

# Roof Integrated Photovoltaic Systems

For presentation during  
CHBA's NZ LEEP PV Webinar Series  
Feb. 2<sup>nd</sup>, 2016.



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# Part A: Introduction

- Our company profile
- BIPV Solar Shingle Systems

# Company Profile

## Residential Building Performance Specialists

- Air Tightness Testing
- Energy Evaluations
  - EnergyStar, EnerGuide, NZ, LEED
- Building Science Training and Support
- Residential Building Performance Diagnostics
- Indoor Air Quality Investigations
- HVAC Forensics

# BIPV Shingle Systems

- DOW Powerhouse  
[www.dowpowerhouse.com](http://www.dowpowerhouse.com)
- SunTegra Solar Shingle by Integrated Solar Technologies (IST)  
[www.suntegrasolar.com](http://www.suntegrasolar.com)
- Solar Shingle Canada  
[www.pvtech.ca](http://www.pvtech.ca)
- CertainTeed Apollo II \*not currently available in Canada  
[www.certainteed.com/products/roofing/solar/341624](http://www.certainteed.com/products/roofing/solar/341624)
- Atlantis Energy Systems  
[www.atlantisenergy.com](http://www.atlantisenergy.com)

# Part B: Case Studies

- What to expect from a builders perspective

# Installation Examples

## Case Study #1: DOW Powerhouse

- Gord Cooke, Custom Urban Cottage | Southampton, ON
- Seaman & Sons Builders
- Target LEED Platinum | EnerGuide Score 96
- 5 kW solar shingle array

## Case Study #2: SunTegra Solar Shingle

- Sifton Properties, Production Bungalow | London, ON
- EnerGuide Score 98
- 10 kW solar shingle array

# Case Study #1

# Custom Urban Cottage





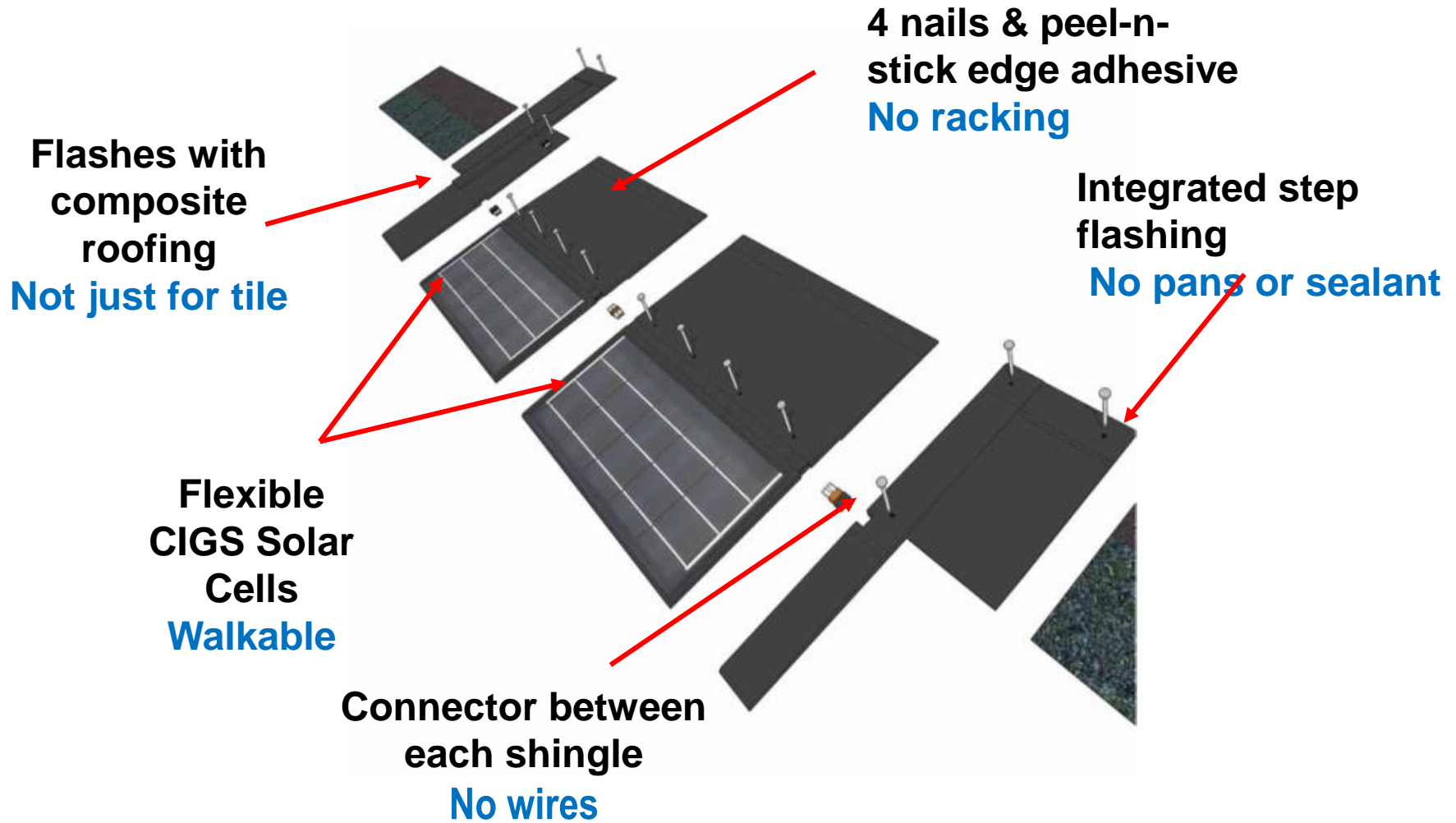
# Custom Urban Cottage



# Custom Urban Cottage

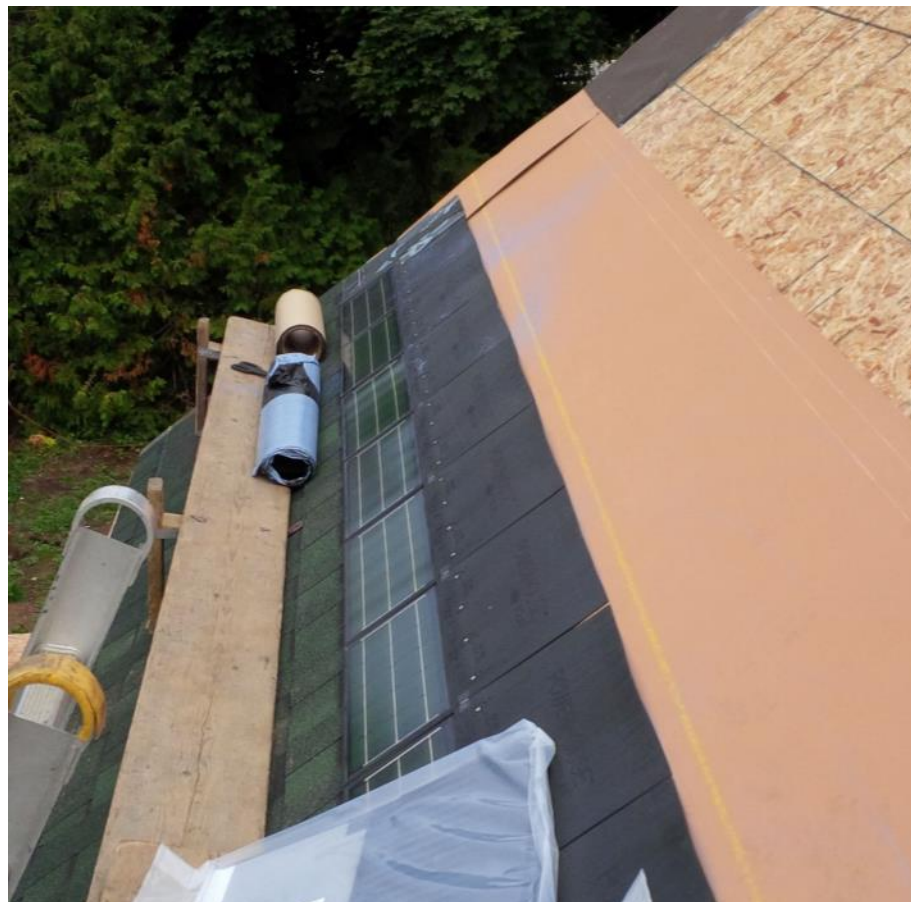


# Installation





# Installation



## DOW Solar Project ID:

2969\_PE\_O1

56 Grosvenor St N

Southampton, ON N0H 2L0

## System Data

STC system rating - DC Watts:

5000.0

Est.1st year production - AC kWh:

6301 < 3 >

Total Sq. Ft. Roof Area / Solar Array Area:

2760 / 648.8 < 4 >

## Project Overview

Roofing Project Manager:

Ryan Magee (647) 206-1394

Authorized Roofing Dealer:

Canadian Energy

Dow Solar Field Operations Specialist: Lyn Schlueter (989) 430-3339

Electric Utility:

TBD

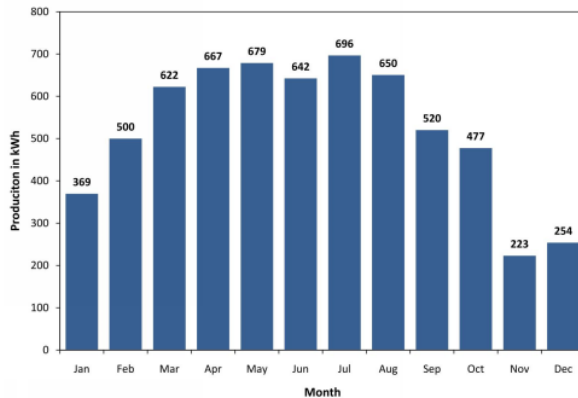
### NOTES:

1. Drawings are per CEC2012. Project design must be evaluated against local governing codes.
2. Installation shall be consistent with Dow Solar installation specifications and the Canadian Electric Code.
3. Estimated 1st year production reflects estimated 2% shade impact.
4. Orientation and total roof area are estimated, verification required.

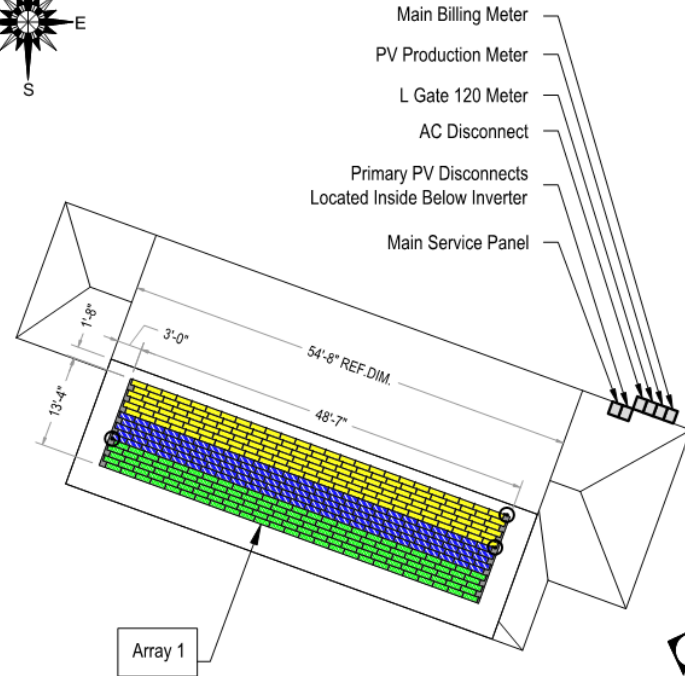
### Bill of Materials - Roofing Materials

Item	Qty	Vendor/Part No.	Description
R1	3	Contractor Supplied	VersaShield, 100' x 42" Roll
R2	3	Contractor Supplied	Ring Shank Nails 3/8" x 1 1/2", 900/Box
R3	2	Contractor Supplied	Ice and Water Shield, 18"x75' Roll
R4	4	11000821	DPS Connector Biscuit 10-PACK
R4	7	11000822	DPS Connector Biscuit 50-PACK
R5	3	362021	DPS Roof Grommet
R6	400	11061145	DPS 12.5-1000 Nom Shingle Rev-J
R7	7	376994	Row to Row LH System Trim Pc
R8	6	376944	Row to Row RH System Trim Pc
R9	1	376998	Starter RH System Trim Pc
R10	1	368172	Row to Row LH w/Thru Roof Pc
R11	1	368170	Row to Row RH w/Thru Roof Pc
R12	1	376995	Finisher RH Trim Pc w/Thru Roof

### ESTIMATED 1ST YEAR PRODUCTION (kWh) < 3 >



Annual	6301
Jan	369
Feb	500
Mar	622
Apr	667
May	679
Jun	642
Jul	696
Aug	650
Sep	520
Oct	477
Nov	223
Dec	254



### 1 SOLAR ARRAY LAYOUT

REF: DOW SOLAR SCALE: NTS

Array #	Inverter		String #	Pitch	Solar Azimuth	True North Azimuth	Shingles	DC Watts	Sq. Ft.		
1	1	SB5000TL-US	1	8:12	20°SW	200°	150	1875.0	243.3		
			2	8:12	20°SW	200°	125	1562.5	202.8		
			3	8:12	20°SW	200°	125	1562.5	202.8		
Totals									400	5000.0	648.8

Sheet

G1



POWERHOUSE  
DOW SOLAR  
Template Ver: 2.0

Dow Solar  
(855) 368-7657  
200 Larkin  
Midland, MI 48674

Drawn By: ADR  
Scale: NTS  
Reviewed: AEB  
Approved: BSB  
Date: 06/13/2014

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COOKE  
56 GROSVENOR ST N  
SOUTHAMPTON, ON N0H 2L0

# Specifications and Costing

Function	Descriptor
PV System Size (kW)	5 kWp
Efficiency (%)	Not listed <ul style="list-style-type: none"> <li>• 650 sq.ft.... (130 sq.ft./kW)</li> <li>• 6,301 kWh annual production (Southern Ontario, 8:12, 20° SW)</li> </ul>
Inverter type	Sunny Boy by SMA America <ul style="list-style-type: none"> <li>• Transformerless 97% eff.</li> </ul>
Element	Cost to Builder
PV panels	\$26,250 complete package <ul style="list-style-type: none"> <li>• included roof underlay, inverter, disconnects, meter base, meter, fasteners, labels and sealants</li> </ul>
Inverters	Included w/ PV panels
Installation	Roofing Contractor <ul style="list-style-type: none"> <li>• included price as part of roof install</li> <li>• added 6 hours of labour.</li> </ul> Electrical Contractor <ul style="list-style-type: none"> <li>• hook-up from panels to meter by electrician</li> <li>• added 12-16 hours to labour</li> <li>• Most hours spent meeting expectations of the local safety inspector who had never seen these shingles before</li> </ul>
<b>Total Installed Cost</b>	<b>\$29,750.... (\$5.95/Watt)</b>

# Energy Impacts & Revenue Generated/Costs Saved

Osprey Place – Vancouver – 800 sq. ft. array (5.7 kWp)

Estimated figures w/ HOT 2000 v. 10.51



Facing South	DOW Powerhouse Shingle
Annual Energy Generated	6,785 kWh
Value per kWh (BC Hydro net metering)	\$0.1195/kWh
Annual \$ benefit to homeowner	\$810/yr
Fractional Performance	
Facing East	84 % of South (5,684 kWh)
Facing West	84 % of South (5,684 kWh)
Facing North	63 % of South (4,272 kWh)



# DOW Powerhouse 2.0

Just released new panel from DOW

- 39 Watts/panel

## Key Features

- Increased power density
- Projected lower installation costs
- Eliminated specialty underlayment
- Easier panel replacement



# Case Study #2

# Production Bungalow



# Production Bungalow





# Production Bungalow



# Solar PV Site Layout and Technical Specifications

**Nameplate Capacity: 9.8 kW DC**

**Number of Solar Modules: 98**

**Estimated Yearly Energy Production: 10,181 kWh/Yr**

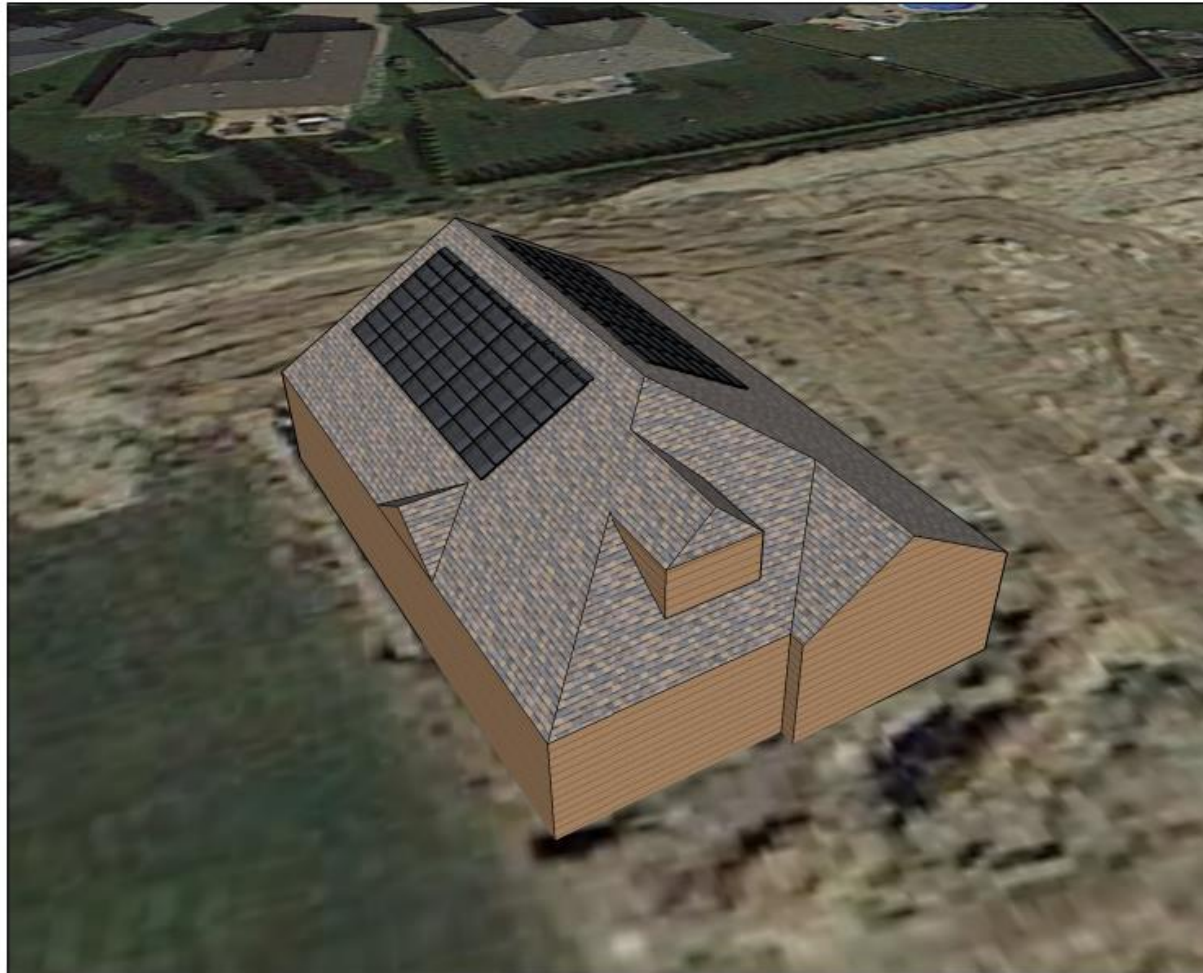
**PROJECT**  
Sifton Model Home

**CLIENT ADDRESS**  
Riverbend Village  
London, Ontario  
Canada

**DESCRIPTION**  
PV Site Layout

**ist** INTEGRATED  
SOLAR  
TECHNOLOGY

181 Westchester Ave., 400B  
Port Chester, NY 10573  
914.249.9364



**Solar Module: SunTegra (100W)**

**SUNTEGRA SHINGLE**  
SOLAR ROOF SYSTEM



**Weather Station: London, ON**  
**Temp. Ambient: -20°C to 40°C**  
**Inverter: (2) Kaco 4.0 TL1**



PROGRESS DRAWING

# Solar PV Site Layout and Technical Specifications

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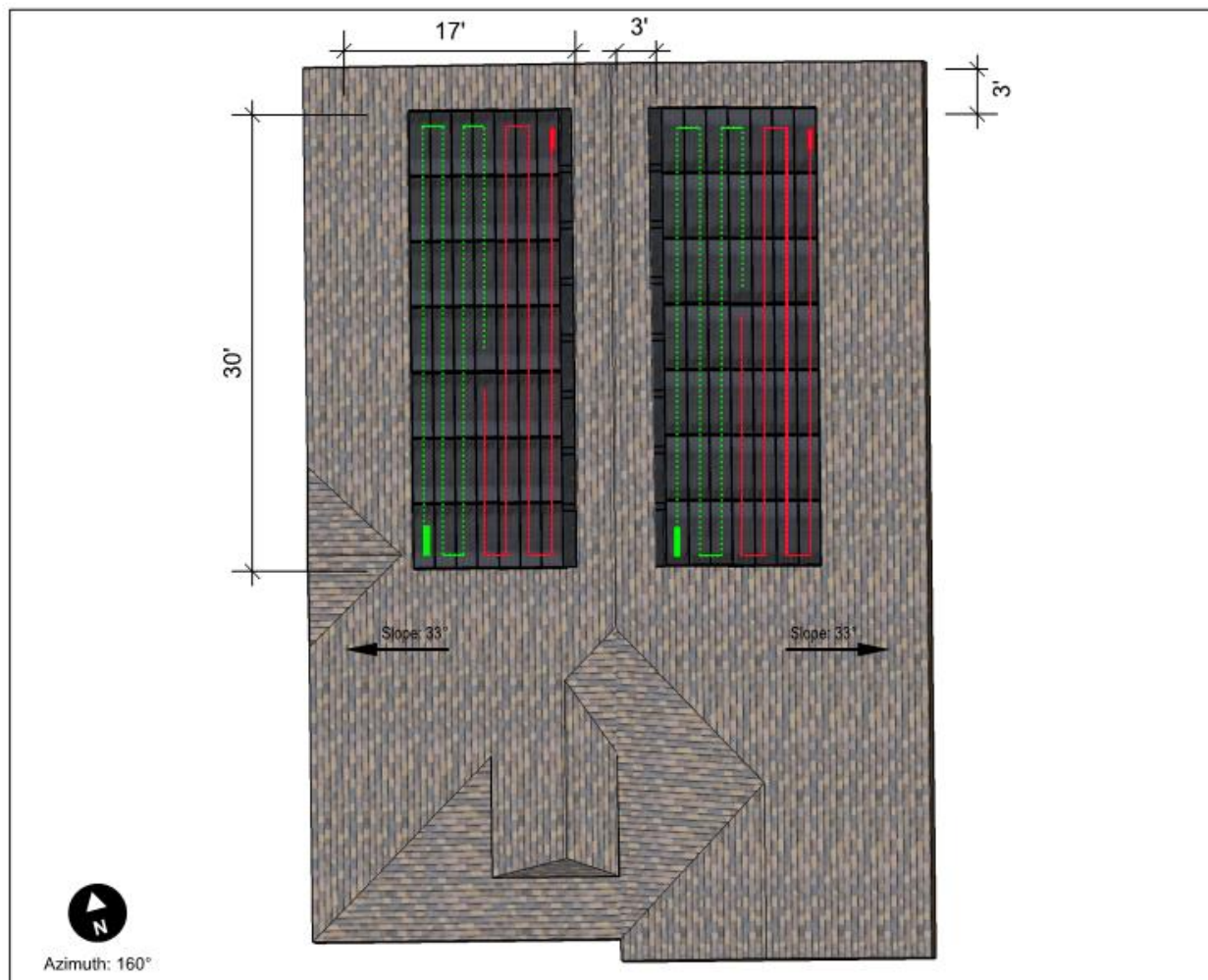
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PROGRESS DRAWING



# Specifications and Costing

Function	Descriptor
PV System Size (kW)	9.8 kWp
Efficiency (%)	15.1 % <ul style="list-style-type: none"> <li>• 708 sq.ft.... (72 sq.ft./kW)</li> <li>• 10,181 kWh annual production (Southern Ontario, 8:12, East &amp; West)</li> </ul>
Inverter type	4.0 TL1 by KACO (x2) <ul style="list-style-type: none"> <li>• Transformerless 97% eff.</li> </ul>
Element	Cost to Builder
PV panels	\$28,766 <ul style="list-style-type: none"> <li>• included all manufacturer PV components and connectors</li> <li>• Original quote closer to \$20,000 - jumped due to US dollar</li> </ul>
Inverters	\$3,995
Installation	\$6,772 Roofing Contractor <ul style="list-style-type: none"> <li>• Includes material (1/4" Dens Deck, fiberglass base sheet, Sopraseal stick, fasteners, etc. &amp; labour</li> </ul> <p>\$x,xxx Electrical Contractor (not included)</p>
<b>Total Installed Cost</b>	<b>\$37,633.... (\$3.8/Watt)</b> <p>Note additional fees not included:</p> <ul style="list-style-type: none"> <li>• + \$1,900 to fly manufacturer to meet with ESA and London Hydro</li> <li>• + \$500 structural engineering needed by City of London</li> <li>• + \$684 hook-up fee for net-metering w/ London Hydro</li> <li>• + \$800 ESA permit fee</li> </ul>

# Energy Impacts & Revenue Generated/Costs Saved

Osprey Place – Vancouver – 800 sq. ft. array (11.1 kWp)

Estimated figures w/ HOT 2000 v. 10.51



Facing South	IST SunTegra Shingle
Annual Energy Generated	14,216 kWh
Value per kWh (BC Hydro net metering)	\$0.1195/kWh
Annual \$ benefit to homeowner	\$1,698/yr
Fractional Performance	
Facing East	83 % of South (11,827 kWh)
Facing West	83 % of South (11,827 kWh)
Facing North	62 % of South (8,793 kWh)





# SunTegra Updates

- DensDeck and fiberglass base sheet is no longer required
- Panels now certified with a Class C fire rating
- Re-engineered perimeter flashing

Results – cost reductions w/ same performance

- Materials costs reduced
- Roofing contractor labour time reduced

# Concerns

## Case Study #1: DOW Powerhouse

- South facing roofing is not insured
- On-going issue not likely to be revisited soon

## Case Study #2: SunTegra Solar Shingle

- Originally designed a 13 kWp array
- Electrical Safety Authority and London Hydro flagged this size of array – greater than 10 kW
- Requested engineered electrical and shop drawings
- Builder opted to install 10 kWp array

# The future is Bright!

Well established BIPV players in Canada

- DOW Powerhouse
- SunTegra Solar Shingles

Aesthetics without compromise

- No longer cost prohibitive
- No longer space prohibitive
- Seamless integration into construction schedule



THANK YOU

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