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# Off-Site Renewable Energy Procurement
## The Impact-Scale Void

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**Individual building projects or small companies increasingly want to purchase off-site renewable energy meeting stringent sustainability requirements, but there are often limited options available, making it challenging for owners to meet their own goals.**

**In 2023 Transsolar encountered this barrier in a variety of contexts. This paper shares our learnings about the state of the market, especially the lack of market products for high-impact renewable energy products at small or medium scale (0.1 - 5 MW). We briefly describe potential policy and market solutions to filling this void before sharing case studies of owners encountering this barrier.**

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## What is Off-Site Renewable Energy Procurement?

Transitioning our buildings to use electricity as their only energy source, with the electricity sourced from renewables such as solar (photovoltaics, PV) or wind (wind turbines), is increasingly seen as the most important solution to eliminating carbon emissions associated with building energy use (after energy efficiency). Buildings, campuses, or neighborhoods with moderate energy use and a large roof area compared to their floor area (typically 1-3 stories) can often install rooftop or other on-site PV that generates more electricity than they consume (on an annual basis).

Denser buildings or developments (often more than 3-6 stories), or those with inherently high energy use (such as laboratories) typically can't cover their annual energy use with on-site renewables. Some urban projects can't generate renewable energy on-site, for example because they are adjacent to a taller building which leaves their roof shaded for most of the day. For these projects to make a net zero energy or net zero carbon claim, they must procure their renewable energy from a generation source located elsewhere – off-site. This could be on a nearby property or elsewhere in the same city or region, but could also be located far away, sometimes even in another state (or country!).

Property owners or companies therefore need off-site renewable energy (also called green power) to support their net zero energy or net zero carbon claims and to support other goals. The US Environmental Protection Agency (EPA) describes three main categories for why companies purchase green power (EPA, 2018b, p. 19-23):

### Environmental

Reduced carbon footprint claimed due to reduced indirect (Scope 2) carbon emissions associated with production of electricity. This is the primary motivator considered in this paper.

Reduced air pollution because conventional fossil fuel power production is a large source of industrial air pollution.

Reduced water impacts because thermal power generation often requires water for fuel extraction, steam production, and power plant cooling.

### Economic

Manage electricity prices through long-term contracts which provide protection against future energy price increases.

Mitigate fuel supply disruptions in the event of natural disasters or other events that impact fuel supply to conventional plants and ultimately put electricity supply at risk.

### Branding / Stakeholder Relations

Meet organizational environment goals, often linked to third-party certifications such as U.S. Green Building Council (USGBC) or International Living Future Institute (ILFI) certifications.

Demonstrate civic leadership by being the first in the community to purchase green power and showing they act on their goals.

Increase brand credibility and generate positive publicity, which can attract new investment, new customers, or increase the value of a property.

This paper focuses on meeting the objectives of building projects with floor area ranging 20,000 – 1 million gross square feet aiming for zero energy or zero carbon status as defined by one of three programs: ILFI Zero Carbon (ILFI) (ILFI, 2022) , the Zero Code (ZERO) (Architecture 2030, 2020a) , or LEED Zero (LEED) (LEED, 2020) . Building owners choose to pursue these certifications for varying combinations of the reasons stated above. Each of these programs is slightly different, but they share a common framework of requiring more than purchase of unbundled Renewable Energy Credits (RECs) to substantiate a renewable energy claim.

Each certification framework defines a hierarchy for procuring renewable energy. Some certifications exclude certain procurement options (ILFI), some assign weighing factors to the procurement options (ZERO), and others only give recommendations about the selection process of procurement options (LEED). Figure 1 summarizes the different hierarchies:

### ILFI Zero Carbon Handbook 2022, p. 30

**Renewable Energy Ownership**

Acceptable forms of procuring renewables include:

- Direct ownership
- Indirect ownership
  - Community Solar,
  - Renewable Energy Investment Fund, or
  - Power Purchase Agreement (PPA or vPPA)
- Other forms approved by the ILFI through the Dialogue which are consistent with the intent of the certification.

Note that the sole purchasing of unbundled RECs is not an acceptable form of procurement.

The International Living Future Institute (ILFI) Zero Carbon certification **does not accept unbundled RECs.** Instead, projects have to procure options that are considered to fulfill **stricter criteria**. First and foremost, the criteria of "Additionality" is stated here. See the next slide for more information on "Additionality".

### ZERO Code 2.0, p. 6, 7

**6.3 Off-Site Renewable Energy Systems**

6.3.1 Adjusted Off-Site Renewable Energy
Adjusted off-site renewable energy shall be determined with the following equation.

Equation 5

$$RE_{off\text{-}site} = \sum_{i}^{n} RE_i \cdot PF_i$$

where
REoff-site Adjusted off-site renewable energy
REi Annual energy procured with the ith procurement method
PFi Procurement factor for ith procurement method

[...]

*Table 6.3.1 Off-Site Renewable Energy Procurement Factors*

| Procurement Option | Variation | Procurement Factor |
|---|---|---|
| Community Solar | Up-Front Payment | 0.90 |
| | Subscription | 0.80 |
| Renewable Energy Investment Fund | Up-Front Payment | 0.90 |
| | Subscription | 0.80 |
| Virtual PPA | Within Balancing Authority | 0.80 |
| | Out of Region | 0.60 |
| Self-Owned Off-Site | n.a. | 0.90 |
| Green Electricity Pricing | Energy Bundled with RECs | 0.90 |
| | Unbundled RPS Qualifying RECs | 0.70 |
| | Unbundled Other RECs | 0.60 |
| Utility Renewable Energy Contract | Energy Bundled with RECs | 0.90 |
| | Unbundled RPS Qualifying RECs | 0.70 |
| | Unbundled Other RECs | 0.60 |
| Direct Purchase of RECs | Unbundled RPS Qualifying RECs | 0.70 |
| | Unbundled Other RECs | 0.50 |

The ZERO Code 2.0 assigns **procurement factors** to different procurement options, hence also putting them into a certain hierarchy but **not completely restricting any option.** For example, unbundled RECs are assigned the lowest factor of all options. The procurement factors are based on factors (see Architecture 2030, 2020b, p. 21 ff), of which "Impact/Additionality" has the biggest weight.

### LEED Zero Program Guide 2020, p. 7, 12

**Renewable Energy Guidance**

LEED Zero recognizes exported on-site renewable energy and off-site renewable energy, consistent with the approach reflected in LEED v4.1. After maximizing passive strategies and investing in energy efficiency to reduce overall energy demand, project teams should follow a hierarchy for selecting renewable energy sources:

1. On-site generation;
2. Local generation, such as community solar or wind, in instances where it will have a beneficial decarbonizing impact;
3. Offsite generation projects, such as through power purchase agreements;
4. Energy attribute certificates (EACs), also known as Renewable Energy Certificates (RECs)

[...]

If purchasing Energy Attribute Certificates (EACs), also known as Renewable Energy Certificates (RECs), the EACs must be Green-e Energy certified or equivalent. Carbon offsets must be Green-e Climate certified or equivalent.

The Leadership in Energy and Environmental Design (LEED) Zero certifications **does not strictly prohibit** certain procurement options but **recommends to follow a hierarchy.** Unbundled RECs are allowed as long as they are Green-e Energy certified.

**Figure 1. Hierarchy of off-site renewable energy options in different certification frameworks**

This hierarchy of procurement options is mainly based on the attribute of "additionality", meaning the likelihood that the energy purchase results in construction of new renewable energy installations that would not have been built otherwise. Green power options with a stronger claim to additionality are preferred in all frameworks. The EPA recommends the term "impact" instead of "additionality", as "additionality" originated in the carbon offset market, where a project has to meet stringent tests to be called "additional" (EPA, 2018a, p. 7 ff). In comparison, "additional" renewables do not inherently include a similar carbon reduction claim (Edison Energy, 2018, p. 4). They might reduce carbon emissions, but it is not always certain. Figure 2 compares how ILFI and ZERO address this topic.

| ILFI Zero Carbon Handbook 2022, p. 29 | ZERO Code 2.0: Off-Site Procurement of Renewable Energy, p. 19 |
|---|---|
| **Additionally**<br><br>Renewable energy assemblies and infrastructure must provide additionality, i.e., create new renewables that would not otherwise exist but for the actions of and investment attributed to the project. While the creation of local or regional installations is recommended, additional renewable energy systems need not be located within the same regional grid.<br>Claimed renewable energy systems cannot pre-date the project unless it can be demonstrated that:<br><br>• Systems were pre-planned for utilization and attribution to the project<br>• Attribution to the project does not displace the utilization or attribution of those resources by another project. | **6. Adjusted Off-Site Renewable Energy**<br><br>Some methods of off-site renewable energy procurement are preferred over others, depending on local factors, considerations, and priorities. For instance, methods with a greater probability of impact/additionality (the likelihood that new renewable energy generating capacity will be installed) or that involve a solid commitment to purchase or acquire renewable energy for the long term (durability) are favored over procurement methods that do not have these characteristics. |
| The International Living Future Institute (ILFI) Zero Carbon certification defines "Additionality" as **"creating new renewables that would not otherwise exist".** The renewable systems cannot pre-date the project unless it can be shown that the systems were planned before the project start to specifically serve the needs of the project | The ZERO Code 2.0 defines "Impact/Additionality" as the **"likelihood that new renewable energy generating capacity will be installed".** |

**Figure 2. Definition of impact/additionality in ILFI and ZERO**

Certification frameworks also prioritize durability. "Durability" is the long-lasting impact of a renewable energy project, ensuring that it provides renewable energy and RECs to the customer over a predefined period. All three certification frameworks require a minimum period for how long the renewable procurement must be solely attributed to the project as shown in Figure 3.

| ILFI Zero Carbon Handbook 2022, p. 29 | ZERO Code 2.0, p. 7 | LEED Zero Program Guide 2020, p. 6 |
|---|---|---|
| **Attribution**<br><br>Renewables for the project, whether on- or off-site, must be shown to be solely attributed to the project (not double-counted), through ownership or contractual agreement, for a period of at least 15 years. Payment for the renewable energy claimed, if not provided from the owner, must be made on behalf of the project. | **6.3.2 Minimum Requirements for Off-Site Renewable Energy**<br><br>Off-site renewable energy delivered or credited to the building project shall be subject to a legally binding contract. Qualifying off-site renewable energy shall meet the following requirements:<br>1. Documentation of off-site renewable energy procurement shall be submitted to the authority having jurisdiction.<br>2. The procurement purchase contract shall have a duration of not less than 15 years and shall be structured to survive a partial or full transfer of ownership of the building property.<br>3. Renewable energy certificates and other environmental attributes shall be assigned to the initial and subsequent building owner(s) for a period of not less than 15 years. The building owner(s) may transfer renewable energy certificates to building tenants while they are occupying the building. | Projects must purchase EACs or carbon offsets annually during the three year period when the certification is valid. On-site renewable energy generation and consumption will vary based on weather and operating conditions, so year to year the required purchase will vary. For LEED Zero certification review, it is sufficient for the project owner to provide a written commitment to purchase EACs or carbon offsets, as applicable, each year during the three-year period when the certification is valid in order to maintain the net zero carbon balance. |
| The International Living Future Institute (ILFI) Zero Carbon certification requires a minimum attribution period of **15 years.** | The ZERO Code 2.0 requires a minimum attribution period of **15 years.** | The Leadership in Energy and Environmental Design (LEED) Zero certifications require a minimum attribution period of **3 years** (first validity cycle). If the project wants to claim LEED Zero for a longer period, it must renew the certification, which is then valid another 3 years. |

**Figure 3. Durability requirements in ILFI, ZERO, and LEED**

Time-of-use of electricity can also be a consideration in a net-zero claim, meaning that the source of electricity is evaluated on an hourly basis, rather than an annual basis. This is an important factor in grids such as California that are increasingly saturated with solar power during the day, but have limited renewables available at night. However, it is not directly addressed in any of the certifications references, and is beyond the scope of this paper.

## What Procurement Options are Available?

The impact/additionality and durability requirements of these frameworks typically cannot be met by purchasing unbundled RECs. Owners must turn to more complex, higher-impact, longer-duration renewable energy products. Table 1 provides a summary description of the diverse products available in the market. For more comprehensive descriptions, see the EPA's Green Power Supply Options (https://www.epa.gov/green-power-markets/green-power-supply-options), which include excellent diagrams explaining the nuanced differences between these products.

Table 2 summarizes the key characteristics of these off-site renewable energy products. **Impact/additionality** reflects how well the products meet the impact goals of certifications. Unbundled RECs, Utility Options, and Community Choice Aggregation, while available even to very small projects, generally do not meet the impact/additionality requirements, as they typically reflect purchases from renewable energy equipment which already exists (or is at least already planned).

Not all product types are available to all scale projects. Although most purchasers are interested in an annual quantity of electricity produced (in MWh or GWh), project scale is typically defined according to the size of PV array (in MW) needed to produce that electricity. For our purposes large projects are more than 5-10 MW; medium is roughly 0.5 – 5 MW, small is less than 0.5 MW. Notable is that both physical and virtual power purchase agreements (PPAs) are generally only available to large projects – though the use of 'aggregate' PPAs that bundle multiple customers is beginning to make these accessible to medium-scale projects.

**Complexity** reflects the contractual complexity and buyers' sophistication required to purchase these products. Complexity generally follows scale – products only available to large-scale projects are also quite complex. The exception is direct ownership. An owner can choose to install a small-scale project off-site, but the complexity of implementing this is high, since it essentially creates an additional capital project for the owner to manage.

Lastly, not all products are available in all locations. Among other factors, this often depends on whether the local electricity market is regulated or unregulated. In regulated markets, only utility companies can generate and sell electricity into the grid, which makes it difficult for third-party generators to sell electricity. This is a challenge for the products that involve selling off-site electricity into the grid – which is most of them!

Figure 4 is an approximate illustration of the range of impact/additionality vs. project scale for each type of product. This shows that large-scale projects can generally meet high impact goals with physical PPAs or virtual PPAs. Virtual PPAs can involve generation equipment located in a different grid than the buyer – in the case where the renewable energy feeds into a 'dirtier' grid with higher carbon emissions than the buyer's grid, the impact is actually higher than if it were in the buyer's grid, since the new renewable electricity displaces this 'dirty' electricity. In addition, aggregate PPAs make the impact benefits of PPAs accessible to medium-sized buyers.

Table 1. **Off-site renewable energy product descriptions**

| OPTIONS | DESCRIPTIONS |
|---|---|
| Unbundled RECs<br>Subset: unbundled iRECs | Renewable Energy Credits (RECs) represent the rights to the attributes of 1 MWh of renewable electricity generation. They are part of every procurement option in order for customers to claim the use of renewable energy (acting as accounting instrument), helping to avoid double-counting of renewable energy. Besides that, RECs can also be a stand-alone procurement option, so-called "unbundled" RECs. This means that the credits are sold separately from the generated electricity.<br>**Sources: EPA, 2018b, p. 34; EPA, 2024d** |
| Utility Options<br>Subset: Green Tariffs / Pricing | Utility options are additional products offered by utilities that aim to provide the customer with renewable energy. RECs and electricity are delivered to the customer for a monthly premium on top of the standard bill.<br>**Sources: EPA, 2018b, p. 35; EPA, 2024a** |
| Community Choice Aggregation (CCA) | CCAs allow local governments to purchase power for their residents from an alternative supplier (not utility), although the transmission and distribution is still done by the utility provider. This is often done by communities, if they want to provide more renewable power than is offered from the utility. The aggregation of demand within the local jurisdiction enables to negotiate better rates with the renewable energy suppliers.<br>**Sources: EPA, 2018b, p. 35 f.; EPA, 2024b** |
| Renewable Energy Direct Investment<br>Also: Renewable Energy Investment Fund | Direct Investment means that a payment goes into an account of a managing entity (e.g. a fund) that uses the money to buy/lease land and to install renewable energy systems on this land. The managing entity could also use the payment to purchase vPPAs. The customer would receive the RECs equivalent to their financial share of the renewable project for a negotiated period (e.g. 15 years).<br>**Sources: Architecture 2030, 2020, p. 13** |
| pPPA<br>(physical Power Purchase Agreement) | A physical PPA is a long-term contract (usually 10-20 years) for the purchase of renewable electricity and the associated RECs between a generator and the purchaser. The contract defines when the renewable generation facility will begin operation, the schedule for delivery of the electricity and other contractual items. The generation facility has to be in the same grid as the project to ensure physical delivery of the electricity, but the generation facility can on-site or off-site.<br>**Sources: EPA, 2018b, p. 36; EPA, 2024e** |
| vPPA<br>(virtual Power Purchase Agreement) | A virtual PPA is a long-term contract (usually 10-20 years) between a generator and the purchaser, where both parties agree on an electricity settlement price. The purchaser receives RECs, but no renewable electricity through its local grid, as the electricity generated by the renewable facility is sold into the wholesale market where the generation facility is located. The purchaser still receives electricity from the local grid. If the generator earns more from selling electricity to the wholesale market than was defined in the settlement price, the generator pays the extra revenue to the purchaser.<br>**Sources: EPA, 2018b, p. 36 f.; EPA, 2024f** |
| Aggregated PPA | Generally, PPAs are currently only available for projects above a certain scale. Hence, aggregation can be a way for smaller projects (e.g. local governments) to access the benefits of large-scale procurement. Larger PPAs can have a bigger impact, better economics and lower risks. The group of buyers would have to establish a management structure and write a request for proposal (RFP) that gets issued to the renewable energy generator/developer. Aggregated PPAs can be physical or virtual.<br>**Sources:RMI, 2021, p. 7-11** |
| Direct Ownership (Off-Site) | Off-site direct ownership means that the building project owner purchases/leases another piece of land (same regional grid) where a renewable energy system gets installed. This system feeds electricity into the grid while the building projects draws electricity from the same grid. In order for this procurement option to work, the project owner has to be able to sell power to the grid, for example via a feed-in tariff. The building project receives the RECs of the off-site generation system.<br>**Sources: Architecture 2030, 2020, p. 9; EPA, 2018b, p. 39 ff.** |
| Community Solar<br>Subset: Remote Crediting | Community solar allows multiple small customers to purchase renewable energy from a developer that constructs a renewable energy system feeding into the same regional grid, but typically off-site of the building project. The customers can subscribe to a portion of the community solar project and typically receive a credit on their utility bill. They may or may not receive the RECs associated with the renewable energy. Therefore, in order for community solar to be a valid form of renewable energy procurement, the delivery of RECs has to be insured within the program.<br>**Sources: Architecture 2030, 2020, p. 5 f.; EPA, 2024f** |

Table 2. **Off-site renewable energy product characteristics**

| OPTIONS | IMPACT/ ADDITIONALITY | PROJECT SCALE | COMPLEXITY | MARKET AVAILABILITY |
|---|---|---|---|---|
| Unbundled RECs<br>Subset: unbundled iRECs | **LOW**<br>low prices of unbundled RECs don't provide enough revenue/ incentive for investing in renewable generation projects<br>**Sources: Architecture 2030, 2020b, p. 8; Edison Energy, 2018, p. 5 f.** | **SMALL - LARGE**<br>projects of all scales can buy unbundled RECs | **LOW**<br>easy purchasing process for unbundled RECs<br>**Sources: EPA, 2018b, p. 42** | **ALL MARKETS**<br>unbundled RECs can be bought anywhere in the US<br>**Sources: EPA, 2024d** |
| Utility Options<br>Subset: Green Tariffs / Pricing | **LOW – MEDIUM**<br>renewable generators might not be new, and offerings might include purchase of unbundled RECs<br>**Sources: Architecture 2030, 2020b, p. 7** | **SMALL – LARGE**<br>projects of all scales can access utility options | **LOW**<br>simple contract structure with utility companies<br>**Sources: EPA, 2018b, p. 42** | **UTILITY DEPENDENT**<br>some utilities might not offer green power programs<br>**Sources: EPA, 2024a** |
| Community Choice Aggregation (CCA) | **LOW – MEDIUM**<br>decisions regarding green power are out of control of consumer; similar impact issues as utility options<br>**Sources: EPA, 2018b, p. 36** | **SMALL – LARGE**<br>projects of all scales can access CCA | **LOW**<br>simple contract structure with utility companies (managing CCA)<br>**Sources: EPA, 2018b, p. 42** | **STATE DEPENDENT**<br>some state legislations do not include option for CCA<br>**Sources: EPA, 2024b** |
| Renewable Energy Direct Investment | **MEDIUM**<br>if investments are managed well, impact can be as high as direct ownership. But revenue might be also used to purchase unbundled RECs<br>**Sources: Architecture 2030, 2020b, p. 13 f.** | **SMALL – LARGE**<br>investment programs allows also small businesses and homeowners to easily purchase renewable energy<br>**Sources: Architecture 2030, 2020b, p. 13 f.** | **LOW**<br>customer only provides investment. Contractual process lies with managing entity<br>**Sources: Architecture 2030, 2020b, p. 13 f.** | **UTILITY DEPENDENT**<br>in regions with traditional (vertical) utility structures, it might be hard to negotiate a feed-in tariff for selling power to the grid<br>**Sources: Architecture 2030, 2020b, p. 13 f.** |
| pPPA | **MEDIUM – HIGH**<br>depending on the location of project and generator, the impact can be lower or higher (grid emissions that are "replaced").<br>**Sources: Edison Energy, 2018, p. 11** | **LARGE**<br>only large-scale projects feasible (at least 5 MW solar)<br>**Sources: EPA, 2024e**<br>**Architecture 2030, 2020b, p. 12** | **HIGH**<br>high contractual complexity<br>**Sources: EPA, 2024e** | **STATE DEPENDENT**<br>project in competitive retail market, generation in competitive wholesale market that is connected with project's independent system operator (ISO)<br>**Sources: EPA, 2024c** |
| vPPA ("clean grid") | **MEDIUM**<br>if generator is located in "clean grid" (low grid emissions), the impact of the vPPA is generally lower<br>**Sources: Edison Energy, 2018, p. 11** | **LARGE**<br>only large-scale projects feasible (at least 5 MW solar)<br>**Sources: EPA, 2024f**<br>**Architecture 2030, 2020b, p. 12** | **HIGH**<br>high contractual complexity<br>**Sources: EPA, 2024f** | **STATE DEPENDENT**<br>project anywhere in the US, generation in competitive wholesale market<br>**Sources: EPA, 2024c** |
| vPPA ("dirty grid") | **HIGH**<br>if generator is located in "dirty grid" (high grid emissions), the impact of the vPPA is generally higher<br>**Sources: Edison Energy, 2018, p. 11** | **LARGE**<br>only large-scale projects feasible (at least 5 MW solar)<br>**Sources: EPA, 2024f**<br>**Architecture 2030, 2020b, p. 12** | **HIGH**<br>high contractual complexity<br>**Sources: EPA, 2024f** | **STATE DEPENDENT**<br>project anywhere in the US, generation in competitive wholesale market<br>**Sources: EPA, 2024c** |
| Aggregated PPA | **MEDIUM – HIGH**<br>depending on the location of project and generator, the impact can be lower or higher (grid emissions that are "replaced").<br>**Sources: Edison Energy, 2018, p. 11** | **MEDIUM**<br>through aggregation, the individual project scale can be smaller than the generation facility scale. The beneficial economics of scale still apply to the generation facility<br>**Sources: RMI, 2021, p. 5** | **HIGH**<br>high contractual complexity<br>**Sources: EPA, 2024e** | **STATE DEPENDENT**<br>depending on type of aggregated PPA (physical or virtual). See "Market Availability" of pPPA or vPPA. |
| Direct Ownership (Off-Site) | **HIGH**<br>direct control over system allows project owner to choose system that best fits the project's renewable energy demand<br>**Sources: EPA, 2024h** | **MEDIUM – LARGE**<br>due to high contractual complexity, only larger projects can currently consider this option | **HIGH**<br>high contractual complexity<br>**Sources: EPA, 2018b, p. 42**<br>**Architecture 2030, 2020b, p. 10** | **UTILITY DEPENDENT**<br>in regions with traditional (vertical) utility structures, it might be hard to negotiate a feed-in tariff for selling power to the grid<br>**Sources: Architecture 2030, 2020b, p. 9** |
| Community Solar<br>Subset: Remote Crediting | **HIGH***<br>high local impact.<br>* high impact only if it is insured that the RECs are assigned to the project (sometimes not the case)<br>**Sources: Architecture 2030, 2020b, p. 5 f.** | **SMALL – MEDIUM**<br>attractive option for small businesses and homeowners<br>**Sources: Architecture 2030, 2020b, p. 5 f.** | **LOW**<br>simple contract structure with community solar generator<br>**Sources: EPA, 2024g** | **STATE DEPENDENT**<br>some state legislations do not include option for Community Solar<br>**Sources: EPA, 2024g** |

## The Impact-Scale Void

As mentioned above, direct ownership, while technically possible for any size project, is not practical for most small-to-medium-scale owners. This leaves what we term the Impact-Scale Void in the bottom right quadrant of this chart. For small-to-medium-scale owners that seek high impact/additionality from their off-site renewable energy purchase, today's market does not provide good options. This is the key challenge that we wish to highlight with this paper.

Community solar is sometimes seen as filling this void. However, in regulated markets it generally is not available. Where it is available, it is often only available to very small buyers (e.g. single-family homes) and they don't provide the RECs to the customers, negating the chance to make a renewable energy claim. In New York City, rooftop space for community solar projects is so limited that most community solar projects have long waitlists for potential buyers. In addition, long-term contracts are often not available for community solar. Finally, in some markets, such as Florida, utility companies market their own PV installations as community solar, but because they are utility-owned they are criticized as maintaining the utility's control over electricity generation. Community solar generally should allow small entities and individuals to take part in the electricity market, which comes with hurdles in regulated markets such as Florida.

Renewable energy direct investment (also known as renewable energy investment funds) are also often suggested as another option for filling the void. However, we have not identified any active funds that a small- or medium-size owner can choose to invest in. Mutual funds or exchange-traded funds are unlikely to meet the criteria of most owners or certification programs. ILFI, for example, requires that the specific energy source (a project and location) is identifiable, which would not be the case when investing in a mutual fund.

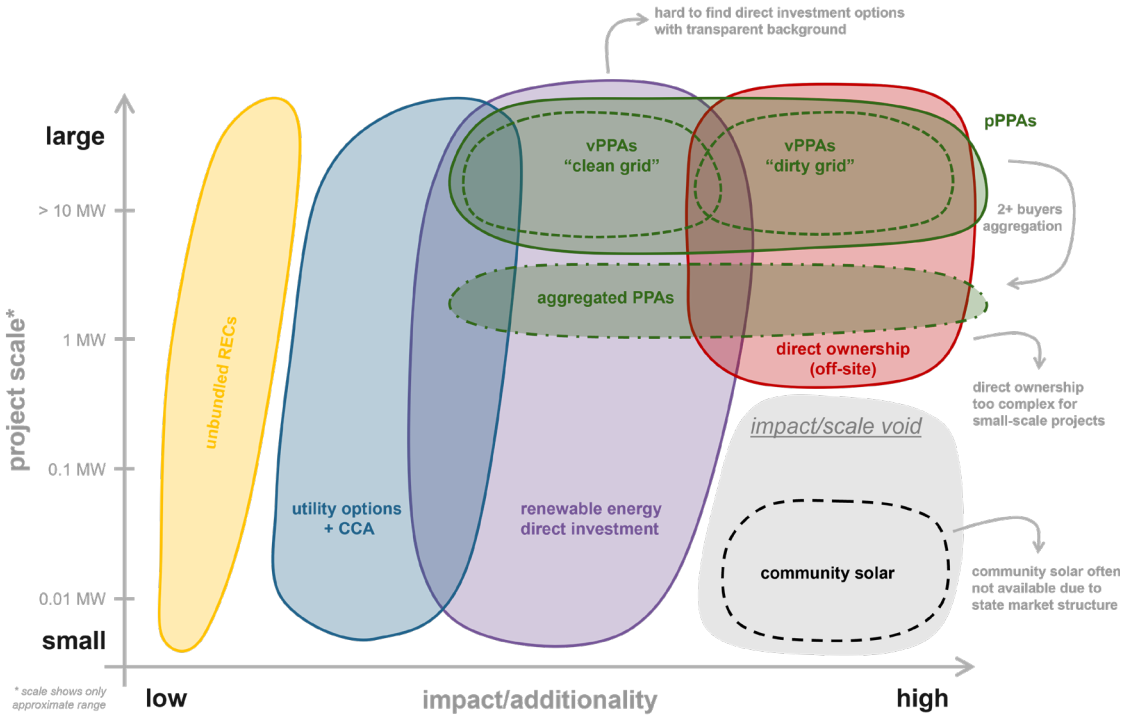


Figure 4. **Scale vs. impact of different green power products and the impact/scale void**

## How to Fill the Void

We see three key opportunities for filling this void and share them to encourage all market actors to advocate for policy changes or to consider the market opportunities the void presents.

1. Enable community solar legislation in every state
   Many states with regulated electricity markets do not permit community solar, so electricity developers cannot directly sell electricity to off-site buyers, even when willing buyers exist. Even in regulated markets, specific legislation permitting community solar can help connect buyers with sellers. Care must be taken not to label utility-owned solar programs, which would rarely meet the impact/additionality criteria, as community solar.

2. Simplify implementation of direct ownership or Remote Crediting
   Direct ownership is inaccessible to owners who cannot manage a second off-site construction project. There is a market opportunity for turnkey developers who are willing to identify sites and build small-to-medium scale PV arrays for remote buyers. Few developers are currently marketing this service or product.

   In a true direct ownership model, the buyer would take ownership of the PV asset after it is built by the turnkey developer. Alternatively, the buyer could purchase electricity from the developer. New York State, for example, has introduced a Remote Crediting program, where developers can sell electricity from a single project to up to ten different buyers. (More than 10 buyers requires a Community Solar program.)

   Some projects have taken unique approaches that achieve a similar impact to direct ownership. PAE's Living Building, for example, donated PV panels to a local affordable housing project (PAE, 2024). This approach meets the additionality criteria, but if the donor doesn't receive payment credits for the electricity generated by these panels, and still purchases electricity from the utility, they are essentially double-paying for electricity.

3. Provide Renewable Energy Direct Investment products
   There is a clear market opportunity to create Renewable Energy Investment Funds that follow stringent criteria. ILFI criteria, for example, would require both showing that your investment went to a specific project (and didn't just purchase unbundled RECs) and that you have a 15-year contract for the investment/electricity purchase.

## Four Case Studies

Lastly, we share four case study projects that have led to the conclusions shared above. Research into potential off-site renewable energy products for all four of these projects occurred in the second half of 2023. Figure 5 shows the scale (and desired high impact) of each of these projects on the scale vs. impact diagram. They range in size from 0.14 MW to 6 MW.

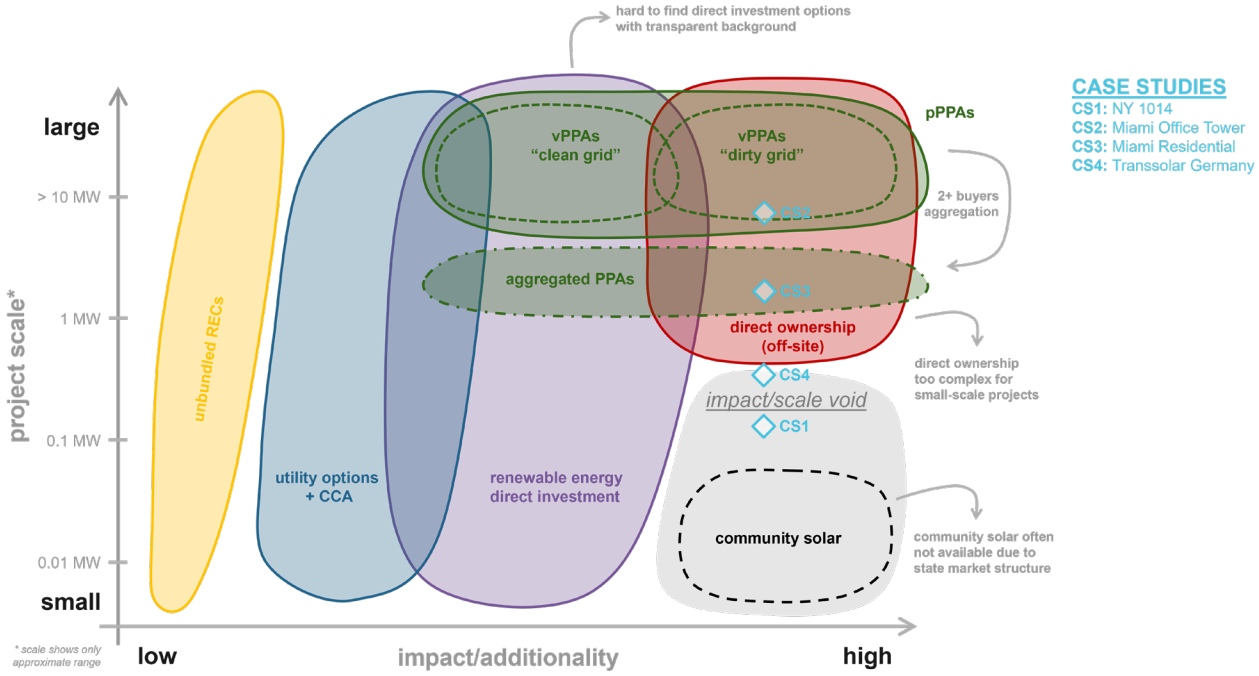


Figure 5. **Case studies plotted on the scale vs. impact diagram**

### Case Study 1: New York Cultural Building

This project is a 20,000 sf renovation and addition to a historic townhouse in Manhattan. It had previously been used for cultural purposes prior to sitting vacant for roughly a decade and will now host various cultural and academic events and include a small residential component for on-site fellows.

To meet the owner's high sustainability goals, the project is targeting ILFI Zero Carbon certification. The roof is fully shaded by a taller building to the south; hence on-site PV is not an option. Due to the small building size, only 150 MWh of annual electricity purchase are required, corresponding to a 0.14 MWp array in New York.

Both physical and virtual PPAs were researched as options, but not viable due to the small project scale. The owner does not have the capacity to manage an off-site direct ownership project, and community solar projects in New York City have long waiting lists and don't have a mechanism for a 15-year contract.

The owner is currently considering Remote Crediting through a handful of solar developers; very few developers in New York are offering this option. Another option is a hybrid, where the owner claims a large fraction of a community solar project, while the remainder is marketed to typical single-family community solar buyers.

### Case Study 2: Miami Office Tower

This is a 1.7 million sf, 40-story build-to-suit office tower in Miami, Florida. Roughly 50% of the tower will be occupied by the anchor build-to-suit tenant, with the other 50% leased to other tenants. The project is pursuing LEED Platinum and LEED Zero Energy certification in response to the corporate anchor's aggressive sustainability goals.

10% of the total annual electricity consumption is generated by on-site PV panels, mostly integrated into the façade. Because of the building height, even with a very energy efficient building, the remaining 90% of electiricty use must be generated off-site. This corresponds to roughly 8,000 MWh annually or an array size of 6 MWp in Florida.

Because Florida is a regulated electricity market, a physical Power Purchase Agreement is not possible. Community Solar is not possible for the same reason – and if it were, this project would be too large. There are utility-operated programs in Florida that describe themselves as community solar, but don't meet the impact/additionality criteria.

The owner is therefore considering an out-of-state virtual Power Purchase Agreement, which requires accepting the cost risk that come with variations in electricity price between regions (if electricity in the generating region is cheaper than in Floria, the buyer loses money). Alternatively the owner may consider off-site direct ownership, but negotiating a feed-in tariff with a utility in Florida seems hardly possible in this regulated market, even for a fairly large owner. Specific to the LEED Zero program, certain unbundled RECs may be allowed as the last-resort option, however they are not preferred by the owner due to their lower impact.

### Case Study 3: Miami Residential Tower

This is a 670,000 sf, 8-story residential condominium tower in Miami, Florida. The project will be constructed of mass timber and considers ILFL Zero Carbon certification as part of the developer's strategy for differentiating the project with environmental performance. As with the office tower, only a limited amount of renewable energy can be generated on-site due to the height, and the remainder must come from off-site. This medium-scale project requires roughly 2,300 MWh annually, sourced from a 1,700 kWp array in Florida.
This project faces all the same barriers as the office tower, but due to its smaller size, a virtual PPA is likely not feasible. Therefore direct ownership off-site may be the only feasible option, but for this smaller-scale project it would be even harder than the office tower to negotiate a feed-in agreement with the utility. Direct ownership might have to be located out-of-state, which would result in risk due to electricity price differenes on-site and off-site. Residential buyers in particular may not accept this risk. A renewable energy investment fund would be an excellent option, if one were available.

### Case Study 4: Transsolar Off-site Renewables for Carbon Offsets

Our final case study is for Transsolar's own purchase of off-site renewable energy. Transsolar has chosen to use renewable energy to both cover our annual electricity use and offset our Scope 3 emissions from other business activities, especially air travel. The energy purchase is meant to cover our operations worldwide – both in Germany and the U.S. This requires roughly 390 MWh annually, or a 415 kWp array in Germany.

Because we do not own any real estate, on-site renewable generation is not a practical option. We seriously evaluated direct ownership, but the complexity of acquiring or leasing land and managing the construction process was too great. Germany has a product called 'Mieterstrom' which is similar to Community Solar, but you can only purchase electricity equal to the amount you consume, which isn't sufficient when we intend to fund additional renewable generation, beyond our consumption, as a carbon offset.

We have identified one new company that offers a product similar to an aggregate PPA. They offer a PPA as small as a 1.8 MW, which is much smaller than most PPAs. This is still more than four times larger than we require, but may be accepted as the only viable option for meeting our corporate zero carbon goal. Although still too large, this is a good example of the need for more aggregate PPAs serving small to medium projects or companies.

## Conclusion

Today's market for off-site renewable power products leaves a critical and challenging void for small-to-medium sized purchases (0.1 – 5 MW) aiming to make stringent net zero carbon claims. These buyers have very few (if any) options for long-term purchases of renewable energy with high impact – meaning they guarantee construction of new renewable energy projects. Policy barriers in some states inhibit these purchases, but there are also market opportunities for new actors to provide products meeting this demand.

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