Generating Electricity From the Sun

David Kelly
CEO, SkyFire Energy
About SkyFire Energy

- Founded in 2001 in Calgary
- Offices and staff in Edmonton and Calgary
- Western Canada’s leading solar EPC (Engineering, Procurement and Construction) firm with hundreds of installations across 8 provinces and territories including:
  - > 1/3 of all grid tied solar in Alberta
  - > 1/3 of all grid tied solar in BC
- Partners:
  - Dave Kelly, P. Eng. – CEO, Founder
    - Serving 4th term on CanSIA board of directors as Chair & SESA board member
  - Tim Schulhauser, MBA, P. Eng. - President
    - Light Up The World board of directors
  - David Vonesch, P. Eng. - COO
    - Board chair of Alberta Renewable Energy Co-operative (SPARK) and Vice-Chair of Alberta Co-operative Energy
- Most experienced and best trained construction staff in the industry including Certified Master Electrician, Journeyman Electricians, CSA Construction Electricians – Solar PV Systems Certified
- COR Certified for highest safety certification in Alberta
Types Of Solar Energy Equipment

- Solar Thermal
  - Passive
    - Greenhouse
    - Windows
    - Passive Solar Home
  - Active
    - Pool Heating
    - Hot Water Heating
    - Space Heating
    - Air Heating

- Solar Electric
  - Grid Tied
  - Off Grid
  - Hybrid battery backup
Alberta’s Solar Resource

Regway SK, 1384
Wild Horse AB, 1373
Waskada MB, 1370
Rainy River ON, 1265
Elkford BC, 1236
Quyon QC, 1208
Chatham NB, 1168
Chesterfield Inlet NU, 1158
Miminegash PE, 1136
Fort Smith NT, 1126
Amherst NS, 1125
Wabush NF, 1074
Burwash Landing YT, 1056

Source: Natural Resources Canada, Canadian Solar Industries Association
# Solar PV Worldwide Potential

<table>
<thead>
<tr>
<th>City</th>
<th>Yearly PV Potential (kWh/kW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cairo, Egypt</td>
<td>1635</td>
</tr>
<tr>
<td>Los Angeles, USA</td>
<td>1485</td>
</tr>
<tr>
<td>Sydney, Australia</td>
<td>1343</td>
</tr>
<tr>
<td>Calgary, Alberta</td>
<td>1292</td>
</tr>
<tr>
<td>Rome, Italy (Italy has 3rd most solar installed worldwide)</td>
<td>1283</td>
</tr>
<tr>
<td>Rio de Janeiro, Brazil</td>
<td>1253</td>
</tr>
<tr>
<td>Edmonton, Alberta</td>
<td>1245</td>
</tr>
<tr>
<td>Beijing, China (China has 2nd most solar installed worldwide)</td>
<td>1148</td>
</tr>
<tr>
<td>Washington, DC., USA</td>
<td>1133</td>
</tr>
<tr>
<td>Paris, France</td>
<td>938</td>
</tr>
<tr>
<td>Tokyo, Japan (Japan has 4th most solar installed worldwide)</td>
<td>885</td>
</tr>
<tr>
<td>Berlin, Germany (Germany has 1st most solar installed worldwide)</td>
<td>848</td>
</tr>
<tr>
<td>Moscow, Russia</td>
<td>803</td>
</tr>
<tr>
<td>London, England</td>
<td>728</td>
</tr>
</tbody>
</table>

Source: Natural Resources Canada for PV potential, SkyFire Energy research for installed capacity ranking
Why Micro-Generation (MG)?

- Simplified application process specifically designed to streamline connection of renewable energy projects (<5MW) – connection process is quick, simple and low/no cost
- No application or metering costs:
  - Free application
  - Free bi-directional meter
  - No on-going metering charges
- Quick approval – Micro-Generation eligibility must be approved within 14 days
How It Works

‘Save’ on retail + Transmission, Distribution & LAF

Credit at retail rate or hourly power pool price
1. Solar photovoltaic (PV) modules convert sunlight into direct current (DC) power.
2. The inverter(s) convert DC electricity from the solar array to the AC electricity found in the building.
3. The inverter backfeeds electricity into the electrical distribution system.
4. The bidirectional meter, which is supplied free of charge by the Wire Service Provider, keeps track of both the energy imported from the grid and the energy exported to the grid. Savings and export credits are reflected on your electricity bill.
Micro-Generation Revenue

- Energy is not purchased from grid so shows up as savings on variable portions of bill
  - Retail rate = ~6.5 $/kWh (assumed)
  - Variable portion of delivery charges = ~3.5 $/kWh (ENMAX Power residential rate D100 and Calgary Local Access Fee)
  - Total year 1 savings rate = ~10 $/kWh
Micro-Generation Revenue

2002-2015 Average Alberta Power Pool and Equivalent 'Solar' Price

$/kWh

*Past 10 years – 50% premium for solar price over average power pool price
*Past 3 years – 65% premium for solar price over average power pool price
Micro-Generation Credit

Reduced variable charges

Retailer charges – March 31 to April 28, 2016

Retailer charges (before GST) $ 2.66
- Fixed price electricity charges 30.24
  480.000 kWh X $0.06300/kWh =
- Billing administration fee 6.50
- Fixed price micro-generation credits 34.08 CR
  541.000 kWh X $0.06300/kWh =

Distributor charges – March 31 to April 28, 2016

(distribution services provided by ENMAX Power Corporation)

Balancing pool consumer allocation $ 1.60 CR
Local access fee (Calgary) 5.36
Transmission charges 16.97
  Fixed charge 12.40
  Variable charge and rider(s) 4.27
Distribution charges 16.67
  Fixed charge
  Variable charge and rider(s)

Total retailer and distributor charges for the current billing period (before GST) $ 40.06
Graph #1. Micro-Generation Generating Units in Alberta

Number of MGG Units as of 2016 May 31
Number of Solar PV Systems as of 2016 May 31 (L1)
MGG Units Generating Capacity
Cumulative Installed Solar PV Array Generating Capacity (L2)
Target Track for PV Capacity to Reach 2 GW Installed by 2024

At the present annual PV growth rate of 34% per year, 2 GW will be reached by 2034 August

Source: Alberta Energy, Howell Mayhew Engineering
- 5/12 pitch roof
- 20 degrees off South
- Edmonton, AB
- Does not include additional credit for offsets – SPARK Green Offset Program adds 1.85 c/kWh for exported energy
4/12 pitch South facing roof

Medicine Hat, AB

Includes Growing Forward Grant

Does not include additional credit for offsets – SPARK Green Offset Program adds 1.85 c/kWh for exported energy or by selling to carbon credit company
Why Solar?

- Very reliable – no moving parts!
- Very long product warranties
- 60 year old proven technology
- Self reliance and independence
- Reduce financial risk and hedge against rising energy prices
- Demonstrate leadership and reduce GHG emissions
- Great investment opportunity – You are already carrying the debt
Slope and Orientation

- S: 75%
- SE: 92%
- E: 75%
- SE: 70%
- S: 100%
- E: 55%
Solar Modules

- **60-cell:**
  - ~1m x 1.65m
  - Options:
    - 260 - 280 Watts – Standard efficiency (16-17%) – Canadian Solar, Hanwha Q-Cells, etc ($)
    - 300 - 320 Watts – Higher efficiency (18-19.5%) – LG ($$)
    - 335 - 345 Watt – High Efficiency (20-21%) – SunPower ($$$$
  - Application: used for residential and sloped roof applications (easier to handle)

- **72-cell:**
  - ~1m x 2m
  - Options:
    - 310 - 340 Watts – Canadian Solar, Hanwha, etc
    - 360 - 375 Watts – LG
  - Application: Commercial flat roof and ground mount systems
**Canadian Solar**

**CS6K-270 | 275 | 280M**

The high quality and reliability of Canadian Solar's modules are ensured by 15 years of experience in module manufacturing, well-engineered module design, stringent BOM quality testing, an automated manufacturing process and 100% EL testing.

**KEY FEATURES**

- Excellent module efficiency of up to 17.11%
- Outstanding low irradiance performance: 96.5%
- Positive power tolerance of up to 5 W
- High PTC rating of up to 90.93%
- IP67 junction box for long-term weather endurance
- Heavy snow load up to 5400 Pa, wind load up to 2400 Pa
- Salt mist, and ammonia resistance, for seaside, and farm environments

**MANAGEMENT SYSTEM CERTIFICATES**

ISO 9001:2008 / Quality management system
ISO/TS 16949:2009 / The automotive industry quality management system
ISO 14001:2004 / Standards for environmental management system
OHSAS 18001:2007 / International standards for occupational health & safety

**PRODUCT CERTIFICATES**

IEC 61215 / IEC 61730: VDE / CE / MCS / CEC AU
UL 1703 / IEC 61215 performance: CEC listed (US)
UL 1703: CSA / IEC 61701 ED2: VDE / IEC 62716: VDE / Take-e-way

**ELECTRICAL DATA / STC***

<table>
<thead>
<tr>
<th>CS6K</th>
<th>270M</th>
<th>275M</th>
<th>280M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Max. Power (Pmax)</td>
<td>270 W</td>
<td>275 W</td>
<td>280 W</td>
</tr>
<tr>
<td>Opt. Operating Voltage (Vmp)</td>
<td>31.1 V</td>
<td>31.3 V</td>
<td>31.5 V</td>
</tr>
<tr>
<td>Opt. Operating Current (Imp)</td>
<td>8.67 A</td>
<td>8.80 A</td>
<td>8.89 A</td>
</tr>
<tr>
<td>Open Circuit Voltage (Voc)</td>
<td>38.2 V</td>
<td>38.3 V</td>
<td>38.5 V</td>
</tr>
<tr>
<td>Short Circuit Current (Isc)</td>
<td>9.19 A</td>
<td>9.31 A</td>
<td>9.43 A</td>
</tr>
<tr>
<td>Module Efficiency</td>
<td>16.50%</td>
<td>16.80%</td>
<td>17.11%</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-40°C to +85°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. System Voltage</td>
<td>1000 V (IEC) or 1000 V (UL)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Module Fire Performance</td>
<td>TYPE I (UL 1703) or CLASS C (IEC 61730)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. Series Fuse Rating</td>
<td>15 A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Application Classification</td>
<td>Class A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Tolerance</td>
<td>0 ± 5 W</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Under Standard Test Conditions (STC) of irradiance of 1000 W/m², spectrum AM 1.5 and cell temperature of 25°C.

**ELECTRICAL DATA / NOCT***

<table>
<thead>
<tr>
<th>CS6K</th>
<th>270M</th>
<th>275M</th>
<th>280M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Max. Power (Pmax)</td>
<td>195 W</td>
<td>199 W</td>
<td>202 W</td>
</tr>
<tr>
<td>Opt. Operating Voltage (Vmp)</td>
<td>28.4 V</td>
<td>28.5 V</td>
<td>28.7 V</td>
</tr>
<tr>
<td>Opt. Operating Current (Imp)</td>
<td>6.85 A</td>
<td>6.95 A</td>
<td>7.04 A</td>
</tr>
<tr>
<td>Open Circuit Voltage (Voc)</td>
<td>35.0 V</td>
<td>35.1 V</td>
<td>35.3 V</td>
</tr>
<tr>
<td>Short Circuit Current (Isc)</td>
<td>7.44 A</td>
<td>7.54 A</td>
<td>7.63 A</td>
</tr>
</tbody>
</table>

* Under Nominal Operating Cell Temperature (NOCT), irradiance of 800 W/m², spectrum AM 1.5, ambient temperature 20°C, wind speed 1 m/s.

**PERFORMANCE AT LOW IRRADIANCE**

Industry leading performance at low irradiance, average relative efficiency of 96.5% from an irradiance of 1000 W/m² to 200 W/m² (AM 1.5, 25°C).

The specification and key features described in this datasheet may deviate slightly and are not guaranteed. Due to ongoing innovation, research and product enhancement, Canadian Solar Inc. reserves the right to make any adjustment to the information described herein at any time without notice. Please always obtain the most recent version of the datasheet which shall be duly incorporated into the binding contract made by the parties governing all transactions related to the purchase and sale of the products described herein.

**MECHANICAL DATA**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell Type</td>
<td>Mono-crystalline, 6 inch</td>
</tr>
<tr>
<td>Cell Arrangement</td>
<td>60 (6 x 10)</td>
</tr>
<tr>
<td>Dimensions</td>
<td>1650 x 992 x 40 mm (65.0 x 39.1 x 1.57 in)</td>
</tr>
<tr>
<td>Weight</td>
<td>18.2 kg (40.4 lbs)</td>
</tr>
<tr>
<td>Front Cover</td>
<td>3.2 mm tempered glass</td>
</tr>
<tr>
<td>Frame Material</td>
<td>Anodized aluminium alloy</td>
</tr>
<tr>
<td>J-Box</td>
<td>IP67, 3 diodes</td>
</tr>
<tr>
<td>Cable</td>
<td>4 mm² (IEC) or 4 mm² &amp; 12 AWG</td>
</tr>
<tr>
<td>Connectors</td>
<td>Friends PV2a (IEC), Friends PV2b (IEC / UL)</td>
</tr>
<tr>
<td>Standard</td>
<td>26 pieces, 520 kg (1146.4 lbs)</td>
</tr>
<tr>
<td>Packaging</td>
<td>(quantity &amp; weight per pallet)</td>
</tr>
<tr>
<td>Module Pieces per Container</td>
<td>728 pieces (49' HQ)</td>
</tr>
</tbody>
</table>

**TEMPERATURE CHARACTERISTICS**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature Coefficient (Pmax)</td>
<td>-0.41 % /°C</td>
</tr>
<tr>
<td>Temperature Coefficient (Voc)</td>
<td>-0.31 % /°C</td>
</tr>
<tr>
<td>Temperature Coefficient (Isc)</td>
<td>0.053 % /°C</td>
</tr>
<tr>
<td>Nominal Operating Cell Temperature</td>
<td>45±2 °C</td>
</tr>
</tbody>
</table>

**PARTNER SECTION**

Canadian Solar Inc. is committed to providing high quality solar products, solar system solutions and services to customers around the world. As a leading manufacturer of solar modules and PV project developer with over 14 GW of premium quality modules deployed around the world since 2001, Canadian Solar Inc. (NASDAQ: CSIQ) is one of the most bankable solar companies worldwide.
GSX Module System

Revolutionary glass-glass solar module system

Features
- Frameless Module
- Constrained Module Mounting
- Glass-Glass Construction
- Integrated Weatherproofing Technology

Benefits
- PID Free
- Lower profile
- No module grounding
- Perfect alignment
- Innovative design options
- Tamper resistant mounting
- Class A fire rating
- Highest durability
- Seamless BIPV applications

Preliminary Electrical Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>GSX260-60M-C</th>
<th>GSX295-60M-C</th>
<th>GSX270-60M-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Power @ STC</td>
<td>260 W</td>
<td>295 W</td>
<td>270 W</td>
</tr>
<tr>
<td>Nominal Voltage</td>
<td>24 V</td>
<td>24 V</td>
<td>24 V</td>
</tr>
<tr>
<td>Peak Power Voltage (Vmp)</td>
<td>30.8 V</td>
<td>31.0 V</td>
<td>31.2 V</td>
</tr>
<tr>
<td>Maximum Power Current (Imp)</td>
<td>8.49 A</td>
<td>8.55 A</td>
<td>8.65 A</td>
</tr>
<tr>
<td>Open Circuit Voltage ( Voc)</td>
<td>37.8 V</td>
<td>38.0 V</td>
<td>38.2 V</td>
</tr>
<tr>
<td>Short Circuit Current ( Isc)</td>
<td>9.04 A</td>
<td>9.11 A</td>
<td>9.22 A</td>
</tr>
<tr>
<td>Module Efficiency</td>
<td>15.3%</td>
<td>15.6%</td>
<td>15.9%</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-40 °C to 85 °C</td>
<td>-40 °C to 85 °C</td>
<td>-40 °C to 85 °C</td>
</tr>
<tr>
<td>Max System Voltage</td>
<td>1000 V</td>
<td>1000 V</td>
<td>1000 V</td>
</tr>
<tr>
<td>Max Series Fuse Rating</td>
<td>15 A</td>
<td>15 A</td>
<td>15 A</td>
</tr>
<tr>
<td>Power Tolerance</td>
<td>-0/+5 W</td>
<td>-0/+5 W</td>
<td>-0/+5 W</td>
</tr>
</tbody>
</table>

Temperature Coefficients

- Nominal Operating Cell Temperature (NOCT): 45 ±2 °C
- Power Temperature Coefficient: -0.38% / °C
- Voltage Temperature Coefficient ( Voc): -0.50% / °C
- Current Temperature Coefficient ( Isc): +0.03% / °C

Preliminary Mechanical Specifications

- Solar Cell: Monocrystalline 8" x 8" (156 mm x 156 mm)
- Number of Cells: 60 (6 x 10)
- Bypass Diodes: 3
- Module Dimensions: 86.9" x 39.4" x 0.3" (2150 mm x 1000 mm x 8 mm)
- Module Area: 3.04 ft² (0.30 m²)
- Class A
- Warranty: 12 years at 90% of rated power output / 25 years at 80% of rated power output
- Certification: Pending / IEC, UL & ECE listing

U.S./International Patents Pending

Specifications are subject to change without notice. Lumos reserves the right to modify specification and design of this datasheet.

Version 30.1.01-02.00M-1.0

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The Swanson Effect
Price of crystalline silicon photovoltaic cells, $/watt

1977 price
$76.67/watt

2013 price
$0.74/watt

Data Source: Bloomberg, New Energy Finance
Micro-Inverters

- Inverters sit on roof directly behind solar modules
- MPPT (Maximum Power Point Tracking) per module – optimizes performance when system has partial shading
- Per-module monitoring
- More expensive
- Best suited for small systems (<3kW)
String Inverters

String (Central) inverters

- Higher capacity inverters located at array or in electrical room
- MPPT per array or partial array – higher impact from shading as modules are wired in series
- Monitoring info at the inverter level
- Lowest cost solution
- Best suited for larger ground mount systems due to new rodent guard and rapid shutdown electrical code requirements
String Inverters

SolarEdge DC Optimized string inverters

- Best of both technologies – string inverter with DC optimizers behind the modules
- MPPT (Maximum Power Point Tracking) per module – optimizes performance when system has partial shading
- Per-module monitoring
- Lowest cost solution – cost competitive with string inverters
- Best solution for building mounted systems >3kW (in most cases)
Racking

- Hundreds of manufacturers and specialized products for every roof type, membrane, etc.

- Sloped roof racking - flashings, standing seam clamps or brackets dependent on roof membrane type – typically adds ~3psf of additional loading.

- Flat roof racking – fixed standoffs or low-slope ballasted arrays – typically adds 2.5 – 8pst of additional loading.

- Ground mount racking – screw piles, pound in piles, or ballasted foundation options.
Farm Solar PV Case Studies

2 MW Solar Farm – Bassano, Alberta
Largest PV system in Western Canada
175 kW grid-tied PV - Poultry Farm
LINDEN, AB
55.9 kW grid-tied PV - Poultry Farm
STANDARD, AB
54 kW grid-tied PV - Commercial Farm
HIGH RIVER, AB
Farm Solar PV Case Studies

13.26 kW grid-tied PV - Farm
MOUNTAIN VIEW COUNTY, AB
25.5 kW grid-tied PV - Net-Zero Egg Barn
BRANT COLONY, AB
18.9 kW grid-tied PV - Dairy Farm
DIDSBURY, AB
### Retail Electricity Bill

<table>
<thead>
<tr>
<th>Site ID</th>
<th>Consumption (kWh)</th>
<th>Energy &amp; Retail Costs</th>
<th>Billing Demand</th>
<th>Wire Service Provider Costs</th>
<th>MCAF Costs</th>
<th>Prior Period Adjustments</th>
<th>Total Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site 1</td>
<td>17,458</td>
<td>$1,103.93</td>
<td>963.00</td>
<td>$8,450.75</td>
<td>$56.45</td>
<td>($20,778.75)</td>
<td>$11,167.62</td>
</tr>
<tr>
<td></td>
<td>RATE= 6100 G036 Large</td>
<td>Adj for May Interim, Adj for March Final, Uplift Charges - 201502, PFAM-RAM ADJUSTMENT OF $7.17 FOR 2015-02, G036 Cr</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Site 2  | 53,702             | $3,323.98             | 283.88         | $3,615.28                   | $25.08     | ($18,997.76)             | $12,033.42  |
|         | RATE= 6100 G035 Large MicroGen | Adj for May Interim, Adj for March Final, Uplift Charges - 201502, PFAM-RAM ADJUSTMENT OF $6.69 FOR 2015-02, G035 Cr |

#### Total
- 71,522 kWh
- $4,450.40
- $12,122.02
- $81.80
- $39,778.93
- ($23,124.71)
- ($24,280.95)

**GST** $1,156.24

**Billing Date:** August 5, 2015

**Billing Period:** July 1, 2015 - August 1, 2015

**Due Date:** August 13, 2015

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*Prior to installing their own 2MW solar farm, their average electricity bill was between $28,000 - $32,000.*

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**Notes:**
- Reduced energy & transmission costs for solar production used on site
- Credit received for energy exported to the grid in June
- Overall bill credit in July: **$24,280.95**
A detailed and comprehensive solar site assessment includes the following:

- Accurate measurements of roof or ground space including locations of plumbing stacks, chimneys, skylights, attic vents, etc.
- Shading analysis from proposed location for solar (sometimes several points need to be analyzed to determine the best location)
- Determine route of cable from site of solar PV array to location of inverter/mains panel
- Determine location of inverter(s) and integration into the building’s electrical system

After the site assessment, your solar provider will be able to determine preliminary ballpark cost, energy production and levelized cost of electricity numbers specific to your home/building.
Solar Installation
Process & Timeline

1. Preliminary Assessment
   + Site Assessment
   + Detailed Design
   + Quotation

2. System Walk Through
   + Delivery of Operation Manuals & Warranties
   + Energization!

3. Bi-Directional Meter Replacement by Wires Owner
   (Typically 1 - 4 weeks from completion of electrical inspection)

4. Customer Approval

5. Microgen Application + Building, Development & Electrical Permits + Product Procurement
   (Typically 2 - 6 weeks depending on product and local municipal permitting requirements)

6. Electrical & Building Inspections

7. Installation
   (Typically 1 - 5 days for a standard residential project)
The Growing Forward 2 solar grant application window reopened on July 5, 2016 and is accepting applications again. This program provides funding towards solar PV systems on Alberta farms, enabling producers to generate their own electricity and save on energy costs while reducing their carbon emissions.

**WHO CAN APPLY?**
- Producers in Alberta with a minimum of $10,000 farm commodity or livestock production income.

**HOW MUCH FUNDING CAN I GET?**
- The grant is calculated based on an eligible system’s wattage, up to a maximum percentage of system cost.
- Third-party contractor-installed systems are funded at a higher rate than self-installed systems.
- A maximum of 100 kW of solar PV capacity or $50,000 per applicant is available through the program.
Leasing Your Land

- Solar developers have been approaching Alberta land owners with options to lease.
- They will pay you for the first right of refusal to develop a solar project on your land.
- If a project is developed you will get lease payments.
- Alberta Agriculture has a paper on the topic with more details.
- Unlike an Oil or Gas lease, the land will not be available for grazing or other agricultural uses.
Battery Backup Option

1) Photovoltaic Array
2) Charge Controller
3) Battery Bank
4) Inverter / Charger
5) Electrical Panel
6) Bidirectional Meter - provided free of charge by wires owner
7) Electrical Grid

Flow of DC (Direct Current) electricity
Flow of AC (Alternating Current) electricity
Battery Backed Up Grid Tie
7.2 kW inverter bank
1100 Ahr 48V battery bank
Expanded to 2200 Ahr
Radio Repeater Site - Grande Cache, AB
1800 W solar array
12V 800 Ahr battery bank
Off Grid Solar Case Studies

Parks Canada Ranger Station – Maligne Lake, AB
5 kW grid-tied PV
Manual adjustable racking for varying seasonal tilt angles
THANK YOU