RE-Source

European platform for corporate renewable energy sourcing

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Introduction to Corporate Sourcing of Renewable Electricity in Europe

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Small print:
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The report can be downloaded at: http://resource-platform.eu/toolkit/
Please get in touch with the RE-Source Platform if you have any comments or feedback on the report and its content in order to enrich our ongoing work in this field.
If you would like more information on the contents of this report or on the work of the RE-Source Platform, please contact info@resource-platform.eu.

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Executive Summary

Corporates are increasingly considering their impact on the environment and climate change. Consequently, they are seeking to reduce carbon emissions while controlling the costs associated with their electricity consumption. Renewable energy procurement provides organisations with a means to power their operations with carbon-free electricity and secure low-cost electricity consumption over a long-time period.

Corporates can adopt different strategies to procure renewable electricity. But before doing so, they should assess which strategy best suits their needs and helps achieve their goals.

This report is an introduction to the different strategies a corporate can follow to procure renewable electricity in Europe.

The strategies are presented as business models and divided into two main categories according to the geographical location of the renewable installation: on-site models and off-site models. The report also covers six less commonly-used variations of off-site models and two top-up models. We describe the key features for each model, including their relationship with Guarantees of Origin (GOs), information on financial and greenhouse gas (GHG) accounting, whether they provide additionality, etc. The report also provides an overview of the European countries in which each model is feasible (or has been implemented). We expect this to evolve over time as corporate renewable energy procurement gains traction.

The main models are complemented with real-world examples to illustrate how they have been applied in various markets, together with details such as ownership, power capacity and location.

TABLE 1
List of models for corporate sourcing of renewable energy

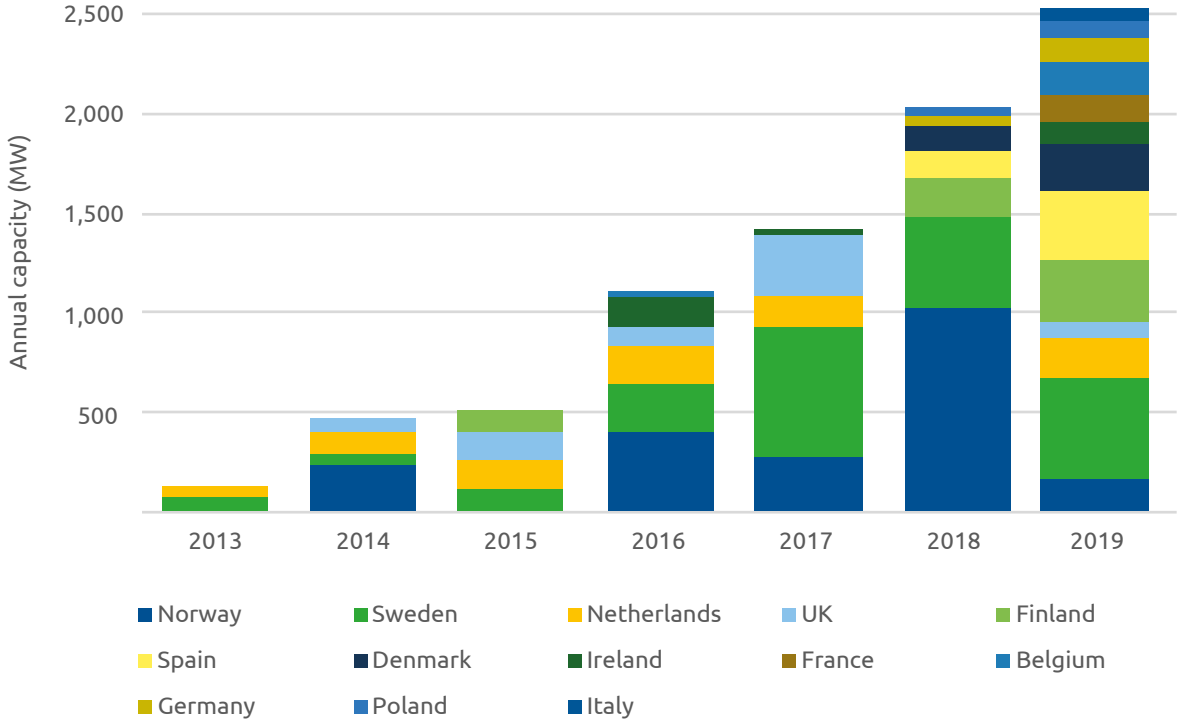
On-site models
A1: Self-owned on-site
A2: Leasing
A3: On-site PPA
A4: Private-wire PPA
Off-site models
B1: Physical PPA
B2: Financial PPA
Off-site variants
C1: Self-owned off-site
C2: Multi-buyer PPA
C3: Multi-seller PPA
C4: Cross-border PPA
C5: Multi-technology PPA
C6: Proxy generation PPA
General and Top-up models
D1: Green electricity supply
D2: Unbundled GOs

To date, green electricity supply contracts, certain types of PPAs and self-owned PV systems have been dominating the space of corporate renewable energy sourcing. There were over 2.5 GW of corporate renewable PPAs in Europe in 2019, growing 65% year-on-year since 2013. Green electricity supply contracts are still the dominant model, but corporates are now turning to other models that allow them to better track the energy they consume and demonstrate to their consumers and investors their commitment to sustainability goals.

As the renewable energy market matures, we expect innovations in the way organisations procure renewable electricity, combining aspects of different models to help meet corporates' evolving needs and expectations.

We hope this report will prove useful for both corporates and policymakers alike in the analysis of the European corporate sourcing market.

FIGURE 1
Corporate PPAs by year and country



Source: WindEurope

Foreword

This report sets out the wide array of options available to corporates looking to source renewable electricity in Europe. Corporate sourcing of renewables is developing rapidly in Europe as wind and solar power have become cost-competitive and the environmental impact of business becomes more and more of an issue. More corporates than ever consider renewable energy as an opportunity to gain a competitive advantage by securing long-term, low-cost electricity in addition to contributing to their sustainability goals. However, the market is still relatively young, and we are keen for Europe to scale up fast, use contract structures that have been pioneered in other markets around the world, and innovate new structures for the European market.

This report furthers one of the core objectives of the RE-Source Platform: to raise awareness of the benefits of corporate sourcing and facilitate business transactions between buyers and sellers. Make them faster, easier and cheaper. We hope that corporate energy buyers who are new to renewable sourcing and new to the European market use it as an introductory 'how to' guide to help them start their journey in the world of renewable electricity purchasing.

This is intended to be one part of the RE-Source Platform's 'European Corporate Sourcing buyer's Toolkit' which includes other useful tools, such as a template corporate PPA contract for Europe, European Corporate Sourcing Directory, training courses and so on.

Until now, corporate sourcing and corporate PPAs have been bespoke, complex deals that can take years to be negotiated and get approved. Much of this is due to their being long-term contracts. At RE-Source, we are aware that if we are to grow the European corporate sourcing market in line with our ambitions, EU targets and corporate commitments, we need to make it more accessible for small and medium-sized businesses who do not yet have the experience or capacity to enter into complex and comprehensive long-term renewable electricity contracts.

Policymakers are an important stakeholder, as many of the business models are hampered by various barriers in different EU Member States. As part of the Clean Energy for All Europeans Package, Member States are required to identify and remove the barriers to PPAs in their National Energy and Climate Plans (NECPs). On our side, we have developed the Corporate Sourcing Directory, one component of the RE-Source toolkit which points out where we see barriers to corporate sourcing in each country.

We hope that this report will prove useful for all the players in the European corporate sourcing market and help unlock the market's huge potential. We encourage readers to get in touch with any ideas or questions that could help further enrich our work going forwards.

Bruce Douglas

Coordinator of the RE-Source Platform and Deputy CEO of SolarPower Europe

"More corporates than ever consider renewable energy as an opportunity to gain a competitive advantage by securing sustainable, long-term, low-cost electricity"

Introduction

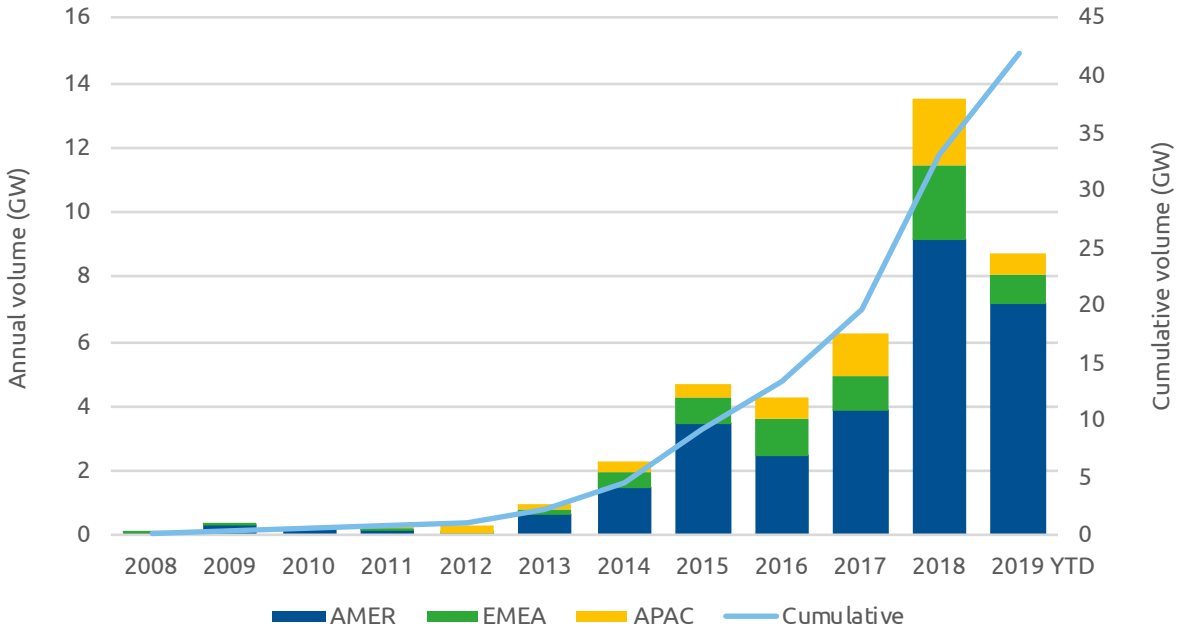
The corporate sourcing market in Europe has taken off over the last few years. Starting in earnest in 2014, the corporate renewable Power Purchase Agreement (PPA) market in Europe has grown to a cumulative capacity of over 8 GW. In 2018, 1.3 GW and 2.1 GW of commercial and industrial on-site renewables respectively were contracted and in 2019 alone, over 2.5 GW of PPAs were contracted.

The RE-Source Platform was founded in June 2017 as an alliance of stakeholders representing clean energy buyers and suppliers. The Platform pools resources and coordinates activities to promote a better framework for corporate renewable energy sourcing at EU and national level.

The potential for the renewable corporate sourcing market in Europe, which includes both PPAs and other forms of corporate sourcing, is significant. Europe has a less mature market than the United States in this respect, where renewable PPAs have been more common since 2013 (see Figure 2).

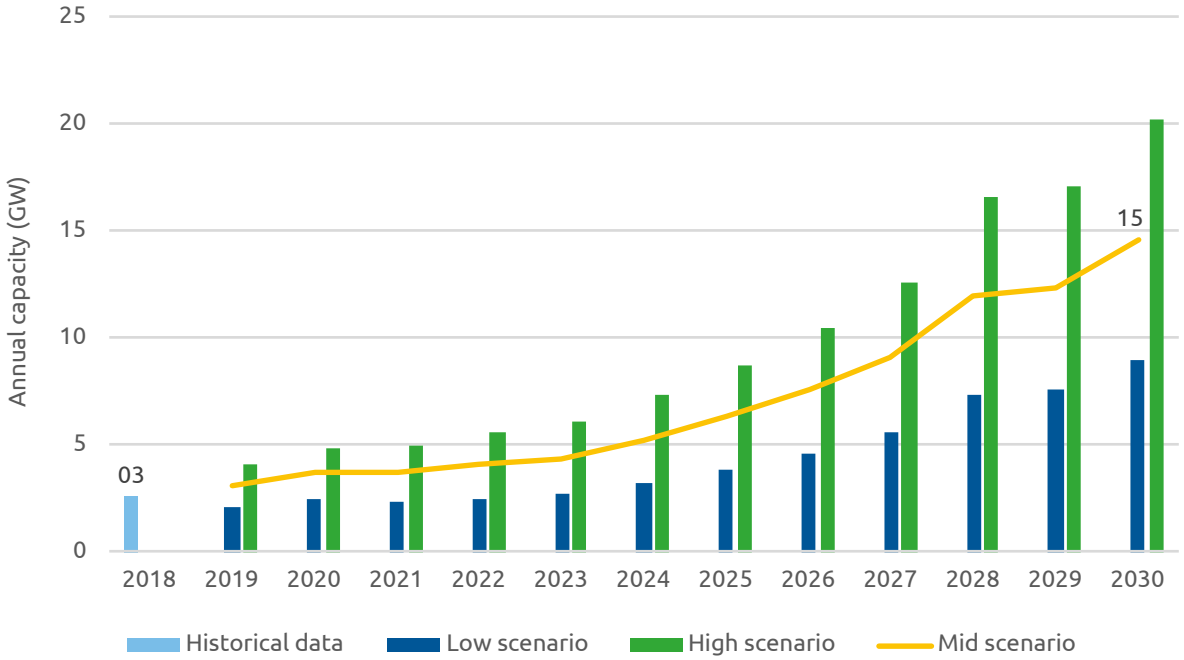
Around 85% of corporate renewable PPAs in Europe have been signed for wind energy. This is largely because much of the activity has been focused in Norway, Sweden and the UK; all countries with a high wind resource. Additionally, wind projects are typically larger than solar PV projects, allowing buyers to procure larger volumes of power in single transactions.

FIGURE 2
Global corporate PPA volumes, by region



Source: BloombergNEF
Note: Chart is for off-site PPAs only. APAC capacity is estimated. Pre-market reform Mexico PPAs excluded. Figures are subject to change and may be updated as more information is made available. Data is through June 2019.

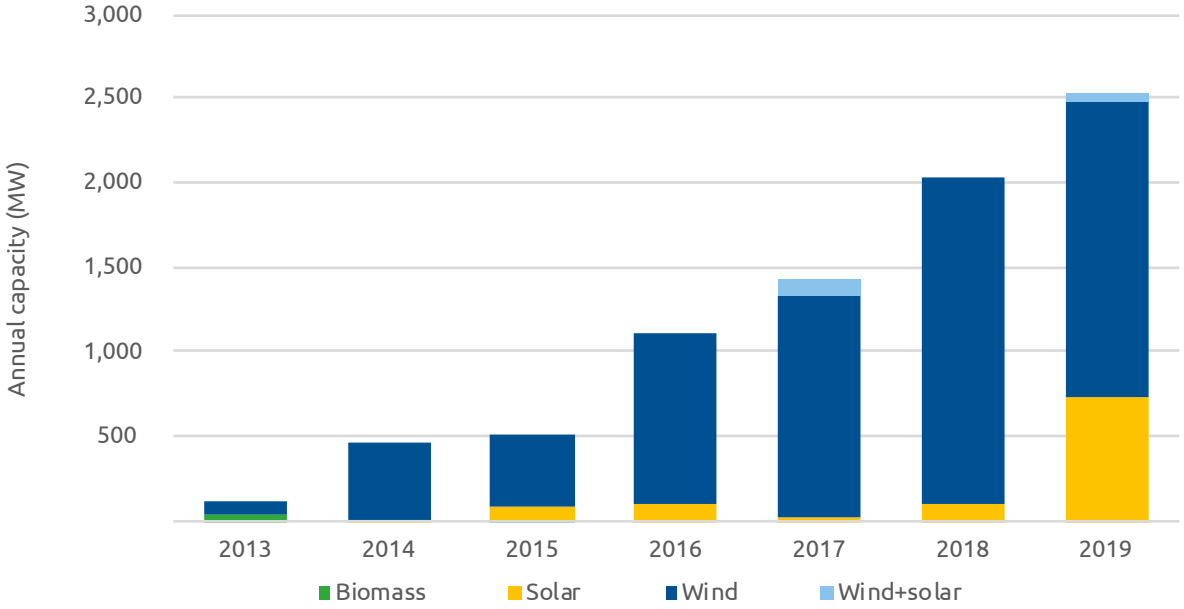
FIGURE 3
Commercial and industrial roof-mounted installed PV in selected European markets



Source: SolarPower Europe.

Commercial and industrial on-site solar installations represent the bulk of the various on-site forms of corporate sourcing, which include on-site self-owned, leasing, on-site PPAs and near-site private wires. In the last five years, Europe has seen annual rates of installations of commercial and industrial on-site solar plants of around 2-3 GW/year, and forecasts show that installations of on-site solar plants will increase dramatically over the coming years.

FIGURE 4
EMEA corporate PPAs, by technology



Source: WindEurope

Corporates have a variety of different drivers for looking to source power from renewables, but the ability to lower and fix electricity costs is a major part of the rationale for these deals. A recent survey of 1,200 companies across six countries showed that, of those sourcing renewables, 92% are doing so in order to reduce electricity costs[1]. Although decarbonisation commitments often provide the initial driver to consider renewable corporate sourcing, the ability for a corporate PPA to reduce electricity cost volatility and generate savings on energy bills over the long term is cited by most corporates as providing the primary business case.

Another crucial element for corporate sourcing of renewables are Guarantees of Origin ('GOs'). A GO is a tracing mechanism that guarantees the origin of the electricity. Their use as part of Corporate Renewable PPAs should be safeguarded to preserve the link between green energy producers and consumers and to protect the environmental credibility of the system[2]. Under the recast EU Renewable Energy Directive, Member States can decide not to issue GOs to producers that receive government financial support[3] and can exempt installations below a minimum capacity limit. All installations bigger than 50 kW are subject to the issuing of GOs, with smaller installations having the option to receive simplified GOs. For more information about GOs, visit the Association of issuing bodies (AIB)[4] and RECS International[5].

1. BayWa r.e. Energy Report 2019, published in partnership with the RE-Source Platform. Available here: https://www.baywa-re.de/en/energy-report-2019/
2. http://resource-platform.eu/wp-content/uploads/files/downloads/RE-Source-Platform-Guideline-on-GOs-and-PPAs.pdf
3. The RE-Source Platform advocates for the mandatory issuance of GOs when a project is receiving government support to allow the proper traceability of renewable electricity. See why it is important: http://resource-platform.eu/wp-content/uploads/files/downloads/RE-Source-Platform-Policy-Recommendations.pdf
4. https://www.aib-net.org/
5. http://www.recs.org/

Key factors in decision making

There are a number of ways that a corporate can procure renewable electricity in Europe. The most suitable will depend on a number of different factors relating to the business: its risk profile, its commitment to corporate social responsibility ('CSR'), its size, the level of engagement of its executives, etc. For each model of corporate sourcing, this report uses the attributes below to describe features that help identify which corporate sourcing path is most appropriate.

Ownership:

The renewable energy assets may be owned by the corporate itself, i.e. self-owned, or they can be owned by a third party. If owned by a third party, the corporate buys the electricity from the asset owner and does not bear the risk of ownership.

On- and off-site:

The renewable energy asset may be located on-site, near-site or off-site with the electricity being delivered by a private wire or via the grid to the buyer. The geographical location consideration is separate to the ownership consideration. One of the benefits of the asset being on-site or near-site is that it provides the corporate with a higher visibility for its CSR credentials and a potential increase in brand reputation.

Additionality:

The principle of additionality applies when a corporate closes an electricity purchasing contract that contributes to the construction of new renewable energy facilities. For example, a power purchase agreement with a corporate for the long-term supply of electricity for a fixed price provides the project with a guaranteed income, an important consideration for banks when deciding whether to lend to the project. The PPA therefore makes the project more bankable. Projects that comply with the principle of additionality result in real and verifiable emissions reduction or emissions avoidance for the corporate, as their direct effect is to increase renewable energy generation.

Guarantees of Origin:

Guarantees of Origin (GOs) are an important element for the corporate sourcing of renewables. GOs are an instrument to track and prove to electricity buyers that a given share of electricity supplied to their business originates from renewable sources. There is no fixed price for a GO, and their value depends on market demand. GOs are available in all EU countries plus Norway, Switzerland and Iceland. GOs can be purchased as part of a contract providing one 'bundled' solution with the electricity from the renewable generation asset. Known as 'bundled GOs', they allow the off-taker to prove their CSR credentials from the renewable electricity purchase. With unbundled GOs, the end-consumer may purchase non-renewable electricity from an electricity supplier but source GOs from a separate GO supplier. This breaks the link between the renewable energy producer and the electricity from that renewable asset.

Green electricity supply:

Similar to a private consumer, a corporate can enter a green electricity supply contract with an electricity provider who will 'match' some or all of the electricity with purchases of renewable energy GOs. The supplier may purchase only renewable energy, or it can purchase a mix of conventional and renewable power and will purchase the same amount of energy in renewable GOs to cover the green electricity supply contracts. In six Member States and Norway, utilities have a quota for the minimum share (or volume) of renewable energy in final consumption (however, these are being replaced in Italy, the UK and Poland). This makes it difficult to prove if any additional renewable electricity is produced in these countries as a result of entering a green electricity supply contract.

Greenhouse Gas accounting:

A greenhouse gas (GHG) emissions assessment provides an audit and an inventory of a corporate's carbon footprint. It is used for directors' reports, investor due diligence and stakeholder communications amongst other things. The Corporate Standard of the Greenhouse Gas Protocol covers the accounting and

reporting of seven greenhouse gases covered by the Kyoto Protocol[6]. Corporates shall separately account for Scope 1 emissions (occurring directly from sources owned or controlled by the corporate) and Scope 2 emissions (from the generation of purchased electricity consumed by the corporate).

Financial accounting:

For financial accounting purposes, corporate renewable PPAs are often considered to be a standard supply contract (an 'executory contract') by the companies purchasing energy, where costs are accounted for based on invoices. However, pricing mechanisms, the way power purchased is used, and the designation or control of a specific asset can cause the contract to be classified as a financial instrument (which has to be fairly valued in every reporting period) or a lease (where power generation assets are recognised on a company's balance sheet). These require different accounting treatment and careful consideration by accounting professionals within companies purchasing energy through PPAs. Further guidance can be found in the IFRS accounting outline for Power Purchase Agreements, and advice should be sought on individual cases from internal or external accounting experts.

Underlying PPA structures:

It is important to understand the various business models suited to approach renewable sourcing. However, understanding the underlying structure of the eventual contract is economically and financially crucial. The type of underlying contract structure can have a significant impact on the power purchase price in negotiation, due to their different treatment of volume and risk allocation. Not all PPA structures will suit the risk appetite of corporates and not all PPA structures can be suited for the different business models outlined in this report. While details of the characteristics of the underlying PPA structures are beyond the scope of this report, they are described in more detail in our Risk mitigation for corporate renewable PPAs (http://resource-platform.eu/toolkit/). Therefore, if considering a PPA-style business model, we suggest that you review it in parallel with our outline of the underlying PPA structures which can be found in the Corporate Buyers' Toolkit (http://resource-platform.eu/toolkit/).

6. https://ghgprotocol.org/corporate-standard

How to use this report

For each business model there is a 2-3-page feature, setting out important information. Below is an example of the format feature for each model.

Features:
This section summarises the main aspects of the model.

Description

Model variables selection (Figure 6):
Self-owned or third party-owned; on-site or off-site; bundled or unbundled GOs.

Map (Figure 7):
This map highlights the countries in Europe where models have been used (dark green) or where there are no administrative barriers (light green). It does not highlight the suitability of the model to the country.

Cash and electricity flow diagram (Figure 8)

FIGURE 5
Description of the features presented in each business model

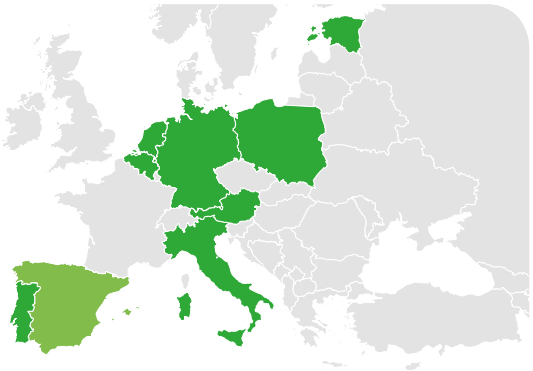
FIGURE 6
Key for model variables selection

SELF | THIRD | ON | OFF | GO BU | GO UN

SELF: Self-owned
THIRD: Third party-owned
ON: On-site
OFF: Off-site
GO BU: Bundled GOs
GO UN: Unbundled GOs

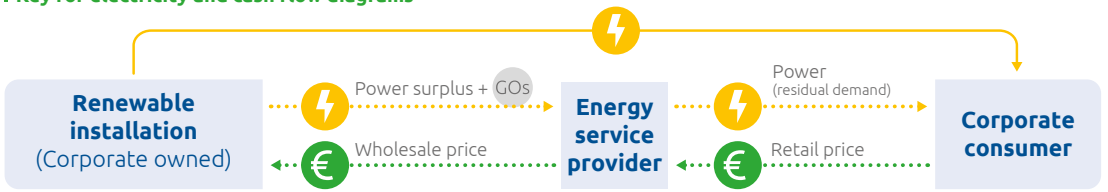
Applicable
Non-applicable

FIGURE 7
Key for maps



Model in use
Model available

FIGURE 8
Key for electricity and cash flow diagrams



Electricity flow
Cash flow
Balancing electricity flow
Balancing electricity cash flow
GOs — Guarantees of Origin from renewable installation
GOs — Guarantees of Origin from GO market
GOs — Transfer of Guarantees of Origin

Which method of green electricity procurement is best for you?

Choosing which business model is most appropriate for your business depends on your situation, risk profile, commitment to corporate social responsibility ('CSR'), size, and so forth. We have considered several decisions that a corporate might want to consider when first approaching renewable energy procurement. For each decision, the models that correspond to the desired outcome are set out in the Table below.

On-site

It may seem obvious, but this is probably one of the first considerations for potential corporate buyers. Do you have the space on-site or on an adjacent or nearby site (for example, this could be on rooftops, on land, or above car parks)? Do you have natural resources which would allow solar panels, wind turbines, etc., to generate efficiently? Would the local community appreciate the addition of renewable installations?

Self-owned

Do you want to own the renewable installation from which you are procuring electricity? This would allow you to make all the decisions related to the installation, but you would also have to be responsible for any risks. Can you fund the project on your own balance sheet or will you need to obtain external financing? How much will external financing cost?

Physical electricity delivery

Is it important to you (or your employees/customers/stakeholders) that there is a direct physical link between the renewable installation and your point of use? Parentheses in this column indicate that these models can be done with a direct physical link, but do not necessarily have to be.

Long-term fixed cost

Is controlling long-term electricity costs your primary driver for procuring renewable electricity? The electricity pricing would make up a part of the negotiations and will be set out in the procurement contract. These models allow a fixed pricing structure, but other structures are also possible (for example: indexation by reference to inflation or other relevant indexes).

Local visibility

Is local visibility of your sustainability credentials important to your employees, your customers, or your brand? The private-wire PPA model may also give your business local visibility (as well as the on-site models assuming your site is visible) depending on where and how nearby it is situated.

More suitable for SMEs

Are you a small or medium-sized corporate? These models require less resource and experience to carry out. However, note that you may also use any of the other models with the help of third parties who may be able to take on the administrative burden on your behalf.

Additionality

Is it important for you to make the maximum positive impact on the environment? These models all result (or can result) in the construction of new renewable energy assets which reduce carbon emissions and help combat climate change. It is possible (and in some markets only possible) to use these models to procure renewable energy from assets which already exist to help extend their lifetime.

For example, a corporate PPA which is signed after a government feed-in-tariff expires can enable the project to avoid being decommissioned. The revenue certainty from the PPA can finance refurbishment or even repowering of the asset to extend its operational life. Stopping existing renewable capacity from going off-line can be as important as bringing new capacity on-line. This form of additionality is sometimes referred to as 'anti-subtractability'.

TABLE 2
Decision-making characteristics to purchase green electricity

		On-site	Self-owned	Physical electricity delivery	Long-term fixed cost	Local visibility - *in sight of consumers and local community*	More suitable for SMEs	Additionality - *encourages new build renewable projects*
 **Common Models On-site**	A1: Self-owned on-site	•	•	•	•	•	•	•
	A2: Leasing	•		•	•	•	•	•
	A3: On-site PPA	•		•	•	•		•
	A4: Private-wire PPA			•	•	(•)		•
 **Common Models Off-site**	B1: Physical PPA			•	•			•
	B2: Financial PPA				•			•
 **Off-site Variants**	C1: Self-owned off-site		•					•
	C2: Multi-buyer PPA			(•)	•		•	•
	C3: Multi-seller PPA			(•)	•			•
	C4: Cross-border PPA			(•)	•			•
	C5: Multi-technology PPA			(•)	•			•
	C6: Proxy generation PPA			(•)	•			•
 **General & Top-up Models**	D1: Green electricity supply						•	
	D2: Unbundled GOs						•	

(•) Parentheses indicate that the feature is possible in that model but not definite and depends on the situation.

Towards 100,000 corporates...

There are many different models available to corporates seeking to source their power from renewables. This variety offers companies the flexibility to find a method that suits their needs in terms of demand profile, risk appetite, long-term stability, cost structure and internal access to finance.

The RE-Source Platform recognises that this complexity can be daunting for a corporate new to this market. It has therefore committed to creating a European Corporate Sourcing Buyer's Toolkit to help navigate the market with increased confidence. This report is part of that Toolkit.

FIGURE 9
The European Corporate Sourcing Buyer's Toolkit[7]

Other products in the Toolkit include:

- The European Corporate Sourcing Directory, which outlines which models of corporate sourcing are administratively possible for each European country and the history of their use in specific territories.
- The EFET Template PPA Contract, which can be used as a baseline for PPA contract negotiations. It was developed by the European Federation of Energy Traders (EFET) and released in 2019.
- Financial Risk Mitigation Products for Corporate PPAs report, written by the providers of the products available to corporates considering entering into PPA contracts. The report describes the possible risks associated with renewable PPAs and ways to mitigate their risk.
- PPA Training Courses across Europe provided by our partner, Pexapark.

The RE-Source Platform helps buyers and sellers work together to simplify transactions and reduce costs in the market whilst ensuring the continuation of innovation does not hinder the market's development.

Our preference is towards the models of corporate sourcing that provide additionality; however, those models may not be feasible for all businesses, particularly new and smaller corporates. However, any new form of renewable energy procurement should be encouraged.

This is a new and constantly evolving market in Europe and across the globe. We hope this report can spur further innovation, increase the number of active corporate buyers of renewable energy in the European market, and help achieve our goal of increasing the 100 companies leading the way in renewable energy sourcing to the 100,000 we need to make a major difference.

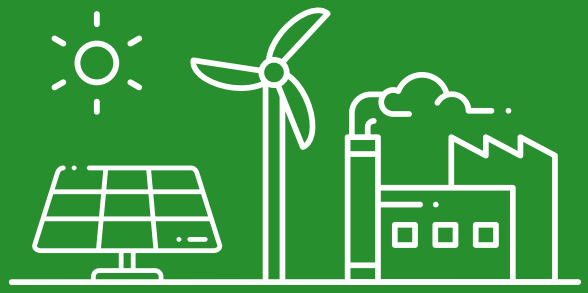
#100to100k

7. http://resource-platform.eu/toolkit/

1.

Common models of corporate sourcing

A: On-site models



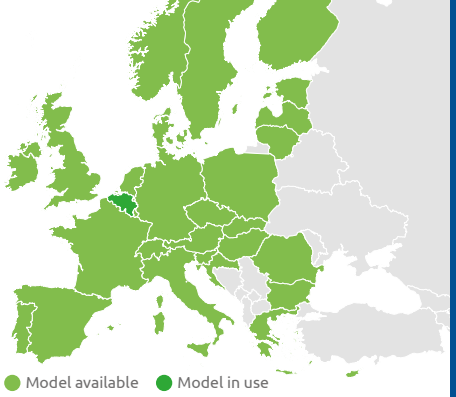
If there is appropriate land, roof space, or carports available, a corporate can install renewable assets within the boundaries of their site, allowing it to benefit from the natural resources in its location and benefit their brand by showcasing their commitment to reducing environmental impact.

These 'behind-the-meter' models benefit from savings of non-commodity grid costs (such as transmission and distribution charges) as well as from the commodity costs saved. However, their primary limitation is lack of scale.

To obtain planning consent, it is important for the corporate to engage with the local community and to carry out an assessment of the visual impact, and its potential effect on the local environment.

SELF | THIRD | ON | OFF | GO BU | GO UN

A1 Self-owned on-site



Description

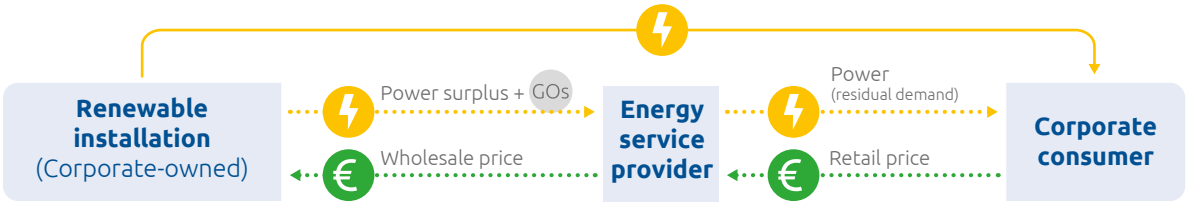
The renewable installation is owned by the corporate that consumes the electricity generated behind the meter. The site may be owned by the corporate (which makes the development process simpler) or leased. It is still possible for a corporate to develop its own renewable asset on leased land/roofs/carports as the additional value it adds to the site and the low-cost renewable energy can appeal to landlords.

The corporate benefits from having the freedom to make all its own decisions regarding the asset but must accept the risks of the project. Since installing a renewable asset can involve a high upfront capital cost, the corporate should be confident that financing the asset (i.e. the cost of raising the money by borrowing from a bank, through its shareholders or on its own balance sheet) costs less than the cost of buying electricity through the grid.

The renewable installation would usually be sized to achieve very high or near 100% self-consumption. Any excess power can be fed into the grid if there is a connection and then sold to the market through a wholesaler.

The corporate power consumer can take on the project management itself or contract the development of the project to an Engineering, Procurement and

FIGURE 10
A1 Self-owned on-site model diagram



Features

- Businesses, particularly those with high energy consumption, can save significant amounts on energy costs (both commodity and non-commodity costs) over the asset's lifetime.
- Building a new renewable asset provides additionality and reduces the carbon footprint of the business.
- Can provide high visibility and credibility with employees, customers and other stakeholders.
- Possibility to sell excess power back to the grid if a connection is available.
- As the corporate owns the assets, it has the freedom to make all decisions concerning it.
- But the risks of the project also lie with the corporate.
- Can create complications between the landlord and the tenant for rented sites and buildings.

Construction (EPC) contractor. It can also contract the Operations and Maintenance (O&M) to an O&M provider for the functioning and overall management of the installation once up and running.

The renewable electricity generated and consumed within the building is counted within the Scope 1 emissions of the building under the international Greenhouse Gas protocol[8].

Guarantees of Origin

No Guarantees of Origin (GOs) are generated for the power that is self-consumed behind the meter. Surplus power that is exported to the grid, and metered, would receive a GO certificate to certify that the power comes from a renewable energy source. (A corporate may choose to retain these excess GOs in some circumstances, to act as unbundled GOs, offsetting non-renewable power bought from the grid within its residual demand.)

8. More information here: https://ghgprotocol.org/sites/default/files/standards_supporting/Diagram%20of%20scopes%20and%20emissions%20across%20the%20value%20chain.pdf

Case study

Self-owned solar and wind at Volvo factory, Ghent, Belgium

Location	Near Ghent, Flanders, Belgium
Buyer	Volvo
Seller	Eneco
Capacity	15,000 solar panels (4.8 – 5.25 MW) and three wind turbines (6 MW)

This plant was the first solar PV installation on Volvo's global manufacturing operations. The installation of 15,000 solar panels on the roof of Volvo's factory in Ghent is part of the company's efforts towards climate-neutral global manufacturing operations by 2025. The PV installation will supply 5% of the plant's power needs and save the company 200,000 EUR/year on its energy bills.

The plant already uses wind power for 11% of its demand. To help finance the PV installation, Volvo offered its 6,000 employees the opportunity to invest in the scheme. This took the form of a so-called crowd-lending in which the employees lent money to start the project. The employees could invest between 250 and 1,000 EUR and 6 years later would receive their money back with a fixed 4% interest rate. The company has also installed a heating network at the site[9].

9. A variant of this model is an on-site renewable microgrid which is a group of interconnected loads and renewable installations within clearly defined electrical boundaries that act as a single controllable entity with respect to the grid. Grid connected microgrids can operate in both grid-connected and island-mode and are a variant of both self-owned on-site renewables and on-site PPAs.

Case study

Decathlon boosts renewable energy through crowdfunding

Location	Roeselare, Maasmechelen, Turnhout - Belgium
Buyer	Decathlon
Seller	GreenPulse
Capacity	840 kW

Clients, employees and neighbours of Decathlon can co-invest, alongside GreenPulse, in the renewable energy project. Participants obtain dividend returns, but also contribute to building a sustainable future.

This co-investment model raises awareness about the green image and sustainable efforts of Decathlon, motivating employees and giving a sustainable angle to engage clients.

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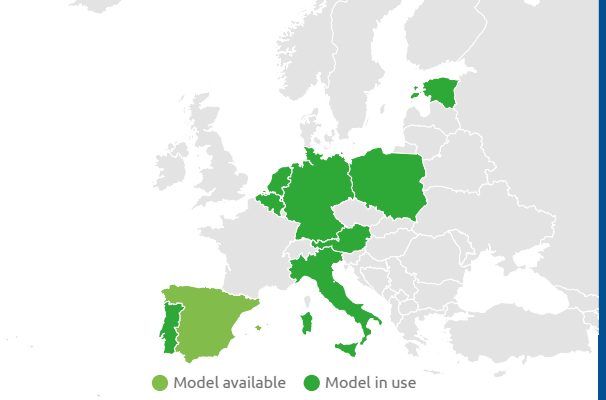
A2 Leasing



Description

A third party owns the on-site installation and leases it with a fixed monthly/annual leasing fee. The project is owned and managed by an organisation with the experience and knowledge to develop and maintain the renewable installation. The leasing fee is unrelated to the volume of power generated. Installations would usually be sized to achieve very high or near 100% self-consumption. Any excess power not consumed on site can be fed to the grid if there is a connection and then sold to the wholesale market.

As there is no PPA or electricity supply contract involved, the leasing model is often subject to different regulatory treatment to an on-site PPA model. In some countries, this can be beneficial in terms of taxes, levies, charges, or accounting treatment.

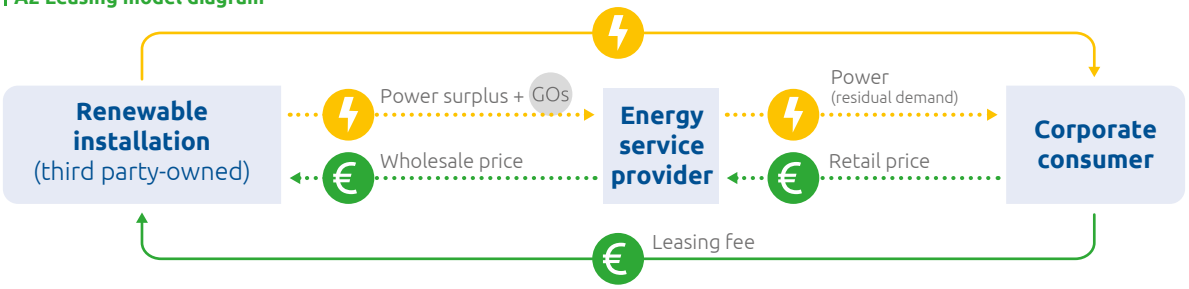
Under International Financial Reporting Standards (IFRS) 16 there is no longer a distinction between operating and financing leases. Depending on the nature of the lease, the arrangement may no longer be 'off-balance sheet'. Lessees may look to change the length and terms of arrangements as a result of the impact of the changes.

Self-consumed renewable power would be accounted for as contributing to Scope 1 emissions reduction.

Guarantees of Origin

No GOs are generated for the power that is self-consumed behind the meter. Surplus power that is exported to the grid, and metered, would receive a GO certificate to certify that the power originates from a renewable energy source.

FIGURE 11
A2 Leasing model diagram



Features

- There is no upfront capital required as the installation is owned by a third party.
- Building a new renewable asset provides additionality and reduces the carbon footprint of the business.
- Can provide high visibility and credibility with employees and customers.
- Fixed fee for installation rental is simple and hassle-free.
- The renewable installation is managed by an expert with the knowledge and experience to ensure the project is developed and maintained successfully.
- In some countries, different regulatory treatment of the lease arrangement can be beneficial in terms of taxes, levies, charges or accounting treatment.
- Businesses or buildings where a third-party lessor owns an asset on the roof can encounter difficulties in obtaining loans with mortgage providers.

Case study

BayWa r.e. and AGCO Fendt Marktoberdorf tractor manufacturers

Location	Marktoberdorf, Bayern, Germany
Buyer	AGCO Fendt
Seller	BayWa r.e.
Capacity	680 kW
Commissioned	2014
CO_2 savings	473 tonnes per year

The commercial and industrial solar PV system is leased without direct investment by the end customer/ system operator, which is AGCO Fendt. The financing and installation of the PV system was carried out by BayWa r.e., which is also responsible for the operations and maintenance on the system, now that it is in operation. This installation is an example of a 100% self-consumption installation, whereby under normal circumstances the Fendt factory consumes all of the power and electricity.

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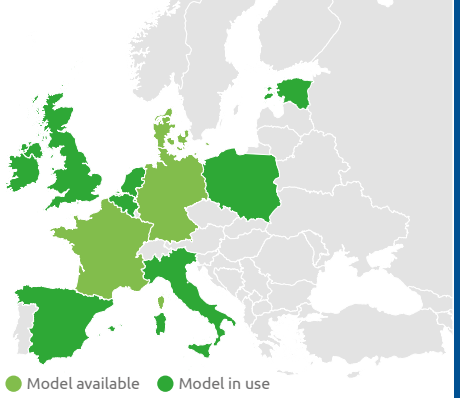
A3 On-site PPA



Description

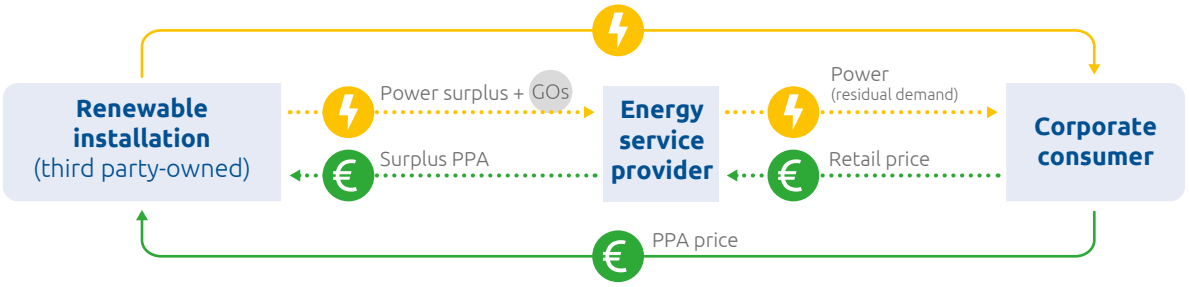
A third party builds, owns, operates, and maintains the installation on-site. The electricity generated by the renewable energy installation is consumed by the corporate, which can secure a long-term fixed price for the electricity through a Power Purchase Agreement (PPA). The PPA electricity supply price will depend on the characteristics of the plant and the retail price of the electricity.

For rented buildings, the corporate must obtain permission from the landlord to enter into a contract with the third party to have the renewables installed.

Installations would usually be sized to achieve very high or near 100% self-consumption, and power surplus is fed to the grid.

The developer may sign a 'surplus PPA' with a utility for the residual power not used by the corporate. Excess electricity, which can happen during weekends and public holidays, for example, and may be distributed via a separate connection between the renewable energy installation and the grid, if such a separate connection point is available.

FIGURE 12
A3 On-site PPA model diagram



Features

- There is no upfront capital required as the installation is owned by a third party.
- Corporates can save significant amounts on energy costs over the lifetime of the PPA contract.
- Building a new renewable asset provides additionality and reduces the carbon footprint of the business.
- Can provide high visibility and credibility with employees and customers.
- The renewable installation is managed by an expert with the knowledge and experience to ensure the project is developed and maintained successfully.
- Corporates can secure a fixed price for electricity over a long-time horizon.
- There may be no need for the generator to hold a supply licence which can create significant savings.

The surplus PPA may be signed at a lower price per kWh than the original corporate PPA as it will be referenced to the wholesale market price.

Self-consumed power would be accounted for as contributing to Scope 1 emissions reduction.

Guarantees of Origin

GOs are not generated for the power that is consumed by the corporate behind the meter. Surplus power that is exported to the grid, and metered, would receive a GO certificate to prove that the power comes from a renewable energy source.

Case study

L'Oreal on-site solar PPA at a factory in Torino, Italy

Location	Torino, Italy
Buyer	L'Oreal
Seller	Enersol SPV
Capacity	3 MWp
Commissioned	2017
CO_2 savings	20 years

The power from this on-site solar PV installation is sold to L'Oreal through an on-site direct wire PPA in Italy. L'Oreal, the French cosmetics manufacturer, entered into a 20-year contract with a 'take or pay' provision with Enersol. Enersol invested €3million for a 3 MWp plant. The pricing structure is an 8-12% discount on the retail electricity price. This project has full self-consumption, meaning that 100% of the solar electricity generated is consumed on-site, and it supplies 30% of the total demand of L'Oreal's factory. This project did not receive any subsidies. The PV system is expected to generate 3,600 MWh/year.

Image by Erich Westendarp from Pixabay

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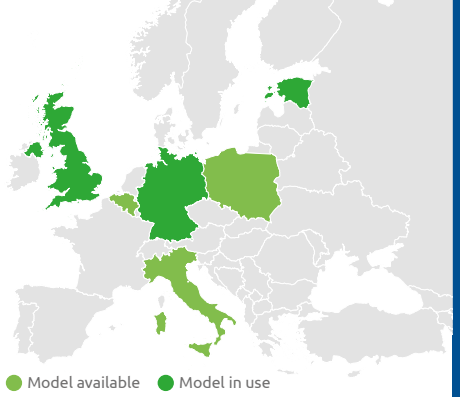
A4 Private-wire PPA



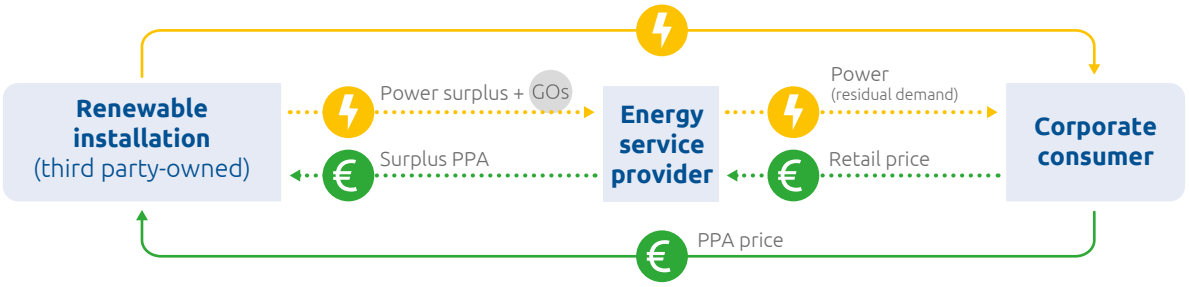
Description

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. The costs of building the private wire are incorporated into the costs of the project and hence into the PPA price. The land can be owned or rented from either the corporate power consumer or a third party. The private wire connects behind the meter, so this model does not use the public grid. This means it avoids non-commodity grid costs (i.e. charges incorporated into electricity bills which come from the government or other third parties) which are expensive and increasing over time.

However, a connection to the grid at the installation site may be required to manage surplus electricity and to make the installation more secure on its own, otherwise surplus power can be exported through the corporate's own grid connection, if the capacity is enough. The costs of the connections should be included in the overall project economics. If there is no grid connection, the system will need to rely on an energy storage system to secure power supply. Such systems come at a significant cost.

In some European countries, for example Ireland, France and Benelux, regulatory barriers make the deployment of private wires very challenging, especially when the lines cross public land. The EU's new

FIGURE 13
A4 Private-wire PPA model diagram



Features

- Can be useful in countries where the quality of the grid is poor.
- The corporate does not require use of its own site/land.
- Corporates can avoid grid charges, allowing the generator and the corporate off-taker to reach commercial agreement on the price more easily.
- Corporates can secure a fixed price for electricity over a long-time horizon.
- There may be no need for the generator to hold a supply licence which can create significant savings.
- There is full visibility of renewable power consumption and credibility, as the power is consumed directly by the corporate behind the meter.
- A grid connection at the installation site may be required to manage surplus or lack of electricity. In such case, grid charges will apply.

Clean Energy Package states that there should be no disproportionate procedures and costs on such direct wires. However, national authorities can refuse planning permission if it would obstruct 'public service obligations'[10] .

This model has been historically used by hydro plants, attracting energy-intensive companies such as chemical or aluminium plants to their locations.

The renewable power-generated would be accounted for as contributing to Scope 1 emissions reduction as the electricity is 'behind the meter'.

Guarantees of Origin

This model qualifies as self-consumption, as per the definition of a 'renewable self-consumer' in the recast of the EU Renewable Energy Directive[11] and the definition of an 'active customer' in the Electricity Market Design Directive[12]. GOs are not generated for the power that is self-consumed behind the meter. Only the surplus of power that is exported to the grid, and metered, would receive a GO certificate.

10. Article 7, EU Directive on electricity market design, as agreed in trialogue in December 2018.
11. Directive on the promotion of the use of energy from renewable sources, Article 2, (z): 'renewable self-consumer' means a final customer operating within its premises located within confined boundaries or where allowed by Member States, on other premises, who generates renewable electricity for its own consumption, and may store and sell self-generated renewable electricity, provided that, for non-household renewable self-consumers, those activities do not constitute their primary commercial or professional activities. (Emphasis added by authors.)
12. Directive on common rules for the internal market in electricity, Article 2, paragraph 6: 'active customer' means a final customer or a group of jointly acting final customers who consume or store electricity generated within their premises located within confined boundaries or where allowed by Member States, on other premises, or sell self-generated electricity or participate in flexibility or energy efficiency schemes, provided that these activities do not constitute their primary commercial or professional activity.

Case study

Shotwick Solar PV Park (72 MW) delivers electricity to UPM's Shotton Paper Mill via a private wire PPA

Location	Deeside, North Wales
Buyer	UPM Kymmene (UK), a paper and forest products manufacturer
Seller	Foresight
Capacity	72 MWp
Commissioned	2016
CO_2 savings	202,500 tonnes per year

Shotwick solar farm is the largest private wire solar park in Europe. It covers an area of just under 250 acres (1 km^2) and supplies one third of the paper mill's annual electricity demand. UPM-Kymmene is also saving over 200,000 tonnes of CO_2 every year thanks to the project. A direct power supply contract with UPM-Kymmene's Shotton Paper Mill[13] (the largest producer of 100% recycled newsprint in the UK) provides up to 100% green energy in daylight hours.

UPM-Kymmene is a Finnish forest materials company, formerly United Paper Mills. The private wire solar project is also connected to the grid and thus has the flexibility to export the electricity surplus to the grid. This represents an attractive arrangement for both the solar park and UPM as a major local employer, as it delivers long-term environmental and economic benefits to the local community.

13. https://welink.eu/paper-mill-run-clean-power-welink-group-completes-sale-uks-largest-solar-park-foresight-solar-fund/
https://britishrenewables.com/shotwick/
More pictures: https://www.comptongroup.com/shotwick-solar-park/

2.

Common models of corporate sourcing

B: Off-site models

These business models involve off-site electricity production from a renewable energy installation. Off-site projects can overcome local logistical problems, including space availability on the company's property or insufficient renewable resources to meet electricity demand. They also allow corporates to benefit from increased economies of scale, the purchase of large volumes of power and reduced generation costs.

However, these grid-based models are 'in front of the meter' and thus do not save on non-commodity grid costs.

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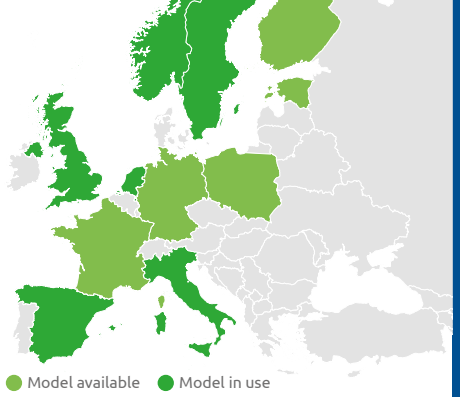
B1 Physical PPA



Description

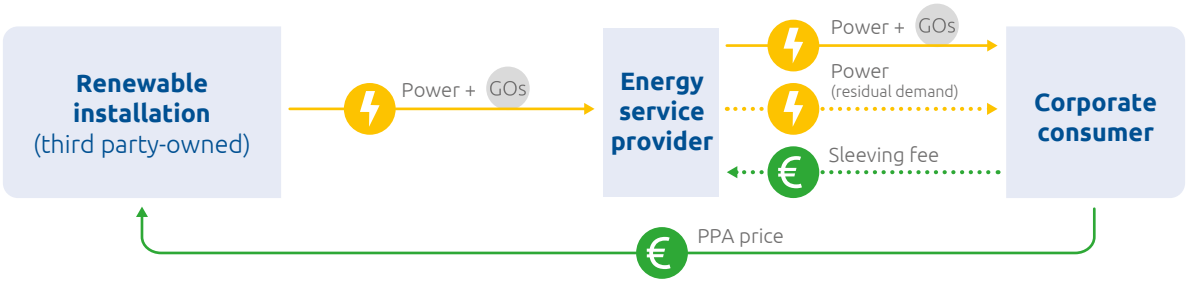
The Physical PPA model involves a physical transmission of electricity via the electricity grid, and a contract or a series of contracts between a developer and a corporate power consumer. The two sides agree to set a price (or pricing structure) over the course of the contract e.g. 5-20 years.[14]

The asset owner maintains and operates the plant and sells the electricity to the buyer at a specific delivery point. The corporate off-taker takes title to the electricity either at the installation's connection point to the grid or at the delivery point.

In some EU countries e.g. Belgium, there are rules against a corporate power consumer buying the power's title at the generator's grid connection point (although administrative barriers to Corporate Renewable PPAs must be identified and removed in the Member States' National Energy and Climate Plans as part of the Clean Energy for All Europeans package).

The PPA agreement can facilitate the construction of a new renewable asset by providing developers with a guaranteed off-taker, usually over the period of loan tenors, making a project more bankable and more likely to be developed.

FIGURE 14
B1 Physical PPA model diagram



14. This deal structure is only available in liberalised electricity markets. The electricity market has been liberalised or is in the process of being liberalised in all EU Member States and in Norway. In Bulgaria, Malta and Cyprus the process of liberalisation is still ongoing.

Features

- There is no upfront capital required as the installation is owned by a third party.
- Corporates can save significant amounts on energy costs over a PPA contract.
- The PPA can facilitate the construction of a new renewable asset by providing developers with a guaranteed off-taker.
- The PPA can be signed with existing installations that no longer receive government support, extending their lifetime.
- Building a new renewable asset provides additionality and reduces the carbon footprint of the business.
- Corporates can secure a fixed price for electricity over a long-term horizon.
- Allows for the purchase of large volumes of electricity through a single transaction as there are no space constraints.

Features

- PPAs can be marketed to increase brand perception and awareness and showcase the corporate's commitment to minimising its environmental impact.
- Credit risk of the off-taker is a key factor considered by the installation owner.
- The seller and the off-taker must be located in the same power market (same bidding zone) to allow for the physical transmission of electricity (or there must be long-term interconnection capacity available).

Where a PPA is signed with an existing installation (often exiting government support) the agreement can extend its lifetime. The price is likely to be lower for an existing installation exiting support as it is likely needed only to cover the basic O&M costs. The development costs should have been amortised at this stage of the installation's life, and there is no clear additionality. However, if the PPA enables the asset to be repowered or refurbished in some way, extending the asset's life, or if it allows the developer to invest in new renewable assets, then there is a case for additionality.

Usually the corporate off-taker will engage a utility to manage the balancing services (i.e. matching the off-taker demand profile with residual power if the renewable asset is not producing sufficient power, or trading the excess power on the wholesale market when the installation is over-producing relative to the demand) and grid access. For these services the utility will charge a 'sleeving fee' which often leads to the contract being known as a 'sleeved PPA'. The management of the price and volume risk arising from the renewable asset not meeting 100% of the demand of the corporate will be specified in the PPA contract.

A corporate may also mandate a 'firming provider' (e.g. trader or aggregator) to convert the variable pay-as-produced output profile into flat baseload blocks, which can be imported more easily into the retail supply contract. This additional optional service is designed to reduce profile or shape risk, where the profile of generation is very different to corporate demand.

For a Physical PPA to be possible, the seller and the consumer must be in the same power market to allow for the physical transmission of electricity.

The final price of the electricity for the consumer is a function of the contracted PPA price plus any additional fees due to the sleeving utility for the transmission and balancing of the electricity.

Normally a Physical PPA can be structured as a standard executory contract (under International Accounting Standards IAS37), as this is typically the simplest method and has less accounting impact. The expenses are included in the income statement, based on the costs attributable to the power delivered to and consumed by the off-taker in its ordinary course of business.

However, the financial accounting treatment of the PPA contract needs to be considered carefully as it could meet the definition of a derivative (under IFRS9) or a lease (under IFRS16)[15]. This would impact how it is valued in the corporate's accounting statements.

Power consumed from the renewable asset would be accounted for as contributing to Scope 2 emissions reduction since it relates to indirect emissions from the generation of purchased energy.

Guarantees of Origin

GOs are bundled with the power and sold from installation owner to corporate consumer as part of the contract.

15. More information on this can be found at World Business Council for Sustainable Development (2017) IFRS Accounting outline for Power Purchase Agreements. Available here: http://resource-platform.eu/files/knowledge/reports/WBCSD-IFRS-accounting-outline-for-PPA.pdf

Case study

Facebook Bjorkheim wind cluster in Norway off-site physical PPA

Location	Rogland County, Norway
Buyer	Facebook
Seller	Luxcara
Capacity	294 MW

The Bjorkheim wind cluster consists of 2 wind projects: Eikeland-Steinsland and Gravdal Skinansfjellet, which are contracted to Facebook via a long-term (15-year) PPA. They are expected to come on-line in January 2020.

Case study

Norsk Hydro utility scale wind off-site physical PPA

Location	Sirdal and Flekkefjord Municipalities, South of Norway
Buyer	Hydro Energi (Norsk Hydro)
Seller	ENGIE
Capacity	208 MW
Commissioned	To be commissioned December 2019
CO_2 savings	180,000 tons pa
Contract duration	29 years

Hydro Energi, a subsidiary of the Norwegian aluminium producer Norsk Hydro, signed the PPA to off-take all the electricity produced for 25 years, demonstrating the growing appetite of industrial energy users to secure long-term delivery of sustainable and competitively priced electricity. The PPA allows Norsk Hydro to produce around 50,000 tons of aluminium at its Norwegian plants each year with electricity from a renewable source at a very competitive levelised cost.

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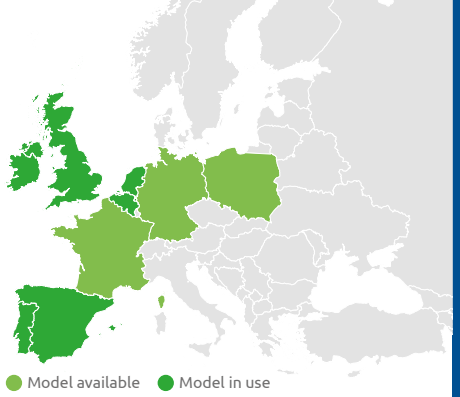
B2 Financial PPA



Description

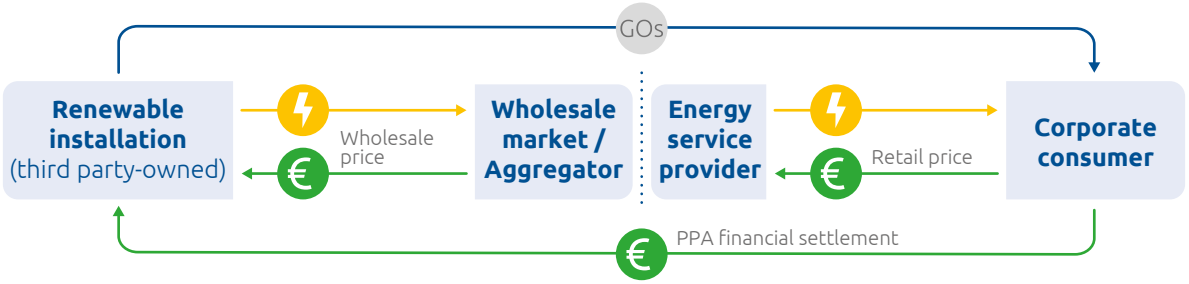
A Financial PPA is a financial derivative contract in which the price for the underlying electricity is settled with a Contract for Difference (CfD). Under the CfD the counterparties agree a 'strike price' for the electricity and a market-based reference price over the duration of the contract. When the strike price is higher than the market reference price, the off-taker makes up the difference. When the market reference price is higher than the strike price, the power producer pays the difference to the off-taker. The contract provides the corporate consumer with a financial hedge against long-term electricity price fluctuation.

There is no physical transmission of power between the producer and off-taker (hence this model also being known as a Virtual or Synthetic PPA) and this allows the PPA to be signed across national borders (see model C4: Cross-border PPAs).

The PPA agreement can facilitate the construction of a new renewable asset by providing developers with a guaranteed off-taker, usually over the period of loan tenors, making a project more bankable and more likely to be developed.

Where a PPA is signed with an existing installation (often exiting government support) the agreement

FIGURE 15
B2 Financial PPA model diagram



Features

- There is no upfront capital required as the installation is owned by a third party.
- Corporates can save significant amounts on energy costs over a PPA contract.
- The PPA can facilitate the construction of a new renewable asset by providing the developer with a guaranteed income stream.
- The PPA can be signed with existing installations that no longer receive government support, extending their lifetime.
- The installation owner still needs to set up a separate contract to sell all the physical power to the market.
- Building a new renewable asset provides additionality and reduces the carbon footprint of the business.
- Corporates can secure a fixed price for electricity over a long-term horizon.

Features

- Allows for the purchase of large volumes of electricity through a single transaction as there are no space constraints.
- Because the model involves only a financial contract, the corporate consumer does not have to consider technical or regulatory details of the renewable installation.
- Installations do not have to be on the same grid as the off-taker, which allows corporates to sign contracts across international borders (see model C4: Cross-border PPAs).
- PPAs can be marketed to increase brand perception and awareness and showcase the corporate's commitment to minimising its environmental impact.
- Credit risk of the corporate is a key factor considered by the installation owner.
- Financial PPAs can be subject to financial derivative accounting which can change the accounting rules that apply to the corporate power consumer.

can extend its lifetime. The price is likely to be lower for an existing installation exiting support as it is likely needed only to cover the basic O&M costs. The development costs should have been amortised at this stage of the installation's life, and there is no clear additionality. This scenario does not meet our definition of additionality. However, if the PPA enables the asset to be repowered or refurbished in some way, extending the asset's life, or if it allows the developer to invest in new renewable assets, then there is a case for additionality.

The financial accounting treatment of the Financial PPA contract needs to be considered carefully as it is likely to meet the definition of a derivative contract under IFRS9 (since the PPA obtains its value from an underlying market-based reference price or index, requires little to no initial investment, and is settled at a future date[16]) which can impact how it is valued in the corporate's statements.

Power consumed from the renewable asset would be accounted for as contributing to Scope 2 emissions reduction since they relate to indirect emissions from the generation of purchased energy.

Guarantees of Origin

GOs are bundled with the PPA and transferred from installation owner to corporate as part of the overall contract. The transfer of GOs are the only physical transfer in the contract.

16. More information on this can be found at World Business Council for Sustainable Development (2017) IFRS Accounting outline for Power Purchase Agreements. Available here: http://resource-platform.eu/files/knowledge/reports/WBCSD-IFRS-accounting-outline-for-PPA.pdf

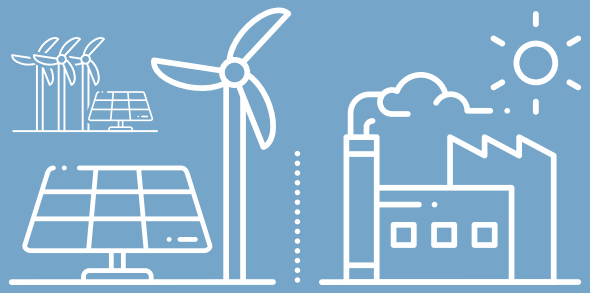
Case study

Foresight Group's Vale Matanças' solar plant off-site Financial PPA

Location	Alcácer do Sal, Portugal
Buyer	n/a
Seller	Exus Management Partners
Capacity	7.2 MW
Commissioned:	December 2018
CO_2 savings:	180,000 tons pa
Contract duration:	10 years

The project was connected to the grid in December 2018. It secured a 10-year PPA with a Spanish utility company and aims to generate 12 GWh of renewable electricity per year. The income of the Vale Matanças solar plant is derived from the long-term PPA. The project was the first investment in a Portuguese utility scale solar plant constructed without any governmental subsidy.

3.
C: Off-site variants



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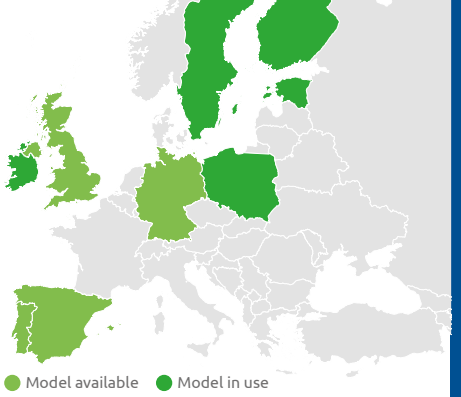
C1 Self-owned off-site



Description

A corporate invests in and owns an off-site renewable installation, or a share of the installation, as a long-term investment and to hedge its own electricity consumption costs. This often requires significant up-front capital to develop the renewable installation.

The electricity produced by the off-site installation is sold into the wholesale market and the corporate cancels the GOs from the renewable energy production against its own electricity use (which is purchased from the retail market).

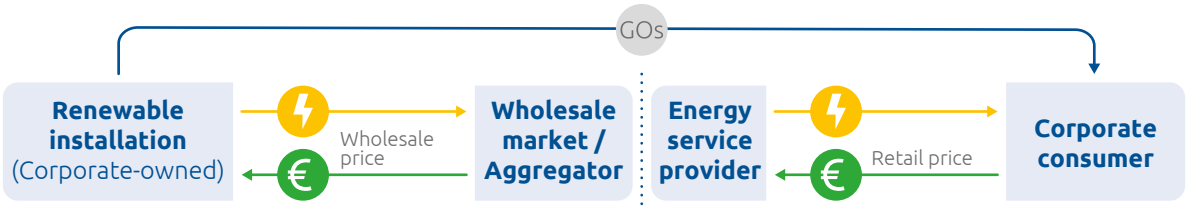
There is not an electricity supply contract between the renewable energy installation and the corporate.

Guarantees of Origin

The corporate consumes the renewable electricity by cancelling the GOs generated by the renewable installation they own against their electricity consumption.

Currently, renewable installations in some countries cannot release the GOs if they receive state support. The owner would have to purchase unbundled GOs from alternative sources which might have an impact on the perceived benefits of owning the renewable installation.

FIGURE 16
C1 Self-owned off-site model diagram



Features

- A simple business model that can be implemented in any jurisdiction as it simply involves the purchase of a renewable installation.
- Building a new renewable asset provides additionality and reduces the carbon footprint of the business.
- Allows cross-border renewable procurement that is easy to communicate.
- If the corporate has to purchase unbundled GOs from alternative sources it might impact the perceived benefits of owning the renewable installation.
- Requires expertise in renewable asset investment which may not be available to the corporate if it is not within their core business.

Case study

Ingka Group (IKEA Group) off-site wind energy investment

Location	Multiple
Buyer	Ingka Group
Seller	Multiple
Capacity	997 MW

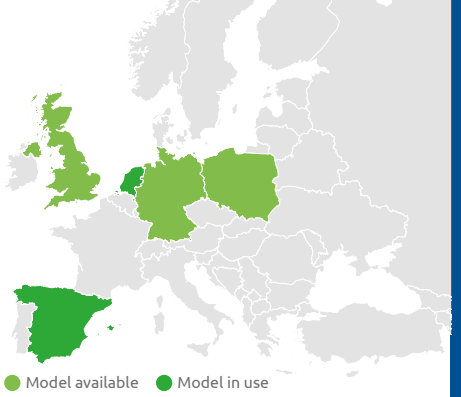
In 2018, 2,559 GWh of electricity was generated from Ingka Group-owned wind farms in 14 markets around the world. In each case the exact business model varies depending on local electricity market design. Often the electricity is sold to the wholesale or spot market and GOs generated by the installation are kept and cancelled by Ingka Group to cover its consumption.

In other markets, where Ingka Group does not receive GOs because the project is subsidised e.g. Germany, Portugal, and France, it buys unbundled GOs in addition to owning its renewable installation to cover its electricity consumption.

Ingka Group, via its Ingka Investments division, opted for direct ownership of its own plants as long-term investments.

SELF | THIRD | ON | OFF | GO BU | GO UN

C2 Multi-buyer PPA



Description

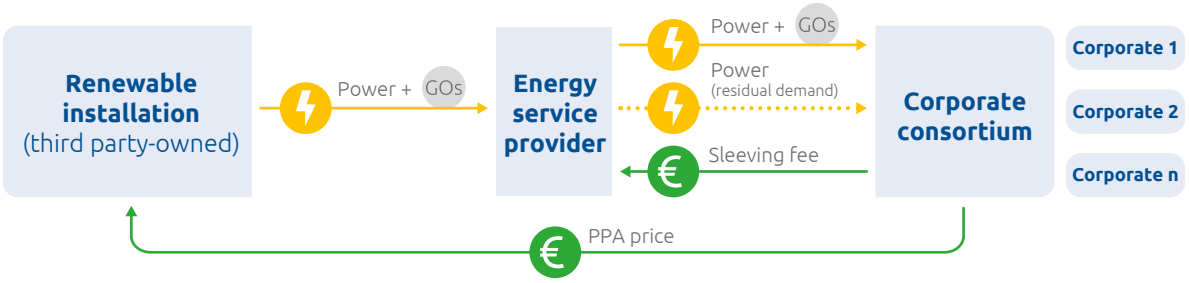
Corporates can form a consortium of buyers to contract the electricity from a single large generator. Ideally the corporates come from different sectors of economic activity so that direct competitors are not entering into a joint electricity supply contract. This can be done with identical contracts between each corporate power consumer and the generator. By signing an off-take agreement with a consortium of buyers, the developer can diversify the credit risk of the off-takers and sell more of the generator's power under one contract. From the buyer's point of view, the legal costs and processes burden can be shared between the members of the consortium. This, however can add complexities and may increase the time to negotiate the contract.

The multi-buyer PPA can be Physical or Financial.

Guarantees of Origin

GOs are bundled with the power and sold from installation owner to corporate consortium as a part of the contract.

FIGURE 17
C2 Multi-buyer PPA model diagram



Features

- Multiple corporate off-takers reduce the credit risk for the renewable installation, not just by diversification through the number of off-takers but also through the different sectors of the economy in which they trade.
- Buyers can pool their resources and expertise to add efficiencies in contract negotiations.
- Negotiating a contract with multiple counterparties may increase complexity and add delays, leading to higher legal costs.
- The governance structure of the consortium itself can be complex and ongoing management of the relationships within the consortium itself needs to be considered.

Case study

Dutch wind consortium with Google, DSM, Philips and AkzoNobel

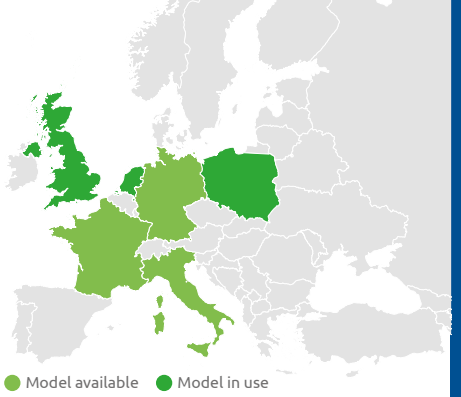
Location	Zeeland, Netherlands
Buyer	Google, DSM, Philips and AkzoNobel
Seller	Windpark Krammer (Krammer); Windpark OSK B.V. (Bouwdokken)
Capacity	136 MW
Commissioned	December 2018

This group of buyers executed its first PPA in October 2016, enabling the construction of the 102 MW Krammer Wind Park project. The consortium signed a second PPA in December 2016, which led to the construction of the 34 MW Bouwdokken Wind Park project. Each partner was contracted for 25% of the project's output.

The buyers are AkzoNobel (chemicals), DSM (health, nutrition and materials), Google (technology) and Philips (electronics). The wind farms were developed by community energy cooperatives and benefit from the Stimulering Duurzame Energieproductie subsidy scheme, known as SDE+.

SELF | THIRD | ON | OFF | GO BU | GO UN

C3 Multi-seller PPA



Description

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). An independent aggregator combines multiple renewable assets into one portfolio and contracts the supply with the corporate off-taker via a PPA. Contracting renewable energy in this way allows energy intensive corporates to meet their demand with available renewable resources whilst avoiding the need to enter into several different contracts.

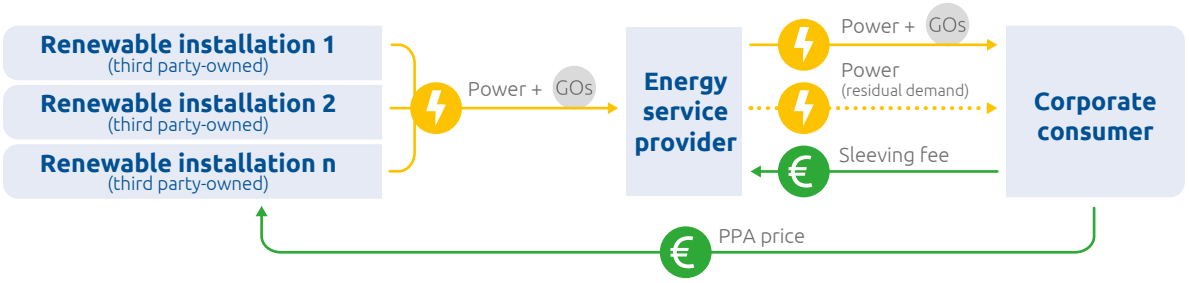
Guarantees of Origin

GOs are bundled with the electricity and sold from the portfolio to the corporate as a part of the contract. GOs can also be unbundled.

Features

- Similar features to Financial or Physical PPA.
- Aggregation of many renewable installations can reduce balancing costs by the utility.
- The aggregator takes on the commissioning and construction risks of projects.
- The aggregator charges a fee for its services, thereby adding extra costs to the model.
- Energy-intensive corporates can meet their demand with diverse local renewable energy sources.

FIGURE 18
C3 Multi-seller PPA model diagram



Case study

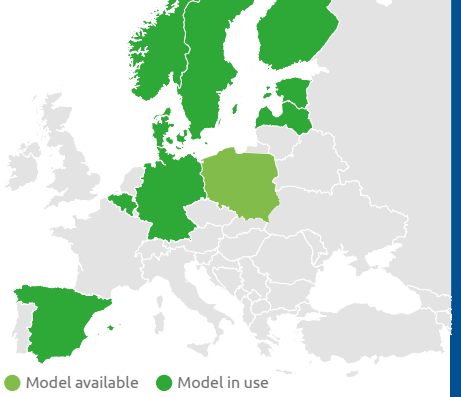
Schiphol Airport aggregated supply PPA

Location	Amsterdam Airport Schiphol, the Netherlands (and other airports in the Schiphol Group)
Buyer	Schiphol Group
Seller	Eneco
Electricity delivered	200 GWh

Schiphol Airport Group signed a 15-year contract with Dutch utility Eneco for the power supply to all its airports, with a clause that within 10 years it had to be 100% renewable. This renewable power must be provided by wind and solar plants located in the Netherlands. Within this contract there are also several sub-initiatives, such as potential on-site solar projects at the airport and electric vehicle charging points.

SELF | THIRD | ON | OFF | GO BU | GO UN

C4 Cross-border PPA



Description

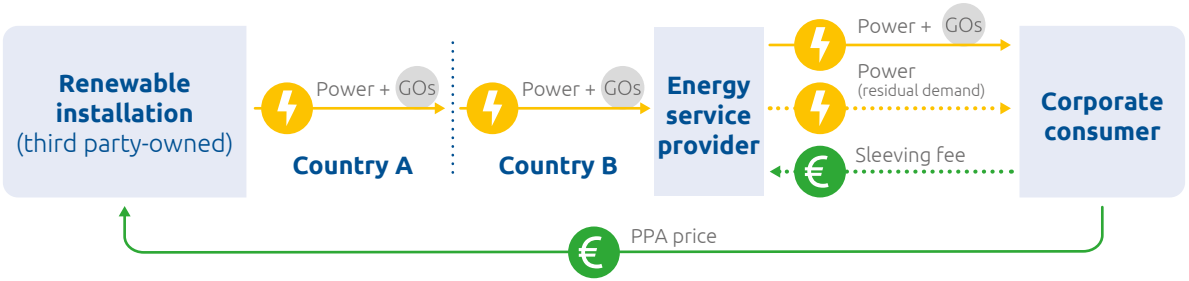
All the off-site models described above, and their variants, can also in theory be done across borders within Europe, including Physical and Financial PPAs.

At present, however, there are very few examples of such deals in Europe. The main barrier to this model is the basis risk, also known as spread risk, which arises from the possibility of a mismatch of electricity prices between the actual delivery point (wholesale market in country A) and the trading point (settlement market in country B) specified in the PPA contract.

Barriers to physical cross-border PPAs include lack of cross-border electricity interconnectors and complexities involved in long-term booking of capacity of cross-border interconnectors.

At the 2016 United Nations Climate Change Conference (COP 22), France, Germany, Portugal, Spain and Morocco signed the Sustainable Electricity Trade (SET) Roadmap: a joint declaration to facilitate cross-border trade of renewable electricity between Morocco and the four EU countries[17]. At the end of 2018, the five countries signed another joint declaration to progressively open their renewable electricity

FIGURE 19
C4 Cross-border physical PPA model diagram



17. https://ec.europa.eu/energy/sites/ener/files/documents/2016_11_13_set_roadmap_joint_declaration-vf.pdf

Features

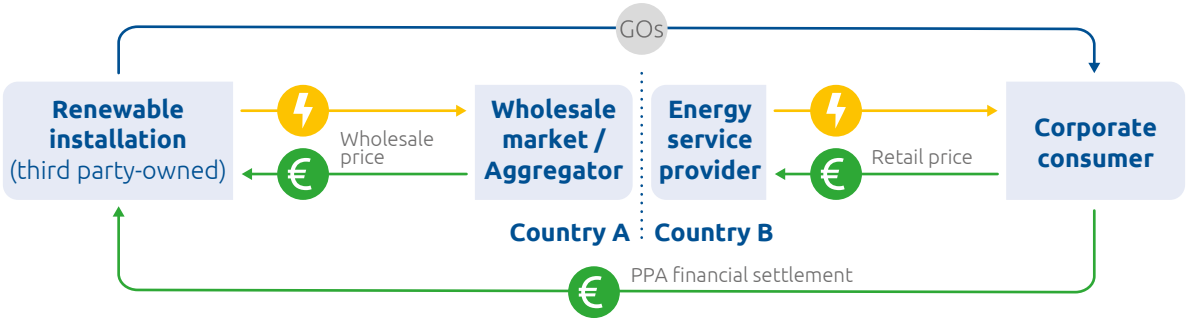
- Similar features to Financial or Physical PPA.
- Allows corporates to procure renewable energy where there are appropriate natural resources and a flexible liquid market irrespective of the country in which their businesses operate.
- The link between the renewable resource and the off-taker is not so obvious and therefore it may be more difficult to communicate, especially if the two countries do not neighbour each other. There is a vulnerability to criticism of not being sufficiently 'credible'.
- For the purposes of the EU's renewables target, it may be unclear which country accounts for the generated renewable electricity, although the assumption is that this would be the country where the renewable installation is located.
- Significant other barriers remain; e.g. wholesale price basis risk, lack of long-term interconnector capacity, foreign currency risks, and cross-border accounting complexities.

markets and facilitate cross-border trade within the signatory countries in the form of PPAs. The SET Roadmap Initiative intends to propose transparent procedures and actions, especially regarding regulatory frameworks and availability of cross-border interconnections, to remove any obstacles to cross-border trade between Morocco and the four European countries and thus facilitate the take-up of cross-border PPAs.

Guarantees of Origin

The renewable installation and the corporates may enter into a third contract to transfer the renewable GOs.

FIGURE 20
C4 Cross-border financial PPA model diagram



Case study

Wind farm in Sweden powering Google data centre in Finland

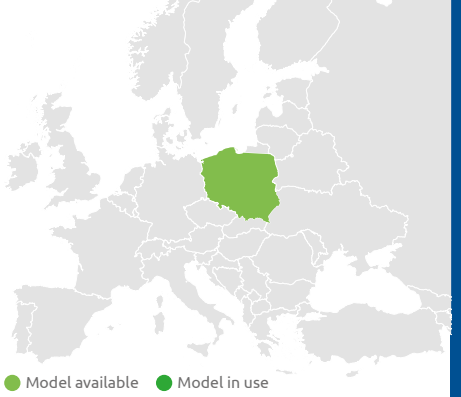
Location	Maevaara, Northern Sweden
Buyer	Google
Seller	OX2 Vind AB
Capacity	72 MW

This Swedish wind farm is powering Google's data centre location in Finland via a cross-border financial PPA. This structure was chosen because the Swedish regulatory framework and support scheme was fully compatible with corporate sourcing, which was not the case in Finland. Furthermore, these two markets are both a part of the Nord-pool power market and are highly correlated in terms of price, which makes it easier to sign a cross-border PPA.

Image by Soonthorn Wongsaita from Shutterstock

SELF | THIRD | ON | OFF | GO BU | GO UN

C5 Multi-technology PPA



Description

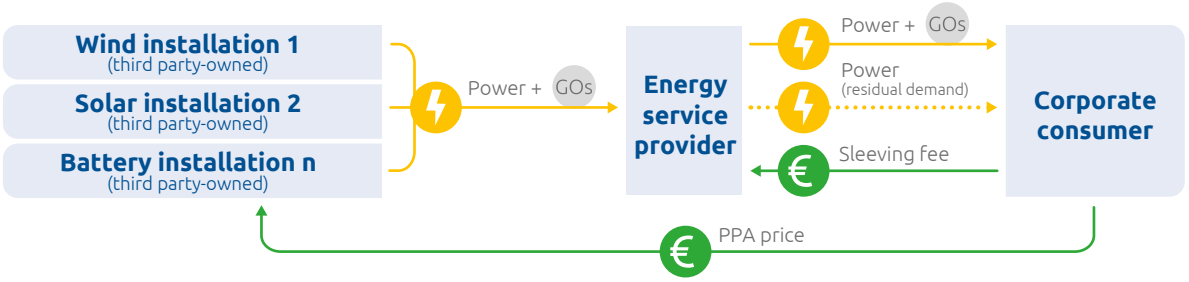
The PPA covers more than one renewable technology such as wind, solar, biomass, hydro or geothermal but could also include storage[18]. Although to date there is little evidence of this model being used in Europe, corporates have recently shown interest in 'firmed' PPAs. It is thought that by combining technologies, a firmer generation shape can be produced compared to a single technology PPA. This structure could eventually help reduce some of the shape/profile risks associated with traditional corporate renewable PPAs.

A third-party Firming Provider may step into this model and provide a service to deliver firm blocks of power to the utility for onward transfer to the corporate.

Guarantees of Origin

GOs are bundled with the power and sold from installation owners to the corporate as part of the contract.

FIGURE 21
C5 Multi-technology PPA model diagram



18. See WBCSD's report 'How multi-technology PPA structures could help companies reduce risk'.

Features

- Similar features to Financial or Physical PPA.
- Multi-technology PPAs can help reduce balancing, shape and/or volume risks.
- This model has been used in the USA but is not yet a common model in Europe.
- Given the lack of examples in Europe, there are fewer advisors with the relevant experience to facilitate the arrangement.

Case study

Sydney Opera House solar & wind multi-technology PPA

Location	New South Wales, Australia
Buyer	Sydney Opera House
Seller	Flow Power
Commissioned	December 2018
Contract duration	7 years

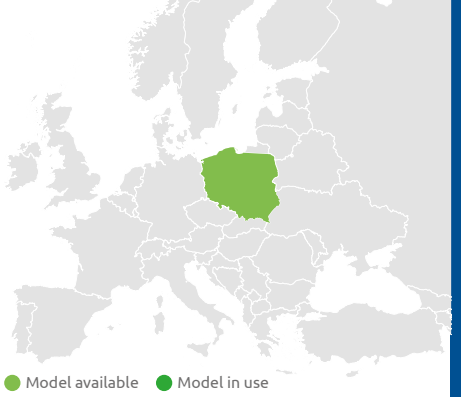
As part of its long-term environmental sustainability plan, the Sydney Opera House is working towards the goal of carbon neutrality. To help meet its objectives, the Opera House set out to find a green energy supplier and made the decision to switch to renewable energy. Following a competitive tender, the Sydney Opera House has entered into a seven-year Corporate Renewable PPA with Flow Power to source electricity from a wind and solar farm.

As part of this contract, the Opera House is investing A$2.4 million ($1.67 million) to source power from the 270 MW Sapphire Wind Farm in Glenn Innes and the 120 MW Bomen Solar Farm in Wagga Wagga.

The PPA covers over 85% of the Sydney Opera House's electricity demand.

SELF | THIRD | ON | OFF | GO BU | GO UN

C6 Proxy Generation PPA

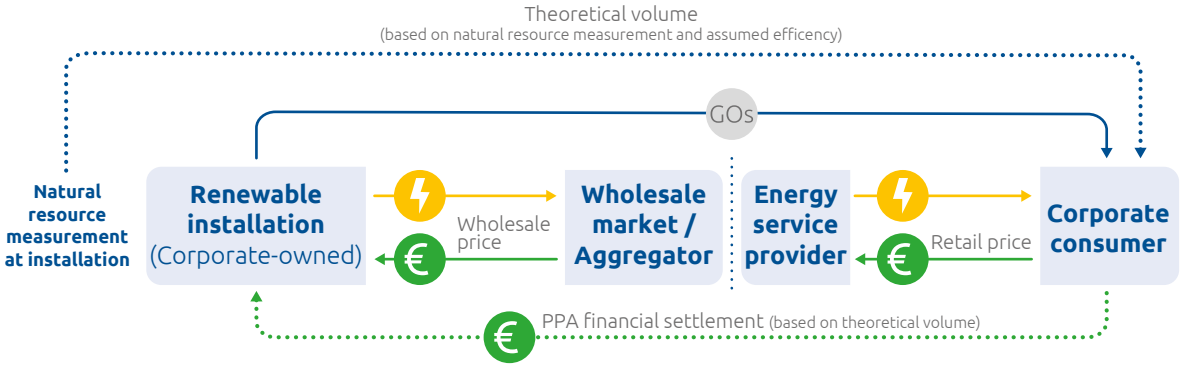


Description

The proxy generation PPA is a concept recently developed in the USA to re-allocate some risks involved in corporate PPAs to the most appropriate parties. Since the corporate renewable PPA has developed from the traditional, conventional utility PPA, it does not naturally suit the risk profile of a long-term contract with a variable renewable energy source. Much of the complexity in the contracts arises from the volume risk (i.e. the production from a renewable energy asset) of the renewable installation that sits with the corporate buyer. Volume risk is dependent on operational risk (e.g. availability of the generation capacity) and weather risk (performance/output of the plant depending on natural resources).

There are numerous clauses in a standard PPA dictating what happens when maintenance is required or if a turbine/solar panel malfunctions, etc. Proxy generation PPAs seek to pass much of the operational risk (e.g. availability) to the installation's operator (as they are best placed to understand and manage these risks).

FIGURE 22
C6 Proxy Generation PPA model diagram



Features

- Similar features to Financial or Physical PPA.
- Operational risk is transferred from the buyer, who does not have control over the operation of the installation.
- The buyer can hedge other risks with insurance products or on the commodity market.
- Since the agreed operational efficiency is fixed beforehand, the PPA contract can be significantly simplified and complexities from clauses related to maintenance, down-time, mechanical availability, etc. can be removed.
- Requires the services of an independent third party to monitor natural resource conditions, which incurs an additional cost.

A proxy generation PPA seeks to transfer the operational risk: the off-taker pays for a theoretical amount of power calculated by a third party based on actual natural resource measurements at the installation site (for example the wind conditions at the turbines of a wind farm), a pre-agreed power curve (this gives the wind-to-power conversion efficiency) and a reliability factor (usually between 80% and 100%). Since the operation's efficiency is a fixed amount, the corporate buyer has no operational risk. A corporate can also mitigate other risks that it is exposed to, namely price and shape/volume/weather, with hedging products which are available on the market.

Guarantees of Origin

GOs are bundled with the power and sold from the installation owner to the corporate as a part of the contract.

Case study

Bloom wind project, Microsoft's data centre in Cheyenne, Wyoming

Location	Kansas (nr Dodge City), USA
Buyer	Microsoft
Seller	Allianz Risk Transfer
Capacity	178 MW
VFA partners	RESurety Nephila Climate

Microsoft teamed up with RESurety, Nephila Climate and Allianz Global's Alternative Risk Transfer unit to create the first Proxy Generation PPA in 2016, winning honours as North American Wind Project of the Year[19]. By combining the Proxy Generation PPA with proxy-revenue based Volume Firming Agreements (VFAs), Microsoft was able to transfer the operational risks of the wind farm to the wind farm operator and mitigate all the weather-related risks of power production with the VFA.

For more information, see the Financial Risk Mitigation for Corporate PPAs report (http://resource-platform.eu/toolkit/).

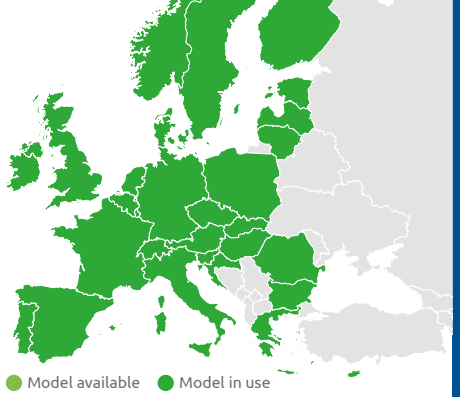
19. https://blogs.microsoft.com/green/2017/03/16/microsoft-recognized-for-innovative-wind-energy-deal-in-wyoming-a-qa-with-brian-janous/

4.

D: General and top-up models

SELF | THIRD | ON | OFF | GO BU | GO UN

D1 Green electricity supply



Description

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

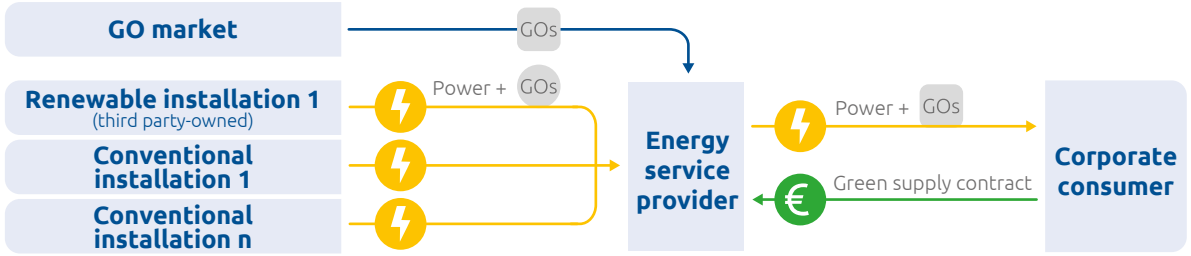
1. The utility enters an off-take PPA with renewable installations, aggregating these into a green electricity supply.

2. The utility backs up the green electricity supply with the purchase of unbundled GOs.

In both cases there is no relationship between the renewable installation and the corporate. Furthermore, there is no additionality (unless the utility can prove that the off-take PPAs have been signed with new build projects whose construction was facilitated by these contracts).

It is not entirely clear how 'green' some green electricity supplies are, especially when a utility can purchase unbundled GOs to 'green-up' their electricity mix. It is therefore possible for a utility to sell a green energy package without purchasing any renewable energy.

FIGURE 23
D1 Green electricity supply model diagram



Features

- There is no upfront capital investment required.
- This simple model is available for both small and large corporate buyers.
- Green electricity supply contracts are flexible and can be of short duration.
- There is a lack of additionality (unless the utility can prove that the off-take PPAs have been signed with new build projects whose construction was facilitated by these contracts).
- It is not entirely clear how 'green' some green electricity supplies are.
- Given the flexibility and ease of the model, it is likely to be a way for corporates to procure green energy over the short term before considering other more long-term and credible solutions.

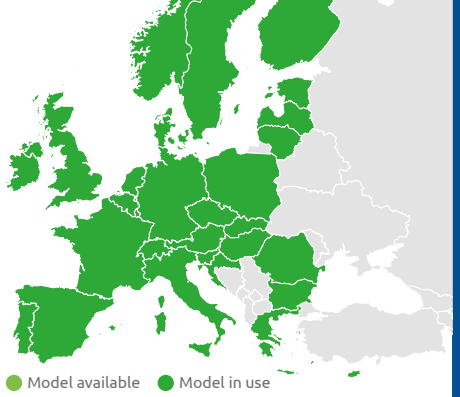
This leads to reputational risks around this model of corporate sourcing and a push for GO-backed renewable energy supply contracts to use only in-country GOs.

Guarantees of Origin

If the utility enters into an off-take PPA with renewable installations, bundled GOs can be transferred from the renewable installation to the final corporate power consumer.

SELF | THIRD | ON | OFF | GO BU | GO UN

D2 Unbundled Guarantee of Origin certificates

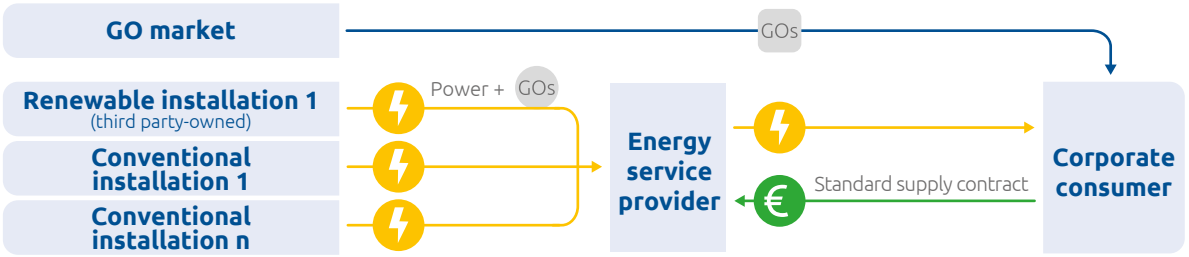


Description

Corporates purchase unbundled Guarantee of Origin certificates equal to the amount of power consumed to 'green' its electricity consumption. A variant of this model is a direct contract between a corporate and a specific renewable installation to buy all the GOs generated by the plant over a long period of time at a fixed price.

The purchase of GOs helps support the income of renewable energy installations, however, new renewable capacity is unlikely to be added to the system solely due to the purchase of these GOs. It is possible to source GOs from Norwegian hydro plants which are amongst the cheapest GOs available in Europe (as there is an abundant supply). These plants are older installations that are not seen to provide additionality.

FIGURE 24
D2 Unbundled Guarantee of Origin certificates model diagram



Features

- There is no upfront capital investment required.
- Enables a fully flexible form of corporate sourcing with no long-term commitment.
- Corporates can meet their CSR objectives without being subjected to the cost or risks of entering into long-term renewable energy supply contracts.
- The purchase of GOs helps support the income of renewable energy installations. However, this model does not lead to clear additionality.
- Corporate sourcing via unbundled GOs adds an extra cost for corporates for every MWh of power consumed.
- Norwegian hydro plants provide an abundant supply of GOs, which are amongst the cheapest GOs available in Europe. However they are not considered to provide additionality.

Corporate sourcing via unbundled GOs adds an extra cost for corporates for every MWh of power consumed. Prices of GOs range widely from approximately 0.10 EUR to 10 EUR per MWh, depending on the location and technology type of the GO.

Unbundled GOs can be an efficient short-term strategy to top-up (e.g. to 100% renewable electricity) from a baseline of long-term PPA contract(s).

Guarantees of Origin

If the utility enters into an off-take PPA with renewable installations, bundled GOs can be transferred from the renewable installation to the final corporate power consumer.

RE-Source

European platform for corporate renewable energy sourcing

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