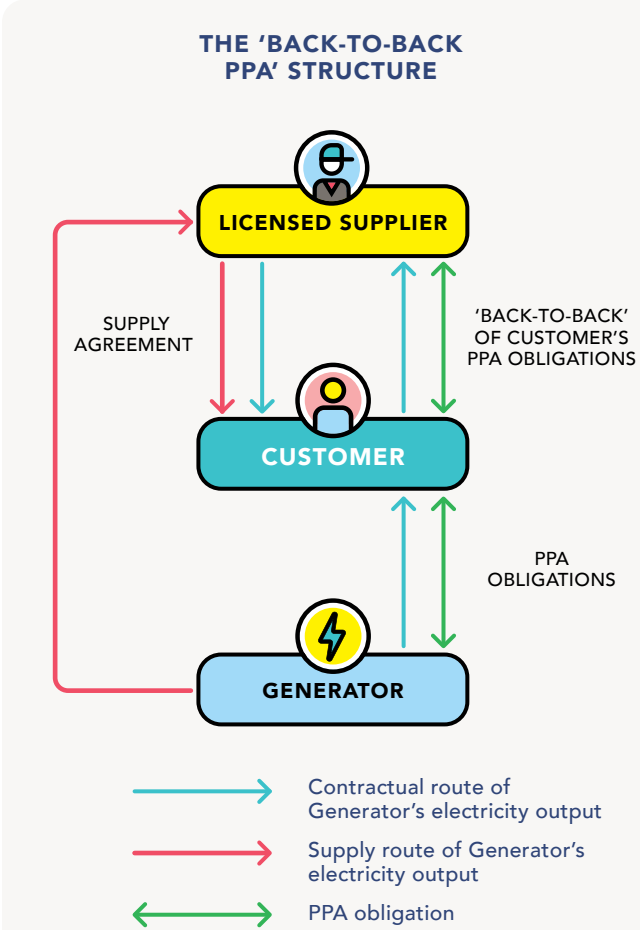


DIAGRAM 3:
The contractual route, supply route and PPA obligations between parties in back-to-back PPA structure.

2. Virtual (or synthetic) PPA

This is effectively a contract for difference. The customer does not take physical delivery of the power from the generator (the generator has a separate PPA with a licensed supplier), but rather agrees a price with the generator for the power that they generate and export. The customer can also take the REGOs from the generator in order to evidence that they are procuring renewable power.

Where the customer uses the Virtual PPA route, the customer could, working with their licensed electricity supplier and the generator, agree that the electricity flows to the customer via their licensed supplier (as shown in Diagram 4)).

Alternatively, the energy does not need to flow to the customer in this way: the generator could sell the electricity they generate via a PPA or in the power market to any offtaker in the usual way, and the arrangement between the customer and the generator can be purely a price guarantee arrangement and REGO purchase agreement.

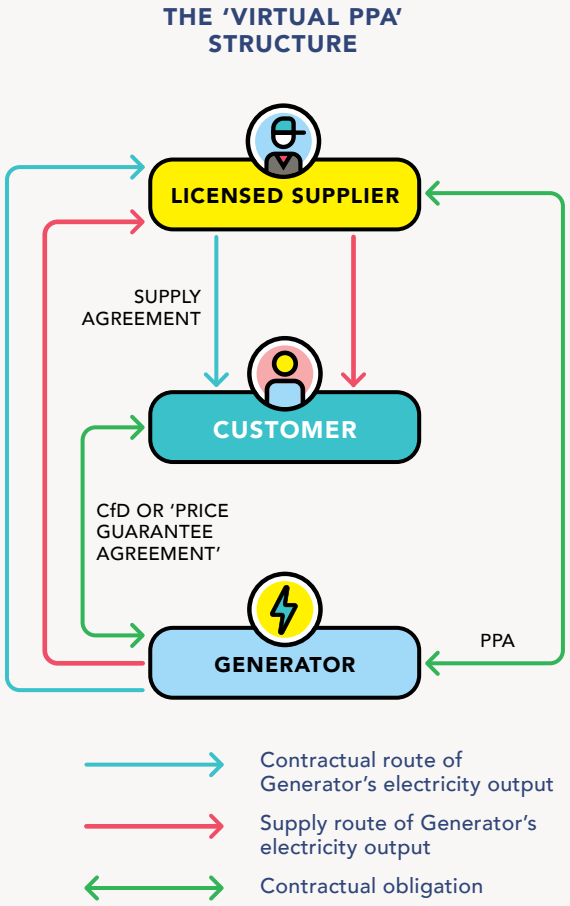


DIAGRAM 4:
The contractual route, supply route and PPA obligations between parties in a virtual PPA structure.

3. Variants on Corporate PPA structure

There are variants of the two models described earlier in the market:

- Multi-buyer (or aggregated) PPA – a number of customers form a consortium. This can allow customers with a lower demand profile to access a corporate PPA. This model can work with either a back-to-back PPA or a virtual PPA.
- Multi-seller (or multi-asset) PPA – a number of renewable assets are combined into one portfolio by an independent aggregator. The aggregator then enters into a PPA with the customer. This model can work with either a back-to-back PPA or a virtual PPA.

These variants can offer more flexibility, but can also lead to increased complexity in the arrangements. For example, in an aggregated PPA, the governance of the relationship between the consortium members would need to be carefully considered, as would how one member's actions could impact the PPA arrangement as a whole.

Self-owned offsite

As with self-owned, onsite generation, the customer will build, own and operate their own installation, but offsite.

The customer will be responsible for the capital cost of the installation, and may similarly build and operate the installation themself, or enter into a contract with an EPC and/or O&M contractor to assist.

CONSIDERATIONS FOR DIFFERENT PROCUREMENT MODELS

This section has outlined the main alternatives to a tariff from a licenced supplier currently available in the UK market. As mentioned, in some cases, there are variants to these models. Additionally, where a customer is engaging in either an onsite and/or an offsite model, it is highly unlikely that their procurement strategy will consist of only one of these models. In most cases, this route will be a component of an overall energy procurement strategy.

The following table summarises some of the pros, cons, and other considerations of the procurement models outlined earlier in the section.

MODEL	PROS	CONS	OTHER CONSIDERATIONS
ONSITE			
Self-owned, onsite generation	■ "Behind the meter" generation = more cost effective (no payment of non-commodity costs) ■ Clear additionality ■ Sole control of asset ■ Direct association with asset	■ Requirement to fund capital investment ■ May require changes to equipment/configuration at premises ■ Responsibility for asset when this is not customer's core business (however, this can be offset by appointing contractors, such as an EPC or O&M)	■ Need space to install ■ Not portable, so requires intention to stay at the relevant site long-term
Onsite or private wire PPA	■ "Behind the meter" generation = more cost effective (no payment of non-commodity costs) ■ Clear additionality ■ Bankable structure for generator if they are looking to inject debt finance ■ Direct association with asset	■ May require changes to equipment/configuration at premises	■ Need space to install (or space nearby) ■ Not portable, so requires intention to stay at the relevant site long-term ■ Potential credit support requirements ■ Accounting considerations, including whether the PPA can be considered a finance lease for the purposes of International Financial Reporting Standards (IFRS)

TABLE 1:
Pros, cons, and other considerations of some alternative procurement routes to a supplier's tariff (offsite table on page 13).

Table continued on next page.

MODEL	PROS	CONS	OTHER CONSIDERATIONS
OFFSITE			
Back-to-back	■ Portable ■ Direct association with asset, electricity and Energy Attribute Certificates (EACs) ■ Majority of UK corporate PPAs done this way – supplier knowhow already high ■ Bankable structure for generator if they are looking to inject debt finance	■ Potential liability for full energy price and all EACs ■ More time consuming/costly to transact ■ Need to "back off" PPA obligations to licensed supplier ■ Can add complexity to changing licensed supplier	■ Engagement is required from the customer's licensed supplier, as the licensed supplier will need to sleeve the relevant volumes into the customer's electricity supply contract ■ Potential credit support requirements ■ Accounting considerations, including whether the PPA can be considered a finance lease for the purposes of IFRS
Virtual (or Synthetic) PPA	■ Portable ■ Corporate only liable for price difference ■ Looks more like normal commercial contract/ financial instrument ■ Easier for corporate in a supplier switch and can even be decoupled from PPA/supply (CFD) ■ Cheaper and quicker to transact, more easily replicated ■ Can include EACs ■ Bankable structure for generator if they are looking to inject debt finance	■ Additional agreements for generator: 2 agreements – export PPA and virtual PPA (although export PPA will be well-known to developer) ■ Arguably less of a direct relationship with asset	■ Both parties will need to consider whether virtual PPA would amount to a regulated investment under UK financial services regulation ■ Both parties will need to fulfil reporting requirements pursuant to European Markets Infrastructure Regulation (EMIR) ■ Potential credit support requirements
Self-owned offsite	■ Sole control of asset ■ Portable (in so far as the asset is offsite so any electricity supply will need to be via the grid) ■ Direct association with asset, electricity and EACs	■ Requirement to fund capital investment ■ Responsibility for asset when this is not customer's core business (however, this can be offset by appointing contractors, such as an EPC or O&M)	■ Whether customer will take power from the asset (which will require a sleeving arrangement as the electricity will need to be supplied via the grid) or will sell the electricity as brown power via a PPA and keep the REGOs only

SECTION 2.4
SUMMARY

This report has outlined the range of electricity procurement routes available to a stakeholder in the built environment and identified a number of factors that can affect a stakeholder's access to them. It has provided more detail on some of the alternatives to a typical route of procuring electricity through a licenced supplier, such as Power Purchase Agreements (PPAs), including their pros and cons.

There are many options available, and the alternatives to a supplier's tariff can seem prohibitively complex. Whilst requiring greater consideration, these options can offer a number of benefits to the consumer whilst more actively contributing to the decarbonisation of the electricity system by directly supporting the creation of new renewable generating capacity.

This report is intended to support stakeholders seeking to apply the recommendations and tools contained in the other reports of this suite of guidance in navigating the options available. Inevitably, should some of the less conventional and more technically and legally complex procurement options be pursued, it is likely to be beneficial to appoint a qualified consultant to advise.

APPENDIX A: GREEN GAS

The following section transposes guidance on green gas from the v1 guidance document, with updates where necessary.

Table 2 provides an overview of green gas products that are commercially available. To date, these specifically relate to biomethane, but it is expected that other types of green gas, such as green hydrogen, will enter the market over the coming decades.

- Biomethane can be produced from a range of sources, including biogas from anaerobic digestion, landfill gas, and synthetic gas from the gasification of biomass.
- Biogas is converted into biomethane through the removal of CO_2, which can then be treated to ensure pipeline quality for injection into the national gas network.

There is a specific Quality Protocol set out by Government for the production and use of biomethane arising from the degradation of organic wastes in a landfill site or anaerobic digestion plant for injection into the gas grid. The protocol is applicable in England and Wales, and if met, the biomethane will typically be regarded as having been fully recovered and to have ceased to be waste.

Green gas certificates

Ofgem does not administer a 'green certificate' scheme for gas similar to the Renewable Energy Guarantees of Origin (REGO) scheme that exists for renewable electricity procurement. Instead, there are two industry-led providers of UK green gas certification:

- Green Gas Certification Scheme: Renewable Gas Guarantees of Origins (RGGOs)
- Green Gas Trading Ltd: Biomethane Certification Scheme (BMCs)

The government is also currently analysing industry feedback to their recent consultation on the proposal to create a certificate scheme for green hydrogen in the UK [2].

Additionality

Where green gas has been subsidised, such as through the Renewable Heat Incentive (RHI) or the Renewable Transport Fuel Obligation (RTFO), it should be noted that no additional green gas can be said to have been directly produced as a result of a green gas certificate being purchased.

PRODUCT	DESCRIPTION
Green Gas Purchase Agreements (GPAs)	Green Gas Purchase Agreement (GPA) models are similar to those seen for electricity procurement, although they are less common due to the volumes of biomethane currently available and the maturity of the market. There may be circular economy opportunities in areas or industries with significant waste or residue streams, but these should be assessed on an individual basis. Organisations procuring a GPA should ensure that the associated green gas certificates are retired on the organisation's behalf.
Green gas tariffs	Due to the limited biomethane to grid capacity within the UK at the present time, the vast majority of green gas tariffs only provide a small proportion of green gas that is backed by RGGOs or BMC. The rest of the supply is fossil-fuel sourced but offset by the supplier through the voluntary offset market – hence being sold as a '100% carbon neutral' tariff. The proportion that is certified biomethane within a green gas tariff was as low as 6% in 2018 [3]. In response, the Government took action to increase the proportion of biomethane flowing into the gas grid by introducing the Green Gas Support Scheme (GGSS) in 2021 – which provides financial support to new anaerobic digesters – and the Green Gas Levy in 2022, which places an obligation on gas suppliers to fund the GGSS.
Unbundled green gas certificates (RGGOs or BMCs)	Green gas certificates can be purchased separately to the sustainable biomethane itself. Due to the low volumes of certified biomethane available within the market, green gas certificates were priced between £6-9/MWh in 2020 depending on their feedstock, with waste products retailing at a higher price than agriculture products, based on engagement with Green Energy UK and Green Gas Certification Scheme. As the certificates can be 'unbundled' separately to the biomethane, there is a risk that the green gas market for certificates may lead to similar issues seen in the renewable electricity market – but this is not presently the case due to the low volumes of biomethane and higher prices of the certificates.

TABLE 2:
Green gas products.

Carbon accounting

Reporting of biomethane use within the UK's Environmental Reporting Guidelines requires a 'dual reporting' approach, similar to that required for electricity consumption, where both location-based and market-based emissions are calculated [4].

Until the start of 2023, the World Resources Institute (WRI), who administer the GHG Protocol, allowed market-based approaches for calculating Scope 1 and Scope 3 emissions associated with biogas consumption, provided its procurement meets the Scope 2 quality criteria. However, this has now been rescinded, as per Annex B of their Land Sector and Removals Guidance [5]. The World Biogas Association has written an open letter to the WRI, signed by over 50 biogas trade associations, calling for Annex B to be removed [6]. As of the publication of this report, there has been no change to the GHG Protocol guidance.

Net zero carbon claims

The treatment of green gas within net zero carbon buildings claims will be defined by the upcoming UK Net Zero Carbon Buildings Standard.

APPENDIX B: FURTHER GUIDANCE ON POWER PURCHASE AGREEMENTS (PPAS)

Frequently asked questions (FAQs) on PPAs

The FAQs below, provided by Burges Salmon LLP, have been transposed from the v1 guidance. They provide answers to some of the key questions a corporate may have if considering pursuing a PPA.

1. **Is there an initial 'rule of thumb' for whether PPAs should be a potential option to explore?**

   The customer will want to consider:

   a. Whether they can make a longer term commitment in respect of the volumes they are looking to purchase (with a Back-to-Back PPA we would normally expect this to be 10-15+ years, for a Virtual PPA, we are beginning to see shorter periods of 5+ years, but the period will need to be sufficiently attractive to the generator and, if the generator is financing a new project with debt finance, they will ideally want the term of the PPA to match the term of the debt). The customer will need to have a good understanding of their energy needs and how those needs might fluctuate over time.

   b. Whether there is management-level support within their organisation (as the procurement process does involve some additional work and cost, including any legal and other advisory fees, and this is often outside the 'core' business of the customer, so will involve working with new concepts and understanding of the risks involved).

   c. Whether they have undertaken financial analysis of how they want to structure the pricing, (e.g., fixed price, market prices with a cap and floor) bearing in mind that the PPA price covers only the cost of the electricity and the customer will still have to pay non-commodity costs via their supply contract (unlike with onsite/private wire generation).

   d. Particularly where putting in place a Back-to-Back PPA, whether their contracted licensed supplier will support the proposed approach. With a Back-to-Back PPA, the customer will need their licensed supplier to sleeve the electricity into their supply contract and this creates some additional work for the supplier (in terms of agreeing, documenting and managing these arrangements), the supplier will usually expect a certain commitment from the customer in terms of the supply period (and this will vary from supplier to supplier), and may only look at this for those customers with a significant annual energy demand (again, this varies from supplier to supplier).

   For the Virtual PPA, depending on the structure that the customer wants to use (and whether they want their licensed supplier to purchase the electricity being produced by the generator), the customer may need to discuss this with their licensed supplier, in terms of arrangements for the movement of REGOs and ensuring the Virtual PPA dovetails with the customer's supply contract.

As a general rule, we would normally only expect a Back-to-Back PPA to be attractive where the customer has a moderate to high energy demand, due to the additional work required (by all parties: generator, customer and licensed supplier) to set up these arrangements. However, with the Virtual PPA, we have seen that this can work for smaller volumes and is perhaps less complex for the customer, in terms of the contract they are entering into with the generator and so suitable for a much wider customer base.

2. Is there a typical % of the energy demand that consumers would normally secure through a PPA?

This varies significantly and will depend on the customer's key drivers. It may be that a customer wants a fixed price for a certain percentage of their electricity demand to hedge against future price increases. Where a customer is looking at this in the context of their sustainability targets, they may want to ultimately have 100% renewable electricity, but may opt to do so via a number of different routes (any combination of onsite generation, private wire, PPA and/or green tariffs offered by their supplier).

3. Is there a typical best practice % of energy demand that you wouldn't exceed with PPAs?

When a customer signs a PPA, they are agreeing to take the volume of electricity produced for the term of that agreement. On that basis, the customer needs to look at their likely demand over the term of the PPA, which can be lengthy (as per above, if a generator has debt funding, they will be looking to at least cover the term of the debt).

Additionally, where the PPA is a fixed price PPA (which would usually be the case, or, if not, we might expect a floor price), the customer is tied into that price for the term, so this can give certainty, but the customer may not want to fix the price for all of their energy demand.

In most cases, we have seen this route as part of an overall energy procurement strategy. The PPA arrangements are sleeved by the licensed supplier/ dovetailed with the arrangements in the customer's supply contract as part of overall supply volumes (so the customer still purchases the rest of their energy demand in the normal way).

4. What is a ballpark example timescale or lead time for PPAs with new plants vs PPAs with existing plants?

In terms of the procurement process to point of signature, we would normally expect this to take between 6-12 months, depending on the procurement process that is run and the length of the contractual negotiations (however, we have seen both shorter and longer processes). We would normally expect that a Back-to-Back PPA will take longer to negotiate than a Virtual PPA (due to the additional complexity in the PPA between the generator and the customer).

The customer may also want to undertake some due diligence on the generator and the projects, for example: Is the developer reputable? Has all planning been secured? Are there any issues within the local community (for example do neighbours to the project site have objections to the turbines/ panels being installed)?

If a customer goes down the route of a Virtual PPA, the time can be shortened as the customer has a template to work with and, as part of procurement of further volumes from other generators, requires that the template stays substantively the same.

If a customer is contracting in respect of a new-build generating station, following signature the generator will then need to build out the asset. We would expect there will be a 'long stop date' in the PPA by which the generator must be ready to export, and if they fail to do so, there will be a right for the customer to terminate.

5. Are there specific sectors/buildings/energy profiles that are most suitable, or most unsuitable, for PPAs?

It is often most attractive to those corporates or organisations that have a fairly stable moderate to high energy demand, but we are starting to see other organisations come in with smaller energy needs. The PPA is portable across the business as a whole rather than being linked explicitly to a site, unlike onsite or private wire generation, so, for this reason, it is a more widely available solution. We have seen a range of customers use this route including corporates, banks, retailers, and local authorities.

6. **Credit rating, board appetite and energy profiles – are these the main blockers? What key questions should be asked internally around these before procuring formal external expertise?**

   Credit strength of the customer is critical to ensure the bankability of the PPA in the eyes of the ultimate investor in the project. From the perspective of the customer, the credit strength of the generator is important to give some assurance as to the long-term viability of the project.

   As we have commented above, management buy-in is important, as this can be seen as something that is not 'core' business. However, we are increasingly seeing that companies are looking at their energy supply, both in terms of this being a large (and growing) cost item and also in terms of how this fits into any sustainability targets of the company. We are also seeing increasing pressure from investors to place more emphasis on environmental, social and governance issues (ESG). If you have management buy-in, this is an important facilitator.

   The customer will need an understanding of their energy profile and how that might fluctuate (or not) over time. We would normally expect Back-to-Back PPAs only to be attractive where the customer has a moderate to high energy demand (for the reasons set out above), but we have seen Virtual PPAs for smaller volumes. Another key point, as flagged above, is the dialogue between the customer and their licensed supplier.

7. **Are there any key considerations to be aware of specifically for real estate landlords?**

   Where a real estate landlord has a portfolio of properties where they are responsible for entering into electricity supply for parts of the building/estate (for example common parts), then we would envisage that their considerations would be substantially the same as any other customer. We would ordinarily expect that the landlord would want to pass through these costs via the service charge, and that the drafting in respect of the service charge in the lease will allow this (as part of wider utility costs).

8. **Aside from long term price certainty, what are the main differences between a Virtual PPA and green tariffs?**

   The reasons that an organisation signs a PPA differ from organisation to organisation. For some, it is peace of mind by financially hedging some of their energy costs over a defined period of time, whereas for others it can be to enhance their brand.

   In our experience, most organisations sign PPAs to meet their sustainability or carbon targets. Many value the ability to be able to point to the specific renewable energy projects they are supporting and purchasing their energy from. This can be for a number of reasons: supporting local projects (which could be community owned), or being able to show stakeholders (customers, investors, funders) specifically where energy is being purchased from, and, where the PPA is with a project under development, showing additionally (i.e., that the signing of the PPA has facilitated new green generation that may not have come on the system without it).

   There has been some scepticism in the market in respect of green tariffs, and there have been some reports of 'green washing'. This has made some organisations wary. With a PPA, whether it is a Back-to-Back PPA or a Virtual PPA, you can point to the exact renewable generating stations that you are buying green power and/or the REGOs from, and some organisations see that as valuable. That is not to say that utilising a green tariff is not a viable alternative, but an organisation may want to ask their supplier some questions around the supplier's portfolio and where they are sourcing any REGOs/GOs from.

9. **Are PPAs typically signed for new or existing assets? What are the key differences between the two?**

   In our experience, generally new assets. For the customer, this can evidence additionality. This does of course rely on sufficient new proposed plant coming forward. For the generator, especially where debt finance is being put in place to finance the construction of a new generating asset, a long term PPA with a fixed or floor price will provide certainty of revenue, which will be key for the project's financial model and business case.

10. How common is it for renewable plants, post-subsidies, to be decommissioned or not be economically feasible for refurbishment or repowering without another PPA/revenue stream?

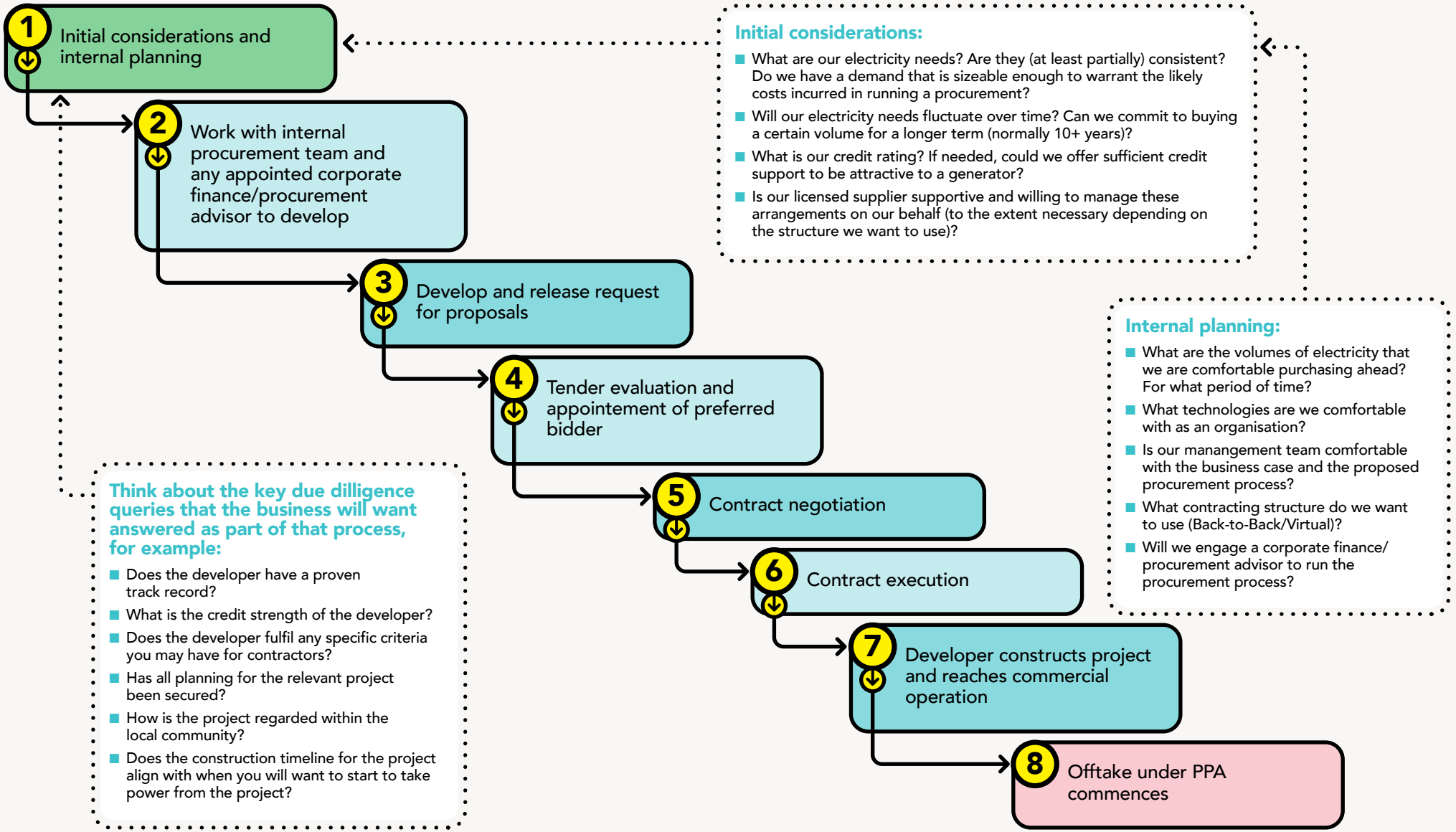
Where a project is coming to end of a subsidy, we would generally see that the generator would want to maximise the life of that asset. Any debt will have been paid off, so the generator can take merchant risk on the power market. The generator may be willing to enter into a PPA to give a fixed revenue stream for an additional period of time, but there may be less appetite to do so as there is not the same imperative to have a certain minimum income, which is usually a requirement for a debt funder. Approach will vary from generator to generator.

Where a generator is looking at repowering (putting in larger turbines for example), this is more akin to a new project because the generator has to secure ongoing land rights, new planning etc., and there are additional costs associated with the significant upgrade to plant/installation of new plant. Here, the generator may need to secure a longer term, certain, revenue stream in order to do that.

Typical PPA procurement process

A high-level overview of a typical PPA procurement process is as illustrated in Figure 5. This has been transposed from the v1 guidance.

FIGURE 5:
Typical steps in a PPA procurement process.



Note that some organisations will be required to comply with public procurement legislation, in which case, any procurement process will need to be run in accordance with the requirements of that legislation.

SECTION 2.5 GLOSSARY

TERM	DESCRIPTION
24/7 CARBON-FREE ENERGY (24/7 CFE)	Describes energy consumption where 100% of demand is matched with carbon-free supply at an hourly resolution or better.
ADDITIONALITY	Additionality describes the situation where an action results in an activity or intervention that otherwise would not have occurred had the action not taken place (i.e., additional relative to business-as-usual). In the context of procuring renewable electricity, additionality is achieved where greenhouse gas emissions reductions/removals occur as a result of new or repowered generating capacity that would not have happened in the absence of engaging in a given procurement route.
ANNUAL-MATCHING	The process by which electricity supply or consumption is matched with renewable power on an annual basis. This can be done by procuring Energy Attribute Certificates (EACs) only or by procuring the renewable power directly from a generator.
BEHIND THE METER	Describes anything that happens on the energy user's side of the meter (i.e., directly within the control of the asset).
BIOENERGY CARBON CAPTURE AND STORAGE (BECCS)	Electricity generation that is produced using biofuels where the resultant CO_2 is captured and stored long term, resulting in net negative carbon emissions.
BIOFUELS/BIOMASS	A fuel that is derived from biological/organic matter.
BLUE HYDROGEN	Hydrogen that is created by reforming natural gas and capturing the resultant CO_2.
BUNDLED POWER/ BUNDLED REGOS	Renewable electricity where the power is sold/procured together with its associated Energy Attribute Certificates (EACs).
CARBON CAPTURE, UTILISATION, AND STORAGE (CCUS)	A technology via which CO_2 resulting from a process is captured and used for other process or stored long term.
CARBON FACTOR	A measure of the emissions intensity of a process or fuel.
CARBON-FREE ENERGY/ ELECTRICITY	A term used to describe zero emissions sources of energy/ electricity generation. This includes renewables and nuclear power.
CARBON-FREE ENERGY/ ELECTRICITY (CFE) SCORE	A score between 1 and 100 reflecting the percentage of an energy consumer's demand that is matched with carbon-free supply at an hourly resolution or better, over the course of a year.
CLEAN ENERGY SOURCES	Energy sources that are zero carbon but not renewable.
CARBON DIOXIDE EQUIVALENT (CO_2E)	CO_2e or Carbon Dioxide Equivalent is a unit used to equivalate the emissions of other greenhouse gases (GHGs) to emissions of carbon dioxide (see Global Warming Potential). It also allows the impact of activities that result in the emissions of a variety of different GHGs to be described by a single number.
CARBON EMISSIONS	In the context of sustainability, Carbon Emissions is used as a collective term to describe the emissions of any GHGs.
CARBON SEQUESTRATION	Carbon Sequestration is the process by which carbon dioxide is removed from the atmosphere and stored within a material.
CLIMATE CHANGE	Climate Change refers to long-term shifts in temperatures and weather patterns. These shifts may be natural, such as through variations in the solar cycle. But since the 1800s, human activities have been the main driver of climate change, primarily due to burning fossil fuels like coal, oil and gas.
CONTRACTS FOR DIFFERENCE (CFD)	A long-term contractual agreement between a low carbon electricity generator and the UK Government which guarantees a "Strike Price" for all electricity generated, where the difference between the market price and strike price is either paid to the generator by the government or paid back to the government by the generator.
CURTAILED/ CURTAILMENT	Describes a situation where the output from variable renewable generators (such as wind turbines) is reduced in times where supply exceeds demand or the transmission infrastructure has insufficient capacity to accommodate the energy flows.

TERM	DESCRIPTION
DECARBONISATION	Decarbonisation is the process of reducing the net amount of Greenhouse Gas (GHG) emissions released to the atmosphere.
DISTRIBUTION NETWORKS	The electricity networks that manage the flow of electricity from the national transmission network to end customers.
DISTRIBUTION NETWORK OPERATOR (DNO)	A licenced company that that manages the operation of a distribution network.
DISTRIBUTION SYSTEM OPERATOR (DSO)	An evolution of a Distribution Network Operator (DNO) which is necessitated by the more complex flows and management of electricity within the distribution networks.
EMBODIED CARBON	Embodied Carbon or Life Cycle Embodied Carbon emissions of a product are the total GHG emissions and removals associated with its manufacture, transport, installation, maintenance, and end of life treatment.
ENERGY ATTRIBUTE CERTIFICATE (EAC)	A certificate that provides information about the environmental attributes of one megawatt hour (MWh) of electricity. REGOs are the EACs used in the UK.
FLEXIBILITY PROVIDER/ FLEXIBILITY SERVICES PROVIDER (FSP)	An owner of assets, or an aggregator managing multiple assets, that can provide flexibility services by making temporary changes to the way they consume, generate, or store electricity when requested, to ensure continuity of supply.
GENERATOR	The operator of an asset that can generate electricity.
GREENHOUSE GAS (GHG)	Greenhouse Gases (GHG) are constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere, and clouds.
GHG PROTOCOL	GHG Protocol establishes comprehensive global standardized frameworks to measure and manage greenhouse gas (GHG) emissions from private and public sector operations, value chains and mitigation actions.

TERM	DESCRIPTION
GLOBAL WARMING POTENTIAL (GWP)	Some GHGs have a substantially higher GWP than carbon dioxide, meaning the same quantity of emissions has a greater impact to global heating. For example, methane's GWP is 25, meaning 1 tonne of methane trap 25x more heat than 1 tonne of carbon dioxide.
GREEN GAS	A gaseous fuel created by processing organic matter by bacteria.
GREEN HYDROGEN	Hydrogen that is created by electrolysing water using renewable electricity.
GREEN TARIFF	A term used to describe a range of energy products offered by suppliers that, as a minimum, have been fully matched with Energy Attribute Certificates (EACs).
GUARANTEES OF ORIGIN (GOS)	The Energy Attribute Certificate (EAC) scheme used in central Europe, closely related to the UK REGO scheme.
HYDROGEN	A gaseous fuel that combusts to produce water.
IN FRONT OF THE METER	Describes anything that happens on the energy system side of the consumer's meter (i.e., not in directly control of an asset).
INTERMITTENT RENEWABLE GENERATION	Renewable electricity generators that depend on variable renewable energy sources, such as wind and solar.
IPCC	The Intergovernmental Panel on Climate Change (IPCC) is the United Nations body for assessing the science related to climate change.
LIQUID AIR ENERGY STORAGE	A form of energy storage where air is compressed into a liquid form and stored in insulated containers. When needed, the liquid air is evaporated and this energy is used to generate electricity, typically through a turbine.
LITHIUM-ION BATTERY	A form of electrical energy storage which uses the reversible reduction of lithium ions in the material to store electricity.
LOCATIONAL MARGINAL PRICING	A way for wholesale electricity prices to reflect the value of the energy at different locations, accounting for the patterns of load, generation, and the physical limits of the transmission system.

TERM	DESCRIPTION
LOCATION-BASED CARBON ACCOUNTING	A methodology for calculating carbon emissions based on the carbon intensity of the local grid area where the electricity usage takes place.
MARGINAL EMISSIONS FACTOR	A measure of the emissions caused by a small change in demand on the system, reflecting the fact such changes in demand do not increase or decrease the demand for all generation types equally.
MARGINAL PRICING	In the context of electricity procurement, marginal pricing is an approach to pricing electricity that sets the price of all electricity based on the cost of meeting the marginal demand (i.e., the final bit of demand on the system).
MARKET-BASED ACCOUNTING	A methodology for calculating carbon emissions based on the specific procurement decisions made by an electricity customer (e.g., claiming the benefit of Energy Attribute Certificates).
NATIONAL GRID ELECTRICITY SYSTEM OPERATOR (ESO)	The licenced company responsible for the management of the GB electricity system's transmission network.
NET ZERO	Net Zero is where all related Greenhouse Gas (GHG) emissions have been reduced in line with a science-based target which aligns with what has been determined to be necessary to stand a reasonable chance of limiting the global temperature increase to 1.5˚C above pre-industrial levels as a minimum. These residual emissions are subsequently responsibly offset to achieve a sum total of zero emissions.
OPERATIONAL CARBON	Operational Carbon are the GHG emissions arising from all energy consumed by a product in-use, over the product's whole life cycle.
PEAK DEMAND	The time of greatest overall energy demand. This can be measured at an asset-level or a system-level.
POWER PURCHASE AGREEMENT (PPA)	A contractual arrangement for power between a generator and a supplier or consumer.
RENEWABLE CERTIFICATES	A general term for Energy Attribute Certificates (EACs).

TERM	DESCRIPTION
RENEWABLE ELECTRICITY GUARANTEE OF ORIGIN CERTIFICATES (REGOS)	The Energy Attribute Certificate (EAC) scheme used in the UK.
RENEWABLE ENERGY CERTIFICATES (RECS)	The Energy Attribute Certificate (EAC) scheme used in the USA and Canada.
RENEWABLE ENERGY	Energy derived from natural sources that are replenished at a higher rate than they are consumed.
RENEWABLE GENERATION	A general term for any electricity generated using renewable sources of energy.
RESIDUAL EMISSIONS FACTOR	A measure of the emissions intensity of electricity from a given system after all electricity 'claimed' via Energy Attribute Certificates (EACs) has been removed from the mix (i.e., the emissions intensity of the residual grid mix).
RESIDUAL GRID MIX	The mix of generation supplying the system after all electricity 'claimed' via Energy Attribute Certificates (EACs) has been removed from the mix.
RETAIL MARKET	The market through which energy customers procure energy from a supplier.
SCOPE 1	Direct emissions from sources that are controlled or owned by an organisation. This includes any onsite combustion (e.g., from gas boilers for heating, and from company vehicles).
SCOPE 2	Indirect emissions that result from the purchase of electricity, heat, or steam that is generated offsite.
SCOPE 3	Indirect emissions from sources that aren't owned or controlled by an organisation, but that they indirectly affect in their value chain.
SELF-OWNED GENERATION	Electricity generating capacity that is owned and operated directly by the referenced party. This could be energy suppliers or building owners.
SUB-HOURLY	At a resolution of less than one hour.
SUBSIDISED GENERATION	Electricity generation that is financially supported by government or other schemes, such as the Contracts for Difference (CfDs).

TERM	DESCRIPTION
SUPPLIERS	Companies that procure energy and supply energy to customers on the retail market.
TARIFFS	The price at which energy is sold by a supplier to a customer.
TIME-BASED ENERGY ATTRIBUTE CERTIFICATES (T-EACS)	Energy Attribute Certificates (EACs) that include the time of generation at an hourly resolution or better.
TIME-MATCHED	Electricity demand that is matched with renewable supply at an hourly resolution or better.
TOTAL GENERATION MIX	The mix of all generation types supplying the system over a given time period.
TRANSMISSION NETWORK	The high voltage system for the transmission of power from large-scale generators to the distribution networks.
UNBUNDLED POWER	Renewable electricity that is sold without the associated Energy Attribute Certificates (EACs).
UNBUNDLED REGOS	Energy Attribute Certificates (EACs) that are sold separately to their associated power.
UNSUBSIDISED GENERATION	Generation that is not financially supported by government or other schemes, such as the Contracts for Difference (CfDs).
WASTE INCINERATION	A process where household waste is incinerated to boil water which is subsequently passed through a turbine to generate electricity.
WHOLE LIFE CARBON	Whole Life Carbon emissions are the sum total of all the associated GHG emissions and removals, for the embodied, operational and disposal of a product through its whole life cycle.
WHOLESALE MARKET	The general term for the market on which electricity is traded by generators and suppliers.
ZERO CARBON	Zero Carbon is where there are no related Greenhouse Gas (GHG) emissions.

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The voice of our sustainable built environment

UK GREEN BUILDING COUNCIL
THE BUILDING CENTRE
26 STORE STREET
LONDON WC1E 7BT

INFO@UKGBC.ORG

ADVANCING NET ZERO

UK Green Building Council
ukgbc.org

COMPANY REGISTRATION NUMBER 01029239
CHARITY REGISTRATION NUMBER 1135153