Agenda

Introductions

1. Solar Financing Models
2. Structural / Racking Solutions
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.
### Solar Financing Models

<table>
<thead>
<tr>
<th>TYPE</th>
<th>FEATURES</th>
<th>BEST OPTION WHEN...</th>
</tr>
</thead>
</table>
| Direct Ownership                | ● Client pays 100% of upfront cost.                                       | **New Construction, Refinancing**  
● Client gets tax credits, depreciation, & incentives.  
| Power Purchase Agreement (PPA)  | ● 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. |
| #1 Retrofit Option              | ● 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. |
| Site Lease (Community Solar)    | ● Financier provides 100% of upfront and ongoing costs (insurance, maintenance)  
● 20-year initial term, with buyout options.  
● Client pays 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

<table>
<thead>
<tr>
<th>TYPE</th>
<th>EXAMPLE CLIENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPA</td>
<td>● Madison Park Dev Corporation (MPDC): 17x rooftop sites.</td>
</tr>
<tr>
<td></td>
<td>● Somerville Community Corporation (SCC): 6x rooftop sites.</td>
</tr>
<tr>
<td></td>
<td>● South Boston Neighborhood Dev. Corp. (SBNDC): 3x rooftop sites.</td>
</tr>
<tr>
<td>PrePaid PPA</td>
<td>● SCC: 7x rooftop sites.</td>
</tr>
<tr>
<td></td>
<td>● SBNDC: 10x rooftop sites.</td>
</tr>
<tr>
<td>Direct Ownership</td>
<td>● Main South CDC (MSCDC): 92 Grand Street Development (2021). Sr Lender: MHP</td>
</tr>
<tr>
<td>Site Lease (Community Solar)</td>
<td>● NYC Housing Authority (NYCHA): 40 rooftop portfolio with roof leases.</td>
</tr>
</tbody>
</table>
2. Structural / Racking Solutions
# Common Racking Solutions

<table>
<thead>
<tr>
<th>Racking Design Choice</th>
<th>Roof Type</th>
<th>Weight</th>
<th>Additional Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ballast with Glue Attachments</td>
<td>Flat</td>
<td>3-5 lbs/sf.</td>
<td>3-5% project cost increase for labor/materials. Requires roof material to be adhered to decking.</td>
</tr>
<tr>
<td>Mechanical Attachments</td>
<td>Sloped (Always)</td>
<td>2-3 lbs/sf.</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>Flat (Sometimes)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Special Racking Solutions

<table>
<thead>
<tr>
<th>Racking Design Choice</th>
<th>Roof Type</th>
<th>Weight</th>
<th>Additional Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wavelet Racking (Ballast)</td>
<td>Flat</td>
<td>7-10 lbs/sf.</td>
<td>Heaviest solution due to density. It is the most dense way to install panels on a flat roof with viable sunlight access.</td>
</tr>
</tbody>
</table>
# Special Racking Solutions

<table>
<thead>
<tr>
<th>Racking Design Choice</th>
<th>Roof Type</th>
<th>Weight</th>
<th>Additional Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post &amp; Rail Racking System</td>
<td>Flat</td>
<td>Point Loading</td>
<td>Pros: potential for re-roofing without removal of solar pv. Also raises above gas lines / vents. Cons: 20-25% cost increase</td>
</tr>
</tbody>
</table>
3. Building Certifications
Building Certifications

• 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

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>kW</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>INSIDE LIGHTING</td>
<td>55.6</td>
<td>for 4368 hrs/year</td>
</tr>
<tr>
<td>OUTSIDE LIGHTING</td>
<td>5.0</td>
<td>for 4368 hrs/year</td>
</tr>
<tr>
<td>ELECTRIC HEATING</td>
<td>20.0</td>
<td>for 6552 hrs/year</td>
</tr>
<tr>
<td>AIR CONDITIONING</td>
<td>253.0</td>
<td>for 6552 hrs/year</td>
</tr>
<tr>
<td>WATER HEATING</td>
<td>5.0</td>
<td>for 6552 hrs/year</td>
</tr>
<tr>
<td>REFRIGERATION</td>
<td>50.4</td>
<td>for 4368 hrs/year</td>
</tr>
</tbody>
</table>

**Additional Equipment**

<table>
<thead>
<tr>
<th>Equipment</th>
<th>kW</th>
<th># of Units</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receptacles</td>
<td>174.8</td>
<td></td>
<td>for 2912 hrs/year</td>
</tr>
<tr>
<td>Range</td>
<td>304.0</td>
<td>38</td>
<td>for 3276 hrs/year</td>
</tr>
<tr>
<td>Dryer</td>
<td>30.0</td>
<td>6</td>
<td>for 4368 hrs/year</td>
</tr>
</tbody>
</table>

**Motors**

<table>
<thead>
<tr>
<th>Equipment</th>
<th>HP</th>
<th># of Units</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elevator</td>
<td>25</td>
<td>1</td>
<td>for 1456 hrs/year</td>
</tr>
</tbody>
</table>

**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
*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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