# Cachelan

# SolarVu®
## ENERGY PORTAL

## OPERATIONS & MAINTENANCE

- Power, energy, revenue, status
- Fault alarms with email notification
- Troubleshooting analytics & logs
- Camera - site conditions & weather
- LDC SCADA connection

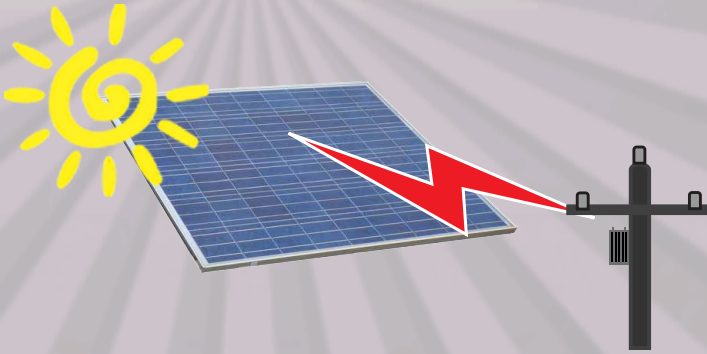## APPLICATIONS

- Solar PV - roof, fixed ground, tracker
- Commercial, farm, residential, solar farms
- FIT, microFIT, net meter, PPA
- Manage portfolio with SMART Enterprise
- Schools - WebLab™ lessons, experiments

## ASSET MANAGEMENT

- Daily output email, reports
- Performance analysis, variances
- Bankability, lifetime data storage
- Photos for insurance & security
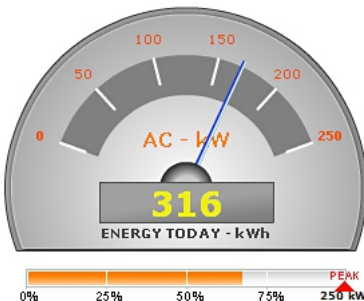- Verify utility payments

## Manage solar PV sites with SolarVu®

SolarVu® is a web energy portal that continuously monitors solar system performance displaying power, energy, revenue, status and trends on a PC or mobile device. SolarVu® can be installed on systems of any size from a small 10kW roof to large 10MW ground array solar farms. It works with inverters and equipment from many different vendors using a single, consistent interface.

SolarVu® continuously monitors equipment and runs analytics to send alarm messages with diagnostic logs as soon as problems occur. Remotely view live inverter measurements to speed up troubleshooting. Create customized reports using lifetime stored data for asset management. Compare the variance of actual output to PVsyst design for bankable analysis when buying or selling systems. Calculate carbon tax offset and learn about energy equivalents.

## Check revenues every day

Each evening, receive an email of daily, monthly and lifetime revenues, peak output and system status. Visit the SolarVu® energy portal to see power now or energy and revenue graphs for any time period. Create and download reports as needed.
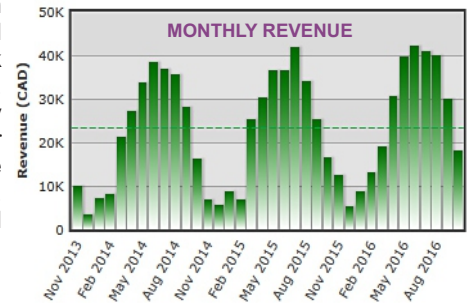


MONTHLY REVENUE

## Why SolarVu®?

To ensure each system is generating as much power as possible. SolarVu® detects faults like bad panels, blown string fuses, arc fault tripped inverters and equipment failure which reduce revenue. Choosing the inverter manufacturer's monitoring package instead, which only provides inverter measurements, can prove costly due to lost revenue from other fault conditions that go undetected. SolarVu® sends alarms for all monitored equipment, gives detailed diagnostic data to reduce expensive O&M time, eliminates unnecessary routine maintenance checks and has portfolio asset management reporting tools. Install a SolarVu® energy portal with appropriate options and achieve the full yield each system was designed for.

## Analyzer to maximize output

When the SolarVu® gages and alarms detect problems the Analyzer tools locate the cause and show maintenance staff where to look, so they can quickly restore full output while minimizing expensive field repair time. Data analysis tools enable financial administrators to measure performance and generate reports.

**WeatherTrak**
Compare actual to expected output

**SnoCam**
Roof conditions, weather, security

**Smart Strings**
Find bad strings and panels

**PowerWatch**
Identify inverters with low output

**Equipment Log**
30 day log of measured parameters

**Inverter Status**
Measured values and faults

**Communications**
Internet connection quality

O&M TROUBLESHOOTING

**Actual to Forecast**
Output variance from PVsyst design

**PayCheck**
Verify utility payments

**Top 10 Days**
Highest output days

**Carbon Fooprint**
Carbon offset energy equivalents

**Payback**
Calculate ROI and yield

PERFORMANCE

AC - kW

316
ENERGY TODAY - kWh

0%   25%   50%   75%   PEAK   250 kW

# O&M Tools Detect and Analyze Faults

SolarVu® continuously runs analytics on the collected data to determine if there is a fault condition. When the SolarVu® gages and reports indicate a problem, use the Analyzer tools to quickly locate the cause. Maintenance staff know in advance what spares to bring and where to look, so they can quickly restore full output while minimizing expensive field repair time.
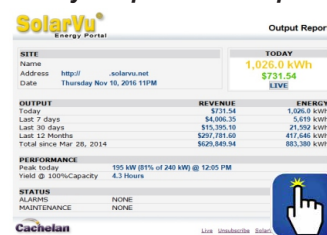
## LIVE Gages & Graphs
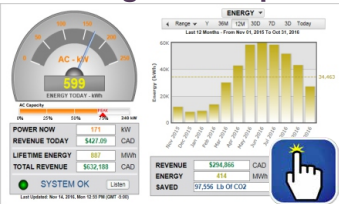
In the LIVE screen, actual power, energy and alarm status are displayed on gages and data boxes. The % AC Capacity bar shows how closely the system is reaching rated output including a daily peak recorder. View graphs of energy, revenue and carbon savings for any time period from the stored lifetime data.

## PowerWatch™

PowerWatch™ continuously tracks and compares the power output from each inverter sending an alarm if one is low. An open string connection, blown fuse or bad panel is obvious by examining the 30 day log of daily power graphs.

## SmartStrings™

Find bad panels that reduce string output leading to lost revenue but which could go unnoticed on large arrays. With smart combiner boxes compare every string and create an alarm if one string is significantly below the others. Eliminate expensive routine maintenance checks by knowing the status of every string.

## Inverter Status & Logs

Diagnose hard to find intermittent problems using the 30 day inverter and meter logs. Engage remotely located external experts to assist in suggesting corrective action using the online logs. Restore operation faster to minimize generation revenue loss.

## Alarms & Diagnostics
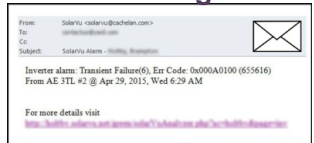
Receive a detailed alarm email as soon as problems occur. Use the text and data logs to diagnose and fix faults quickly for maximum up time. Retrieve equipment manuals, roof layouts and electrical drawings online from links within SolarVu® to reduce repair time.
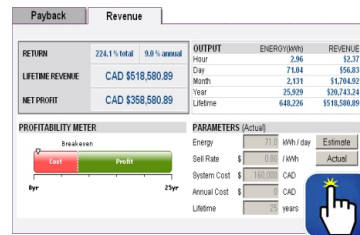
# Asset Management

Live gages, graphs and reports ensure you always know if the system is operating normally. Track performance over any time period using the lifetime stored data. A daily email summarizes output performance and maintenance alarms. Track returns with the payback calculator.
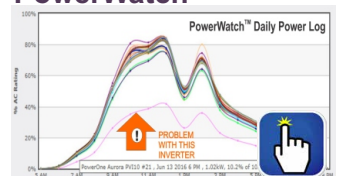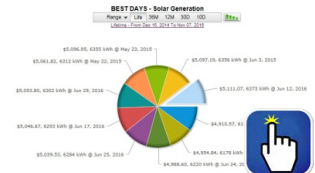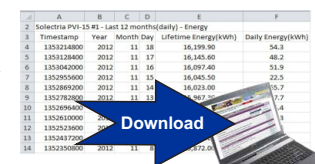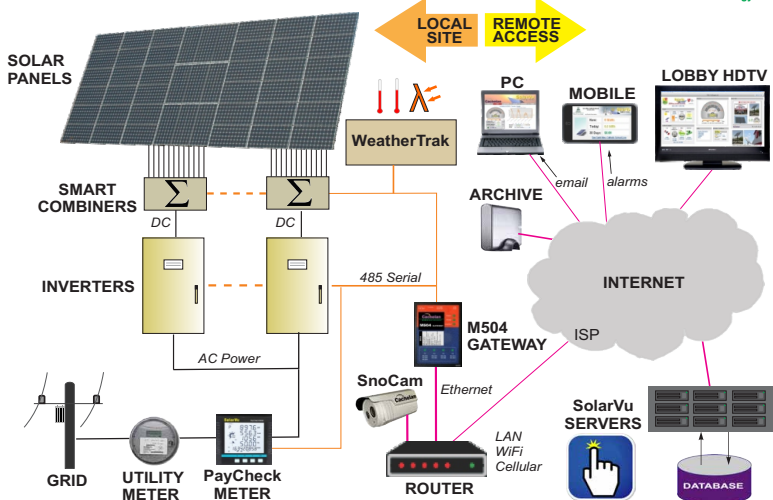
*Daily Output Email Report*

*Payback Calculator*

## Best Days

Use the Best 10 Days analyzer to see the effects of aging or determine if dirt build up is reducing output by comparing similar periods since startup.

## Spreadsheet Analysis

Download lifetime data manually for any time period to do spreadsheet analysis or automatically transfer records to a remote server.

# Learn about Solar Energy

Online lessons with experiments are available for teaching renewable energy in schools. SolarVu® WebLab™ guides students in analyzing performance of their school's solar PV system. Ideal for science projects.

*See how school boards are using SMART Enterprise to compare schools at BigGreenBoard.solarvu.net*

# No software to install or maintain

**SmartGrid** IoT Cloud Technology

**LOCAL SITE** — **REMOTE ACCESS**

SOLAR PANELS

SMART COMBINERS

INVERTERS

GRID

UTILITY METER

PayCheck METER

WeatherTrak

M504 GATEWAY

SnoCam

ROUTER

PC

MOBILE

LOBBY HDTV

ARCHIVE

email

alarms

INTERNET

ISP

SolarVu SERVERS

DATABASE

LAN WiFi Cellular

Ethernet

485 Serial

AC Power

DC

DC

**SolarVu Servers**

SolarVu is a cloud computing service that uses smart grid technology to manage DG (distributed generation) systems. Access is from a mobile device or PC browser. There is no software to install or computer hardware to maintain. System upgrades are automatically added ensuring each energy portal always has the latest features. Lifetime data is stored and backed up on secure servers located in a data center with standby generation for reliable 24/7 high speed downloads. Data over any time period can be downloaded and saved for custom analysis.

GE871

Designed Manufactured Operated in Canada
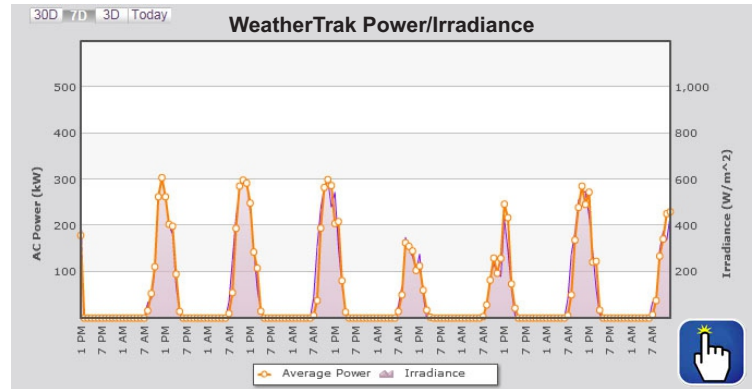
## Compare output to specifications

Daily insolation, energy and peak irradiance are recorded for viewing graphically or downloading for analysis. If any inverter output is below expected from the measured irradiance, a SunLowPower alarm is issued. Check that the system output meets specification under actual conditions of irradiance and temperature.

| STATUS | NOW |
|---|---|
| | 41.2kW |
| | 50kW |
| | 82% |
| 812W/m² | |

*Compare power generated to rated capacity under different conditions. Adjustable alarm for output below ratings at any irradiance level.*

*WeatherTrak™ includes irradiance, panel and ambient temperature sensors. Optional anemometer is available.*

| Irradiation | Solar Irradiance | 785 W/m² | Peak Today | 785 W/m² @ 1:35 PM |
|---|---|---|---|---|
| | Insolation Today | 2,484 Wh/m² | Full Sun Hours | 2.5 |
| Temperature | TA: Ambient Temperature | 7.4 °C | Today | Peak 11.7 °C @ 1:55 AM |
| | TP: Panel Temperature | 14.4 °C | Today | Peak 17.9 °C @ 1:05 PM |

**WeatherTrak Power/Irradiance**

30D 7D 3D Today



Average Power   Irradiance

## Verify utility payments

To reconcile utility payments received, PayCheck™ monitors a customer owned energy meter that is installed at the same measurement point as the LDC FIT meter. Enter the energy and revenue for the period covered from the customer LDC statement and Paycheck™ will show the corresponding values measured by SolarVu® using the PayCheck™ meter. If the variation is significant, print the SolarVu® daily energy log and review with the LDC against utility records to determine why. This ensures any issues are detected early and the correct compensation is received. Printed reports can serve as an audit for investors that the revenues received accurately match the energy delivered.

*Reconcile utility statements to verify correct payments are received.*

**UTILITY FIT kWh METER**    **PAYCHECK kWh METER**

| | Utility | | SolarVu* | | Difference | Variation % |
|---|---|---|---|---|---|---|
| Payment | $ 299,165.23 | — | $ 301,168.35 | = | - $ 2,003.12 | -0.7 % |
| Energy | 426014 kWh | — | 422396 kWh | = | 3,618 kWh | 0.9 % |

ENERGY 426 1149 Days MWh    ENERGY 422 1149 Days MWh    Calculate

## Performance Analysis

Whether you are buying, selling or operating solar PV sites, generate performance analysis reports to demonstrate bankable results. Enter the PVsyst original design values once then let SolarVu® calculate the energy and revenue variance to designed output for any time period. With the PayCheck™ meter installed, get the same reports that separate asset management software provides without the expense.

Demonstrate recorded measured values to realize the full site value when selling. Verify performance guarantees on a portfolio of sites. Solar farm operators can analyse each section of the total project. If the variance is below expected, use the SolarVu® Analyzer tools for detailed measurements to determine why, then take corrective action.

*Generate performance analysis reports comparing actual output to PVsyst design forecast.*

**PayCheck Actual to Forecast**

Actual ■  PVsyst Forecast ■

| Actual | Forecast | Variance |
|---|---|---|
| **370,034** kWh | **347,680** kWh | **6** % |
| **$199,448** CAD | **$187,400** CAD | **$12,049** CAD |

| | Nov 15 | Dec 15 | Jan 16 | Feb 16 | Mar 16 | Apr 16 | May 16 | Jun 16 | Jul 16 | Aug 16 | Sep 16 | Oct 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PVsyst Expected (MWh) | 11.37 | 7.11 | 11.01 | 16.15 | 28.99 | 35.50 | 43.74 | 45.84 | 46.88 | 42.49 | | 12.00 |
| Actual Generation (MWh) | 13.95 | 6.65 | 10.47 | 14.77 | 20.25 | 38.24 | 49.04 | 54.72 | 50.11 | | | |
| Energy % Variance | 23% | (5)% | (5)% | (9)% | (31)% | 8% | 12% | 20% | 2% | | | |
| | | | | | | | | | | | | |
| | Nov 15 | Dec 15 | Jan 16 | Feb 16 | Mar 16 | Apr 16 | May 16 | Jun 16 | Jul 16 | | | |
| PVsyst Expected (kWh/m²) | 47.50 | 27.90 | 56.70 | 76.90 | 120.40 | 144.50 | 170.90 | 199.50 | | | | |
| Actual Insolation (kWh/m²) | 43.95 | 27.15 | 47.37 | 71.02 | 91.33 | 149.44 | 168.02 | 211.39 | 193.24 | | | |
| Insolation % Variance | (7)% | (3)% | (16)% | (8)% | (24)% | 3% | 7% | 12% | (3)% | (3)% | | |

## See local site conditions

Install a camera to check local weather and roof conditions. Get a live image each time you visit your SolarVu® portal. Every hour, SolarVu® records a snapshot so you can check changing conditions for the entire month. Still image capture minimizes data transfer on 3G cellular internet connections. For security and insurance, 2 weeks of 24/7 video is saved in the camera.

If power output seems low, check whether snow coverage or clouds are the cause before dispatching an expensive truck roll. Watch tracker movement to verify operation and parking. IP settings are pre-configured to eliminate complex setup. Installation only requires a single cat5e cable for signal and power from the SolarVu enclosure to the included weatherproof SnoCam enclosure on the roof.

*Install up to 4 cameras for multiple views on large sites*

| SnoCam A | SnoCam B | SnoCam C | ALL |
|---|---|---|---|



Date: Nov 02, 2016, Wed 05:02 PM
Daily Energy: 948 kWh, Revenue: $741
Daily Insolation: 1,743 Wh/m², 1.7 FSH
Peak Irradiance: 494 W/m² @ 4:45 PM

< Prev Hour    24 Hour    Next Hour >

*Check snow coverage, storm damage and local weather for any period Download images for performance reports and insurance claims.*

**SnoCam - March, 2014**    Back

| SUN | MON | TUE | WED | THU | FRI | SAT |
|---|---|---|---|---|---|---|
| Mar 30,2014 776 kWh | Mar 31,2014 734 kWh | | | | | |
| Mar 23,2014 785 kWh | Mar 24,2014 0.00 kWh | Mar 25,2014 450 kWh | Mar 26,2014 734 kWh | Mar 27,2014 396 kWh | Mar 28,2014 81.0 kWh | Mar 29,2014 115 kWh |
| Mar 16,2014 710 kWh | Mar 17,2014 575 kWh | Mar 18,2014 688 kWh | Mar 19,2014 55.0 kWh | Mar 20,2014 114 kWh | Mar 21,2014 551 kWh | Mar 22,2014 294 kWh |
| Mar 09,2014 230 kWh | Mar 10,2014 224 kWh | Mar 11,2014 462 kWh | Mar 12,2014 0.00 kWh | Mar 13,2014 28.0 kWh | Mar 14,2014 247 kWh | Mar 15,2014 309 kWh |
| Mar 02,2014 4.00 kWh | Mar 03,2014 9.00 kWh | Mar 04,2014 2.00 kWh | Mar 05,2014 3.00 kWh | Mar 06,2014 8.00 kWh | Mar 07,2014 95.0 kWh | |

Click on photo to enlarge for details

Views: 15624
gcc.solarvu.net    NEWS  Feedback  Cachelan

**Visit live sites at www.solarvu.com**

## Managing portfolios and solar farms

Efficiently manage multiple sites from a single log in with SMART (System Management And Reporting Tool) Enterprise. Status indicators show which locations have an alarm. Quickly identify and fix problems to minimize revenue loss. Unlike proprietary portals from inverter vendors, new sites using different equipment can be added with the same consistent interface. Any number of locations can be included and accessed from a PC or mobile device.

Multiple sites can be subdivided into groups or a big solar farm into zones. Jump directly to any location without having to remember the site login. Change settings, compare site performance, troubleshoot problems and share information for managing existing sites and implementing design improvements on new ones. Separate visitor and administrator passwords allow different privileges for sharing by multiple users.

IPPs can generate custom reports for any time period to evaluate performance of their power generation assets. These can be in PDF format for distribution or as a downloaded file for detailed spreadsheet analysis.

*See status of a complete portfolio on one screen. Navigate directly to problem sites for troubleshooting problems.*



Sort by any parameter

Create groups of related sites

Go directly to site without login

Quickly identify problem sites

### OWNERS
*Go to any site to check status, revenue and performance*
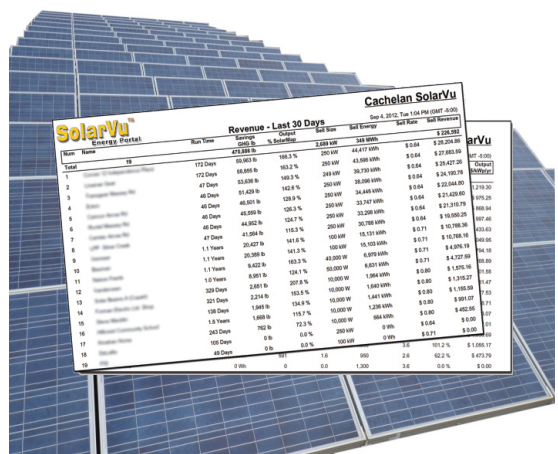


### MAINTENANCE
*Receive alarm messages when problems occur*
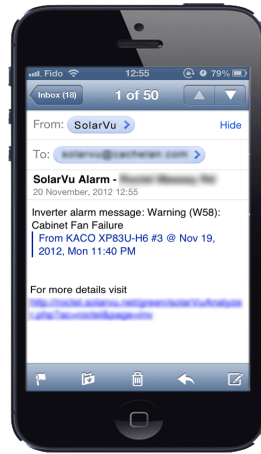


### INVESTOR
*Create custom PDF reports for any time period grouped by parameters of interest*



## How to Buy

### Maintenance Plans

Installers receive a SMART Enterprise account that includes all SolarVu® portals they sell as an aid to providing maintenance contracts to deliver better for customer service. Remotely diagnosing site issues may eliminate a truck roll and ensures the right equipment is brought to complete a repair in the minimum time. The dealer/developer logo appears at the bottom of each screen with a link to their website for quick access to support and referrals. All features are enabled for the first 2 years after which monitoring is still free but the PAM (Performanance Analysis and Maintenance) advanced analytics and diagnostics service is optionally available for a small monthly fee.

### LDC SCADA

Cachelan can supply the necessary equipment, programming and commissioning to connect to the LDC (utility) SCADA system when this is required as a condition for grid connection. A detailed single line drawing is supplied with each order for LDC approval.



### Learn More

Download the online interactive brochure then click the icons to play videos and jump to links for more information about each feature. Before buying, experience SolarVu® in action by visiting live sites at solarvu.com to evaluate how it will help you manage your systems.

*Interactive brochure*

solarvu.net/brochure

### How to Order

Ask your project developer to include SolarVu® as the energy portal in the system they provide. Cost will vary depending on equipment and options. It is pre-configured to go live as soon as the PV system is connected, ready to use. Alternatively, SolarVu® can be retrofit to existing systems. SolarVu® is typically used in FIT configured systems. For net metered or energy storage applications, choose the Cachelan NRGpilot™ portal. Contact Cachelan with system details for a quote and SLD (single line drawing) or for custom requirements not shown.

**Cachelan**
SMART GRID ENERGY

cachelan.com
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contactus@cachelan.com

### Visit live sites at www.solarvu.com