The Housing Development Consortium of Seattle-King County

GUIDELINES FOR
SOLAR INTEGRATION

Part of a series highlighting techniques critical to building better affordable housing

HOUSING DEVELOPMENT consortium

Exemplary Buildings Program

Advancing Ultra-Efficient Buildings in Affordable Housing

CONTENTS

Cover photo courtesy of Bellwether Housing

OVERVIEW

The Housing Development Consortium of Seattle-King County (HDC) launched its Exemplary Buildings Program (EBP) as a regional collaborative effort targeting nothing less than transformation of the affordable housing market. Why? Because the interrelated crises of climate change, equity, and housing demand both boldness and urgency. We believe it's possible to create equitable access to healthy, safe housing that is *both* affordable *and* ultra-efficient. The EBP task force has defined a comprehensive set of performance standards and building practices designed to reduce the overall premium (the additional costs of implementing ultra-efficiency) to the point where the premium can be financed through the operational savings generated. These standards are available at exemplarybuilding.housingconsortium.org.

Design Charrettes. Meeting those performance goals depends on broad engagement and a relentless focus on best practices. Our design charrettes are a critical tool for both. Each intensive session brings together recognized thought and practice leaders in one of several technical areas: Balanced Ventilation with Heat Recovery; Domestic Hot Water; Early Integrative Design; Solar Integration; and Wall Assemblies. Charrette participants, including experts from the EBP task force, rigorously sift through all of the current and emerging technologies. Each is analyzed in the context of changing construction practices and local construction culture; the Puget Sound region's marine climate; codes and regulations; and cost.

Guidelines. The path to achieving cost efficiency includes standardization, training, and partnerships with suppliers. A fundamental purpose of EBP is to present approaches that are repeatable so that cost efficiencies can be accomplished at scale with partner suppliers and subcontractor familiarity. Each charrette produces a set of practical guidelines to support teams early in their design and pricing efforts, helping to streamline the process of building exemplary buildings.

It is important to note that EBP's guidelines are not restricted to developments striving to meet the full set of "exemplary" criteria. In fact, our hope is that they can be used to improve affordable multifamily housing more generally.

We hope these guidelines facilitate the affordable housing sector's ability to achieve construction cost efficiency, quality, and durability while pursuing the performance goals of the Exemplary Buildings Program and the specifications for projects in King County, Washington. Performance data from the program's demonstration projects will be used to continually refine the guidelines and update these publications.

Partners. We're grateful for the time and exceptional talent of the charrette participants and for the generosity of our program funders and charrette sponsors. Their commitment to this vision is vital.

Marty Kooistra
Executive Director, Housing Development Consortium of Seattle-King County (HDC)

EXECUTIVE SUMMARY

Installing solar panels on affordable housing provides a steady predictable stream of financial benefits for 25-30 years or longer. A system shields the building owner from utility rate increases over the life of the system and generates a strong positive cash flow offsetting operating costs and the financing costs of other building improvements. Upfront capital costs can be reduced by LIHTCs, Federal Investment Tax Credits for solar, accelerated depreciation, and Seattle City Light's "Green Up Community" program and can qualify for low-cost financing. However, most of these opportunities and the lowest cost for installation are available only at the time of initial construction.

For these reasons, the Exemplary Buildings Program believes that the goal for solar systems, in conjunction with other sustainable building measures, should be to *maximize solar PV deployment in balance with other uses of roof space.*

In addition to incentives and financing, planning for a solar system as part of the early integrative design process can offer signification cost reductions and maximize the solar potential. In 2020, the Solar Energy Industries Association (SEIA) listed the "supply chain, overhead and margin" as over half of the average industry costs of $2.83 per installed watt.[1]

These guidelines will cover the early integrative design and general development process; funding and financing opportunities; best practices in equipment and contracting; and tools to put all of this together. Our goal is to enable sound decision making in the development process.

Efforts have been made to present information that is true and accurate. However, since federal, state, and local programs and incentives can change at any time, it is essential to work with a solar consultant/contractor to get the most up-to-date information. We hope this document proves useful as a resource to assist with the integration of solar into multifamily affordable housing.

Steve Gelb
Northwest Regional Manager, Emerald Cities Collaborative
Lead, HDC Exemplary Buildings Program Solar Integration Charrette

[1] Solar Energy Industries Association (June 11, 2020). ***Solar Market Insight Report 2020 Q2*** . Retrieved from https://www.seia.org/research-resources/solar-market-insight-report-2020-q2.

KEY ELEMENTS OF SOLAR DEVELOPMENT

At the very start of the development process, and as part of the early integrative design process, we recommend taking these steps to maximize the benefits and minimize the costs for solar systems.

1. **Solar Advisor.** Engage with an organization experienced in solar design and installation as part of the early integrative design process.

2. **Integrate Design to Maximize Opportunity**. Because a solar system requires roof space, considering the tradeoffs between larger or smaller systems and other rooftop uses for equipment or amenities is important to consider at the earliest stages of development.

3. **LIHTC.** Depending on the funding strategy, limitations, and competitiveness, discuss whether the solar system should be considered in the basis for tax credits for the building.

4. **Investment Tax Credit and Accelerated Depreciation**. Special tax credits are available for solar systems, so it is important to discuss tax credit investors' appetite and process for integrating these into your funding strategy.

5. **Utility Funding.** Consider what utility programs are available and their capacity for funding your project when it will be built. This funding can potentially pay over 50% of the cost of the system.

6. **Solar Financing**. Low-cost lending specifically for solar and other sustainability upgrades are available and should be considered early in the development process.

7. **System Size and Electrical Use**. To size a solar system for maximum benefits, you will need to know whether the electrical system for the building will be master metered or individually metered and the common area demand for electricity.

8. **Net Metering and Virtual Net Metering**. Spreading the benefits of the system to individual meters through virtual net metering may be necessary to maximize system benefits. Some utilities are beginning to pilot virtual net metering, so it is important to understand if this is available for your building project.

Rachel Lee (Washington Environmental Council)

A STREAMLINED DEVELOPMENT PROCESS

Optimizing the size of a solar system and ensuring the lowest possible cost requires a streamlined process and early integrative design. During the design phase, this will ensure optimal use of roof space and reduce design iterations due to roof layout changes. During construction, be sure to integrate solar installation with the construction schedule to save on installation costs for solar installer. The chart below provides an overview of the process and areas that need to be considered. A more detailed review of the process follows.

I. Conceptual Phase	II. Schematic Design	III. Design Development
1. Engage with solar advisor 2. Include solar in concept design costing 3. Strategy for roof use 4. Financing strategy 5. Solar ownership strategy **6. Conceptual proforma**	1. Review solar details with financial partners 2. Plan solar investment tax credit and LIHTC strategy 3. Review utility funding 4. Feasibility of solar financing 5. Common area electric load 6. Confirm electric network capacity	1. Finalize roof design 2. Finalize size of solar system 3. Solar equipment specs 4. Determine online monitoring vendor **5. Create final proforma**
IV. Construction	**V. Commissioning**	**VI. Operations**
1. GC selects solar contractor 2. Installation 3. Finalize interconnection agreement with utility 4. Final inspection	1. Finalize net metering with utility 2. Confirm online monitoring 3. Request incentives tied to install date	1. Periodic cleaning 2. Replace inverters at Year 15 3. Replace panels at time of roof replacement or retrofit – approximately 30 years

Solar Development Process Timeline

PRODUCT SPECIFICATIONS FOR MULTIFAMILY AFFORDABLE HOUSING

Solar technology has progressed significantly in recent years and its cost has dropped considerably. A solar system consists of three components: the panels that product DC electricity, the inverters that convert the DC electricity to AC for use by the building or the grid, and the racking system to support and orient the panels on the roof. A monitoring system should be added to keep track of the energy being generated by the system. An overview of the key components and a chart depicting the Exemplary Buildings Program standards follow.

Size the System

Rooftop PV panels must be sized to the electric load requirement of the building and which meter(s) will be tied to the solar production. Panels should be installed on all available roof area with allowances for shade, mechanical equipment access, and walkways. If the electric load requirement of the building demands a smaller PV system than the roof can accommodate, consider potential virtual net metering opportunities. Load will not likely be an issue for a solar system installed on master-metered buildings (supportive housing, senior housing) that will have more load than even the largest system can provide.

Panel Mounting

A ballasted system mounts PV panels on weighted freestanding racks which do not typically require mechanical attachment to the roof, making installation easy and affordable. Ballasted mounting systems may require additional roof structural support (see "Rooftop Design and Analysis" below) and greater spacing between rows to prevent shade falling on panels.

Photo courtesy of Bellwether Housing

Mechanically fastened steel rack systems penetrate the roof to connect to the structural frame of the building. Solar PV panels are raised higher and with greater tilt to allow more density and less risk of shading, leading to superior energy generation potential.

System Monitor Installation

A web-connected digital monitor should be installed to give real-time readouts on voltage, current, power output, state of charge, and alerts to notify staff of functional issues.

System Specs: Exemplary Buildings Program Recommendations

SYSTEM COMPONENT	EXEMPLARY BUILDINGS PROGRAM RECOMMENDATIONS
Modules (Panels)	• Tier-1 modules. • 25-year warranty. • Listed on Bloomberg, NEF Tier-1 PV module list.
Total Solar Resource Fraction (TSRF)	• 90% minimum for each roof area. **TSRF** is a measure of available solar energy. It takes into account solar access (how much sunlight is available based on our latitude, climate, and shading from surrounding structures) and the tilt and orientation of the panels.
Module Efficiency	• 18% minimum. But, very high efficiency can decrease cost effectiveness and should be assessed in a proforma.
Inverters	• String inverters with designated space. • Listed on California Energy Commission Solar Equipment List.
Monitoring	• Standard online portal recommended. • EGage or other utility-grade system recommended.
Racking	• Ballast system, no attachments to roof if possible, in buildings under six stories without wind concerns. • Anchored system for larger buildings requires close coordination with roofing contractor.
Max cost/watt	Base/Code — Incremental Anchored — $5.00/watt — $3.50/watt Ballasted — $3.00/watt — $2.00/watt These represent direct costs. To minimize cost, contracting directly with the solar contractor should be considered.
Modeling Performance	• The electric production and value of system can be modeled with PV Watts, a tool available from the National Renewable Energy Lab (NREL). A solar contractor or designer can provide this.

ROOFTOP USE DESIGN AND ANALYSIS

Maximizing the solar potential of the building in the most cost-effective way requires coordination with all of the other potential uses of roof space. Consider cost, code requirements/extra points, funding points, and general building goals when assessing the rooftop use. These considerations are summarized in the table below (which spans multiple pages).

MEASURE/ AMENITY	DESCRIPTION	CHEAPEST/ DEFAULT	BEST ALTERNATIVE/ MOST COST-EFFECTIVE
General Structural	Units over 400-500 lbs on the roof need additional structural support.		
Solar Panel Size and Production	Each panel generates approximately 400-420 watts electricity and l is 80 x 40 inches in size.	Maximize capacity where solar exposure is best, in continuous rows.	
Solar Anchoring/ Racking	Structural engineers need to know early in the process. Ballasted systems are generally 6-8 lbs/ft^2 and attached systems are 3-4 lbs/ft^2. 4 lbs per square foot dead load is the solar-ready requirement in the Seattle Building Code.	Ballasted system is typical, does not require roof penetrations, and is cheapest to install. Adding structural roof capacity to achieve 6-8 lbs/ft^2 needed for a ballasted system install adds some cost. Over 6 stories requires roof anchors with penetration. An anchored system should be coordinated with the roof install. An anchored system can "float" over some ventilation and equipment located on the roof.	Expand solar to all available roof area.
Ventilation with Heat Recovery Ventilator for Residential Units	Balanced ventilation with heat recovery required by Energy Code.	Unitized is often least expensive and frees the rooftop for solar. Central system would need to be on the roof.	Floor by floor HRV or unitized system maximizes rooftop for solar. For a centralized ventilation system, consider the location of rooftop HRV early in the process. Rooftop HRV (typical specs): 6,000 lb rooftop unit for up to 100-unit building requires additional structural support and ~150 ft^2.

Rooftop Use Summary Table (part 2 of 3)

MEASURE/ AMENITY	DESCRIPTION	CHEAPEST/ DEFAULT	BEST ALTERNATIVE/ MOST COST-EFFECTIVE
Ventilation & Heating—Corridors	HRV to provide ventilation and recycled heat for the corridors.	Passive ventilation from operable windows is cheapest and requires no energy. Central HRV with ducts is the next most energy efficient.	For a common area ventilation system, consider the location for rooftop HRV early in the process. Locate near other equipment and in coordination with solar. Rooftop HRV (typical specs): 3,000 lbs requires additional structural support and ~150 ft^2. For rooftop DHP: 80-300 lbs/compressor each; 4-6 DHPs for a 100- unit building.
Ventilation Ducts	Link exhaust to centralized, common area or hybrid HRV systems. HRV needs to be separated from the emergency pressurization.	Centralized HRV requires insulated ducts on the rooftop.	Ducts can be located in the roof cavity for centralized rooftop systems for common or unit ventilation. Plan early in design process to optimize. Rooftop duct placement can be coordinated with solar panels. Panels can be run over other vents and smaller equipment, especially if the solar system is an anchored system.
Ventilation & Heating—Common Areas	Single or multi-head DHP for common rooms.	Alternative is Rooftop HP/Return Package Unit: 150 ft^2 footprint, typical 2/100 unit building, 1,100 lbs each.	Preferred location for DHPs is: 1) in a garage 2) ground level 3) wall mount 4) rooftop
Heat Pump DHW Compressors			Locate near water intake and in the parking garage when possible, or at ground level. If located on the roof, a modular system uses 25 ft^2/2 compressors; each compressor serves 6+ residential units and weigh 100 lbs.
DHW Storage			Locate next to Compressors; see above. Primary Storage—100 lbs/occupant Swing Tank Storage—additional Storage Kit - 2,000/6 units
Elevator Penthouse	Different jurisdictions require different sizes.	Elevator manufacturers say that the elevator package on the roof is cheaper for the manufacturer to install, but there's a tradeoff with other construction expenses.	Locating solar inverters and other equipment in proximity to or on the elevator penthouse should be considered.

Rooftop Use Summary Table (part 3 of 3)

MEASURE/ AMENITY	DESCRIPTION	CHEAPEST/ DEFAULT	BEST ALTERNATIVE/ MOST COST-EFFECTIVE
Green Roof Stormwater Management	Requires water retention. Rooftop stormwater management is needed or mitigation in some other manner is required.	It is cheaper to mitigate stormwater in other ways.	Green Roof not recommended. Other stormwater mitigation optimizes the solar.
Fire Requirements and Access	Where either axis of the building is more than 250 feet, provide a minimum 6-foot-wide clear perimeter around the edges of the roof. Where either axis of the building is 250 feet or less, a minimum 4-foot-wide clear perimeter is required around the edges of the roof.		
Plumbing Vents			Vents can be joined inside the building to reduce rooftop penetrations.
Roof Warranty/Lifetime			30+ year roof to align with solar life. Shading from solar panels may extend roof life.
Trash Room Exhaust			Place directly above the trash room and chute.
Transformer Exhaust		Located on the rooftop.	Consider the location that offers least interference with solar panels.
Commercial Space Ventilation	May be required.		Consider the location that offers least interference with solar panels.

WORKING WITH UTILITY—NET METERING

Net Metering Your Grid-Tied System

If you generate more electricity over a billing period than you consume, the utility will credit your electric bill for every kilowatt-hour of electricity sent back to the power grid. The credit is applied at the retail rate for power. Net metering will continue for the life of the solar electricity installation.

Seattle City Light Net Metering

When you install a solar electric system up to 100 kW AC in compliance with City Light Interconnection Standards and sign an Interconnection Agreement, the solar electricity you generate that is not immediately needed goes back onto City Light's grid and is credited to your account at the retail rate. Affordable housing may receive City Light net metering for **solar installations up to 250 kW AC** if the building invests in efficiency first (receives at least 15 points in Section 5.2A of the Evergreen Sustainable Development Standard, or **ESDS**, v.3.0.1). Meter readings by City Light record a customer's "net" electricity use. At the end of any billing period, if your electricity production exceeds your consumption, a billing credit at current retail rates is applied to your next bill. Most customers will accumulate kWh credits in the summer months and begin using any available kWh credits in the fall and winter.

Per Washington state law RCW 80.60.030, on March 31st of each calendar year, any remaining kWh credits accumulated in the previous net-metering year will be granted to the utility without any compensation to the customer. Customers should be minimally affected by this reset. Large Solar Program customers participating in the Large Solar Export Rate do not accumulate annual credits.

Rachel Lee (Washington Environmental Council)

FUNDING AND FINANCING

Seattle City Light's "Green Up Community" Program

Seattle residents can make a powerful environmental impact by contributing toward clean energy development through City Light's "Green Up Community" program. City Light ratepayers voluntarily contribute a fixed amount every month to the program. City Light then purchases renewable resources as Renewable Energy Credits (RECs) offered as a single product through Green Up. The Green Up Community program may purchase all the RECs generated during the first five years of operation from eligible new solar installations. Below are the program specifications. Funding availability is competitively awarded and not guaranteed.

Payment. Green Up Community pays $1,500 per KW (DC) installed solar in **pre-payment** of the first five years of RECs.

Eligibility.

1. Projects must be new or a new addition to an existing solar installation.
2. Minimum 30 kW system size up to 100 KW or larger if projects meet high energy-efficiency standards as defined above.
3. Will be installed on public or nonprofit affordable housing or facilities of low-income service providers.
4. Must be within the Seattle City Light service territory.

Renewable Energy Tax Credits (RETC) and Low-Income Housing Tax Credits (LIHTC)

The investment tax credit (ITC) for most renewable energy facilities, including solar, is 26% of its cost (and is now fixed until 2023, when it freezes at 10%). So, for example, a $100,000 project generates a $26,000 renewable energy tax credit (RETC). A project can simultaneously qualify for the far larger low-income housing tax credit (LIHTC). Other things to consider:

1. **LIHTCs are competitively awarded.** While the same expenditure can qualify for both the LIHTC and the RETC, applying for both reduces the total award. Some may see this as reducing the "value" of scarce LIHTCs and is something that should be considered.
2. **Bond-financed housing.** While most LIHTCs are competitively awarded, a second rule allows properties that benefit from tax-exempt housing bonds to qualify for the LIHTC (usually at a lower rate; see below) without the competitive process. The amount of credits is proportional to the percentage that is bond-

financed; but if a housing development is more than 50% bond-financed, then 100% of the eligible costs qualify for the LIHTC.

3. **The LIHTC must be monetized.** Even though the state allocates LIHTCs, it doesn't provide actual money. Like the RETC, LIHTCs must be monetized. Typically, there's a partnership or limited liability company with a managing general partner and an investor limited partner that is allocated most of the credits and depreciation.

4. **Rates for LIHTCs.** Under both the 9% Tax Credit Program and the 4% Bond/Tax Credit Program, the credit is based on the cost of new construction or rehabilitation of existing buildings. Land is not included. Under the 9% Tax Credit Program, the tax credit is calculated on these costs multiplied by 9% per year over the ten-year period (*i.e.,* 90% in total). Congress fixed this program to a 9% rate for all projects, and recently fixed the 4% rate as well.

5. **Basis (and the LIHTC) is reduced by half the RETC.** Claiming both credits has a drawback, in that it devalues the LIHTC somewhat. Assume a $100,000 project that qualifies for both the 26% RETC and a 9% LIHTC. That yields a $260,000 RETC and a $130,000 basis reduction. The LIHTC applies the 9% rate to this reduced amount, yielding a $783,000 LIHTC (*i.e.,* $870,000 x 9% x 10 years).

Accelerated Depreciation

A tax credit investor who claims the commercial ITC for a solar PV system placed in service can typically also take advantage of accelerated depreciation (Modified Accelerated Cost-Recovery System, or **MACRS**) to reduce the overall cost of a PV installation.

When the commercial ITC is claimed, accelerated depreciation rules allow the full tax basis minus half the ITC to be depreciated over a five-year MACRS depreciation schedule using a half year convention. Under the rules of this depreciation schedule, taxpayers are allowed to deduct a larger portion of this amount in earlier years, giving them the benefit of a greater immediate reduction in federal tax liability. A business with a solar PV system placed in service between January 1, 2018 and December 31, 2022 can elect to claim a 100% bonus depreciation. Starting in 2023, the percentage of capital equipment that can be expensed immediately drops 20% per year (*e.g.,* 80% in 2023 and 60% in 2024) until the provision drops to 0% in 2027.

The calculation can vary somewhat calculated and should be confirmed by a tax accountant. The depreciation is typically approximately 10%, a significant contribution to the solar cost.

Borrowing

Typically, a solar project cost is relatively small compared to the total affordable housing project, and taking out special debt for the solar might not make sense from an administrative and legal perspective. Since solar has a regular and predictable return and increases in value with increasing electric rates, borrowing should be a component of the capital stack for a solar project. The debt instruments below may be considered as part of the solar financing package:

1. **Tax-Exempt Bond Financing** (4 - 5% rate) is available with 4% LIHTCs and the solar can be incorporated into the project's financing.

2. **Taxable Debt** (4.5 - 5.5%) from a financial institution is an option if tax-exempt bond debt is not available.

3. **Community Debt** (2.5%) funding is crowdsourced or raised from high-wealth individuals to support the housing project generally.

4. **Washington State Housing Finance Commission Sustainable Energy Trust** (2 – 3%) funding is available for efficiency and renewable energy measures on affordable housing, new or retrofit, and could be in a position below the primary mortgage.

Direct Financial Benefits

The primary financial benefit from a solar system is the value of the electricity generated. The three primary factors to consider when assessing the value of the electricity produced by the system over time are:

1. The **power generated** by the system when new is a factor of the efficiency of the panels, their placement, and the sunlight reaching them. This is determined at the time of installation.

2. The **value of the electricity** is the amount of energy generated (KWh) multiplied by the current commercial rate of power. Electric rates in Seattle have been increasing by an average of 3.5% per year. This will increase, quite substantially, the value of the electricity being produced by the solar system over time. A 3.5% increase in rates over 30 years would result a power value that is 2.7 times its value when installed.

3. However, solar panels suffer some **degradation** over time, reducing their power output. This is typically at a rate of 0.5% per year or less. After 30 years, the panels would have lost about 15% of their power-generating capacity.

Indirect Financial Benefits

In addition to the direct financial benefits, solar can help meet ESDS and Energy Code requirements, often at a lower cost and with a greater return than other options. Solar projects can also score additional ESDS points to help qualify for and get extra points for LIHTC from the Washington State Housing Finance Commission. ESDS Version 4 for Fall 2020 requires the following that could apply to solar:

1. New Construction – 50 points required.
2. Rehabilitation – 40 points required.

Multifamily greater than 3 stories		
C406—Additional efficiency package options (in addition to code requirements)	C407 Performance-based compliance (in addition to code requirements)	ESDS Points
1	-3%	ESDS Mandatory
2	-6%	5
3	-9%	10
4	-12%	15
5	-15%	20
NA	-18%	25

The points in the table on the left are available for **ADDITIONAL REDUCTION IN ENERGY USE** in new construction.

The points to the right are available for **RENEWABLE ENERGY.** All systems must provide at least 1200 kWh/year production.

kWh/SF/Year	ESDS Points
0.14	1
0.28	2
0.42	3
0.56	4
0.7	5
0.84	6
0.98	7
1.12	8
1.26	9
1.4	10
1.54	11
1.68	12
1.82	13
1.96	14
2.1	15

Washington State Housing Finance Commission: solar PV systems qualify for points when scoring projects for tax credit evaluation.

- **9% LIHTC Points** – non-competitive projects (currently).
- **4% LIHTC Points** will be awarded for projects that install a solar system with an annual energy production per square foot of conditioned floor area of the building:
  - **3 points:** Annual energy production between 0.15-0.27 kWh/ ft^2/year.
  - **5 points:** Annual energy production greater than or equal to 0.28 kWh/ ft^2/year.

Financial Analysis/Solar Proforma

The figures below illustrate the Exemplary Buildings Program's solar proforma template. This tool provides options and scenarios for the most common installations of solar systems on affordable housing in King County. The template can be reviewed and downloaded at exemplarybuilding.housingconsortium.org. Please rename it for use with your project. Below is a step-by-step guide to its use.

Solar Proforma Users Guide.

The proforma is color coded to guide you in entering information. **The pale orange cells** are required to properly integrate all of the factors in your project. **The pale green cells** provide a place for you to override formulas or standard values that may not be accurate for your project. **Note:** once you override a cell's data or formula, it will no longer be accessible in the template.

Solar Program Design Proforma	Required Inpu	Optional Input
1. Solar System/Production	**Base/Code/ Fund Points**	**Incremental**
System Size (W)	25,000	75,000
Total PV Output (Kwh/year)	27,500	82,500
Average Power Price ($/kwh)	$0.1086	
Annual Rate Increase	3.50%	
Total Solar Power Value ($/year #1)	**$2,987**	**$8,960**
2. Costs	**$100,625**	**$177,188**
Install Price per watt	$3.50	$2.25
Solar Installation	$87,500	$168,750
Tax Partnership Structuring Fees	$0	
Design & Development Costs (10% Default)	$8,750	
Operating Reserve (inverters, maintenance	$4,375	$8,438

1. SOLAR SYSTEM/PRODUCTION

- ✓ **Enter Project Name.**
- ✓ **Enter System Size** – Either enter the total in the first column ("Base") or use the first column to enter the code or funding requirements and the" Incremental" column to enter the difference to the maximize size considered.
- ✓ **Average Power Price** - is for Seattle City Light Territory and adjusted to the year of install. Override for Puget Sound Energy or other utilities.
- ✓ **Annual Rate Increase** – an estimate based on current trends.

2. COSTS

- ✓ **Install Price per watt** – from solar installer. Enter both "base" and "incremental."
- ✓ **Tax Partnership Structuring Fees** – if not incorporated into the entire project.
- ✓ **Design and Development Costs** – for large projects (over 100,000 kw) this is a high estimate and should be overwritten.

3. Sources				$ 277,813
Tax Credits				
Tax Credit			2021	
Investment			22%	$ 21,175
Depreciation			10%	$ 9,625
Low Income				9%
LIHTC/year	$7,710	Price	$0.90	$69,387

Grant 1 -	Green Up	Rate	Maximum	
watt		$ 1.40	100,000	$ 35,000

Grant 2 -		Rate	Maximum	
Select Grant		$ -	-	$ -

Production Incentives			kWh/year	# of years
Incentive #1			$ -	10
Incentive #2			$ -	5

Loan		Required		$142,626
Annual		2.5%	Term - Years	15
Loan Fees		0.5%	**Payments**	**$11,577**
Balloon		10	**Balloon $**	**$53,072**

Power Purchase Agreement			
Discount	10.0%	Term/years	0
Escalator	3.0%		

3. SOURCES

- ✓ **Tax Year Installed** – estimate for the solar system. Investment Tax Credit and Depreciation - are calculated based on the year installed.
- ✓ **Low-Income Housing Tax Credits** – choose from the drop down, enter 0% if not applying LIHTC to the solar.
- ✓ **Grant 1** – enter the source, type of grant from dropdown list, rate and maximum.
- ✓ **Grant 2** – enter the source, type of grant from dropdown list, rate and maximum.
- ✓ **Production Incentives** – not currently used in WA.
- ✓ **Required Loan for Solar** – is calculated based on the balance of capital needed after tax credits and grants. Enter the interest rate, term, and loan fees for standard loans.
- ✓ **Balloon Payment** – if structured as a balloon payment, enter year that the payment takes place.
- ✓ **Power Purchase Agreement** – if there is a 3rd party owner/developer who sells the power back to the building owner, enter the power discount, length of agreement, and escalator in the cost of the power over the course of the agreement.

4. Cash Flow Assignments			Power Value	Loan Resp.
Project			0%	0%
Building Owner/LLC			100%	100%
To			0%	0%
			100%	**100%**
Production Incentives			**#1**	**#2**
Project Developer			0%	0%
Building Owner/LLC			100%	100%
To			0%	0%
			100%	**100%**

5. Cost/Benefit Analsysis	Base	Incremental
First Cost	$100,625	$177,188
Tax Credits	$7,700	$23,100
Grants &	$8,750	$26,250
Cost After Credits/Incentives	**$84,175**	**$127,838**
Simple	**28**	**14**

4. CASH FLOW ASSIGNMENTS

- ✓ Allows you to assign the value of the power, payback of the loan, and the production incentives to different parties involved in the project.

5. COST/BENEFIT ANALYSIS

- ✓ A quick view of the financial payback at current utility rates. With increases, the return will be faster.

6. POWER VALUE (FOR NET METERING)

next page

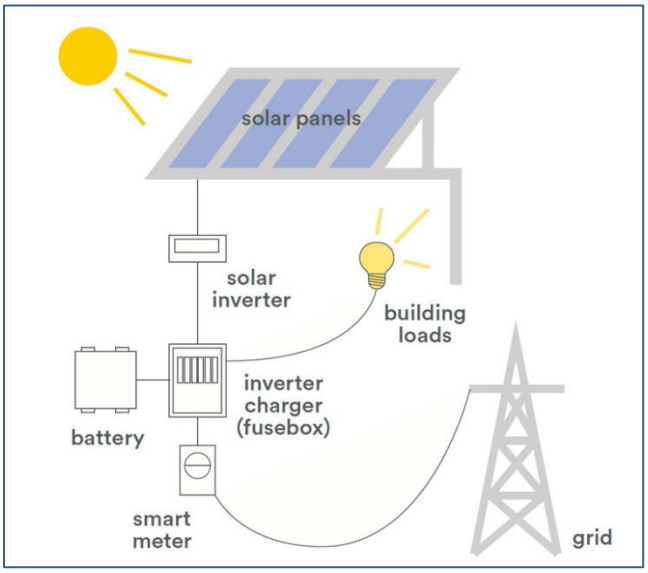
- ✓ Enter the KWH that qualifies for net metering. Then enter the wholesale price for power over the net metering maximum.
- ✓ The balance of the proforma provides a detailed year-by-year depiction of the costs and benefits of the solar system. This information can be used as part of a life-cycle cost analysis calculation for the project.

Power Value			1	2	3	4	5
Power Production kWh			27,500	27,363	27,226	27,090	26,954
Price per kWh - Retail			$ 0.1086	$ 0.1124	$ 0.1163	$ 0.1204	$ 0.1246
Power Value (Net Metering)	Max KWH	250,000	$ 2,987	$ 3,076	$ 3,167	$ 3,262	$ 3,359
Power Value (Wholesale)	Cost/KWH	$ 0.0316	$ -	$ -	$ -	$ -	$ -
TotalPower Value	NPV=		$2,987	$3,076	$3,167	$3,262	$3,359
Cash Flow-Project Developer	**NPV**	**Total**	**1**	**2**	**3**	**4**	**5**
Power Value		$0	$0	$0	$0	$0	$0
Production Incentive # 1		$0	$0	$0	$0	$0	$0
Production Incentive #2		$0	$0	$0	$0	$0	$0
Loan Replayment			$0	$0	$0	$0	$0
Power Purchase Agreement		$0	$0	$0	$0	$0	$0
Net Benefit	$0	$0	$0	$0	$0	$0	$0
Cummulative Benefit		$0	$0	$0	$0	$0	$0
Cash Flow - Building Owner	**NPV**	**Total**	**1**	**2**	**3**	**4**	**5**
Power Value		$141,682	$2,987	$3,076	$3,167	$3,262	$3,359
Production Incentive # 1		$0	$0	$0	$0	$0	$0
Production Incentive #2		$0	$0	$0	$0	$0	$0
Loan Replayment		-$157,264	$(11,577)	$(11,577)	$(11,577)	$(11,577)	$(11,577)
Power Purchase Agreement		$0	$0	$0	$0	$0	$0
Net Benefit	-$49,552	-$15,583	-$8,590	-$8,501	-$8,410	-$8,315	-$8,218
Cummulative Benefit		-$15,583	-$8,590	-$17,092	-$25,502	-$33,817	-$42,035
Cash Flow - Owner - Base	**NPV**	**Total**	**1**	**2**	**3**	**4**	**5**
Power Value	25%	$35,420	$747	$769	$792	$815	$840
Production Incentive # 1		$0	$0	$0	$0	$0	$0
Production Incentive #2		$0	$0	$0	$0	$0	$0
Loan Replayment	36%	-$56,962	$(4,193)	$(4,193)	$(4,193)	$(4,193)	$(4,193)
Power Purchase Agreement		$0	$0	$0	$0	$0	$0
Net Benefit	-$25,277	-$21,541	-$3,447	-$3,424	-$3,401	-$3,378	-$3,353
Cummulative Benefit		-$21,541	-$3,447	-$6,871	-$10,272	-$13,650	-$17,004
Cash Flow - Owner - Incremental	**NPV**	**Total**	**1**	**2**	**3**	**4**	**5**
Power Value		$141,682	$2,987	$3,076	$3,167	$3,262	$3,359
Production Incentive # 1		$0	$0	$0	$0	$0	$0
Production Incentive #2		$0	$0	$0	$0	$0	$0
Loan Replayment		-$157,264	$(11,577)	$(11,577)	$(11,577)	$(11,577)	$(11,577)
Power Purchase Agreement		$0	$0	$0	$0	$0	$0
Net Benefit	-$49,552	-$15,583	-$8,590	-$8,501	-$8,410	-$8,315	-$8,218
Cummulative Benefit		-$15,583	-$8,590	-$17,092	-$25,502	-$33,817	-$42,035
Cash Flow - Residents		**Total**	**1**	**2**	**3**	**4**	**5**
Power Value		$0	$0	$0	$0	$0	$0
Production Incentive # 1		$0	$0	$0	$0	$0	$0
Production Incentive #2		$0	$0	$0	$0	$0	$0
Net Benefit	$0	$0	$0	$0	$0	$0	$0
Cummulative Benefit		$0	$0	$0	$0	$0	$0

APPENDIX A: SOLAR GLOSSARY

A

- **AC Power (Alternating Current)**: A type of electrical current whose magnitude and direction varies at regular cycles. In the United States, the standard is 60 cycles per second (60 Hz).
- **Aggregation:** The act of grouping customers for a common purpose, such as for bulk buying.
- **Array:** See Photovoltaic (PV) Array.
- **Attached System**: A solar system mounted directly on the building, typically the roof. Occasionally systems are mounted on the building façade.



B

- **Behind the Meter**: Refers to solar installed on the property of a residence or business for the customer's own use. The electricity generation from the solar array is used on-site and reduces that customer's demand on the electricity grid.
- **Bill Crediting**: In a community solar model, shares in the community solar array are credited to individual subscribers' utility bills at a determined rate. The credits may appear as kilowatt hours or as a dollar value. The net result is that the credits lower the subscribers' electric bills.

C

- **Community Solar:** Also known as Shared Solar or Community Shared Solar. Under a community solar model, multiple shareholders (owners) purchase one or more solar panels or kW capacity in a centralized array. These shareholders receive financial benefits (credit on their utility bills, cash payments, *etc.*) from the solar energy production.

D

- **DC Power (Direct Current):** An electrical current whose magnitude and direction stay constant. The photovoltaic cells on solar panels capture energy from sunlight and create DC, which must be converted to AC for use in grid-connected applications.
- **Detached System:** Also known as a ground-mounted system, this is a solar system that is not attached to a building but is supported by a structure built into the ground.
- **Developer (Solar Developer):** The entity that facilitates the design and build of the solar array. Developers may identify and analyze sites, build financial models, secure funding, and sign up customers. Developers may hire sub-contractors or provide services internally for engineering, installation, or other aspects of the solar development process.
- **Distributed Generation (DG):** Power-generating systems located at or near the point of energy consumption. Contrast with centralized generation (large-scale power plants providing power for a large number of users).

G

- **Grid:** The infrastructure of power lines, transformers, and substations that delivers electric power to consumers. The utility grid is owned and managed by electric utility companies.
- **Grid-Connected System:** A solar electric or photovoltaic (PV) system in which the PV array acts like a central generating plant, supplying power to the grid.

H

- **Hard Costs:** The hardware and material costs included in a solar installation.
- **Host Site:** The rooftop or land parcel used to host a PV system. In many solar projects, the host site owner is a different entity than the solar system owner. The site owner and the system owner may enter an agreement stipulating payment for site leasing or credits from the PV system via a Power Purchase Agreement (see Power Purchase Agreement below).

I

- **Incentive:** A subsidy or tax credit provided to help reduce the cost of solar.
- **Installer:** A contractor that installs solar systems.
- **Interconnection:** The process by which a generator (solar, wind, gas, *etc.*) connects and supplies power to the grid.
- **Inverter:** A device that converts direct current electricity into alternating current to supply power to an electricity grid.
- **Investment Tax Credit (ITC):** A federal tax credit provided to the owner of a solar installation. The ITC allows residential, commercial, industrial, and utility owners of photovoltaic (PV) systems to take a one-time tax credit based on installed costs.

K

- **Kilowatt (kW):** A unit of electrical power equal to 1,000 watts.
- **Kilowatt-Hour (kWh):** One thousand watts acting over a period of one hour. The kWh is a unit of energy.

L

- **Lease:** A legal contract through which a customer buys the power from a solar array, but does not own the panels. Leases often offer a fixed monthly rate for electricity produced by the solar array and require no money down for customers.

M

- **Master Meter:** A meter used to measure the entire electricity usage of a multifamily building or other property with multiple tenants.

N

- **Net Metering:** A policy whereby utility customers receive credit from their utility provider for excess electricity from an onsite interconnected generator.

O

- **Orientation:** Placement with respect to the cardinal directions: north, south, east, and west. Azimuth is the measure of orientation from north.

P

- **Peak Sun Hours:** The equivalent number of hours per day when solar irradiance averages 1,000 W/m^2. For example, six peak sun hours means that the energy received during total daylight hours equals the energy that would have been received had the irradiance for six hours been 1,000 W/m^2.
- **Peak Watt:** A unit used to rate the performance of solar cells, modules, or arrays; the maximum nominal output of a photovoltaic device in watts (Wp) under standardized test conditions (usually 1,000 watts per square meter of sunlight with other conditions, such as temperature, specified).
- **Permitting:** The process by which a local unit of government allows for certain development, changes, and activities in their jurisdiction.
- **Photovoltaic (PV):** A method of generating electrical power by converting sunlight into direct current electricity using semiconductors.
- **Photovoltaic (PV) Array:** An interconnected system of PV modules that function as a single electricity-producing unit. The modules are assembled as a discrete structure, with common support or mounting. In smaller systems, an array can consist of a single module.
- **Photovoltaic (PV) Cell:** The smallest semiconductor element within a PV module to perform the immediate conversion of light into electrical energy. Also called a solar cell.
- **Photovoltaic (PV) Conversion Efficiency:** The ratio of the electric power produced by a PV device to the power of the sunlight incident on the device.
- **Photovoltaic (PV) Module:** The smallest environmentally protected assembly of solar cells and ancillary parts, such as interconnections and terminals, intended to generate direct current power under unconcentrated sunlight.
- **Photovoltaic (PV) System:** A complete set of components for converting sunlight into electricity by the photovoltaic process, including the array and balance of system components.
- **Power Purchase Agreement (PPA):** A legal contract in which a developer owns and operates a solar array and a customer or group of customers agree to purchase the system's electric output for a predetermined period.

R

- **Ratepayer:** Another term for an energy customer.
- **Renewable Energy Credits (RECs):** Also known as renewable energy certificates, RECs are tradable commodities that monetize the environmental benefits of the renewable power supplied to the grid. One REC represents 1 MWh of electricity from renewable sources. RECs are often a key component of a project's economic performance.
- **Renewable Portfolio Standard (RPS):** Also known as a renewable energy standard, RPS is a policy mechanism that mandates electric utilities supply a specified amount of power from renewable energy sources by a target date.

S

- **Soft Costs:** Non-hardware costs related to photovoltaic systems, such as financing, permitting, installation, interconnection, and inspection.
- **Solar Investment Tax Credit (ITC):** See Investment Tax Credit (ITC).
- **Solar Resource:** The amount of solar insolation a site receives, usually measured in kWh/m^2/day, which is equivalent to the number of peak sun hours.

T

- **Time-of-Use Rates:** A utility billing system in which the price of electricity changes depending upon the hour of day at which it is used. Rates are higher during the afternoon when electric demand peaks. Rates are lower during the night when electric demand is off peak. Time-of-use rates foster behavior change in customers when they shift usage to off-peak hours when rates are cheaper.

V

- **Virtual Net Metering:** A billing arrangement that allows more than one customer (usually many) to receive bill credits for the energy production of a shared solar array.

APPENDIX B: SAMPLE SOLAR PROFORMA

The next three pages display the Exemplary Buildings Program's solar proforma template populated with representative data. A blank template can be reviewed, downloaded, and renamed for use with your project at exemplarybuilding.housingconsortium.org.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Solar Program Design Profo	*Required*	*Optional Input*													
2	-enter project name-															
3																
4	**1. Solar System/Production**	**Base/Code / Fund Points**	**Incremental**		**3. Sources**		#######		**Base/Code/ Fund Points**	**Incremental**		**4. Cash Flow Assignments**				
5	System Size (W)	25,000	75,000		**Tax**										**Power Value**	**Loan**
6	Total PV Output (Kwh/year)	27,500	82,500		Tax Credit Year			2021				Project			0%	0%
7	Average Power Price ($/kwh)	$0.1086			Investment Tax Credit			26%	$ 25,025	$ 43,875		Building Owner/LLC			100%	100%
8	Annual Rate Increase	3.50%			Depreciation MACRS			10%	$ 9,625	$ 16,875		To Residents/Participants			0%	0%
9	Total Solar Power Value ($/year #	**$2,987**	**$8,960**												**100%**	**100%**
10					**Low Income Housing Tax Credits for Solar -**				0%							
11	**2. Costs**	**$100,625**	**$177,188**		LIHTC			Price	$0.90	$0	$0	**Production Incentives**			**#1**	**#2**
12	Install Price per watt	$3.50	$2.25									Project Developer			0%	0%
13	Solar Installation	$87,500	$168,750		**Grant 1 -**	**Green Up**	**Rate**	**Maximum**				Building Owner/LLC			100%	100%
14	Tax Partnership Structuring Fees	$0			Select Grant Type		$ -	100,000	$ -	$ -		To Residents/Participants			0%	0%
15	Design & Development (10% Default)	$8,750													**100%**	**100%**
16	Operating Reserve (inverters, mainte	$4,375	$8,438		**Grant 2 -**		**Rate**	**Maximum**								
17					Select Grant Type		$ -	100,000	$ -	$ -		**5. Cost/Benefit Analsysis**			**Base**	**ncremental**
18												First Cost			$100,625	$177,188
19		**SCL Rates**	**ITC**		**Production Incentives**			**kWh/year**	**# of years**			Tax Credits			$34,650	$60,750
20	**2020**	$0.1048	26%		Incentive #1			$ -	10			Grants & Incentives			$0	$0
21	**2021**	$0.1086	26%		Incentive #2			$ -	5			**Cost After Credits/Incentives**			**$65,975**	**$116,438**
22	**2022**	$0.1129	26%									**Simple Payback**			**22**	**13**
23	**2023**	$0.1174	10%		**Loan**		**Required**		**$182,413**							
24	**2024**	$0.1223	10%		Annual Interest Rate		2.5%	Term -	15							
25					Loan Fees		0.5%	**Payments**	**$14,806**							
26					Balloon Payment -		10	**Balloon $**	**$67,876**							
27																
28					**Power Purchase Agreement**											
29					Discount	10.0%	Term/years	0								
30					Escalator	3.0%										
31																

NOTE: *Due to space limitations, columns 11-29 have been deleted from this example.*

31															
32	**Power Value**			1	2	3	4	5	6	7	8	9	10	30	
33	Power Production kWh			110,000	109,450	108,903	108,358	107,816	107,277	106,741	106,207	105,676	105,148	95,118	
34	Price per kWh - Retail			$ 0.1086	$ 0.1124	$ 0.1163	$ 0.1204	$ 0.1246	$ 0.1290	$ 0.1335	$ 0.1382	$ 0.1430	$ 0.1480	$ 0.2945	
35	Power Value (Net Metering)	Max KWH	250,000	$ 11,946	$ 12,302	$ 12,669	$ 13,047	$ 13,436	$ 13,837	$ 14,250	$ 14,675	$ 15,112	$ 15,563	$ 28,013	
36	Power Value (Wholesale)	Rate/KWH	$ 0.0316	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	
37	TotalPower Value	NPV=		$11,946	$12,302	$12,669	$13,047	$13,436	$13,837	$14,250	$14,675	$15,112	$15,563	$28,013	$566,727
38															
39	**Cash Flow-Project Develope**	NPV	Total	1	2	3	4	5	6	7	8	9	10	30	Total
40	Power Value		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
41	Production Incentive # 1		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
42	Production Incentive #2		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
43	Loan Replayment			$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
44	Power Purchase Agreement		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
45	Net Benefit	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
46	Cummulative Benefit		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
47															
48															
49	**Cash Flow - Building Owner**	NPV	Total	1	2	3	4	5	6	7	8	9	10	30	Total
50	Power Value		$566,727	$11,946	$12,302	$12,669	$13,047	$13,436	$13,837	$14,250	$14,675	$15,112	$15,563	$28,013	$566,727
51	Production Incentive # 1		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
52	Production Incentive #2		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
53	Loan Replayment		-$201,135	$(14,806)	$(14,806)	$(14,806)	$(14,806)	$(14,806)	$(14,806)	$(14,806)	$(14,806)	$(14,806)	$(67,876)	$0	-$201,135
54	Power Purchase Agreement		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
55	Net Benefit	$114,356	$365,593	-$2,860	-$2,504	-$2,137	-$1,759	-$1,370	-$970	-$557	-$132	$306	-$52,313	$28,013	$365,593
56	Cummulative Benefit		$365,593	-$2,860	-$5,365	-$7,502	-$9,261	-$10,632	-$11,601	-$12,158	-$12,290	-$11,984	-$64,297	$365,593	$365,593
57															

NOTE: *Due to space limitations, columns 11-29 have been deleted from this example.*

58																
59	**Cash Flow - Owner - Base**	**NPV**	**Total**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**30**	**Total**
60	Power Value	25%	**$141,682**	$2,987	$3,076	$3,167	$3,262	$3,359	$3,459	$3,562	$3,669	$3,778	$3,891	$7,003	**$141,682**
61	Production Incentive # 1		**$0**	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
62	Production Incentive #2		**$0**	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
63	Loan Replayment	36%	**-$72,852**	$(5,363)	$(5,363)	$(5,363)	$(5,363)	$(5,363)	$(5,363)	$(5,363)	$(5,363)	$(5,363)	$(24,585)	$0	**-$72,852**
64	Power Purchase Agreement		**$0**	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
65	**Net Benefit**	**$12,105**	**$68,830**	**-$2,376**	**-$2,287**	**-$2,196**	**-$2,101**	**-$2,004**	**-$1,904**	**-$1,801**	**-$1,694**	**-$1,585**	**-$20,694**	**$7,003**	**$68,830**
66	**Cummulative Benefit**		**$68,830**	**-$2,376**	**-$4,664**	**-$6,860**	**-$8,961**	**-$10,965**	**-$12,868**	**-$14,669**	**-$16,363**	**-$17,948**	**-$38,643**	**$68,830**	**$68,830**
67															
68	**Cash Flow - Owner - Increm**	**NPV**	**Total**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**30**	**Total**
69	Power Value	75%	**$425,046**	$8,960	$9,227	$9,502	$9,785	$10,077	$10,378	$10,687	$11,006	$11,334	$11,672	$21,010	**$425,046**
70	Production Incentive # 1		**$0**	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
71	Production Incentive #2		**$0**	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
72	Loan Replayment	64%	**-$128,283**	$(9,443)	$(9,443)	$(9,443)	$(9,443)	$(9,443)	$(9,443)	$(9,443)	$(9,443)	$(9,443)	$(43,291)	$0	**-$128,283**
73	Power Purchase Agreement		**$0**	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
74	**Net Benefit**	**$102,251**	**$296,763**	**-$484**	**-$217**	**$58**	**$342**	**$634**	**$934**	**$1,244**	**$1,562**	**$1,891**	**-$31,619**	**$21,010**	**$296,763**
75	**Cummulative Benefit**		**$296,763**	**-$484**	**-$701**	**-$642**	**-$301**	**$333**	**$1,267**	**$2,511**	**$4,073**	**$5,964**	**-$25,655**	**$296,763**	**$296,763**
76															
77	**Cash Flow - Residents**		**Total**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**30**	**Total**
78	Power Value		**$0**	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
79	Production Incentive # 1		**$0**	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
80	Production Incentive #2		**$0**	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
81	**Net Benefit**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
82	**Cummulative Benefit**		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
83															

STAY CONNECTED

If you're considering developing an exemplary building and would like a sounding board or technical assistance, please reach out to us. If you've applied our guidelines, we hope you'll share your feedback. Continuous learning is both a guiding principle and a core method of HDC's Exemplary Buildings Program; your experiences will help us continually improve our model and refine the practices we champion.

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Edwards Mother Earth Foundation

American Cities Climate Challenge

Seattle Office of Sustainability & Environment

HDC's EXEMPLARY BUILDINGS TASK FORCE

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