ZERO CODE™

Off-Site Procurement of Renewable Energy

Technical Support Document

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TECHNICAL SUPPORT DOCUMENT: Off-Site Procurement of Renewable Energy

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ZERO Code – The Architecture 2030 Building Energy Standard

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1. BACKGROUND

This is a support document for the ZERO Code developed by Architecture 2030. The ZERO Code defines a zero-net-carbon (ZNC) building as "*a highly energy efficient building that produces on-site, or procures, enough carbon-free energy to meet building operations energy consumption annually.*" This means that on-site and/or off-site renewable energy systems would be constructed along with the building to generate as much energy on an annual basis as the building uses for heating, cooling ventilation and other purposes. However, there will typically be times when more energy is consumed at the building and other times when more renewable energy is generated. The "net" descriptor in the definition allows for this temporal mismatch.

Annual energy use and carbon emissions track each other quite closely; however, the relationship changes over the course of the day and season, especially in areas where solar energy is a significant source of electric generation. On sunny days with mild weather, solar energy can contribute much more energy to the grid resulting in extremely low carbon emissions per unit of electric generation. At other times, the contribution of fossil fuel generators to the grid will be much greater with resulting higher carbon emissions per unit of electric generation. This variability can be accounted for with hourly analysis of building energy use and detailed information about the local grid, but for simplicity, the ZERO Code assumes that the relationship is constant, e.g. ZNC is achieved when annual renewable site energy production is greater than annual building site energy use.[1]

The ZERO Code requires that the building achieve a minimum level of energy efficiency independent of the amount of renewable energy installed or procured. The latest ASHRAE Standard 90.1-2016 or other standards of equal or greater stringency are used to set this minimum. These standards are designed to reduce energy use and only indirectly reduce carbon use. If the goal of the standards were to reduce carbon emissions instead of energy use, the standards would push buildings toward electrification in areas with large amounts of renewable energy generation. In areas with clean grids, electric heat pumps for space and water heating result in significantly less carbon emissions than comparable gas-fired equipment. For simplicity the ZERO Code references existing high performance energy efficiency standards with the knowledge that these standards allow or in some cases encourage gas-fired building equipment.

On-site renewable energy systems are one method of achieving ZNC, but not all buildings can achieve the ZNC goal solely with on-site renewable energy. Many buildings in dense urban areas – mid-rise or high-rise buildings – and energy intensive

building types will require some or all of the renewable energy to be procured off-site in order to achieve ZNC.

This technical support document describes several potential options for off-site procurement of renewable energy within the context of codes, and presents a process for evaluating and assigning a weight to each procurement method. The feasibility/desirability of each option will vary with how the electric system is structured and the laws and regulations applicable to each city, state, province, country or local jurisdiction that adopts the ZERO Code. It is anticipated that qualifying off-site renewable energy systems and their weightings will vary with each adoption of the ZERO Code. The purpose of this technical support document is to provide information to enable these adaptations.

2. POTENTIAL OFF-SITE PROCUREMENT METHODS

2.1 Community Renewables

With this arrangement, a renewable energy developer constructs a wind or solar farm and offers capacity to individual building owners or energy users. The local utility is usually a partner with the renewable energy developer and most programs monitor production from the solar panels leased or purchased by the building owner. Typically, renewable energy production is directly credited to the building owner's utility bill as if the solar panels were located on the roof or elsewhere on the property. For this reason, it is not possible to purchase more energy from a community solar system than the building uses. When complying with the ZERO Code, the RECs and other environmental attributes associated with the renewable energy capacity of community solar must be assigned to the ZNC building.

Most community renewable energy programs generate electricity with solar photovoltaics, but other sources of renewable energy are possible, in particular, wind. An advantage of solar is that it is incremental, meaning that a portion of the production can be easily assigned to each program participant by allocating a number of panels to a particular property. Similar accounting can still be done with wind, but the process is a bit more complicated since turbines tend to be very large and an individual building would only need a portion of a turbine's capacity to achieve ZNC.

When available, community solar is an attractive option for small businesses and residential customers that have a moderate load but can't install on-site renewable energy because of shading or other limitations.

There are two participation models for community solar: long-term and short-term. With the long-term model, the building owner/developer purchases, or leases long-

term, enough capacity to offset building energy and achieve ZNC. The short-term participation model is much more akin to a green tariff and typically allows the owner/developer to opt out of the agreement on short notice.[2]

2.2 Renewable Energy Investment Fund

A Renewable Energy Investment Fund (REIF) is a monetary account set up to accept payment from building owners or developers who are unable to install enough on-site renewable energy. Management of the fund can vary but would likely be done a local or provincial governmental entity, although utilities may also have a role, depending on local circumstances. The managing entity would use the money to acquire or lease land and install renewable energy systems to offset the energy used by the building. The managing entity may choose to outsource development responsibility to renewable energy developers or even purchase virtual PPAs. Creating a REIF may be especially appealing in areas where community solar is not available.

Payment would be made to the REIF before building occupancy. This would enable the investment to be included in the initial construction budget and financed through the mortgage or other long-term instruments. The payment would be proportional to the amount of renewable energy needed to achieve ZNC and represent a specific amount of renewable energy capacity, which is set by the ZERO Code. The environmental attributes associated with the renewable energy system, including RECs and/or carbon credits, would be permanently assigned to the building owner or developer and live with the building in the event of a sale.

Low-income housing programs provide an analogous precedent for REIFs. In communities with requirements for low-income housing, developers often have the option to either provide a certain percentage of low-income housing as part of their project or alternatively, they may contribute to a fund that the local housing authority uses to build low-income housing on another site.

If the program is set up properly and effectively managed, it should provide near equivalency to the installation of on-site renewable energy systems. Contributions to the REIF would result in new renewable energy generation being added to the grid and operated for the long-term. In order for the program to function, the REIF would need to sell power into the grid. This is easily accommodated in restructured electric markets, but in areas dominated by vertically integrated utility companies, some sort of reasonable feed-in tariff would need to be negotiated with the utility for a period of time that is long enough for the capital investment in the renewable energy system(s) to be financially viable.

The amount of money to be paid to the REIF should be adequate to attract renewable energy developers. The basis for the payment can be justified from a number of perspectives.

- *Social Cost of Carbon – Societal Benefit*. The contribution can be based on the benefit to society.
- *Renewable Energy Developer Pro Forma*. The contribution can be set at a level necessary for investments to work out for the renewable energy developer. This amount will depend on applicable feed-in tariffs, land purchases or leases, and the cost of installing and operating the renewable energy systems.
- *Building Owner/Developer Pro Forma*. The contribution can be set at a level that is comparable to the cost of other options like on-site PV.[3]

With the REIF, building developers are paying in advance for the impact their buildings will have on climate change and this money is used to construct off-site renewable energy systems to offset that impact.

2.3 Virtual Power Purchase Agreement

Direct (or physical) power purchase agreements are a common way to finance and install on-site photovoltaic (PV) systems.[4] Energy service providers install, own, and operate the PV system, which is located on a building owner's property. The building owner agrees to purchase power from the system for the term of the contract (usually 15 years) according to a schedule of prices set in the contract. The PV developer (or energy service provider) bears the cost and risks associated with construction and operation. The building owner agrees to buy the renewable power for the contract term, but often does not get to claim the environmental benefits since most contracts assign these to the seller.[5] Like with community solar, to comply with the ZERO Code the RECs and environmental attributes must be assigned to the ZNC building.

Virtual (or financial) power purchase agreements (PPAs) are a similar arrangement, except that the renewable energy system is not located on the building owner's property. Instead it is located in farm land, pastures, or rural land owned or leased by the renewable energy developer. While direct PPAs are almost exclusively PV systems, virtual PPAs often include wind or even geothermal power plants. Virtual PPAs are the financial instrument most commonly used by large multi-national companies like Google and Amazon to acquire renewable energy to offset their operations. The buyer (customer) agrees to buy power from the system at a specified price schedule and period of time. In this way, they avoid the price fluctuations of the energy market and assume more predictable utility expenses. If prices go up they benefit; however, if prices go down, they end up paying more.

To comply with the ZERO Code, the RECs and environmental benefits of virtual PPAs must be assigned to the buyer. The Rocky Mountain Institute Business Renewables Center developed a Term Sheet for negotiating virtual PPAs and this document makes it clear that the RECs and environmental benefits are assigned to the buyer, in contrast to the typical direct PPA.[6] Since one of the motivations of international companies to enter into virtual PPAs is to claim the environmental benefits, having the RECs assigned to them is essential.

Proximity is a potential issue with virtual PPAs. Sometimes the renewable energy system is located in a separate electric grid, thousands of miles from the electric load it is offsetting. Many buyers of virtual PPAs prefer to enter into agreements with renewable energy systems located close to their facilities, or at least in the same electric grid or market.

Another issue is that virtual PPAs are an agreement between an organization (often a corporation) and a renewable energy developer. They are not associated with a particular building that is complying with the ZERO Code. This creates an accounting and record-keeping problem similar to that discussed with the direct ownership option (see above). Transparent documentation is needed to assure that an adequate portion of the environmental benefits from the renewable energy system are assigned to the ZNC building for a minimum period of time and are not double counted. Tying the PPA to a particular building is a major challenge for virtual PPAs. The renewable energy developer is making a deal with a creditworthy counterparty for the duration of the contract. Developers would be leery of a deal where the counterparty could change each time the building is sold.

In traditional energy markets (no retail competition), the vertically organized utility will sometimes serve as the broker for virtual PPAs between renewable energy developers and their large customers.[7]

2.4 Direct Ownership

With direct ownership, the building developer/owner of a ZNC building purchases or leases a separate parcel and constructs a renewable energy system on that land to off-set energy used at the building. The building draws power from the grid while the renewable energy system delivers power to the grid. For this option to work, the building owner/developer would need to be able to sell power to the grid Independent System Operator (ISO), Regional Transmission Organization (RTO), or utility through a feed-in tariff or other means[8]. The energy produced and the environmental attributes (RECs, etc.) would be allocated to one or more buildings in order for them to comply with the ZERO Code.

ZNC portfolios, campuses, and communities are variations of direct ownership. For a ZNC campus, the renewable energy system is located on the same property but not constructed as part of each individual building. Instead, energy from the campus system is allocated as needed for each building to achieve ZNC. For ZNC portfolios and communities the arrangement is similar, except that the buildings and the renewable energy system(s) are typically located on separate sites.

There are several issues with regard to direct ownership of off-site renewable energy systems in the context of codes.

- The first is the accounting and recordkeeping involved in allocating production from the renewable energy system to the various buildings that depend on its production to achieve ZNC. This needs to be done in an open and transparent manner that can be verified by the authority having jurisdiction over administering the ZERO Code.
- The second challenge is to assure that ownership of the renewable energy system is retained by the same entity as the building owner. Otherwise, the renewable energy system could be sold separately and detached from the building that depends on it for ZNC compliance.

A final consideration is that owning and operating a renewable energy plant is generally not a core competency of most businesses or institutions. For this reason, organizations often enter into agreements with energy service providers to construct and manage the renewable energy system.

2.5 Green Retail Tariffs

Some utilities, community choice aggregators, and other retail electricity providers offer their customers 100% renewable energy from the grid. This offering typically comes at a premium. The principal problem with this method of acquiring renewable energy is that green tariffs are voluntary and the customer (buyer) can opt out of the program on short notice and revert back to the standard offering. This creates a loophole that prevents the typical green tariff from qualifying as a means to acquire off-site renewable energy, at least in the context of the ZERO Code. If you can opt out on a moment's notice, it does not support a long-term commitment and additionality.

In order to qualify for the ZERO Code the tariff must be structured such that the building developer/owner makes a long-term commitment to buy 100% renewable energy. The obligation also needs to be passed on to future owners in the event that the property is sold.

Some retail providers are evaluating methods whereby customers can pre-pay for 100% renewable energy at the time of building construction.[9] This could potentially

enable the premium to be financed as part of the initial construction budget. Future building owners and/or tenants would receive 100% renewable energy, but pay according to the standard (default) tariff. Deed notations and/or covenants are other possible means of structuring a long-term commitment.

2.6 Direct Access to Wholesale Markets

In restructured electricity markets or markets with "retail competition", large customers can shop for sources of electricity beyond the offerings of the local utility. Electricity suppliers compete with each other and with the default utility based on price and product differentiation. That differentiation could be renewable energy. Suppliers can offer renewable energy products, either through direct sourcing from independent power producers or by bundling conventional electricity products with RECs. Retail competition allows large-building owners/developers to choose products that satisfy their renewable energy needs at competitive rates.

Most of the world's major electricity markets have been at least partially restructured. Retail competition is common in Europe, parts of the United States, Australia, Colombia, Japan, New Zealand, the Philippines, Russia, and Turkey. Mexico and most South American countries are moving toward retail competition.

To comply with the ZERO Code, the contract needs to be for an extended period of time to align with the building life. If the renewable energy offering is based on the purchase of unbundled RECs, the offering should be treated in the same manner as unbundled RECs (see below).

2.7 Unbundled RECs

Renewable energy credits or certificates (RECs) represent the environmental attributes or benefits associated with renewable energy. For most of the off-site procurement methods, the RECs are used for tracking and verification of the renewable energy purchased. However, the RECs can be separated from the underlying renewable energy they are associated with and sold separately from the electricity, typically in increments of one MWh.

The concept of RECs is international, but the term used varies in other countries. REC is used in the United States, Australia, India and other places. A variation is called an I-REC (the "I" standing for international). Europe uses the term Guarantees of Origin (GOs), Mexico uses the term Certificados de Energia Limpia (CELs), and the term Tradable Instruments for Global Renewables (TIGRs) is used in other areas. In some countries more than one designation is used.

RECs can be categorized in a number of ways according to the source of renewable energy (*type*), when the renewable energy was generated (*vintage*), and where it was generated (*geography*). To comply with the ZERO Code, the source of the renewable energy should be wind, solar, or from a geothermal power plant, the generation should occur in the same period of time (year) of the building energy that is being offset, and the generation source should be in the same geographic area and electric grid of the ZNC building to which the RECs are credited. The market sets a higher price for RECs when more conditions or restrictions apply. Certificates may be purchased directly from renewable energy project owners or through third-party brokers and are typically verified so that the purchaser can claim sole ownership of the generated renewable energy regardless of the ultimate destination of the electrons.

To approximate on-site renewable energy, a contract would have to be structured such that the building owner, future building owner, and/or tenants would be required to purchase RECs for an extended period of time.

3. EVAULATION CRITERIA FOR OFF-SITE PROCUREMENT METHODS

On-site and off-site renewable energy systems may be compared and evaluated in terms of the following considerations. This set of criteria is not exhaustive and jurisdictions implementing the ZERO Code may consider any and all additional relevant criteria.

- *Additionality*. Additional renewable energy generating capacity is added to the grid in proportion to the energy demand of the ZNC building.
- *Long-Term Commitment*. The ZNC building developer makes a long-term commitment to procure renewable energy and the commitment is structured to survive a sale of the property.
- *Assignment to ZNC Building*. The renewable energy installed or procured is directly assigned to the ZNC building through a transparent accounting procedure.
- *Grid Management Capability*: The renewable energy production can be managed to supply the grid when power is needed but to avoid over-generation for low-load conditions.
- *Environmental Impact*. The renewable energy system has minimal impact on natural resources and habitat.

- *Inspirational/Educational Value*. The renewable energy system is a visible asset associated with the ZNC building. As such it has the ability to inspire and educate building developers, designers, and the public on the benefits of renewable energy.
- *Incremental Acquisition*. The renewable energy can be procured or installed in increments to match the exact loads of the ZNC building (some procurement options require a minimum contract that exceeds the needs of the building).
- *Permanent Financing*. The cost of the renewable energy system or procurement is known at the time the building is constructed and can be included in the permanent financing for the project.

4. MINIMUM REQUIREMENTS FOR OFF-SITE PROCUREMENT METHODS

In order for the off-site procurement methods to offset the annual energy consumption of the ZNC building and work in the context of mandatory codes, they need to meet certain minimum requirements. Many of the requirements are common to all procurement methods and are listed below:

1. The building owner shall sign a legally binding contract to procure qualifying off-site renewable energy.
2. The procurement contract shall have duration of not less than 15 years and shall be structured to survive a partial or full transfer of ownership of the property.
3. RECs and other environmental attributes associated with the procured off-site renewable energy shall be assigned to the building project for the duration of the contract.
4. The renewable energy generating source shall be photovoltaic systems, solar thermal power plants, geothermal power plants, and/or wind turbines. The adopting entity can consider other renewable energy sources if appropriate for the locality.
5. The generation source shall be located where the energy can be delivered to the building site by the same utility or distribution entity, the same ISO or RTO, or within integrated ISOs (electric coordination councils).
6. The off-site renewable energy producer shall maintain transparent accounting that clearly assigns production to the ZNC building. Records on power sent to or purchased by the building shall be retained by the building owner and made available for inspection by the authority having jurisdiction upon request.

The following minimum requirements are for specific procurement options.

- *Direct Ownership*: Ownership of a remote generation asset must be tied to the ZNC building so it can't be sold separately.
- *Renewable Energy Investment Fund (REIF)*: Entity must be properly and effectively managed to prevent fraud or misuse of funds.
- *Direct Access to Wholesale Markets and Green Tariffs*: The offering shall not include the purchase of unbundled RECs.
- *Unbundled RECs*: The vintage of the RECs shall align with building energy use.

5. COMPARISON OF RENEWABLE ENERGY PROCUREMENT OPTIONS

The minimum requirements for each option are summarized as specific bullet points in Table 1. This table also shows the advantages and disadvantages from the perspective of the building owner/developer. These bullet points were taken from a National Renewable Energy Laboratory (NREL) report[10] that looks at voluntary programs at the international level. When the requirements needed to qualify for the ZERO Code are factored in, some of these advantages and/or disadvantages are negated. These are shown in italics when negated.

Table 1 – Advantages, Disadvantages, and ZERO Code Requirements for Off-Site Procurement Methods

	From NREL Report *(points negated by ZERO Code requirements are italicized)*		
Option	Advantages to Owner	Disadvantages to Owner	ZERO Code Requirements
Direct Ownership (includes ZNC portfolios and campuses)	Control over the generation asset Energy savings and potential demand charge savings Fixed electricity costs for the project lifetime Visible renewable energy project with potential local impacts Greater power reliability if used with storage in areas with weak grids Drives a new renewable energy project and new renewable energy capacity	Requires up-front capital investment or need to obtain financing Project may need to compete for internal capital and meet internal return rates Corporate owner responsible for long-term operations and maintenance Corporate owner bears risk of potential underperformance of assets On-site projects may only be able to meet a small fraction of load	Transparent accounting shall assign production to the ZNC building(s) Ownership of remote generation asset must be tied to the ZNC building so it can't be sold separately RECs and/or other environmental attributes must be allocated to the ZNC building(s) Generation source(s) shall be wind, solar, and/or geothermal Generation source(s) shall be located within the same geographic area and utility grid as the ZNC building

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	From NREL Report *(points negated by ZERO Code requirements are italicized)*		
Option	Advantages to Owner	Disadvantages to Owner	ZERO Code Requirements
Community Renewables	*Flexible terms, no long-term requirements* No project-level risk Simple to align with existing electricity procurement practices	Less compelling marketing Generally less control over resource type and project details There may be no new renewable energy capacity added to the energy system in some cases May not yield cost savings or long term price certainty equivalent to other structures	A 15 year commitment is required RECs and other environmental attributes shall be assigned to the ZNC building(s) Generation sources shall be wind, solar, and/or geothermal Generation sources shall be located within the same geographic area and utility grid as the ZNC building
Virtual Power Purchase Agreements	No up-front capital investment for the corporate off-taker Facilitates transactions with large renewable projects with economies of scale Developer assumes project risk and handles operations and maintenance Possibility for price hedging through fixed PPA price or contract-for-differences PPA contracts may yield net savings in some markets	Some contract durations (e.g., 15 years) may be long for corporations given business strategy timeframes Typically requires approval of executives in the corporation *Power price risk and basis risk if the project is located in a region that is different from where energy is consumed* It may be more difficult for corporations to clearly communicate the value of renewable energy procurement via a financial PPA Other risks include counterparty and accounting risks	A 15 year commitment is required RECs and other environmental attributes shall be assigned to the ZNC building(s) Generation source(s) shall be wind, solar, and/or geothermal Generation source(s) shall be located within the same geographic area and grid as the ZNC building
Renewable Energy Investment Fund (REIF)	Not addressed by NREL	Not addressed by NREL	REIF must be properly and effectively managed RECs and/or carbon credits shall be assigned to the ZNC building(s) REIF shall invest in solar, wind, and/or geothermal
Direct Access to Wholesale Markets (includes deals brokered by vertical utilities)	Cost savings possible—competitive supplier may offer lower rates than incumbent utility No up-front capital investment *Period of commitment may not be long (some suppliers offer near-term fixed rates)* Corporation not responsible for operations and maintenance	Corporation may have little control over project from which renewable energy is sourced Pricing can change unless locked into a long-term contract Markets can have volatility and there can be turnover in suppliers Renewable energy may be sourced from older or non-preferred renewable energy sources	A 15 year commitment is required RECs and other environmental attributes shall be assigned to the ZNC building(s) Generation source(s) shall be wind, solar, and/or geothermal Generation source(s) shall be located within the same grid and geographic area as the ZNC building The offering shall not be based on the purchase of unbundled RECs.

Table 1 – Advantages, Disadvantages, and ZERO Code Requirements for Off-Site Procurement Methods

	From NREL Report *(points negated by ZERO Code requirements are italicized)*		
Option	Advantages to Owner	Disadvantages to Owner	ZERO Code Requirements
Green Retail Tariffs	*No up-front capital investment for the corporate off-taker* Ability to work directly with current service provider (i.e., the vertically integrated utility) Some programs offer long-term fixed price More favorable pricing than green pricing programs Corporate purchaser not responsible for operations or maintenance	Not all utilities offer programs, so not universally available Corporations have less control over project details by working through utility rather than directly with developer Pricing and program structure can require substantial negotiations with the utility Typically a long term commitment May not yield cost savings equivalent to PPAs or other structures	A 15 year commitment is required RECs and other environmental attributes shall be assigned to the ZNC building(s) Generation source(s) shall be wind, solar and/or geothermal Generation source(s) shall be located within the same grid and geographic area as the ZNC building(s) The offering shall not be based on the purchase of unbundled RECs.
Unbundled RECs	*No project-level risk* Simple to align with existing electricity procurement practices *Flexible terms, no long-term requirements*	Less compelling marketing *Generally less control over resource type and project details* There may be no new renewable energy capacity added to the energy system in some cases May not yield cost savings or long term price certainty equivalent to other structures	A 15 year purchase commitment is required Generation source(s) shall be wind, solar, and/or geothermal Generation source(s) shall be located within the same grid and geographic area as the ZNC building The vintage of the RECs shall align with building energy use

6. ADJUSTED OFF-SITE RENEWABLE ENERGY

Some methods of off-site renewable energy procurement may be preferred over others, depending on local factors, considerations, and priorities. For instance, methods with a greater probability of 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 are favored over procurement methods that do not have these characteristics.

The method used in the ZERO Code to encourage one procurement method over another is to apply a multiplier to each procurement option. On-site renewable energy is normalized with a multiplier of 1.0 and each off-site procurement method has a multiplier relative to on-site renewable energy. If the multiplier is less than one (which will be typical for off-site procurement), the adjusted renewable energy is calculated as the amount procured times the multiplier. If an off-site procurement option has a multiplier greater than one (not common, but possible), the option would be favored

over on-site renewable energy and the adjusted renewable energy for that option would be greater than the amount procured. High multipliers apply to the more favorable procurement options while low multipliers apply to less favorable options.

The process for calculating the adjusted off-site renewable energy is shown in the following equation:

$$RE_{offsite} = \sum_{i=1}^{n} C_i \cdot RE_i = C_1 \cdot RE_1 + C_2 \cdot RE_2 + \cdots + C_n \cdot RE_n$$

where

$RE_{offsite}$ Adjusted off-site renewable energy

C_i Coefficient or multiplier for the i^{th} renewable energy procurement method or class

RE_i Annual energy production for the i^{th} renewable energy procurement method or class

n The number of renewable energy procurement options or classes considered

With many procurement options, it is not necessary that the amount of renewable energy procured match the building energy use. In this case, renewable energy can be procured that exceeds building energy use. With other procurement options, such as green tariffs, the amount of renewable energy that may be procured must generally match the building electricity use, so it may not be possible to acquire more through this method than the building uses. This means that those procurement options cannot be the sole means of off-site procurement when ZNC is the target; they must always be supplemented with another class of off-site procurement. If only one off-site procurement method or class is allowed its multiplier must be equal to or greater than 1.

The multipliers (or coefficients) are determined by judging how well each off-site procurement option meets the evaluation criteria described above. Each criterion is given a weight to represent its relative importance. Each procurement option is then judged relative to each criterion on a subjective scale, e.g. the inspirational/educational value of an option is judged to be high, medium, low, or zero. The subjective scores are then translated into simple numerical scores and an overall multiplier is calculated for each procurement option. Risks associated with some procurement methods are similar, and when this is the case, they can be grouped together into common classes to simplify the procedure.

Considerable judgment is involved in weighting the criteria, scoring each procurement option, assigning procurement options to a class, and choosing how much to mark

down the class. The risks associated with each procurement option are mitigated to some extent by the minimum requirements described above. Additional locality-specific mitigating requirements can be added when the ZERO Code is adapted for specific cities, states, provinces, or countries. This may further reduce risk and result in higher multipliers. When the ZERO Code is adapted for other locations, one or more of the procurement methods may be unavailable, or other procurement methods specific to the jurisdiction may be available and preferred.

Appendix A provides an example of how the weighting process has been completed for United States conditions.

APPENDIX A: Example Calculation of Multipliers

The following section provides context-specific examples for the comparison and classification of off-site renewable energy procurement options. It presents the advantages and disadvantages of each method based on a stakeholder-led process of evaluation.

A1. UNITED STATES PROCUREMENT OPTIONS

The following sections describe how off-site renewable energy procurement options are implemented in the United States. It discusses the risks and challenges associated with each off-site procurement option as compared to on-site renewable energy. In the United States context, on-site renewable energy is the basis of comparison because it meets most of the evaluation criteria described in Section 3 of the main document, e.g. additionality is achieved, it represents a long-term commitment, production is directly associated with the ZNC building, it has low environmental impact, and renewable energy capacity can be matched to the exact needs of the building.

A1.1 COMMUNITY RENEWABLES

Community solar programs are active in the states of Colorado, Delaware, Maine, Massachusetts, Minnesota, New York, Vermont, and Washington, but other states are in the process of implementing programs including California, Hawaii, and Maryland, as well as the District of Columbia.

The local utility is usually a partner with the renewable energy developer and most programs monitor production from the solar panels leased or purchased by the building owner. Typically, renewable energy production is directly credited to the building owner's utility bill as if the solar panels were located on the roof or elsewhere on the property. When this is the case, it is not possible to purchase more electricity from a community solar system than the building uses.

With community solar, the RECs and other environmental attributes associated with the renewable energy capacity must be assigned to the ZNC building. However, this essential requirement is not satisfied by most community solar programs in the United States. Most programs keep the RECs and sell them in order to improve the financial viability of the program.[11] Buying renewable energy without the RECs does not achieve the goals of a ZNC building because someone else owns the rights to the environmental benefits.

A1.2 RENEWABLE ENERGY INVESTMENT FUND

An issue with a Renewable Energy Investment Fund is how to determine the amount of payment. Three methods were listed in the general discussion, based on 1) the social cost of carbon, 2) the renewable energy developer perspective, and 3) the building developer perspective. In the United States the Environmental Protection Agency, along with several other agencies, calculated the social cost of carbon in 2018 at about \$40/tonne of CO_2e emissions. Average emissions for United States electric power production are about 0.61 tonnes/MWh. This results in a societal benefit of about \$25/MWh of renewable energy production (not including the value of energy produced). The net present value of this benefit over a 30-year building life at a 3% discount rate is about \$400/MWh of annual renewable energy production.

A1.3 VIRTUAL POWER PURCHASE AGREEMENT

In the United States, incremental acquisition is a challenge with virtual PPAs. The minimum size for solar virtual PPAs is about 5 MW and the minimum size for wind PPAs is about 10 MW.[12] A 5 MW solar system would power approximately 1 million ft² of office space. Also, the counterparty to the renewable energy developer must have an excellent credit rating. The minimum renewable energy system sizes and credit requirements make virtual PPAs an unlikely option for small developers or building owners. However, governmental entities or utilities could serve as the counterparty and sell or allocate shares to individual building owners.[13]

A1.4 DIRECT OWNERSHIP

2.4 Direct Ownership (see above) addresses the general issues related to direct ownership. There are no additional or specific issues for the United States.

A1.5 GREEN RETAIL TARIFFS

In the US, some utilities, community choice aggregators, and other retail electricity providers offer their customers 100% renewable energy from the grid. This offering typically comes at a premium, usually in the range of about \$0.02/kWh.[14]

An issue with green retail tariffs in the United States is, what qualifies as renewable energy? The types of renewable energy included in a retail provider's renewable portfolio vary considerably and are often defined by the Renewable Portfolio Standard (RPS), which is regionally applicable. These standards require investor owned and other utilities to secure a certain percentage of their electric power from renewable energy sources, but what counts as renewable energy varies in each state or jurisdiction. Wind, solar, and geothermal power plants are clearly renewable energy and are recognized

as such in all programs. More controversial sources are biomass, large hydro-electric plants, and unbundled RECs. Biomass is only renewable if forest growth and expansion exceeds wood harvesting and clearing, which is often challenging to verify by the customer.

Hydro-electric plants are renewable energy sources driven by the evaporation and condensation of water, but it has been decades since new large-scale dams have been constructed. The best sites are already taken, and potential new sites are likely to face significant opposition from land owners, environmentalists, and other interest groups. For this reason, the RPS requirements in most states exclude large legacy hydro-electric plants from being considered renewable energy, but some states like New York allow it. Additionality is the principal reason that policymakers choose to exclude large hydro. The purpose of the RPS requirements is to encourage utilities to invest in or purchase *new* renewable energy, not take credit for large legacy hydro-electric plants that already exist.

The renewable energy portfolio that backs up green retail tariffs often includes purchases of unbundled RECs. Like biomass and hydro-electric power, each state and each RPS ruling is different in the way unbundled RECs can be counted toward meeting the RPS requirement. The issues associated with unbundled RECs (see below) trickle down to the renewable energy portfolios that contain them.

But the issue of additionality goes beyond large legacy hydro-electric plants. Any long-term commitment to purchase green energy should result in *new* renewable energy generating capacity being installed. Whether or not green tariffs achieve additionality will depend on a number of factors.

In California, all retail electric providers have to report renewable content and portfolio emissions factors separately for each offering, but this requirement may not apply in all jurisdictions. This prevents renewable energy sold through 100% renewable energy programs from being double counted in the standard offering, but as noted earlier, the RPS requirements vary considerably by state.[15] If the accounting is separate for each offering, there is less chance that retail providers will blur the lines between their default portfolio and special renewable energy offerings or green tariffs.

In summary, in the US there are many issues with green tariffs as an alternative to on-site renewable energy: difficulty in structuring a long-term commitment, debatable sources of renewable energy, and uncertainty about whether additionality is achieved.

A1.6 DIRECT ACCESS TO WHOLESALE MARKETS

How well renewable energy procured through direct access to the wholesale market meets the evaluation criteria in Section 3 of the main report depends on the terms of

the procurement contract. The contract needs to be for an extended period of time to align with the building life. If the offering is based on the purchase of unbundled RECs, it should be treated as a REC. In any event, the source and location of the renewable energy generating plants should be specified in the contract and limited to wind, solar, and/or geothermal power plants.

A1.7 UNBUNDLED RECs

Unbundled RECs in the United States are underpriced. The average cost of a REC (with no restrictions) is less than $1, or less than 5% of its true value to society. At a price this low, it is highly unlikely that the market will respond by installing new renewable energy generating capacity. The prospect of additionality is extremely low.

Even if RECs were properly valued, for the purchases to approximate the construction of on-site renewable energy, a contract would have to be structured such that the building owner, future building owner, and/or tenants would be required to purchase enough RECs to offset building energy for 20 years or more. There are no known US precedents for such a contract, although the terms are certainly feasible.

As mentioned earlier, unbundled RECs may represent a share of the renewable energy portfolio of utilities and other retail electricity providers. The issues discussed here trickle down to green retail tariffs when this is the case.

A2. EVALUATION OF PROCUREMENT OPTIONS AND CALCULATION OF MULTIPLIERS

Table 2 is a qualitative comparison of each of the off-site procurement options discussed in this document. The comparison is based on the conditions of the United States and will likely vary for other countries. This assessment is based on the procurement methods meeting the minimum requirements discussed in Section 4 of the main report. The first column of the table lists the evaluation criteria discussed in Section 3 of the main report. Each procurement option is judged relative to these criteria in a qualitative way, using the scales shown in Table 3.

Table 2 – Qualitative Comparison of On-Site and Off-Site Procurement Methods – United States

Evaluation Criteria	*On-Site*	*Community Solar*	*REIFs*	*Virtual PPA*	*Self-Owned Off-Site*	*Green Retail Tariffs*	*Direct Access*	*Unbundled RECs*
Probability of Additionality	High	Medium	Medium	Medium	Medium	Low	Low	Zero
Long-Term Commitment	Yes	Possible	Yes	Yes	Possible	Difficult	Possible	Difficult
Assignment to ZNC Building	Yes	Yes	Possible	Possible	Possible	Yes	Difficult	No
Grid Management Capability	Possible	Yes	Possible	Possible	Possible	Yes	Yes	No
Environmental Impact	Low	Depends	Depends	Depends	Depends	Depends	Depends	Depends
Inspirational/Educational Value	High	Medium	Low	Low	Medium	Low	Low	Low
Incremental Acquisition	Yes	Yes	Yes	Possible	Yes	Yes	No	Yes
Permanent Financing	Yes	Unlikely	Possible	Possible	Possible	No	No	No

The qualitative evaluations in Table 2 are converted to a numeric score using the scales shown in Table 3. Each criterion is given a weight indicating its importance relative to the other criterion. For instance, "Probability of Additionality" is given a weight of 30% out of the total 100%. "Permanent Financing" has the lowest weight at 3%. The weights will likely change when this procedure is applied to other countries.

Table 3 – Qualitative/Numeric Scales and Weight for each Evaluation Criterion – United States

Criterion	Scales				Weight
Probability of Additionality	High	Medium	Low	Zero	30%
Long-Term Commitment	Yes	Possible	Difficult	No	24%
Assignment to ZNC Building	Yes	Possible	Difficult	No	12%
Grid Management Capability	Yes	Possible	Difficult	No	12%
Environmental Impact	Low	Depends	High	n.a.	6%
Inspirational/Educational Value	High	Medium	Low	Zero	6%
Incremental Acquisition	Yes	Possible	Difficult	No	6%
Permanent Financing	Yes	Possible	Unlikely	No	3%
Numeric Score	3	2	1	0	100%
	Good			Bad	

Based on this procedure and the judgments from Table 2, the coefficients, or markdowns, for each procurement option are calculated in Table 4. For each option the sum-product is calculated by summing the score for each criterion times its weight. These values are shown in the row labeled "Sum of Numeric Scores * Weight". The value for on-site renewable energy is 2.88 and the other values are divided by 2.88 to determine the "Calculated Coefficient". The Calculated Coefficient for self-owned, community solar, virtual PPAs, and REIFs are similar so these are grouped into Class 1. The average multiplier for these options is 0.76, but the recommended coefficient is rounded to 0.75. Likewise, direct access and green tariffs are similar so these are

grouped as Class 2 with a recommended multiplier of 0.55. Unbundled RECs are in a class by themselves and the recommended multiplier is 0.20.

Table 4 – Numeric Scores and Calculation of Off-Site Multipliers – United States

		Class 1				Class 2		Class 3
Evaluation Criteria	*On-Site*	*Self-Owned Off-Site*	*Community Solar*	*Virtual PPA*	*REIFs*	*Direct Access*	*Green Retail Tariffs*	*Unbundled RECs*
Probability of Additionality	3	2	2	2	2	1	1	0
Long-Term Commitment	3	2	2	3	3	2	1	1
Assignment to ZNC Building	3	2	3	2	2	1	3	0
Grid Management Capability	2	2	3	2	2	3	3	0
Environmental Impact	3	2	2	2	2	2	2	2
Inspirational/Educational Value	3	2	2	1	1	1	1	1
Incremental Acquisition	3	3	3	2	3	0	3	3
Permanent Financing	3	2	1	2	2	0	0	0
Sum of Numeric Scores * Weight	2.88	2.06	2.27	2.18	2.24	1.45	1.64	0.61
Calculated Coefficient	1.00	0.72	0.79	0.76	0.78	0.51	0.57	0.21
Average for Class				0.76			0.54	0.21
Recommended for Class				**0.75**			**0.55**	**0.20**

Architecture 2030 has developed a spreadsheet to assist with this process. The spreadsheet is available at www.zero-code.org.

APPENDIX B: Resources about Off-Site Renewable Energy Procurement

A series of resources about off-site procurement of renewable energy in the US are cited below. These procurement mechanisms are mostly voluntary and are not tailored to mandatory code compliance. Nevertheless, they provide some very useful lessons and information.

Solar Energy Industries Association – Direct PPAs and Solar Leases

The Solar Energy Industries Association has endorsed model agreements for both direct PPAs and solar leases. See https://www.seia.org/research-resources/model-leases-and-ppas. With direct PPAs and solar leases, the renewable energy system is installed on-site, but the terms of the lease set a precedent for off-site procurement.

The SEIA website has six agreements: three for solar leases and three for PPAs. For both PPAs and solar leases, there is a commercial building version as well as two residential versions: aggregated vs. disaggregated. The aggregated version is for vertically integrated companies who finance and install systems. This disaggregated version is for companies that work with a network of third-party installation partners or financiers.

The commercial PPA has restrictions on assigning the agreement in the event of a real estate transaction, which should commit the new owner to honoring the agreement. However, with regard to environmental attributes (RECs), the model agreement says that *the environmental attributes and tax credits accrue to the seller and there are no exceptions in the standard agreement*. This sets a bad precedent; the building owner who installs solar using the standard agreement can't claim to be a ZNC building since someone else owns and is taking credit for these benefits. The commercial model solar lease has similar language with regard to assignment, but the agreement has a check box where the environmental attributes can be assigned to the lessee. The default, however, is that the environmental attributes accrue to the lessor.

Table 5 – Treatment of RECs and Property Sale in SEIA Model Agreements

	Direct PPAs	Direct Solar Leases
Environmental Attributes	The **environmental attributes** and tax credits **accrue to the seller**. There are no standard exceptions to this in the standard agreement.	The environmental attributes accrue to the lessor by default, but a clause in Exhibit 1 allows the attributes to be assigned to the lessee.
Sale of Property	There are restrictions on assigning the agreement in the event of a real estate transaction. Basically, the new owner of the building has to honor the agreement.	Similar restrictions apply, but the language is not as clear.

Rocky Mountain Institute, Business Renewables Center

The RMI Business Renewables Center works with businesses to help them procure renewable energy. The virtual or financial PPA is the main tool they recommend. They have developed two tools to assist businesses. The first is a model term sheet for virtual PPAs. Unlike the SEIA model agreement, the RMI term sheet makes it clear that the environmental attributes accrue to the business, e.g. they are not retained by the renewable energy developer. The second tool is a request for proposals (RFP) template that businesses can use to shop for renewable energy purchasing opportunities. The term sheet can be downloaded from the RMI website. The RFP template is available only to members of the Business Renewables Center. For more information go to https://www.rmi.org/our-work/electricity/brc-business-renewables-center/.

Sullivan & Worcester

Elilas Hinckley[16] is an attorney that advises corporate clients on the procurement of clean energy. His former firm is Sullivan & Worcester and the firm has published an excellent piece on procurement of off-site renewable energy called *Edge Advisory: Focus on Corporate Renewables.* The document can be downloaded at http://cdn2.hubspot.net/hubfs/878449/Edge-Advisory-September-2016-FINAL.pdf?t=1511197049837. It contains seven articles by a variety of authors. The titles of these articles:

- Energy Transition Driving Corporate Participation in Renewable Energy Purchasing
- Keys to Success for Corporate Procurement Transactions
- Market Outlook: Corporate Clean Energy Purchasing
- Unlocking Clean Energy Value in Dormant Corporate Properties
- Interview Q&As with Sector Leaders
- State Policy Developments and Prospects
- Financing International Projects

Stoel Rives LLP

The Stoel Rives law firm publishes a blog titled, "Renewable + Law" with contributions that address a number of issues related to off-site procurement of renewable energy. From the website: "First published in early 2008, Renewable + Law blog is dedicated to tracking all major policy and legal developments impacting the U.S. renewable energy industry. Whether your interest involves solar energy, wind energy, biomass,

ocean and hydrokinetic energy, biofuels, waste-to-energy, geothermal, electric energy storage or other clean technologies, we blog about it." See also footnote 4.

National Renewable Energy Laboratory,

The National Renewable Energy Laboratory (NREL) has released several publications on corporate procurement of renewable energy:

- O'Shaughnessy, Erik, et. al., Status and Trends in the U. S. Voluntary Green Power Market (2014 Data), NREL/TP-6A20-65252.
- Lori Bird, et. al., *Policies for Enabling Corporate Sourcing of renewable energy Internationally, A 21st Century Power Partnership Report*, NREL/TP-6A50-68149. Developed in cooperation with the Center for Resource Solutions, International Renewable Energy Agency and World Resources Institute.
- Renewable electricity: How do you know you are using it? (two-page flyer)
- Jenny Heeter, Renewable Energy Certificate (REC) Tracking Systems: Costs & Verification Issues, slide presentation, October 11, 2013.
- "A Guide to Community Solar: Utility, Private, and Non-profit Project Development", November 2010. The guide was developed for the National Renewable Energy Lab by Northwest Sustainable Energy for Economic Development, Keyes and Fox, Stoel Rives, and the Bonneville Environmental Foundation. See NREL document 49930. This document provides guidance to organizations that want to set up community solar systems, and has examples of programs circa 2010.

U. S. Environmental Protection Agency – Social Cost of Carbon

The United States Environmental Protection Agency, along with 11 other federal agencies[17], calculated the social cost of carbon for use in cost effectiveness analysis of federal programs. Two reports have been issued:

- Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866, Interagency Working Group on Social Cost of Carbon, February 2010
- Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866 Interagency, Working Group on Social Cost of Greenhouse Gases, August 2016

The social cost of carbon (SC-$CO_{2)}$ "is the monetized damages associated with an incremental increase in carbon emissions in a given year. It is intended to include (but is not limited to) changes in net agricultural productivity, human health, property

damages from increased flood risk, and the value of ecosystem services due to climate change."[18] The SC-CO_2 was calculated through multiple simulations using three integrated assessment models and three different discount rates for future costs: 5%, 3%, and 2.5%. Figure 1 shows the results for one calendar year (2020). In addition to the average values for these discount rates, the study also looked at a high value representing the 95th percentile.[19] The SC-CO_2 values for all years through 2050 are shown in Table 6.

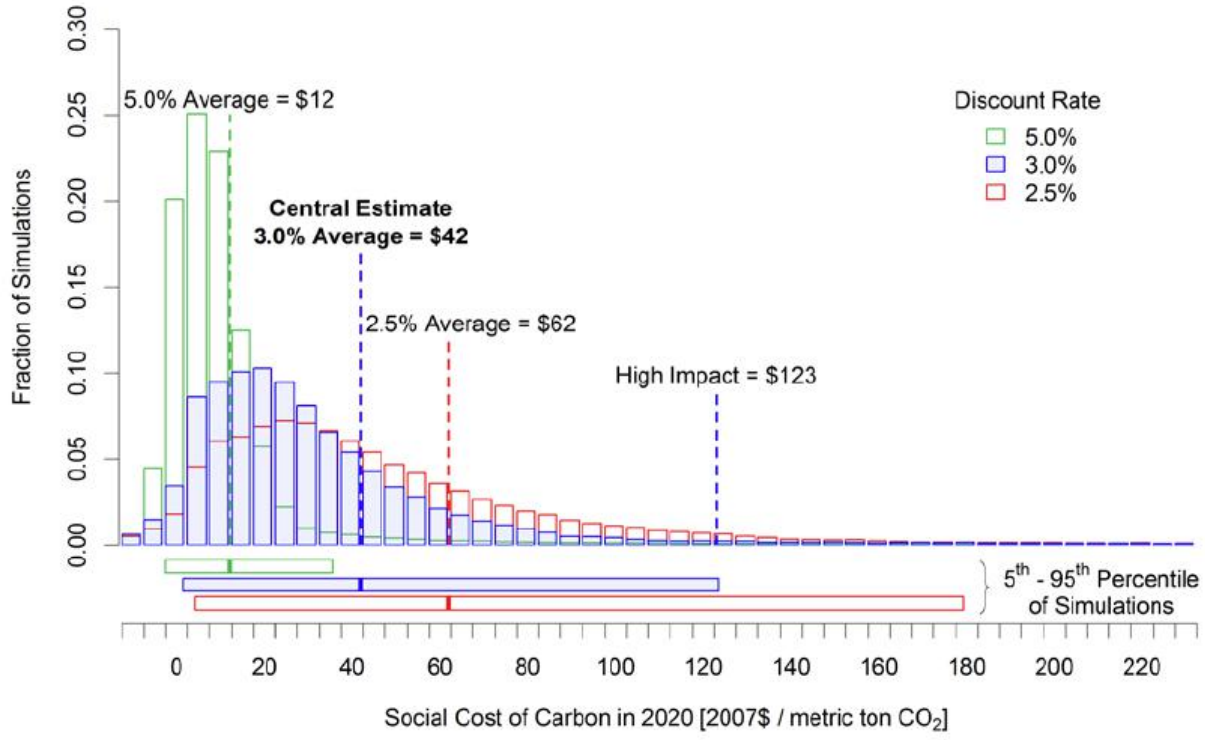

Figure 1 – Frequency Distribution of SC-CO2 Estimates for 2020

Source: Figure ES-1 of 2016 Report

Table 6 – Social Cost of Carbon

Source: 2016 Update, Table A1

Year	5% Average	3% Average	2.5% Average	Average (95th PCT at 3%)
2010	10	31	50	86
2011	11	32	51	90
2012	11	33	53	93
2013	11	34	54	97
2014	11	35	55	101
2015	11	36	56	105
2016	11	38	57	108
2017	11	39	59	112

2018	12	40	60	116
2019	12	41	61	120
2020	12	42	62	123
2021	12	42	63	126
2022	13	43	64	129
2023	13	44	65	132
2024	13	45	66	135
2025	14	46	68	138
2026	14	47	69	141
2027	15	48	70	143
2028	15	49	71	146
2029	15	49	72	149
2030	16	50	73	152
2031	16	51	74	155
2032	17	52	75	158
2033	17	53	76	161
2034	18	54	77	164
2035	18	55	78	168
2036	19	56	79	171
2037	19	57	81	174
2038	20	58	82	177
2039	20	59	83	180
2040	21	60	84	183
2041	21	61	85	186
2042	22	61	86	189
2043	22	62	87	192
2044	23	63	88	194
2045	23	64	89	197
2046	24	65	90	200
2047	24	66	92	203
2048	25	67	93	206
2049	25	68	94	209
2050	26	69	95	212

From these values, the economic benefit of reducing building energy use or producing renewable energy can be calculated. At present, each MWh of electricity produced in the United States results in 1,348 lb (0.61 tonnes) of CO_2e. If this is assumed to decline at a rate of 3% due to improvements in our grid, the net present value of the benefits of saving one MWh for thirty years is $404.[20]

If the social cost of carbon is assumed to be $40/tonne for a single year (this is the average value for 2018 at 3%), the net present value of the benefits of saving one MWh of electricity is approximately $25. This calculation is shown below:

$$\frac{\$40}{tonne} \times \frac{1348\ lb}{MWh} \times \frac{tonne}{2205\ lb} \approx \$25/MWh$$

California Energy Commission – Required Renewable Energy and Off-Site Options

The CEC is in the process of developing the 2019 standards for California, which will require low-rise residential buildings to include on-site renewable energy. The 45-day language was available at the time of this writing. The basic proposal is that enough on-site renewable energy be installed to offset the electricity of the dwelling unit (gas use for space and water heating is not offset). The prescriptive PV requirement is fixed according to the climate zone, the number of dwelling units, and the conditioned floor area. The required PV system capacity (DC) in Watts is given by following equation. The coefficients A and B for the various California climate zones are given in Table 7.

$$PV\_system\_capacity = A \times Conditioned\_Floor\_Area + B \times NmbrDU$$

Table 7 – Proposed California PV Requirement for Low-Rise Residential Buildings

Climate Zone	A = Watts per Conditioned Floor Area	B = Watts per Dwelling Unit
1	0.793	1,270
2	0.621	1,220
3	0.628	1,120
4	0.586	1,210
5	0.585	1,060
6	0.594	1,230
7	0.572	1,150
8	0.586	1,370
9	0.613	1,360
10	0.627	1,410
11	0.836	1,440
12	0.613	1,400
13	0.894	1,510
14	0.741	1,260
15	1.560	1,470
16	0.590	1,220

There are four exceptions to the basic requirement, mostly based on the available solar-ready zone. "A solar zone is a section of the roof designated and reserved for the future installation of a solar electric or solar system."[21] The existing 2016 California standards require that single family residences have a minimum solar zone of no less than 250 ft². The minimum solar zone for all other buildings is 15 percent of the total roof area, excluding skylights.[22] See the standard language for the many exceptions to the solar zone requirements.

Of interest here is proposed language that would allow buildings to comply with the PV requirement through what the CEC calls a "Community Shared Solar Electric Generation System or Community Shared Battery Storage System". Qualifying community systems would be eligible to be partially or totally substituted for the on-site renewable energy system that would otherwise be required. This proposal is in draft form at the time of this writing and is subject to change. To qualify, the community system would have to meet the following requirements:

- The renewable energy or battery storage system must be installed and available for inspection prior to the final inspection of the building that depends on the system for compliance.
- The enforcement agency must have access to inspect the renewable energy or battery storage system.

- Documentation that creates development entitlements for the building shall be completed prior to filing the building permit application.
- The off-site system shall provide the same or better energy performance than the on-site system it is off-setting. Software approved by the CEC must be used to show equivalency.
- The benefits from the off-site system shall be in the form of dedicated power utility energy reduction credits or payment for energy bill reductions. Most community solar legislation in the United States requires this.
- The off-site system shall have a useful life of at least 20 years.
- The energy saving benefits (RECs) of the off-site system shall accrue exclusively to the dedicated building.
- The entity managing the community system shall maintain records and be accountable for a period of at least 20 years. The records shall be available for audit by the CEC or its assignees.
- Community system providers shall be approved by the CEC.

Sonoma Clean Power (SCP) – Green Tariffs

Sonoma Clean Power is a California Community Choice Aggregator (CCA) that buys power for residences and businesses in Sonoma County. SCP offers a voluntary tariff called EverGreen that includes electric power from 100% renewable sources. Customers that opt for EverGreen pay a couple of cents more per kWh and the electricity they use comes entirely from local renewable energy sources. In the SCP case, geothermal is the source of the renewable energy.

Green tariffs are voluntary and the customer can opt out on short notice. This makes the typical green tariff unacceptable as an alternative to on-site renewable energy. To address this issue and to provide an alternative for the thousands of residences that lost their homes as part of the Tubbs fire of 2017, Geof Syphers, the CEO of SCP, Sonoma County, and the City of Santa Rosa are developing a program that would offer cash to home owners and developers who are rebuilding. To qualify for the highest amount of cash, residencies would need to be 20% more energy efficient than California's already tough energy efficiency standards. In addition, on-site renewable energy would be required, but as an alternative, the home owner or developer could prepay for EverGreen power for a period of 20 years. Prepayment would address the need for a long-term commitment and also increase the probability of additionality.

Since all retail electric providers in California have to report renewable content and portfolio emissions factors separately for each offering, SCP cannot blur the lines

between the default portfolio (called CleanStart) and the EverGreen portfolio. As more customers sign on to EverGreen, SCP will have to acquire more renewable energy. The renewable energy credited toward EverGreen cannot be double counted in CleanStart. Furthermore, the state has an aggressive policy to increase the renewable energy requirements for default offerings, preventing renewable energy counted toward CleanStart to be moved over to EverGreen. As Geof points out, a person pre-paying for twenty years of EverGreen would cause a net increase of renewable energy to be produced quickly (and certainly within the next RPS compliance period).

Non-Profit Initiatives – RE100.org, CDP.net and wemeanbusinesscoalition.org

In addition to the RMI Business Renewables Center, several other organizations have surfaced to accelerate and promote the procurement of renewable energy by businesses.

- CDP.net, formerly the Carbon Disclosure Project, "is a not-for-profit charity that runs the global disclosure system for investors, companies, cities, states and regions to manage their environmental impacts. Over the past 15 years we have created a system that has resulted in unparalleled engagement on environmental issues worldwide."[23]
- "RE100 is a collaborative, global initiative uniting more than 100 influential businesses committed to 100% renewable electricity"[24] More than 100 international corporations have made the commitment.
- "The We Mean Business coalition is catalyzing business action and driving policy ambition to accelerate the low-carbon transition."[25]

Brokers

Several organizations have emerged to help corporations acquire renewable energy by brokering the deals.

- 3Degrees is located in San Francisco and offers "comprehensive clean energy services that enable organizations, utilities and individuals to transition towards a low-carbon economy." They work with corporations to broker deals with renewable energy developers. They also have a consulting practice that works with utilities and others to set up community solar or shared renewable energy projects. Details can be found at https://3degreesinc.com/about/.
- Altenex is a subsidiary of Edison Energy, the parent company of Southern California Edison. Altenex works with companies "interested in purchasing renewable energy as a way of helping them control energy costs and improve

the environmental performance of their operations." Details can be found at http://www.altenex.com/about.html.

Renewable Energy Certificate Tracking Organizations

The Center for Resource Solutions operates the Green-e program, which tracks RECs in the United States and other countries. The organization works with other organizations and publishes research documents on voluntary procurement of renewable energy. Details can be found at https://resource-solutions.org/.

END NOTES

[1] In mixed fuel buildings, using site energy as the metric for evaluation, results in more renewable energy offset than either source energy or carbon emissions, based on United States national average source energy use and carbon emissions associated with electricity use.

[2] Since solar production is seasonal, most programs require at least a year of participation to include both the cloudy and sunny months.

[3] The cost of installing on-site PV is in the range of $1,500 to $3,000 per kW_{stc} of capacity, but this includes the benefit of electric power as well as the environmental benefits. The fee to the REIF should only include the environmental benefit portion of the cost.

[4] The investment tax credit for solar energy in the United States has encouraged schools, local governments and other entities that do not pay federal tax to procure solar though direct PPAs. With this arrangement, the solar service provider can realize the tax advantages, which the school or government can't take advantage of.

[5] With many, if not most, direct PPAs, the seller keeps the RECs and other environmental benefits. Sometimes these are sold to utilities to help them meet the requirements of their renewable portfolio standard. In fact, the model PPA agreement promoted by the Solar Energy Industries Association (SEIA) states that the environmental attributes are assigned to the seller. See SEIA in the Appendix.

[6] See Rocky Mountain Institute in the Appendix.

[7] See Lori Bird, et. al., Policies for Enabling Corporate Sourcing of Renewable Energy Internationally, A 21st Century Power Partnership Report, NREL/TP-6A50-68149, May 2017

[8] In California, local governments and school districts can participate in a program called renewable energy self-generation bill credit transfer (RES-BCT) whereby a portion of the energy from a renewable energy system owned by the local government or school district can be credited toward the utility bills of specific buildings owned by the entity. Information on the program offered by PG&E can be found at https://www.pge.com/en_US/for-our-business-partners/interconnection-renewables/export-power/distributed-generation-handbook/net-energy-metering/res-bct-program.page. The other California investor-owned utilities offer similar programs. System size is limited to 5 MW.

[9] Sonoma Clean Power, a community choice aggregator serving Sonoma County, is exploring this option as a way to expedite the reconstruction of homes destroyed by the Tubbs fire in Santa Rosa and surrounding areas.

[10] Lori Bird, et. al., Policies for Enabling Corporate Sourcing of renewable energy Internationally, A 21st Century Power Partnership Report, NREL/TP-6A50-68149. Developed in cooperation with the Center for Resource Solutions, International Renewable Energy Agency and World Resources Institute.

[11] National Renewable Energy Laboratory document 49930 reviews a number of community solar programs in the United States and virtually all of them keep the RECs and in some cases sell them to utilities to help them comply with their renewable portfolio standards.

[12] These thresholds were provided by Blaine Collison, Managing Director of Marketing & Strategic Partnerships for Altenex, a company that brokers deals between renewable energy developers and buyers of virtual PPAs and other renewable instruments.

[13] Per Blaine Collison.

[14] A typical offering is the EverGreen program offered by Sonoma Clean Power.

[15] California for instance has "buckets" of renewable energy sources. The first Bucket, and the preferred method, is renewable energy systems that sell power directly to the California ISO. At least 75% of the renewable energy must come from this bucket. The second bucket is renewable energy that is "firmed and shaped", e.g. variable solar energy is supplemented and augmented with conventional sources. Unbundled RECs represent the third bucket and cannot exceed 10%.

[16] Mr. Hinckley is now a partner in the K&L Gates law firm in Washington DC.

[17] The following agencies were part of the working group: Council of Economic Advisers, Council on Environmental Quality, Department of Agriculture, Department of Commerce, Department of Energy, Department of Transportation, Environmental Protection Agency, National Economic Council, Office of Energy and Climate Change, Office of Management and Budget, Office of Science and Technology Policy, and Department of the Treasury.

[18] Executive Summary of the 2016 update.

[19] See the 2016 update, page 20.

[20] These calculations are documented in a supplementary spreadsheet.

[21] See Section 100.1 of the 2016 California Building Energy Efficiency Standards.

[22] See Section 110.10 of the 2016 California Building Energy Efficiency Standards.

[23] See www.cdp.net.

[24] See the www.RE100.org.

[25] See www.wemeanbusinesscoalition.org.