Carbon Neutral Government Symposium
Solar PV Systems
Vancouver, Dec 2014

Canadian Solar Industries Association
L'Association des Industries Solaires du Canada

www.cansia.ca
Introduction to CanSIA

About us:
• Trade Association for the Canadian solar industry.
• Represent over 700 corporate members nationwide.

Mission and Strategic Objectives:
• Strengthen and expand Canadian solar markets.
• Develop an efficient and professional solar industry with the capacity to provide innovative solar energy solutions.
Solar Energy Available

"I'd put my money on the sun and solar energy. What a source of power! I hope we don't have to wait till oil and coal run out before we tackle that."

- Thomas Edison

How we use Solar Energy

Solar Hot Water
Solar Wall
Solar Electric
PHOTOVOLTAIC

Source; HES, Solarwall, Thermodynamics

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Applications for Solar: Off Grid

Remote Homes

Lodges/Fish Farms

Telecom

Rail/Highway/Traffic
Applications for Solar: Grid Tie

Solar Farms

Commercial Buildings

Residential
World Solar Market

- China – 12.02GW, 36%
- EU – 7014MW, 21%
- Japan – 6613MW, 18%
- USA – 4676MW, 14%
- Canada -334MW, 1%

Source: SPV MARKETING
BC Hydro Net Metering Market

<table>
<thead>
<tr>
<th>Year</th>
<th># of customers</th>
<th>capacity, kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2006</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2008</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>2010</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>2012</td>
<td>150</td>
<td>500</td>
</tr>
<tr>
<td>2014</td>
<td>300</td>
<td>1600</td>
</tr>
</tbody>
</table>
Why is there so much growth in solar electricity?

- Green Jobs created 35/MW
- Distributed Generation
- 30% more Solar potential than Germany
- Incentive Programs
- Falling Costs
- Grid parity in 2020-2025
- Carbon Offsets
Economic Development and Job Creation

35 Green Jobs per MW (4200 - Canada 2010)
25 of those jobs are installers
Regionally diversified – Victoria to Prince George

SOURCE: NAVIGANT

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Distributed vs Central Generation

Power would have to travel 1000 km’s to come from Peace Canyon to Victoria. Up to 20% of the energy can be lost through transmission.

Relieving burdens on grid distribution and transmission capacity, improving system efficiency, reliability and power quality and reducing the volume of power needed from centralized generation assets.
Solar Potential - Canadian

4.13 Sun Hours

3.2 Sun Hours

30% More Solar Potential than Germany

Source: NRCAN
## 1 kW of PV in BC

<table>
<thead>
<tr>
<th>City</th>
<th>Electrical Production/kW¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Victoria</td>
<td>1086</td>
</tr>
<tr>
<td>Vancouver (YVR)</td>
<td>1055</td>
</tr>
<tr>
<td>Abbotsford</td>
<td>991 k</td>
</tr>
<tr>
<td>Kelowna</td>
<td>1209</td>
</tr>
<tr>
<td>Kamloops</td>
<td>1182</td>
</tr>
<tr>
<td>Fort St John</td>
<td>1197</td>
</tr>
<tr>
<td>Cranbrook</td>
<td>1229</td>
</tr>
<tr>
<td>Prince George</td>
<td>1046</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>1124 kWh per year</strong></td>
</tr>
</tbody>
</table>

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**Legend**

Photovoltaic potential (kWh/kW) South-facing, tilt=latitude

- 0 - 500 kWh/kW
- 500 - 600
- 600 - 700
- 700 - 800
- 800 - 900
- 900 - 1000
- 1000 - 1100
- 1100 - 1200
- 1200 - 1300
- 1300 - 1400
- 1400 +

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Helping Hand - Solar Electric Programs in Canada

NET METERING – BC, ON, MN, NS, NB, NF, PEI

NET BILLING – AB, NWT

REBATE – SASK

STANDING OFFER PROGRAM– ON, BC

FEED IN TARRIF – ONTARIO-39.6/kWh
Net Metering - Reducing the Load

- 50W
- 100W
- 50W
Net Metering – Outflow Credit

1000W

900W

100W
Net Metering
PV prices are falling (5%?) 13%/year

2005 - 160W - $1,555 - $9.71/W
2011 - 225W - $807 - $3.58/W
2014 - 250W - $225 - $0.90/W
Grid Parity – Solar Down vs Hydro Up

Increase in electrical rates 2-7% per year?
PV installed costs continue to fall

2013-BC Hydro forecasts 26% rate increase by 2016
Determine your cost of Energy

Assumptions:

- 10kW @ $35,000
- Owner gets 11,000 kWh per year (Victoria)
- PV Solar systems last 30 years

and

\[ 30 \times 10,860 = 325,800 \text{ kWh} \]

So:

\[ \text{Cost per kWh} = \frac{35,000}{330,000} \]

\[ = 10.74\text{¢} \]

We pay $0.12 at 320 Mary St as of April 1
CARBON OFFSETS

Carbon Contributor

Carbon Neutral

6.24 g/kWh
Grounds Keeping – Fuel vs Elec

GHG Saved = 16,308 kg/year

GHG Saved = 411 kg/year
Domestic Hot Water - Gas vs Elec

GHG saved = 901 kg/year

40 Gallon tank

4 person use

2.0 KW SOLAR PV SYSTEM
8 x SOLAR MODULES

ELECTRIC HOT WATER

2,200 KWh
Residential EV Owner

1.5 KW SOLAR PV SYSTEM
6 x SOLAR MODULES

ELECTRIC VEHICLES

16,000 KM/YR +

GHG saved = 3211 kg/Year

Source:
www.cansia.ca
Heating – Gas Furnace vs Heat Pump

GHG Saved = 3172 kg/year

2000sf-2500sf Home – 50% Heating Capacity

4039 kWh/year

3.75KW of SOLAR PV

15 x SOLAR MODULES

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Example - Residential

- 7.5KW SOLAR PV SYSTEM
- Yard Equipment
- Hot Water
- Heat Pump
- Electric Vehicle

GHG saved = 7695 kg/year
Example - Educational Building

73KW SOLAR PV SYSTEM

Yard Equipment
Heat Pumps
Electric Vehicles

GHG saved = 66,137 kg/year
Camosun College

Grounds Keeping Equipment
Golf Carts
EV charging station
Bike charging station

- 923 kWh used
- 4430 kWh generated
Educational Benefits
Real time production data
Contact Details

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