RENEWABLE ELECTRICITY TOOLKIT

Partnering for Progress on Renewable Electricity

Check out our other sustainability toolkits at:
sigmaaldrich.com/sustainabilitytoolkits

DISCLAIMER

The materials in this toolkit are intended to serve as general guidance and background information only.

We have compiled the content of this toolkit carefully and in accordance with our current state of knowledge.

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What You'll Find

The Renewable Electricity Toolkit is designed to help you understand the basics of renewable electricity, and how to create a comprehensive action plan that will help you bring projects to life.

Drawing on insights from our nearly two decades of experience in renewable electricity, this toolkit provides a structured framework for embarking on your journey. It will guide you through the renewable electricity markets, formulating a strategy, key stakeholders to involve, and what to expect post-implementation.

In addition, you will see our projects come to life in case studies throughout the toolkit.

SUPPLIER EXPECTATIONS

- Develop a renewable electricity target to secure at least 80% renewable electricity by 2030.
- Ensure the quality of your renewable electricity purchases, prioritizing long-term contracts that cause new renewable electricity capacity on the grid, and align with standards such as Green-e®.
- Install on-site renewable electricity generation where feasible.

WHY DOES RENEWABLE ELECTRICITY MATTER?

Renewable electricity is a major decarbonization lever.

By purchasing electricity from renewable sources, you can directly address your Scope 2 emission footprint. When done strategically, this decarbonization lever can yield both financial and sustainability benefits while enhancing brand reputation.

Business Resilience

By directly investing in solar, wind, or other renewable energies, companies can reduce their dependence on fossil-fuel energy sources; bring price stability to their energy supply; and future-proof their business against tightening emissions regulations and carbon pricing mechanisms. Depending on the deal structure, companies who choose to purchase renewable electricity may also realize financial benefits or manage risk.

Brand Reputation

By establishing a renewable electricity program, suppliers can enhance their brand reputation and differentiate themselves from competitors. A commitment to renewable electricity can signal to stakeholders that a company is dedicated to decarbonizing their operations and creating value for customers and shareholders alike.

Decarbonization & Company Goals

By incorporating renewable electricity into your decarbonization strategy, you not only reduce your own emissions (Scope 2), but also play a critical role in reducing the value chain emissions (Scope 3) associated with the products your customers sell. For this reason, we expect all our partners to pursue renewable electricity.

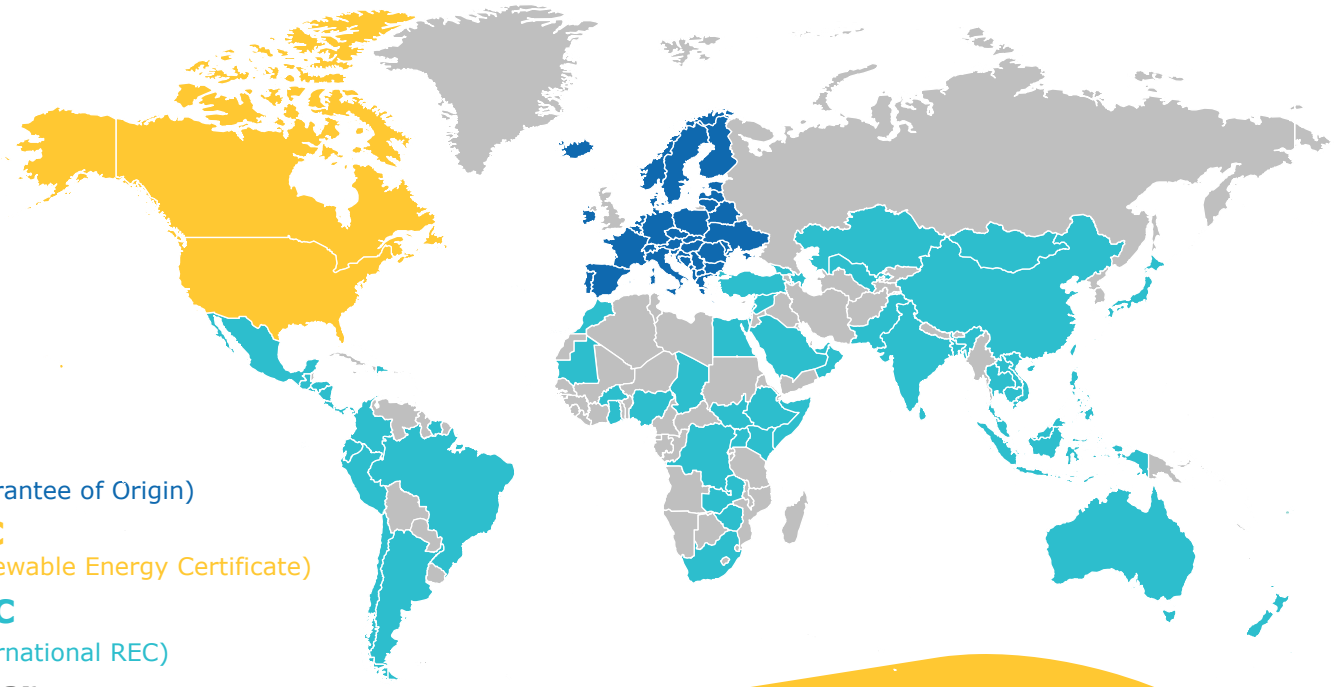
Scope 2 Emissions:
Indirect emissions from the generation of purchased energy.

To learn more about emissions, check out our **Environmental Accounting Toolkit**.

GET STARTED

1. Renewable electricity markets & EACs

The first step in your journey is to understand the renewable electricity markets and the various types of Energy Attribute Certificates (EACs) used to convey ownership and substantiate renewable electricity claims. Note that the map below is subject to change as governments modify their EAC policies.



GO
(Guarantee of Origin)

REC
(Renewable Energy Certificate)

iREC
(International REC)

Other
(National Systems or N/A)

Energy Attribute Certificates (EACs) are fundamental to all renewable electricity claims.

- An EAC is a **market-based instrument** that represents the property rights to the environmental, social and other non-power attributes of renewable electricity generation. EACs substantiate a company's claim to renewable electricity.
- EACs are minted when **one megawatt-hour (MWh) of electricity is generated** from a renewable electricity resource.
- EACs cannot be traded or applied against a company's electric consumption outside of the EAC's respective market.

GET STARTED

2. Renewable electricity options

It's important to understand the various renewable electricity options. When formulating your strategy, you may pursue a mix of these, depending on your needs.

On-site

On-site renewables are located on the same property where the electricity is consumed. These systems generate electricity for the hosting site using renewable sources such as solar, geothermal, or wind. Solar photovoltaic (PV) systems are the most common technology at commercial/industrial facilities.

Green Tariffs

Green tariffs are utility programs that allow their customers to subscribe to a rate structure that delivers EACs and energy (MWh) together. Depending on the program, you may not have visibility into where exactly the EACs are generated or other information about the generation assets.

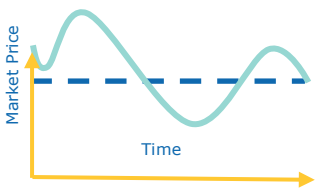
Unbundled EACs

Unbundled EACs are a contractual instrument involving the purchase of EACs from a broker, or directly from the owner of a renewable electricity asset. The EACs are purchased separate from the purchase of electricity (MWh), hence the term "unbundled", which can come with reputational risk. Be vigilant and set clear requirements aligned with your EAC quality standard and target framework to ensure compliance and transparency (see Step 3 "Take Action").

Green PPAs

A Power Purchase Agreement (PPA) delivers electricity (MWh) to a consumer at an agreed-upon price over the contract's duration. A PPA for renewable electricity should include the EACs associated with the identified generation asset. These systems can be directly connected to a specific site; in deregulated markets they can be connected to the same grid as the end-consumer.

VPPAs



A Virtual Power Purchase Agreement (VPPA) is a financial agreement that is settled as a Contract for Differences. The settlement is based on the difference between an agreed VPPA Strike Price and the Market Price of power, calculated at the time the renewable electricity is generated (typically every 15 minutes, but settled monthly or quarterly). VPPAs deliver EACs to the buyer, but not the physical electricity, as the electricity is sold into the grid as "null power" where the renewable electricity assets are located.

GET STARTED

2. Renewable electricity options

Certain renewable electricity options are more widely available than others and vary by region. The market is evolving quickly, so keep this in mind as you develop your strategy. The chart below is subject to change.

- **Widely available**
- **Partially available**
- **Hardly/not available**

Additional Considerations:

Determine if there are any regional government incentives for renewable electricity programs for your specific industry or electricity sources.

Structure	North America	Latin America	Europe	China / Korea	India	ROW
On-Site Owned*	🟢	🟢	🟢	🟢	🟢	🟢
On-Site PPA*	🟢	🟢	🟢	🟢	🟢	🟢
Green Tariff	🟢	🟡	🟢	🟡	🟡	🟡
Unbundled EACs	🟢	🟢	🟢	🟢	🟢	🟡
Green PPA	🟢	🟢	🟢	🟢	🟡	🟡
Virtual PPA*	🟢	🔴	🟢	🔴	🔴	🔴

*This contract structure typically results in purchaser-caused new supply.

GET STARTED

2. Renewable electricity options

Onsite Renewables

Onsite renewables can be broken down into two categories which are inclusive of all renewable energy technologies (wind, solar, geothermal, etc.):

1. Owned Assets

With owned assets, companies will purchase the equipment with the goal of benefitting from lower electricity costs and EAC ownership.

PROS:
- Significant savings on utility bills
- Apply for tax credits and other local or national incentives
- Maintain asset & property control

CONS:
- High upfront cost
- Maintenance responsibility
- Low coverage (5-25% of site consumption)

2. Third Party (PPA or other)

Property owners have the option to partner with a third party to install solar on their land or building. Several contract structures may be available.

PROS:
- No or low upfront cost
- Predictable payments for power and/or EACs generated
- No responsibility for maintenance and operation

CONS:
- No tax benefit
- Long-term commitment with possible easements and deed restrictions
- May or may not include EACs

On-Site Owned

Darmstadt, Germany

We installed a **560 kW** PV system on the roof of our distribution center in Darmstadt, Germany. This project reduces CO_2e emissions by approximately **235 tons** annually and produces approximately **400 MWh** of electricity.

On-Site Land-Lease

Sheboygan, Wisconsin, USA

We partnered with We Energies to install **2.25 MW** of on-site solar consisting of **7,000 solar panels** via land-lease and REC agreement, matching **16% of the site's electricity consumption**

GET STARTED

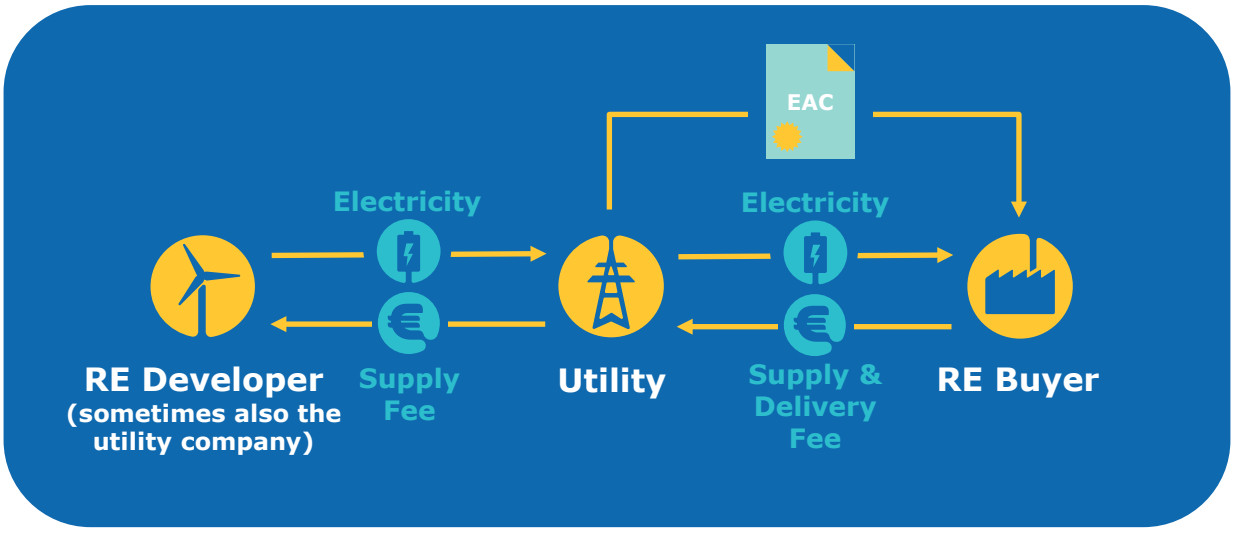
2. Renewable electricity options

Green Tariff

Utility companies commonly offer renewable electricity rates that buyers can choose to participate in. This can be an attractive option in markets where your footprint is smaller and you're looking for a direct-buy solution that supports local renewable electricity development.

NOTE: Green Tariffs could be called "Bundled EAC PPAs" in some regions.

1. Renewable Electricity (RE) Buyer selects a Green Tariff rate offered by the local utility company.
2. The utility company may or may not own the RE assets. However, as the buyer, your transaction is only with the utility company.
3. Utility company delivers electricity to the buyer.
4. EACs are retired on the buyer's behalf, typically outlined in the rate structure and contract language of the Green Tariff product.



Green Tariffs

LatAm and APAC

We participate in Green Tariffs in several countries where our footprint is limited, including several Latin America and APAC countries.

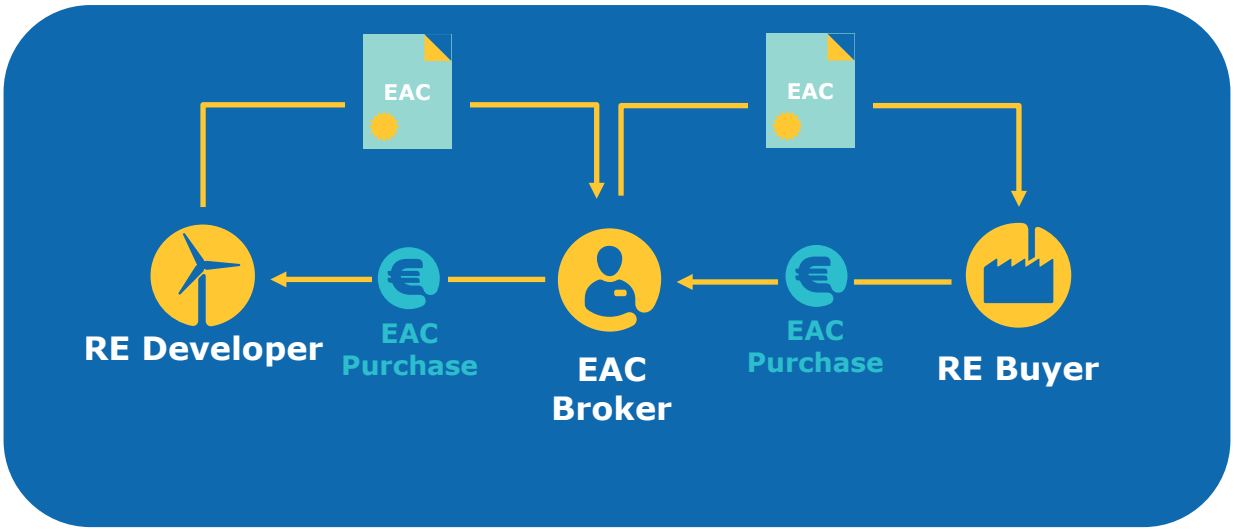
GET STARTED

2. Renewable electricity options

Unbundled EACs

The term "unbundled EACs" refers to the purchase of EACs separately from the purchase of electricity. In this type of transaction, there is typically a broker or reseller involved who buys EACs from renewable electricity developers, then resells them to renewable electricity buyers. Buyers can also source unbundled EACs from renewable electricity developers by contacting them directly.

Care must be taken to ensure the quality of the EAC purchased as there are a wide variety of unbundled EACs available. It is important to understand where they are coming from, when the facility was built, if the EACs come with any third-party certification, etc. More information about EAC quality standards will be shared in Step 3 "Take Action".



Unbundled EACs

Because unbundled EACs typically do not cause the addition of new renewable electricity capacity to the grid, companies should limit use of unbundled EACs, leveraging this option to fill gaps from any shortfalls associated with other contracts.

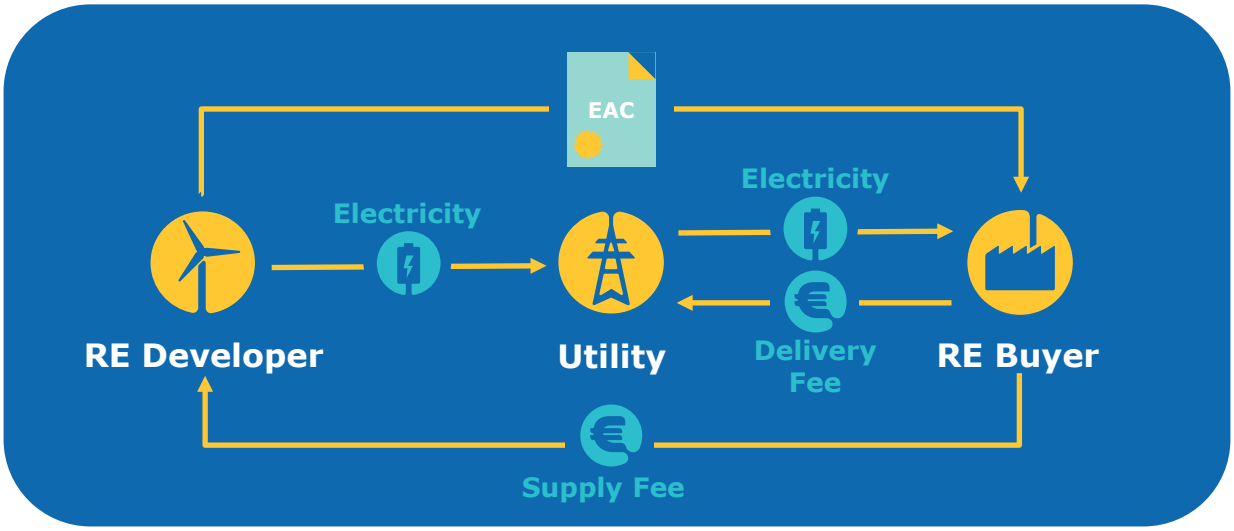
GET STARTED

2. Renewable electricity options

PPA – Power Purchase Agreements

PPAs are credible mechanisms for local renewable electricity sourcing, especially if the buyer helps cause new renewable electricity to the grid. A PPA agreement is an EAC purchase bundled with physical electricity purchase.

1. Renewable electricity (RE) Buyer signs PPA with RE Developer at a fixed rate per kilowatt-hour. Term can vary from 1 to 30 years.
2. RE Developer delivers electricity to the grid (typically the same grid where the buyer is consuming the power).
3. RE Buyer pays the RE Developer for the commodity supply and pays the local utility company for delivery of the electricity.
4. RE Developer sends EACs to RE Buyer.



Green PPA

Wuxi and Nantong, China

We entered into a **10-year** agreement for a total of **300,000 MWh** of renewable electricity in China, matching **80% of our electricity consumption** in the country.

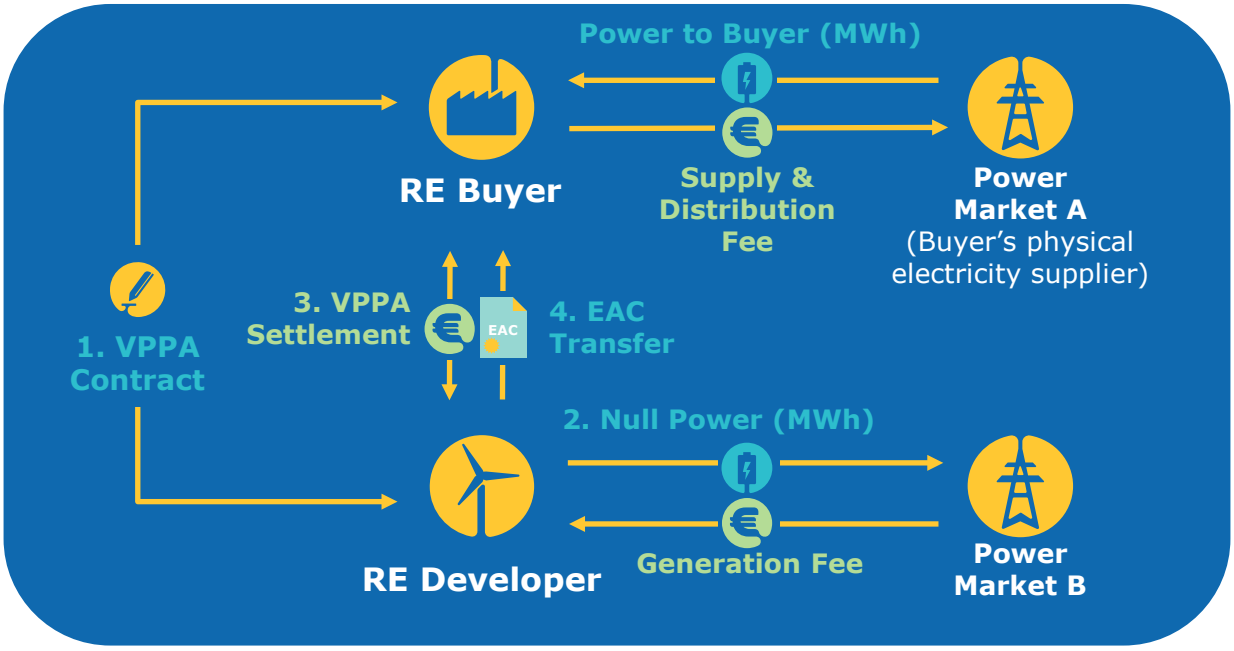
GET STARTED

2. Renewable electricity options

VPPA – Virtual Power Purchase Agreements

VPPAs can be a good option for high credit buyers with an appetite for large volumes of renewable electricity to cover sites across multiple grid regions.

1. Renewable electricity (RE) Buyer signs VPPA with RE Developer at a fixed rate (VPPA strike price). Term is typically 10-20 years.
2. RE Developer sells null power into local wholesale market and receives market price.
3. RE Developer and RE Buyer perform financial settlement (typically monthly).
4. RE Developer sends EACs (not energy) to RE Buyer, typically quarterly.



our approach

We decided early on that we wanted to play a role in the advancement of renewable electricity globally. Given the geographic diversity of our sites, we needed a solution that could scale.

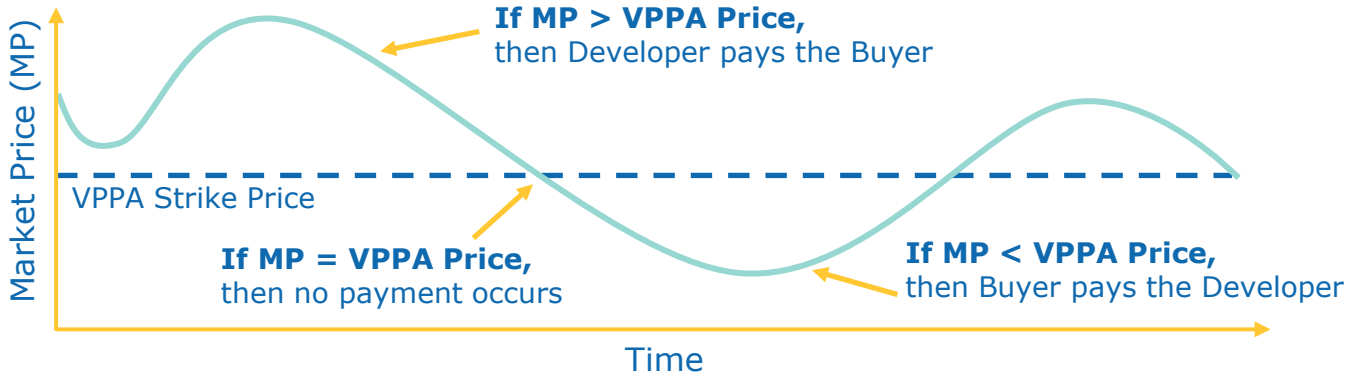
To execute on our strategy, we partnered with trusted advisors in the renewable electricity industry to seek out attractive projects with mature developers.

GET STARTED

2. Renewable electricity options

VPPAs – Other important things to know!

- Financial settlement is a Contract for Differences (CFD) that may require specific accounting treatment.
- RE Buyer receives (or pays) the net difference between the VPPA Strike Price and the Wholesale Market Price (MP) of electricity on the grid the RE asset is connected to.



- EACs are delivered to RE Buyer; **physical electricity is not**.
- There is no direct impact on conventional electricity procurement at the facility-level.
- Can be negotiated bilaterally with a developer, or as part of a buyer's consortium where aggregating demand can pique RE developers' interest and improve contract terms.
- VPPAs are complex agreements requiring deep knowledge and understanding of electricity markets and terminology. Expert counsel and third-party advisors can support the negotiation.
- RE Buyer must have excellent credit, as the RE Buyer's credit and long-term purchase commitment is what enables the RE Developer to finance a project. This early and critical involvement is what enables the RE Buyer to substantiate causation claims.

CASE STUDIES

VPPA – North America
Texas, USA

In 2021, we acted as the lead buyer within a buyer's consortium, signing a 12-year, VPPA with Enel Green Power for **68 MW** of the 350 MW-total **Azure Sky Wind and Storage** project.

The project achieved commercial operation in May 2022, and is projected to produce roughly **258 GWh** of renewable electricity annually, matching nearly 100% of the electricity consumption of our Life Science business in the United States. That same year, this VPPA propelled our Life Science business to reach **77% renewable electricity globally**.

Our portion of the project equates to approximately 14 wind turbines that stand nearly 183 meters tall.

VPPA – Europe
Spain

In 2023, we signed virtual power purchase agreements with Matrix Renewables and Nadara (formerly Renantis) for wind and solar which is expected to deliver **300 GWh** of renewable electricity once the facilities are in operation.

These contracts will provide EACs issued in the form of Guarantees of Origin that will serve all three of our business sectors (Life Science, Healthcare, and Electronics) with **100% renewable electricity** throughout the European Union and Switzerland.

Read our VPPA press releases to learn more:

- Azure Sky Wind
- European VPPA
- Liberty Solar

TAKE ACTION

3. Define your EAC quality standards and secure leadership buy-in

Defining how you approach renewable electricity from a quality and philosophy standpoint will help steer your execution strategy. For example, we prioritize projects that bring new renewable electricity capacity to the grid, in lieu of purchasing unbundled EACs from projects built prior to our involvement.

If we must purchase EACs in a particular region, or for a particular reason, we've defined acceptable criteria and information that must be transparent.

Once your quality criteria is established, it may be a good time to secure initial leadership buy-in, explaining the options on the market, and presenting your quality standards.

Renewable electricity quality criteria

Consider the following in addition to Chapter 7.5 of the GHG Protocol Scope 2 Guidance to define acceptable EACs and data needs.

Acceptable EACs

Many different EACs exist. Through a vetting process, determine which products meet your standards for claims and traceability. Determine if you would like your certificates for any given contract to be generated from a single facility.

Impact & Causation:

Focus on projects that cause new renewable electricity capacity, e.g. by financially backing new generation assets. Buying unbundled EACs from a broker, although quick and easy, does not constitute causation and carries reputational risk.

EAC Data

Determine what data will be required, and the minimum thresholds related to the generation facility and EACs including:

- Type of acceptable renewables (solar, wind, hydropower, geothermal)
- Name of generation facility
- Age of generation facility (<15 years)
- Vintage (when the EAC was minted)
- Third party certification (e.g. Green-e®)
- Ensure contractual language conveys your unique claim to the EAC's environmental benefits.

TAKE ACTION

4. Understand your footprint and develop a strategy

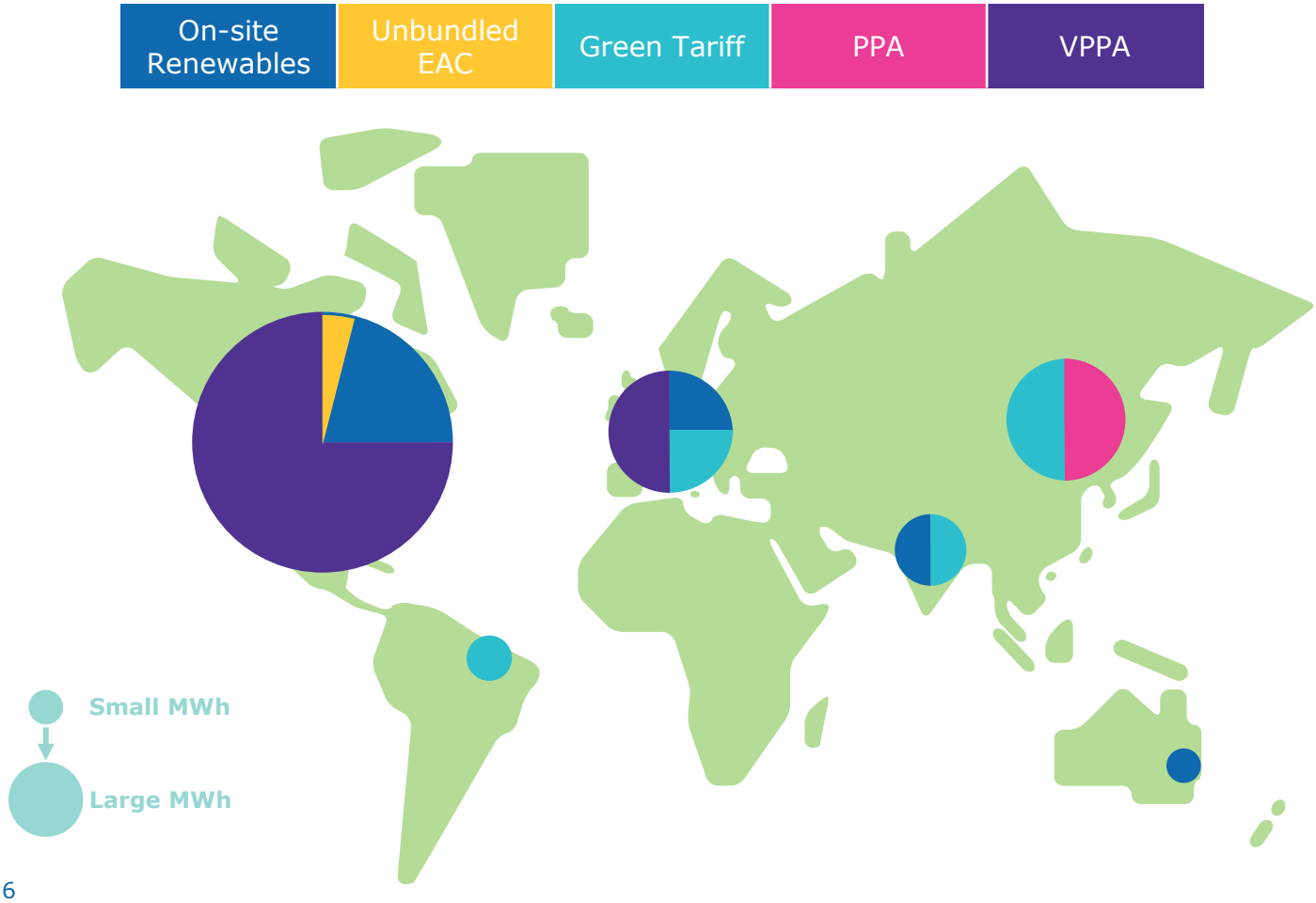
Now that you understand what's available for renewable electricity at a global scale, it's time to think local. Start with understanding where your largest electricity consumption is, rolling it up by state, country, and renewable energy market. At each layer, determine what your options are. By doing so, you can formulate a strategy that's right for your business.

Explore resources such as the Asian Clean Energy Coalition (ACEC), Clean Energy Buyers Association (CEBA), and RE-Source for access to industry insights and resources. By engaging with industry networks and forums, you can actively learn about and contribute to the latest developments in the renewable energy industry.

The Together for Sustainability (TfS) Academy and Energize program also offer additional trainings and insights on renewable electricity procurement.

Renewable Electricity Strategy

(For illustrative purposes only)



TAKE ACTION

5. Build your extended team and execute contracts

After developing your strategy, it's time to roll out your program. Bringing the right internal and external stakeholders together at the right time will help ensure a smooth process.

- **Onsite Renewables:** Key stakeholders include Sustainability, Operations, Controlling, and Procurement as these projects meet at the crossroads of electricity supply and CapEx investments. These projects should complement site master plans and fit in with the overall infrastructure strategy of the site.
- **Green Tariffs and Power Purchase Agreements:** Key stakeholders typically include Procurement, Sustainability, and Operations. For PPAs, some companies may choose to work with a third-party buyer's rep. Ensure clear responsibilities for reporting of EACs received as electricity reporting may be performed by site personnel who need to be informed.
- **Unbundled EACs:** Typically, unbundled EACs are managed centrally by an organization, requiring a smaller team from Procurement and Sustainability to get these contracts in place.

keys to VPPA success

A strong foundation is built upon collaboration across the organization and equipping stakeholders with tools and resources to drive change toward your common goal.

Cross-functional VPPA team

Include:

- Buyer's rep / Consultant
- Procurement
- Sustainability
- Operations
- Finance
- Accounting
- Tax
- Treasury
- Legal (internal and external)

TAKE ACTION

6. Communicate your achievements

An important part of your renewable electricity journey is celebrating successes and sharing your story with the world. As you execute agreements, involve your Communications teams to plan announcements and activities, and encourage others such as your suppliers to follow in your footsteps.

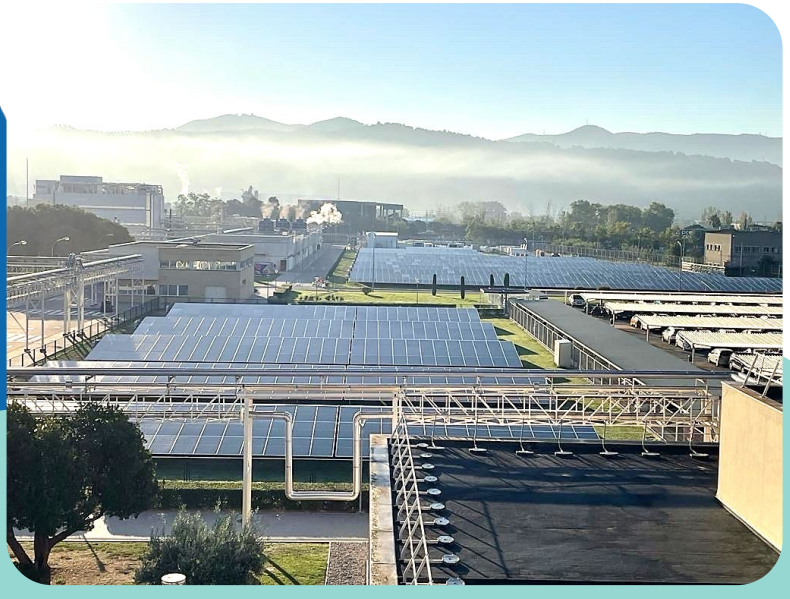
When communicating, it is paramount to ensure accuracy of claims to avoid greenwashing or embellishing. Several guides such as the Climate Group and CDP's RE100 Renewable Electricity Claims Guidance exist to help you make accurate and defendable claims.

In your communications, consider mentioning:

- Name of the facility and developer
- Type and location of the renewable electricity asset
- Contracted capacity in kilowatts or megawatts
- Expected annual generation of the facility in megawatt-hours
- Contract duration, CO_2e avoidance, and other public facing facts

CASE STUDY

At our Healthcare manufacturing site in Mollet del Vallès, Spain, we installed solar in 2023. The project generates up to **2.8 GWh** of green electricity and saves up to **800 tons** of CO_2e per year.



MEASURE PROGRESS

7. Enter commercial operation phase and measure success

After celebrating the negotiation and signing of a renewable electricity deal, it is important to deliver on your contractual obligations, establish operating protocols, and measure success of the project.

Monitor performance of the contract or asset, ensure it is producing and delivering to expectations.

For owned assets, establish a preventative maintenance and monitoring plan to maintain peak performance of the assets.

Ensure delivery of EACs, establish EAC trading accounts if needed, and retire your EACs, taking them out of circulation and substantiating your environmental claims.

Ensure your environmental accounting is in place and the right people are provided with copies of documents such as settlement statements or EAC transfers and retirements.

For VPPAs especially, align with Accounting, Tax, and Treasury to define key operating protocols including contract valuation and establishing a plan for your monthly or quarterly financial settlements.

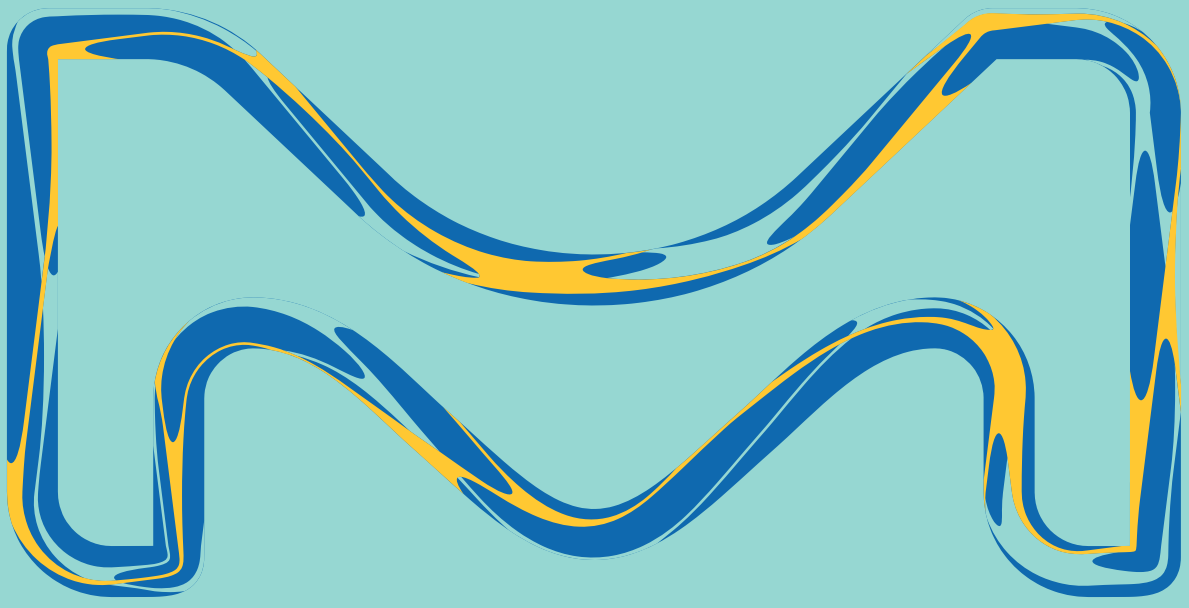
SHARE YOUR PROGRESS

- We expect our suppliers to develop a renewable electricity strategy and achieve greater than 80% renewable electricity by 2030.
- Communicate your commitments, achievements, and long-term strategy through our annual decarbonization survey.

RESOURCES

Explore additional resources to enhance your renewable electricity strategy and take further action.

GUIDELINES AND STANDARDS	**U.S. EPA Green Power Claims Guidance** **Center for Resource Solutions Green-e® Standard** **Center for Resource Solutions Clean Energy Accounting Project** **GHG Protocol Corporate Standard (Scope 1&2)** **GHG Protocol Scope 2 Guidance**
TARGETS AND COMMITMENTS	**Science Based Target Initiative (SBTi)** **Climate Group's RE100:** Bringing together businesses committed to using 100% renewable electricity
GENERAL	**International Renewable Energy Agency (IRENA):** Provides analyses and outlooks regarding renewable energy **Climate Group/CDP Renewable Electricity Claims Guidance:** Provides guidance for verification, reporting and communication of renewable electricity use **Database of State Incentives for Renewables & Efficiency:** Contains information about incentives for investing in renewable energy technologies in the United States **Clean Energy Buyers Association (CEBA):** An organization connecting and advocating for clean energy buyers **Asian Clean Energy Coalition (ACEC):** An organization driving renewable electricity procurement in Asia **RE-Source:** A platform advancing renewable energy sourcing in Europe
BUYER CONSORTIUMS AND TRAINING MATERIALS	**Net Zero Consortium for Buyers:** Buyer's consortium focusing on causation of new renewable electricity **Energize Program**: Supply chain renewable energy program **Together for Sustainability (TfS) Academy**: Free training materials, including modules on renewable energy



MilliporeSigma in the U.S. and Canada Life Science business of Merck KGaA, Darmstadt, Germany.