Community
Solar Opportunities

St. Paul's Anglican Church
Edmonton, Alberta
Oct. 19, 2019
1-5pm

Energy Efficiency Alberta

SOLAR POWER INVESTMENT COOPERATIVE OF EDMONTON
SPICE

Anglican Diocese of Edmonton

Community Solar Opportunities

Workshop Outline

1-2:30
Introduction to the solar photovoltaics
SPICE's project with the Anglican Diocese of Edmonton
The unique solar opportunity that communities have
The Micro Generation option
Economics and funding possibilities
St. Paul's Anglican church solar system

2:45-3:45
Alberta's new Small Scale Generation Regulation
How larger "export only" solar projects work
Creating community investment opportunities

3:45-5:00
Community Benefit Agreements
How can we make them work for us?

Solar Power Investment Cooperative of Edmonton

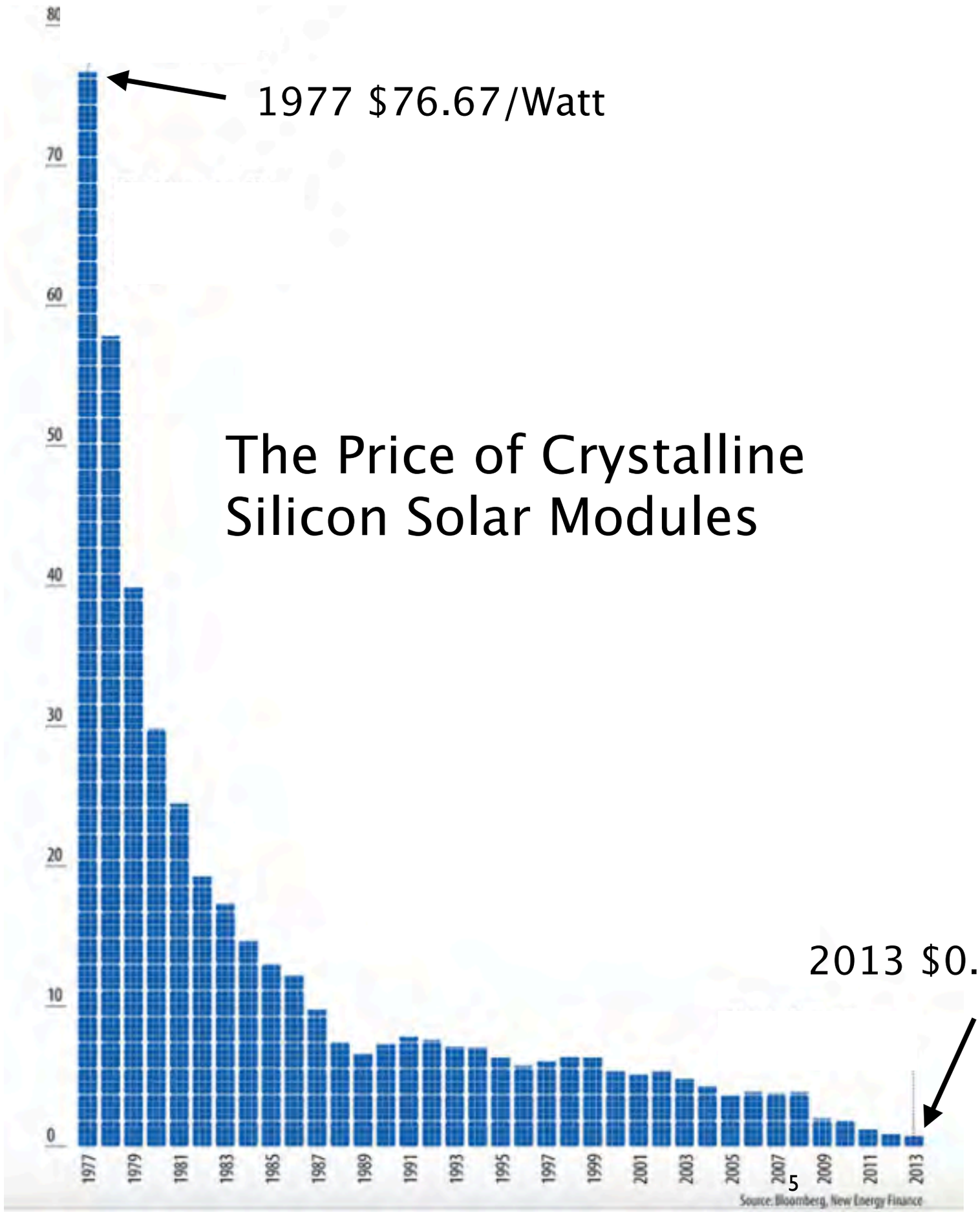
* SPICE is a community investment cooperative incorporated as an Opportunity Development Cooperative (ODC).
* SPICE is a cooperative by intention
* SPICE's primary commitment is to create competitive, ethical, community-powered investments with people, planet, and profits weighted equally.
* SPICE helped develop the Edmonton Federation of Community Leagues (EFCL) Green Leagues program.
* SPICE’s work has been supported by two community energy capacity building grants awarded by Alberta government.
* SPICE is presently developing the tools to provide investment services.

In many jurisdictions worldwide solar is now the fasted growing source of new generation capacity and rapidly moving toward being the least expensive option.

California:

- 30% of new electricity generation last year was solar: 1/2 small and 1/2 big.
- New large scale solar is now generating electricity at rates under 2¢/kWh.
- New solar + storage is presently beating new natural gas in price.
- Starting Jan. 1 every new home built in California must be net zero.

The Price of Crystalline Silicon Solar Modules



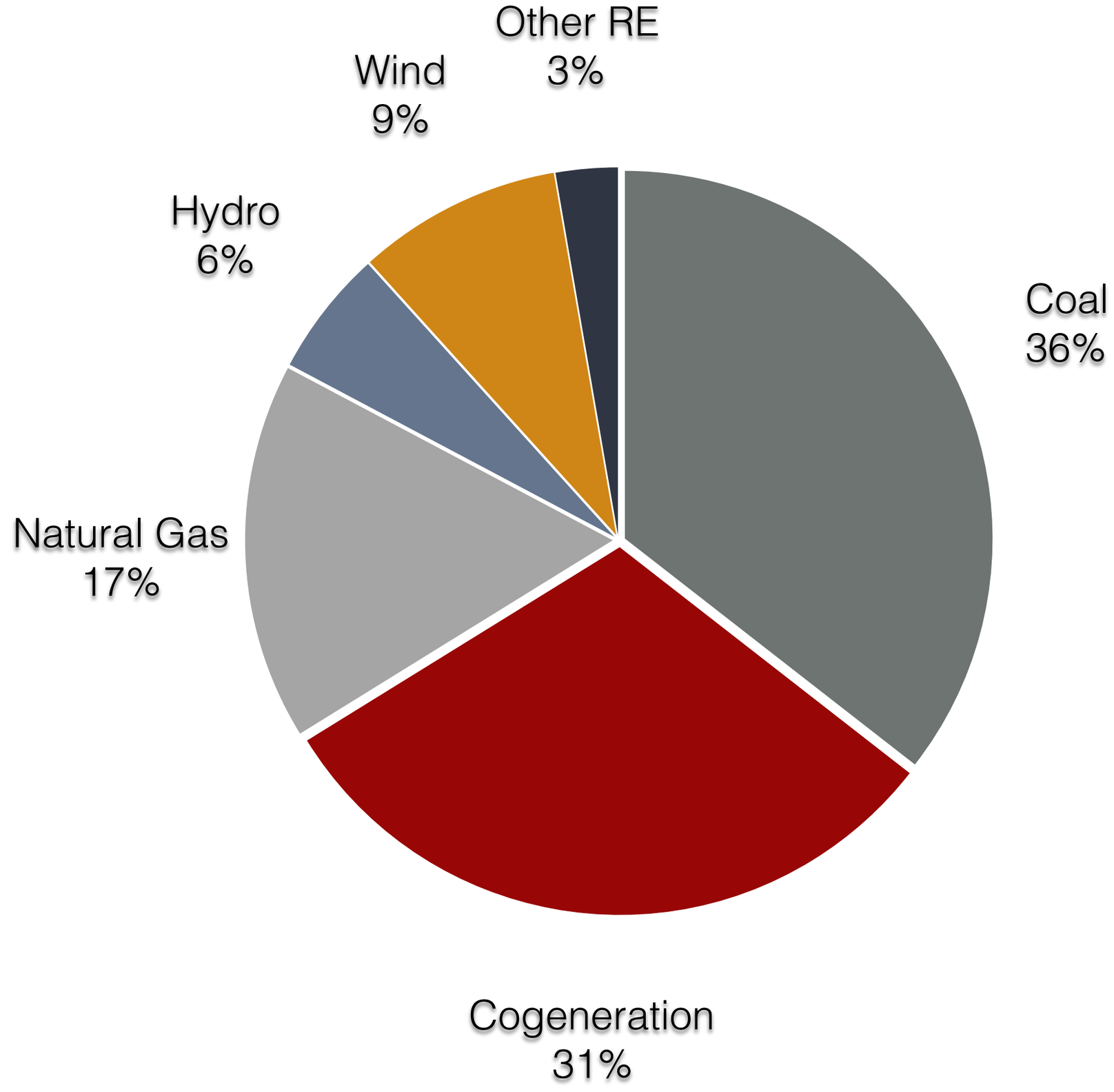
Bloomberg Earth Policy Initiative

Solar Resources and Production - Worldwide

Country	Share of Total Consumption (2018)	Capital City	PV Potential kWh/yr./Watt
Italy	7.3%	Rome	1.283
Alberta		Edmonton	1.245
Canada	0.6%	Ottawa	1.200
China	3.3%	Beijing	1.148
United States	2.3%	Washington DC	1.133
Japan	6.8%	Tokyo	0.885
Germany	7.9%	Berlin	0.848

Natural Resources Canada and Wikipedia

Alberta's Electricity Generation Capacity 2019



Data Source: AESO

Alberta peak demand 11.7 GW 2019

SPICE received a Community Generation Capacity Building grant from the Government of Alberta. A number of possible pilot projects were considered:

- Northern Alberta Cooperative Housing Association
- Servus Credit Union (also a co-op)
- A Metis Community project
- Blatchford Community Housing Project
- The Anglican Diocese of Edmonton

Anglican Diocese of Edmonton Church Project

- A pre-feasibility study examined the potential of 13 church sites.
- Sites with export potential are of particular interest.
- The three sites were chosen.
- Metering was installed to harvest consumption data.
- The sites were analyzed for both Micro Generation and Small Scale Generation potential.

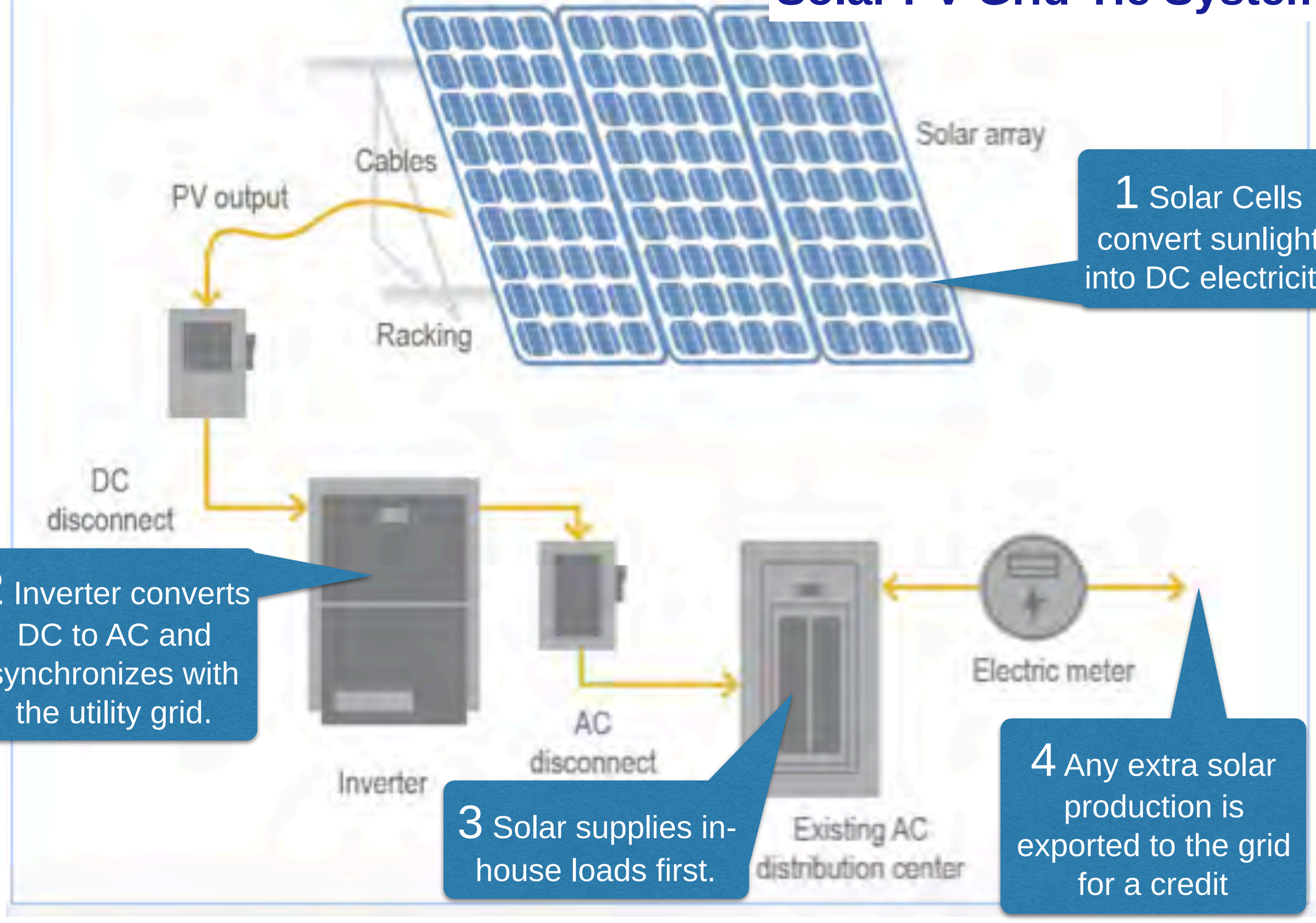
St. Michael of All Angels Anglican Church 277%

St. Matthias Anglican Church 234%

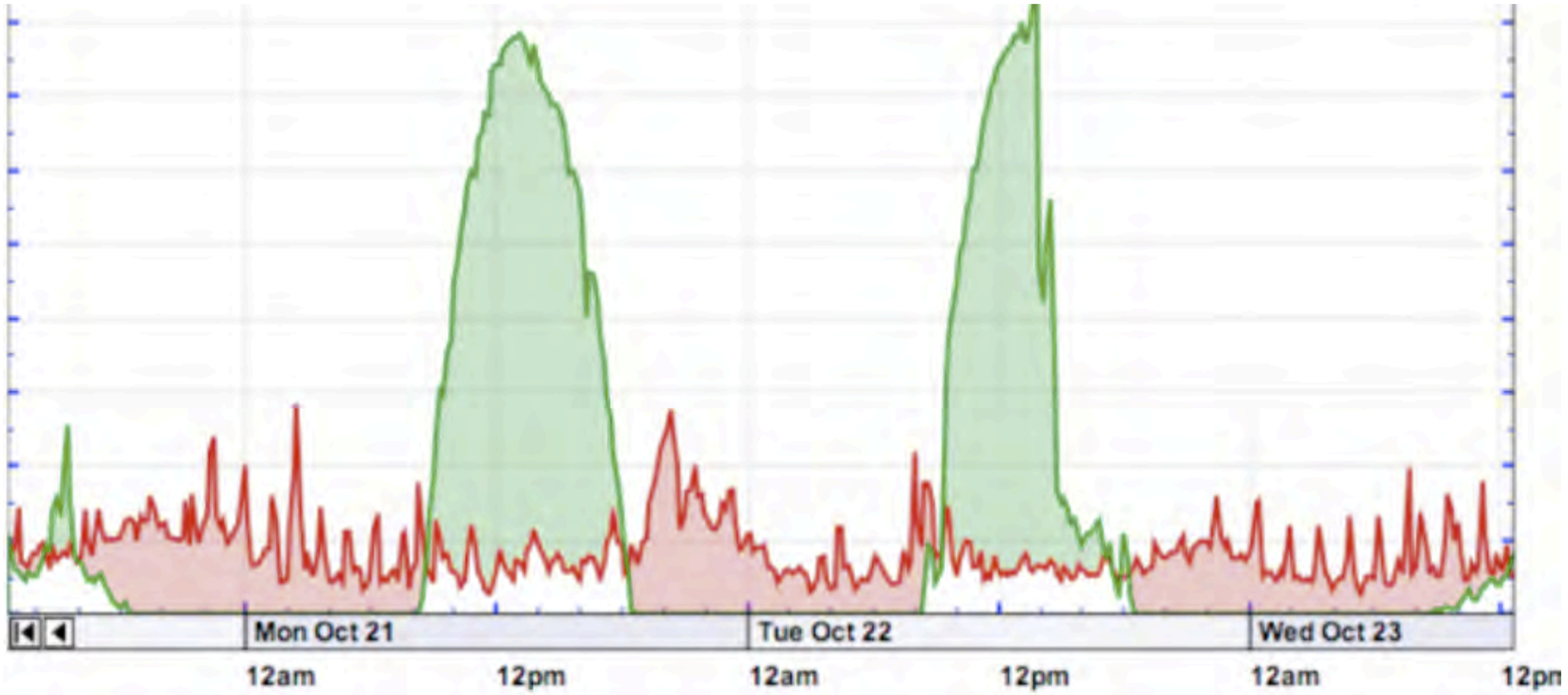
Three sites showed particular potential for export.

St. Faith and St. Stephen Anglican Church 152%

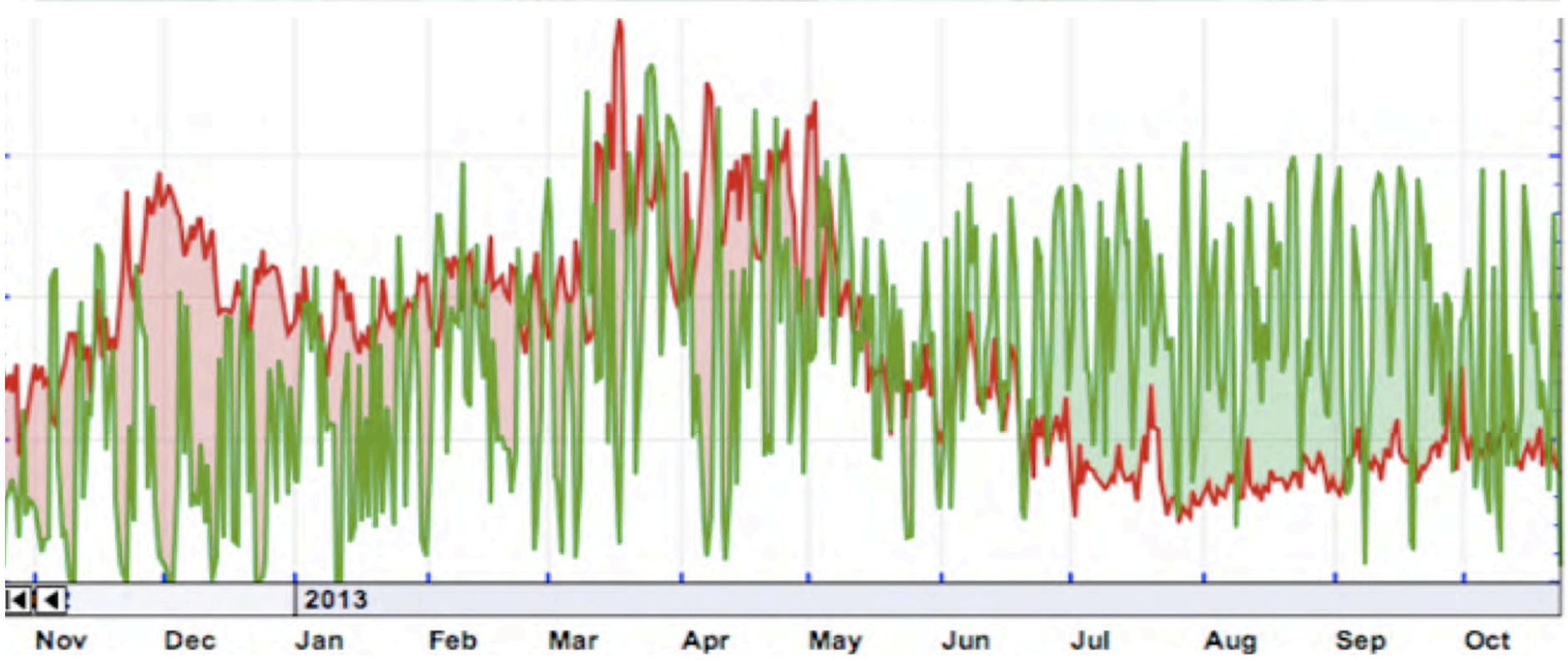
Solar PV Grid-Tie Systems



3 Days



1 Year



RED = Consumption GREEN = Solar Production

Solar Modules

- Very durable (length of life?)
- Very low degradation rate (0.5%/yr.)
- Difficult to damage
- No moving parts
- Low maintenance
- Standard warranties = 25 yrs.

Evergreen and Gold Renewable Energy

Synchronous Inverters

String Inverters

- Supplied by a series string of solar modules
- Typically have high DC voltage inputs
- Output is vulnerable to spot shading
- Durable: 10-25 yr. warranties
- More cost effective for medium to large systems

Micro Inverters

- Individual modules are controlled and monitored
- Lower DC voltage inputs
- Good for sites with shading
- Superior data collection
- Durable: often 25 yr. warranties
- More cost effective for smaller system

Net Zero?

6kW solar system = electricity requirements of the average Alberta household

7kW Sunfind Solar

Net Zero?

27.2kW solar system = electricity requirements of a community league

27.2kW Rio Terrace Community League

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Net Zero?

2.5kW solar system = fuel required to drive 16,000km/yr. (average Canadian)

2kW Harlan Solar

Solar Project Development Process

The Ideal Site:

- ✓ Shading - 100% Solar Access
- ✓ Orientation - Modules face True South
- ✓ Tilt Angle - Equal to Latitude
- ✓ Snow - Snow Cleared
- ✓ Soiling - Minimal Soiling
- ✓ Temperature - Good Array Air Circulation

The Steps:

- ✓ Find a solar contractor: solaralberta.ca
- ✓ Get three site surveys and proposals
- ✓ Apply for building and electrical permits
- ✓ EPCOR Interconnection Agreement application
- ✓ Install
- ✓ Final inspection

Developing Alberta’s Solar Resource

“Roof Top” Systems

- ✓Higher efficiency - less line loss
- ✓Potentially lower environmental impact
- ✓Profits are kept in the community multiplying economic benefits
- ✓Utilizes local labour and higher job density
- ✓Unleashes broad sources of capital
- ✓Empowers people and increases energy literacy
- ✓Inherently democratic

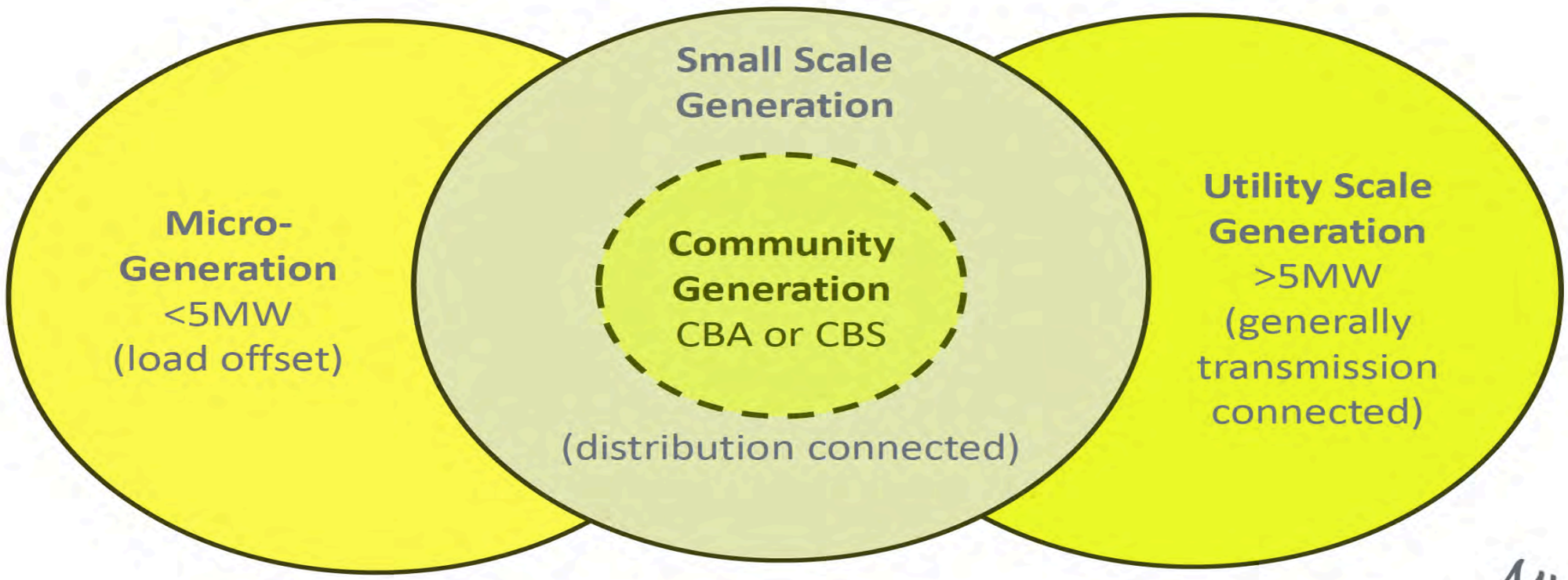
“Solar Farm” Systems

- ✓Lower installed cost
- ✓Quickly boost solar generation capacity
- ✓Increased tax base revenue
- ✓ Investment cooperative opportunity

Developing Alberta’s Solar Resource

“Roof Top” Systems

“Solar Farm” Systems



Edmonton Area Churches

St. Paul's United Church 27kW

All Saints Lutheran Church 15kW

St. Albert United Church 5kW

Westmount Presbyterian Church and
Right At Home Housing Project134kW

Micro Generation - How it works

Nu Energy Group

Solar production can be consumed on site with any extra exported to the grid.

Any solar exported is credited at the customer's retail rate.

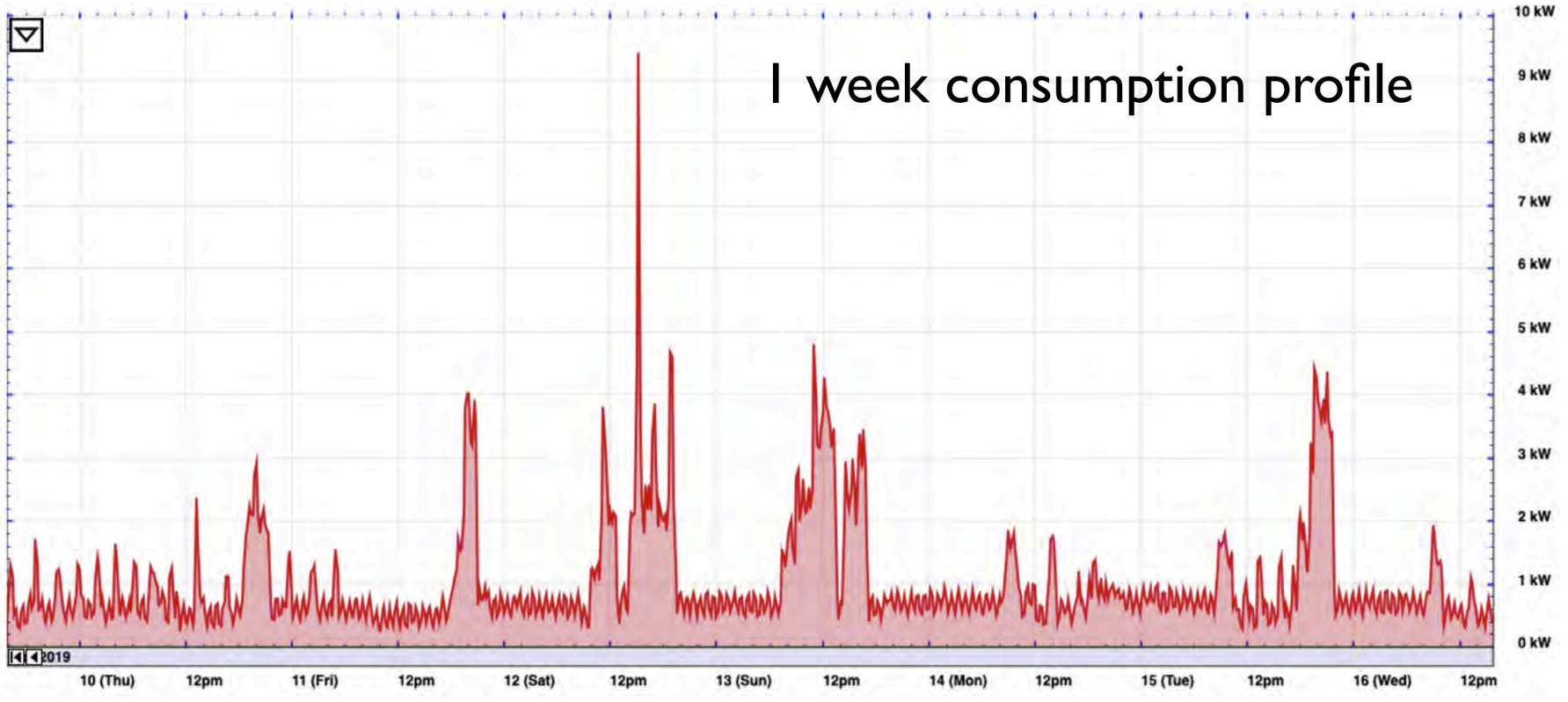
Systems must be attached to an existing load.

System size is limited to the amount of the site's historical consumption.

Systems can be up to 5MWDC in size.

St. Michael and All Angels Church

Determining Electrical Consumption



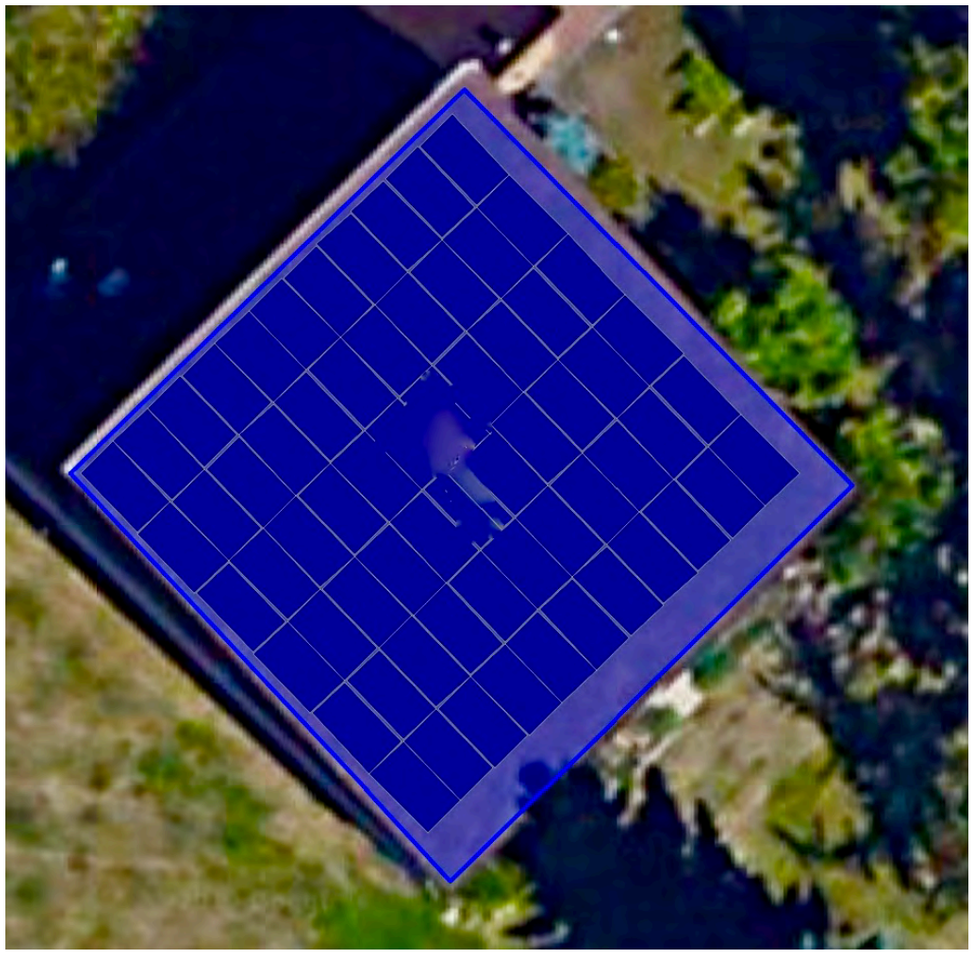
eGauge monitoring device

St. Michael and All Angels Church

- 27° pitch roof facing SE
- Large unimpeded relatively new roof
- Annual consumption: 10,027 kWh
- Possible winter shading

Modeling the Solar Array

9.2kW Solar System



25.4kW Solar System

St. Michael's Church 9 kW Micro Generation Solar System Economic Analysis

System size DC	9.2 kW
Electricity consumed (last 12 months)	10,027 kWh
Solar energy generated (yr. 1)	10,885 kWh
Net capital cost	$22,163
Net Savings with system	$3,066/yr.
Levelized Cost of Energy	16.20
Simple Payback	8.2 yrs.
Discounted Simple Payback	10.7 yrs.

Other Possible Financial Benefits

1. **Electricity Cost Savings**
   Derived from solar electricity consumed and exported.

2. **Resale Value**
   Increase in property's market price

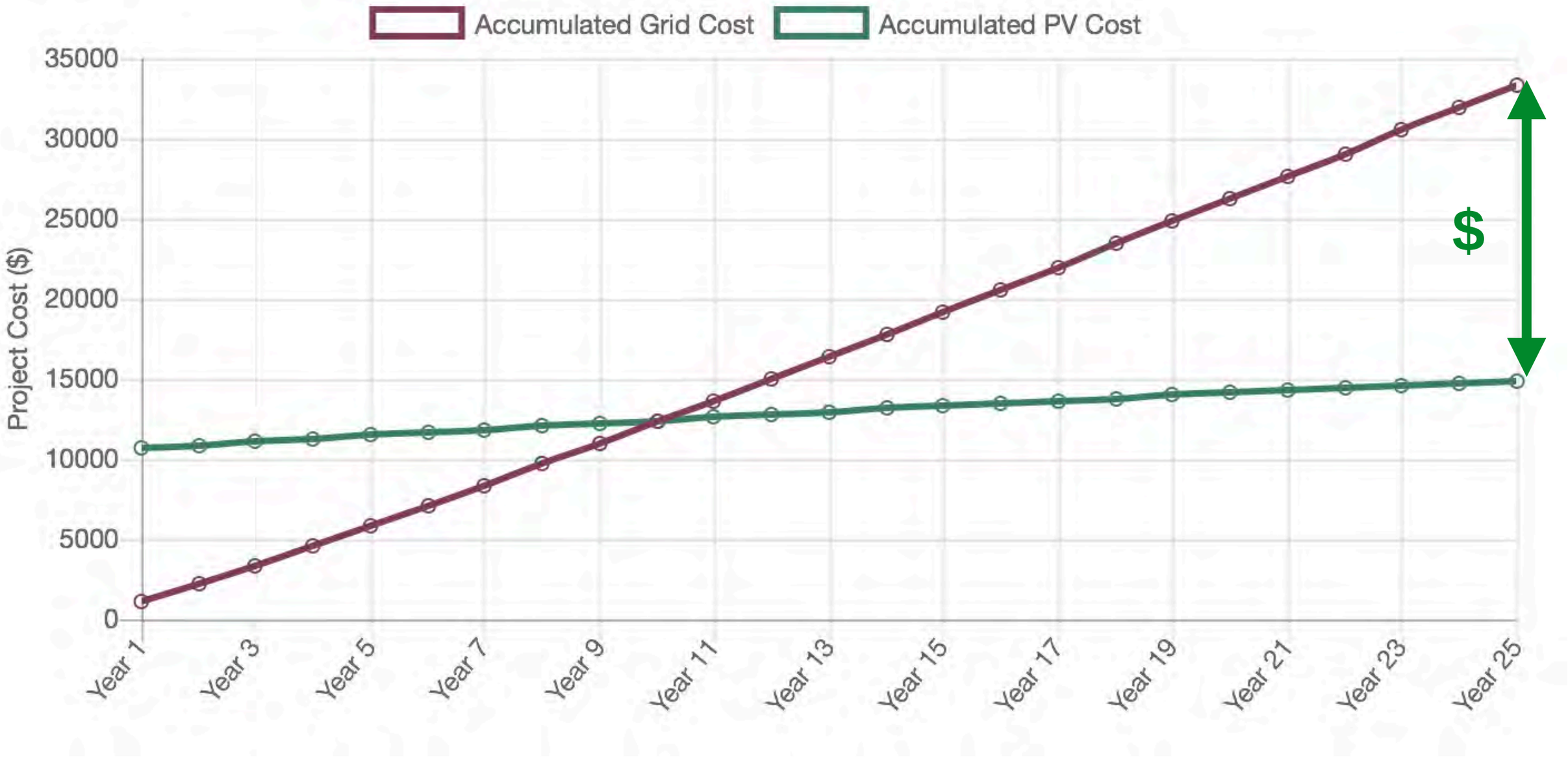
3. **Utility Price Security**. Known, consistent, prepaid electricity prices - inflation proof.
   Calculated as Levelized Cost of Energy

4. **Avoided Cost** - the cost of business as usual
   Calculated as Levelized Avoided Cost of Energy

5. **Utility Solar Rates** - Several Alberta retail utilities have enhanced rates for solar exports.

6. **Tax Benefits**
   Capital Cost Allowance, After tax earnings?

Solar PV Total Accumulated Cost ($) Compared to Grid Purchased Cost



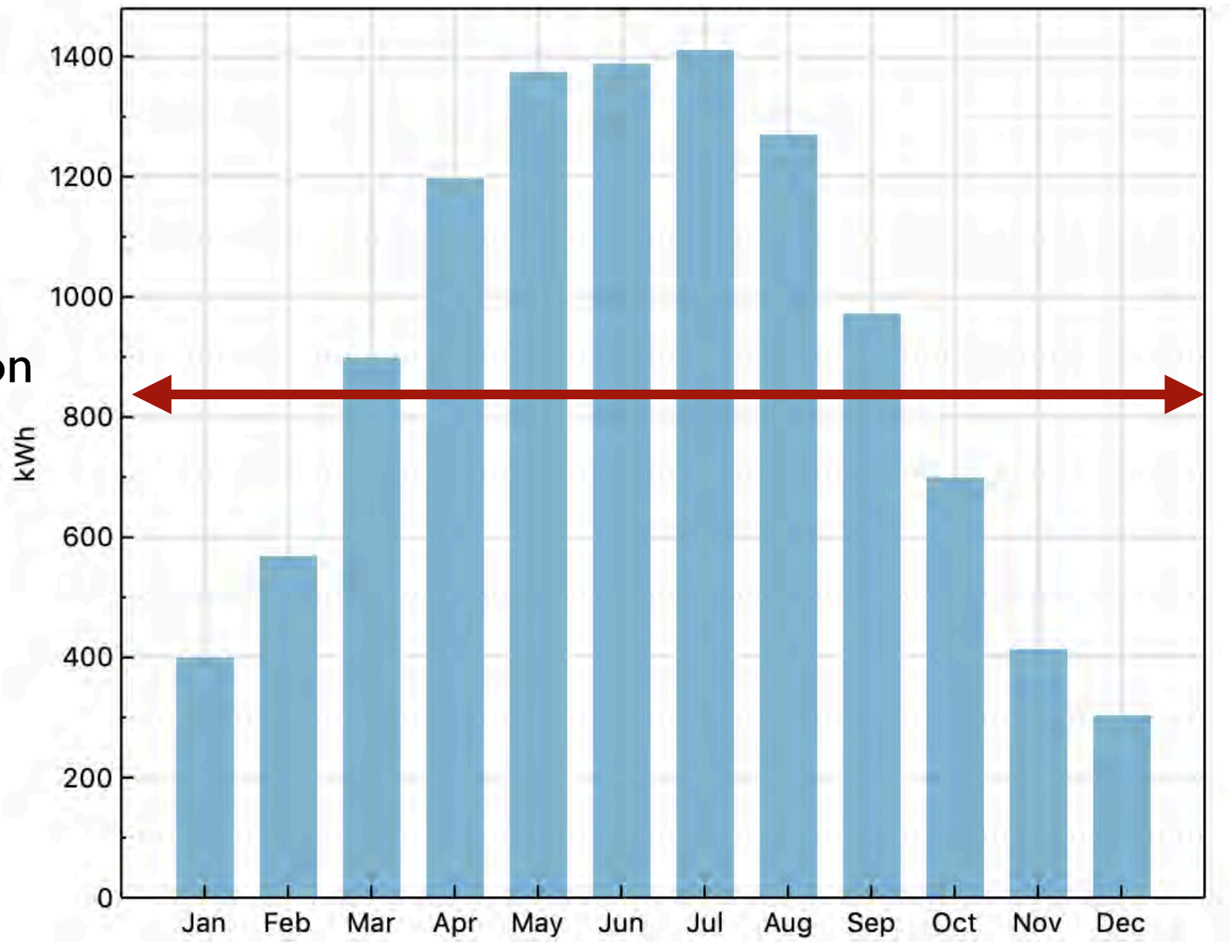
Special Solar Rates Available

- Low Rate: 6.95¢/kWh
- High Rate: 18.95¢/kWh

2% cash back on energy imported
Prices guaranteed until March 2024

St. Michael's Consumption
836kWh/month

St. Michael's Monthly Solar Energy Production



Funding options

- City of Edmonton Residential Program
- Charity Tax Credit
- Grants - Eco City

Additional Strategies:

- Bundle with energy efficiency investments
- Move loads to daytime use
- Purchase green electricity

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Thank You and Questions

Energy Efficiency Alberta

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Solar PV Life Cycle Environmental Impact

Hazardous Materials

- Various hazardous materials are utilized in PV cell manufacturing.
- Many of these materials are valuable and are recycled during the process.

Greenhouse Gas Emissions

- PV module lifetime GHG emission = 40g/kWh
- Coal lifetime GHG emissions average 1000g/kWh
- Each kWh produced in Alberta reduces our GHG emissions load by 750g.

Heavy Metal Emissions

- Some heavy metals, nitrogen oxides and sulfur oxides are used in solar PV manufacturing process
- A coal fired plant with modern particulate controls produces 90 - 300X the emissions

Rare Earth Metals

- PV cells do not utilize rare earth metals.
- 95% of modules are silicon based, 5% contain Cadmium Telluride.

Water

- Required in manufacturing only.
- Uses less than half of the water required by Alberta's present mix.

Energy Payback

- 2 years for a complete Alberta solar system (modules, rack, inverter, etc.)
- 1.8 in Medicine Hat and 2.1 in Fort MacMurray