
RESONANT ENERGY
Solar for Affordable Housing
Energy Cohort Presentation
January 12, 2021

Agenda

Introductions

1. Solar Financing Models
2. Structural / Racking Solutions
3. Building Certs: Passive House (PHIUS 2018+), LEED, City of Boston Net Zero
4. Estimating Energy Usage for New Construction
5. Roof Material / Warranty
6. External Equipment Mounting

Who We Are

- **Mission**: To expand access to clean energy in underinvested communities
- **About**: Boston-based development company building projects in MA, NY
- **Focus**: Affordable Housing, Nonprofit, Small Commercial
- **Mechanics**: Aggregating solar projects for low-cost, high quality installations and impact financing

Affordable Housing Portfolio Aggregations

MADISON PARK DEV. CORP. (x15)

SOUTH BOSTON NDC (x13)

SOMERVILLE COMM. CORP (x16)

NYC HOUSING AUTHORITY (x35)

Somerville Community Corp. (SCC) Solar Retrofit Overview

METRIC	SCC PORTFOLIO TOTALS
# of Sites Retrofitted with Solar	**16** (7 Prepaid PPAs, 6 PPAs, & 3 direct purchases)
25-Year Lifetime Savings (after solar loan payments; excludes roof replacement costs)	**$887,000**
Philanthropic Support facilitated by Resonant Energy	**$50,000:** Grant for roof replacement **$360,000:** Solar loans **$140,000:** Roof loans
# of Roofs Replaced	**9**
25-Year Environmental Impact	• 7,652,087 kWh of solar electricity generated • 5,964 tons of CO_2 equivalent GHG emissions avoided

Executive Summary

New Construction

- **Financing**:
  - Power Purchase Agreement (PPA)
  - Direct Purchase with tax-eligible partner
- **RE's Role:** Integrating with the Development Team to create a successful project.

Retrofit

- **Financing**:
  - Power Purchase Agreement (PPA)
  - Prepaid PPA (client pays 70-80% of cost)
- **RE's Role:** Partnering with Asset Mgmt to add solar to <10 year-old buildings.

1. Solar Financing Models

Solar Financing Models

TYPE	FEATURES	BEST OPTION WHEN...
Direct Ownership	• Client pays 100% of upfront cost. • Client gets tax credits, depreciation,, & incentives.	**New Construction**, Refinancing • Property has a tax-eligible partner to monetize solar tax benefits w/ LIHTC
Power Purchase Agreement (PPA) **#1 Retrofit Option**	• Financier provides 100% of upfront and ongoing costs (insurance, maintenance) • 25-year initial term, with buyout options. • Client buys all electricity produced for onsite usage and receives 10-20%+ discount.	**New Construction**, Y1-Y10 • New: Tax partners / lenders don't want to take on upfront cost of solar. • Y1-Y10: Project is A) under LIHTC restrictions and needs no-cost option and B) Roof is <= 10 yrs old for solar suitability.
Site Lease (Community Solar)	• Financier provides 100% of upfront and ongoing costs (insurance, maintenance) • 20-year initial term, with buyout options. • Client receives 10-15% of the output as "free" electricity credits in lieu of a cash lease payment. • Rest of power sold at a 10-20% discount to offsite customers in same utility territory.	**New Construction**, Y1-Y10 • New: Tax partners / lenders don't want to take on upfront cost of solar • Y1-Y10: Project is A) under LIHTC restrictions and needs no-cost option and B) Roof is <= 10 yrs old for solar suitability.
PrePaid PPA	• Financier provides 20-30% of upfront cost and all ongoing costs (insurance, maintenance) • 20-year initial term, with buyout options. • Client gets electricity value only; Financier gets all tax credits & state incentives.	Nonprofit owned: LIHTC Deals Y15+ • Client wants to maximize savings to the building and has cash on hand or the ability to borrow to fund upfront 70-80% cost.

Financing Models: Case Studies

TYPE	EXAMPLE CLIENTS
PPA	• **Madison Park Dev Corporation (MPDC):** 17x rooftop sites. • **Somerville Community Corporation (SCC):** 6x rooftop sites. • **South Boston Neighborhood Dev. Corp. (SBNDC):** 3x rooftop sites.
PrePaid PPA	• **SCC:** 7x rooftop sites. • **SBNDC:** 10x rooftop sites.
Direct Ownership	• **Main South CDC (MSCDC):** 92 Grand Street Development (2021). Sr Lender: MHP
Site Lease (Community Solar)	• **NYC Housing Authority (NYCHA)**: 40 rooftop portfolio with roof leases.

2. Structural / Racking Solutions

Common Racking Solutions

Racking Design Choice	Roof Type	Weight	Additional Notes
Ballast Mounted	Flat	6-9 lbs/sf.	No penetrations - easy / cost effective solar install. Heaviest solution.
Ballast with Glue Attachments	Flat	3-5 lbs/sf.	3-5% project cost increase for labor/materials. Requires roof material to be adhered to decking.
Mechanical Attachments	Sloped (Always) Flat (Sometimes)	2-3 lbs/sf.	Note: the best way to facilitate solar pv on small, flat roof with deep insulation where ballast isn't possible is to add another layer of decking on top of the insulation.

Special Racking Solutions

Racking Design Choice	Roof Type	Weight	Additional Notes
Wavelet Racking (Ballast)	Flat	7-10 lbs/sf.	Heaviest solution due to density. It is the most dense way to install panels on a flat roof with viable sunlight access.

Special Racking Solutions

Racking Design Choice	Roof Type	Weight	Additional Notes
Post & Rail Racking System	Flat	Point Loading	Pros: potential for re-roofing without removal of solar pv. Also raises above gas lines / vents. Cons: 20-25% cost increase

3. Building Certifications

Building Certifications

"Net Zero"

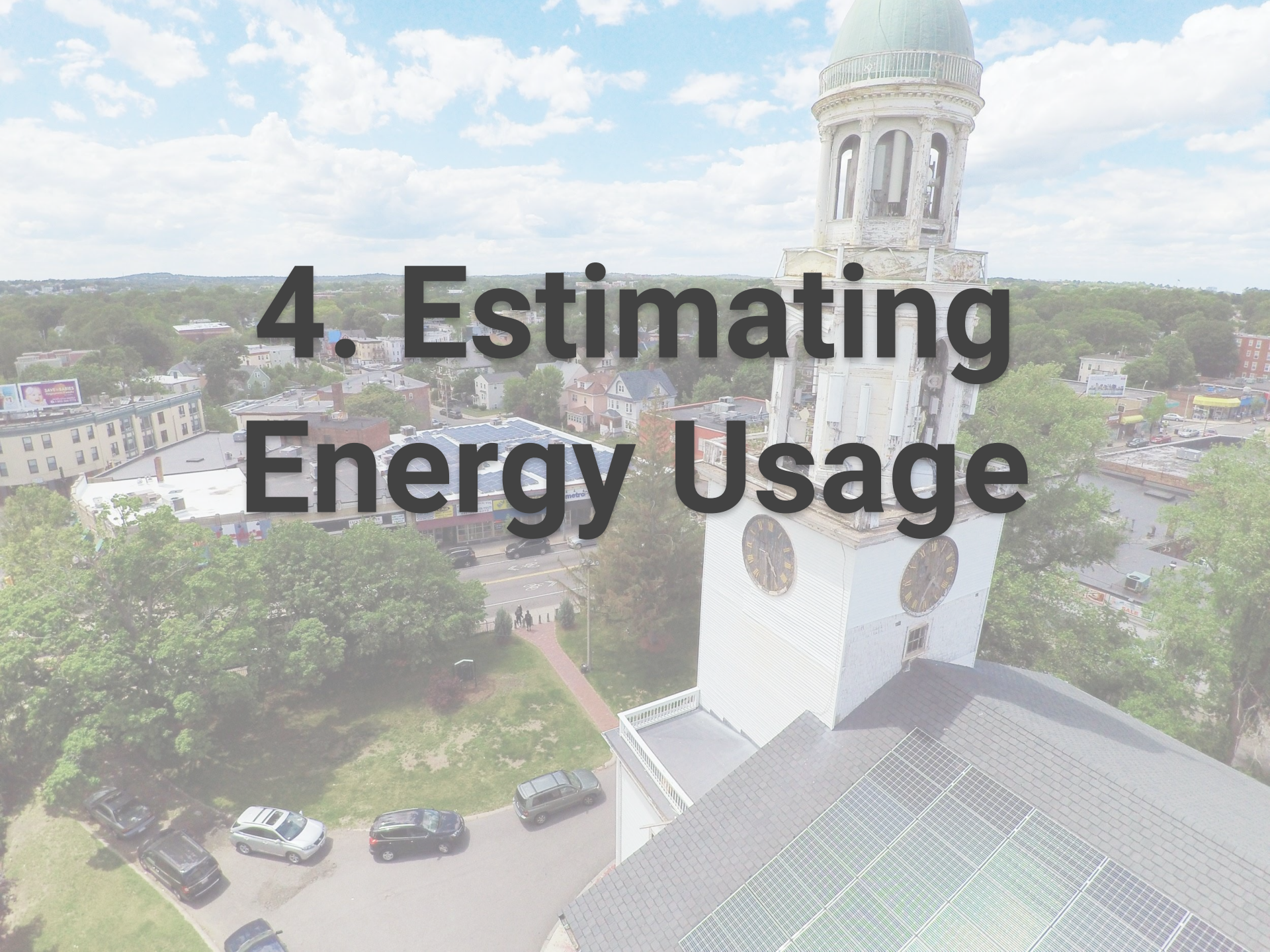
✓

✓

✓

- Resonant has experience helping clients obtain these building certifications, among others.
- We work closely with the project's **energy specialists** to optimize the solar design to meet these requirements.

City of Boston Article.



4. Estimating Energy Usage

Estimating Energy Usage

- Key Considerations
  - Solar size (kW-DC) relative to common area usage
  - Utility rate class
  - Single vs. 3 phase service, & net metering rules

- Techniques:
  - HERS modeling, or other usage modelling
  - Using load assumptions to estimate building's annual electric usage

Example Engineer's Estimate

Load Information

Fill section below with **new** load for any 3ph service or 1ph greater than **200 amps**
For each line below provide connected load in **Total kW** or **HP** (do not duplicate)
Note: If there are multiple buildings, please submit a separate Load Sheet for each.

SERVICE SIZE 1200 **amps** 120/208 **volts** 3 **phase**

SQUARE FOOTAGE* 55,600

Equipment Type	kW		Usage	
INSIDE LIGHTING	55.6	for	4368	hrs/year
OUTSIDE LIGHTING	5.0	for	4368	hrs/year
ELECTRIC HEATING	20.0	for	6552	hrs/year
AIR CONDITIONING	253.0	for	6552	hrs/year
WATER HEATING	5.0	for	6552	hrs/year
REFRIGERATION	50.4	for	4368	hrs/year

Additional Equipment	kW	# of Units		Usage	
Receptalces	174.8		for	2912	hrs/year
Range	304.0	38	for	3276	hrs/year
Dryer	30.0	6	for	4368	hrs/year
			for		hrs/year
			for		hrs/year
			for		hrs/year
			for		hrs/year

Motors**	HP	# of Units		Usage	
Elevator	25	1	for	1456	hrs/year
			for		hrs/year
			for		hrs/year
			for		hrs/year

Total Connected Load	922.8	kW
Total Diversified Load	384.43	kW

5. Roof Material & Warranty

Roofing Material Considerations

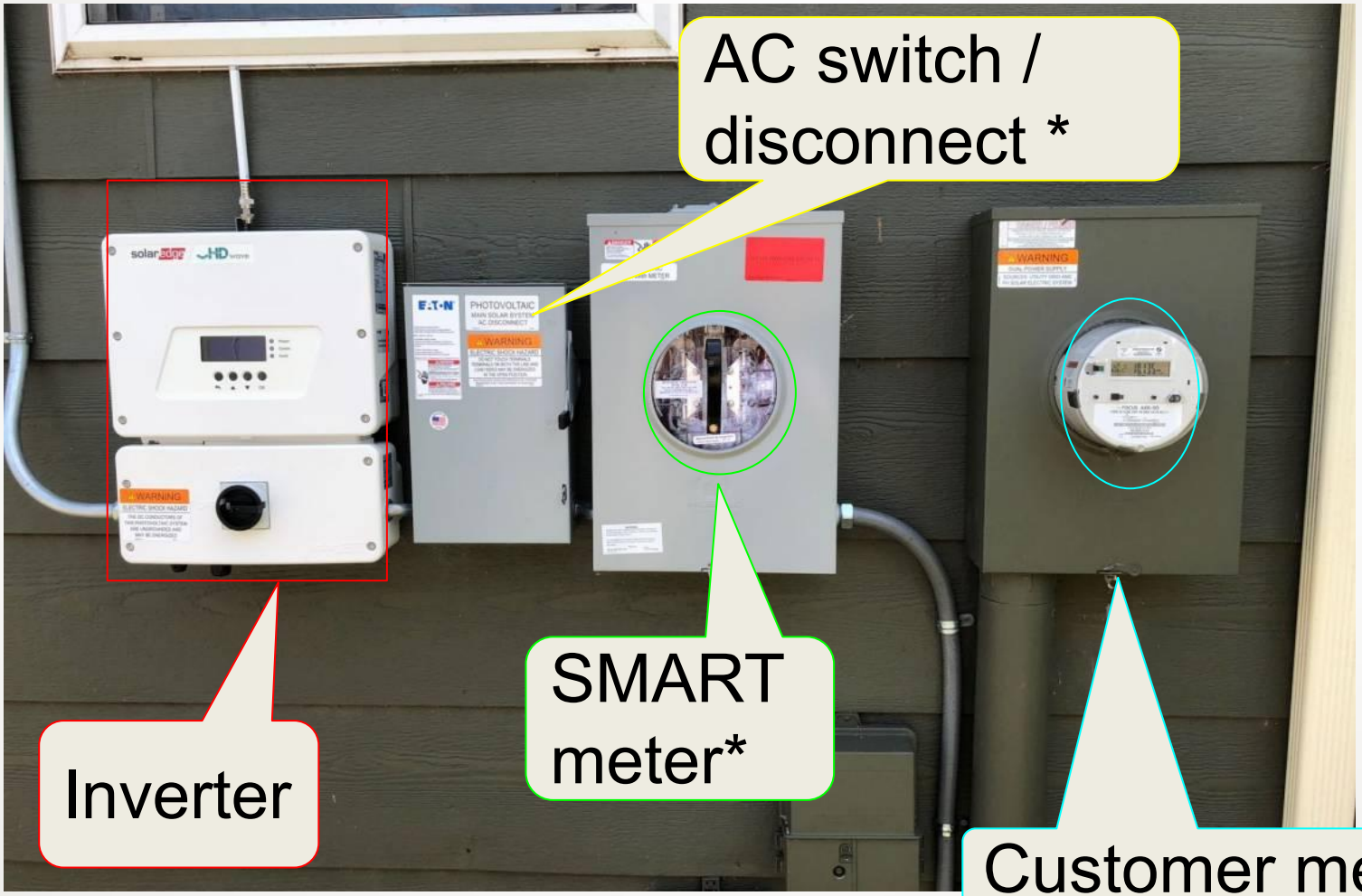
- For flat roofs, clients are increasingly required to use white material for reflectivity, which often means TPO.
- However, TPO is prohibitively expensive to make penetrations through.
- The best choice here is White EPDM to ensure that we can switch to attachment racking if needed.

Roof Warranty Process

- Resonant Energy works with clients to ensure that each installation we do **does not impact existing manufacturers' warranties** for roofs.
- This may require paying the roofing contractor for pre- / post- solar installation inspections
- These **costs are always covered** as part of the solar project cost.

6. External Equipment Mounting

Equipment - Resi Example



*NOTE: SMART Meter and Disconnect must be on the exterior of the building where utility can easily locate.

Commercial Inverter Set Up

Fun To Energize Your System!

Thank You

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