

# Solar Resource Assessment

Use the power of on-site measurements to get a robust business model and improve the profitability of your PV projects



**Campbell**<sup>®</sup>  
S C I E N T I F I C

in partnership with

**CALIBSUN**

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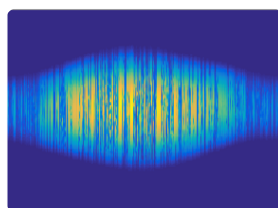
# Accurate & robust site's yield assessment using on site data

## Monitoring



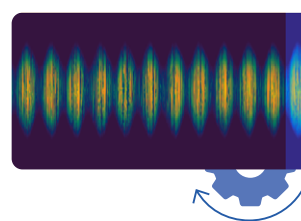
Data collection using Campbell's meteorological station

## Quality Check



Identify anomalies, ensuring high level of both availability and quality of data

## Calibration



Calibration of historical satellite irradiance databases

## Our service includes:

### 1. Set up a File Transfer Protocol (FTP) access to receive measurement data

- Validation of data availability and accuracy after setting up the weather station

### 2. Monitor and perform Quality Check of measurement data for 12 months

- Monitoring the quality of measurements
- Providing remote procedures and support for cleaning pyranometers and operational maintenance

### 3. Provide 3 quarterly reports

- Report on data availability and quality
- Provision of raw measurement data

### 4. Deliver a final report

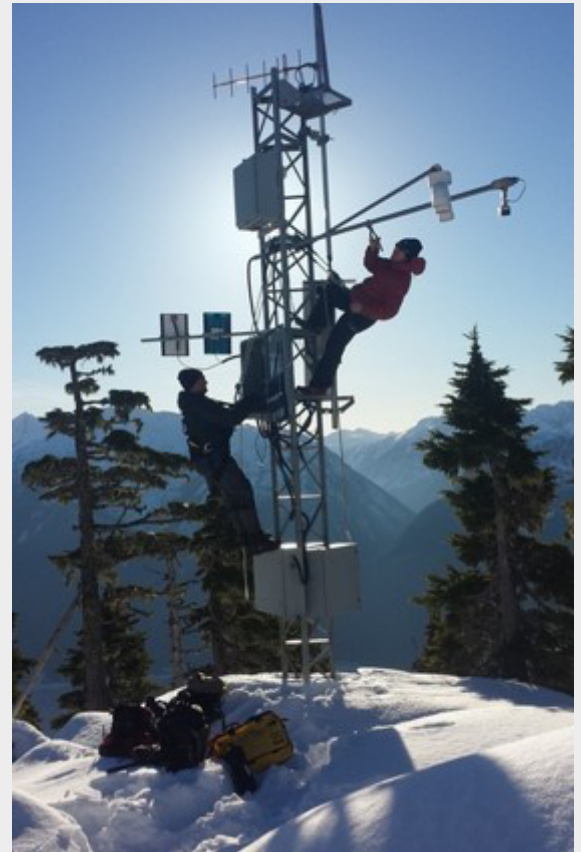
- Consolidate information included in the quarterly reports
- Provision of calibrated data package:
  - Calibrated GHI irradiance time-series (15 years)
  - TMY: calibrated GHI, ambient temperature
  - Additional raw data: temperature, wind, rain, humidity, soiling
- Analysis and presentation of results via videoconference

# About Campbell

At Campbell Scientific, our approach to the design and manufacture of robust monitoring systems empowers solar energy project developers and operators with the critical information needed to make performance ratio calculations, reports, and critical decisions that ensure their return on investment.

Our solution designs, community, and client interactions demonstrate that we are a trusted advisor with the knowledge and experience to ensure your monitoring solution will outlast the life of your solar projects.

Informed by direct client interaction, field experience, and our insatiable curiosity about what we can do to reduce project uncertainty and waste, we provide systems and sensors for solar resource monitoring, operational solar met monitoring, and PV soiling.





# Hardware General attributes

## Reliable instrumentation

- ✓ Community-approved
- ✓ High-quality data

## Tested on the field

- ✓ Long service life
- ✓ Durable in extreme environments
- ✓ Data integrity

## Easy to maintain and operate

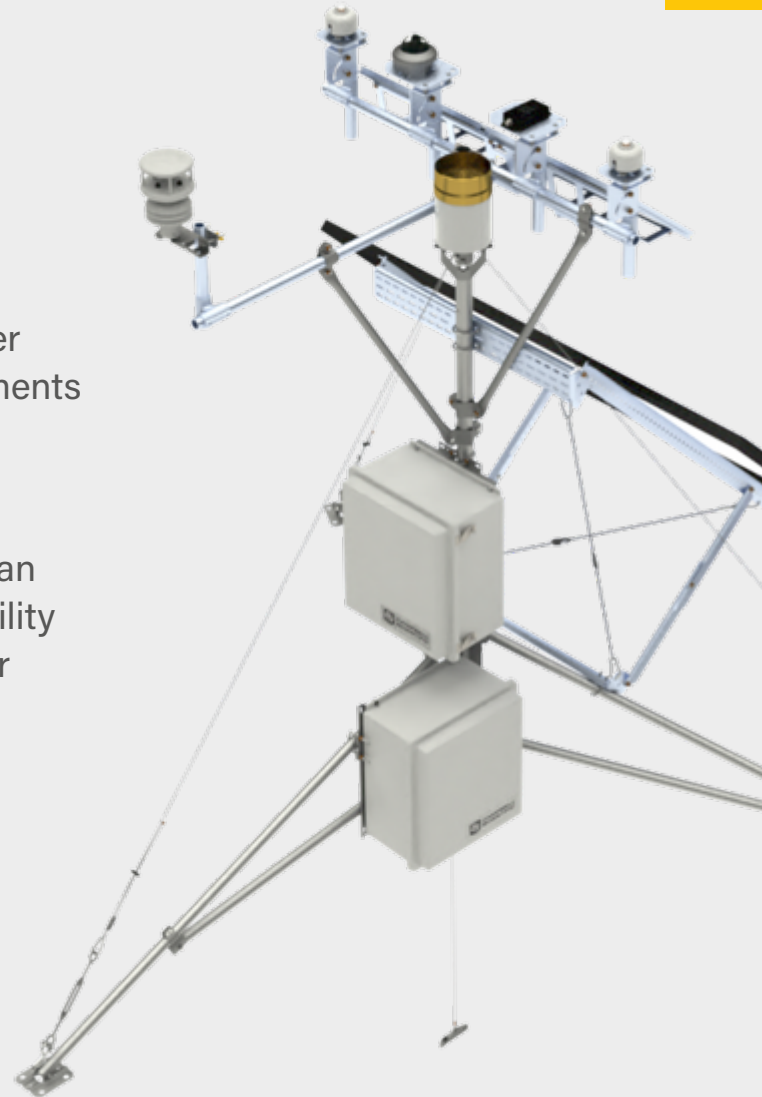
- ✓ Open platform
- ✓ Modular design
- ✓ Low power consumption
- ✓ Scalability
- ✓ Fast, easy connections



## Our Solar Resource Assessment Station

The SunScout is a Solar Resource Assessment Station class A. A weather station designed to provide measurements of irradiance, solar panel soiling and meteorological parameters.

This system provides on-site data for an in-depth understanding of the availability and variability of the solar resource for your specific project.



- ☒ Intelligent diagnostic functions enable you to receive on-site data and alerts if critical system parameters, such as power, are outside predefined limits and require special attention.
- ☒ By providing you with key information, you can ensure proper maintenance, increase or reduce data transmission intervals, and have confidence in data quality.

## Core Station



### Meteorological Sensors

- Easy-to-install Metsens500 all-in-one sensor providing air temperature, relative humidity, wind speed and direction and barometric pressure.
- TE525 Tipping-bucket rain gauge for precipitation.

### Global Horizontal Irradiance (GHI)

- Class A pyranometer using the hukseflux SR30 with ISO 17025 calibration.
- Premium pyranometer mount that allows for easy leveling and elevation adjustment.

### Soiling

- Dustsens photovoltaic (PV) soiling sensor that provides high accuracy daily soiling loss.
- Uses the most proven and reliable soiling method from the IEC 61724-1 standard with a direct measure of power loss using short-circuit current between two panels (clean vs. dirty).

### Power supply

- Designed for continuous off-grid operation in even the coldest and harshest climates Intelligent sensor and peripheral control to maximise up-time and deliver a complete data record.

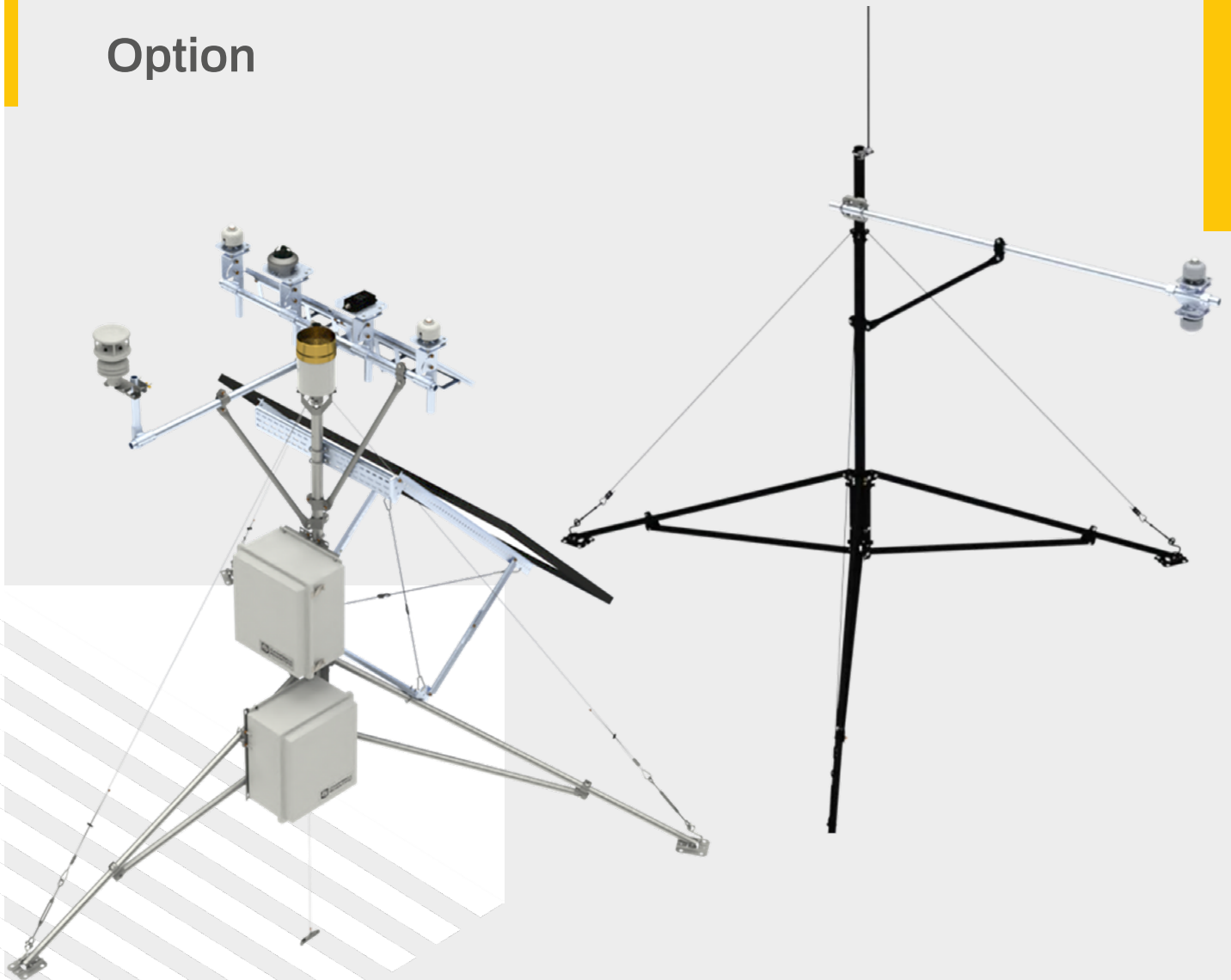
### Tripod

- Wide footprint for extra stability in high-wind environments.
- Easy-to-install center-point anchor system Full station designed to be installed within six hours.

### Data Acquisition

- Campbell scientific CS350 datalogger with embedded cellular gateway.
- Raised and angled wiring terminals for convenient wiring in the field.
- Programmed according to industry best practices and IEC 61724-1 guidelines.
- Easy-access maintenance button to record when maintenance tasks are performed.

## Option



### Diffuse Irradiance

- Diffuse Horizontal Irradiance (DHI) measured by SPN1 for bifacial or single-axis tracker project.
- Calculated Direct Normal Irradiance (DNI) using onboard solar position algorithm to provide complete component sum irradiance.

### Additional Irradiance

- Class A pyranometer for redundant GHI pr Plane of Array (POA).
- Reference cell options to match your project's PV technology.

### Albedo

- Your choice of class A or class C pyranometers.
- Matte black powder-coated tripod and mounting hardware to minimize reflections and improve accuracy.



# Our Services

Campbell Scientific systems are designed to operate in the harshest environments. The installation, commissioning and maintenance services provided by Campbell Scientific, give you the added assurance that your systems are configured and maintained to continue to capture exceptionally reliable data throughout the life of your project.

Campbell Scientific's installation and commissioning services ensure that your measurement equipment is installed, adjusted and configured correctly from the outset, enabling seamless integration into established networks and immediate data capture. To ensure continuous, lifelong, trouble-free operation, we recommend regular maintenance to ensure measurement accuracy.

## Installation and Commissioning

Robust, documented testing to ensure systems comply with defined requirements and, where applicable, industry standards. and system verification prior to installation.

- ☀ A site survey can be carried out prior to installation to facilitate site selection and sensor installation.
- ☀ Installation is carried out by an experienced Campbell Scientific technician.
- ☀ Installation plans, risk assessments and method statements are drawn up and shared prior to all work.
- ☀ Flexibility to suit your schedule and time constraints.
- ☀ Post-installation system verification, training and assistance with software installation and configuration.

## Maintenance

Regular maintenance ensures the quality and data assurance of your system, and reduces the total cost of ownership over the system's lifetime.

### Other services :

Campbell Scientific offers a range of services to help you select, install, configure and maintain the right solution for your unique application. To give you peace of mind throughout your project, we complement product selection, system design and configuration expertise with professional project management and lifecycle services.

### Our training courses:

Campbell Scientific offers a selection of virtual and face-to-face training courses to help Campbell Scientific participants and users get the most out of their product, system or project.

Training courses are a great way to learn about your Campbell Scientific product. Whether you're a beginner or a more advanced user, our training courses offer something to suit everyone.

# About CalibSun

CalibSun is a spin-off of Solaïs, a trusted leader in the photovoltaic industry since 2008, renowned for its cutting-edge expertise and innovation. CalibSun develops and delivers solar and energy forecasts services for PV developers, aggregators, traders, and grid operators to maximize profits while minimizing operational risks.

With a disruptive approach, enhanced by on-site data valorization, CalibSun empowers its customers with highly reliable, actionable insights to optimize both short- and long-term energy production management.

## CalibSun brings 15 years of R&D experience with renowned partners

### Partnership with Paris Saclay University (Mines Paris)



Since 2009, we have been in partnership with Mines - Paris (Paris Saclay University), world-renowned engineering school, ranked N°1 in the EU, specialized in solar resource & satellite data valorization and meteorology.

Over 15 scientific publications

### Member of SCIDOSOL Research chair



Academic and industrial partners for disruptive innovation in solar resource forecasting.



# Calibration of satellite database

## CALIBSUN reduces uncertainty of satellite data for your PV site

CalibSun provides historical satellite data calibration — already best practice in the wind industry — reducing the gap between estimation and reality in your sites' yields assessment.

### What CALIBSUN offers:

- ✓ Refine P50 for a more secure investment and increased project value
- ✓ Reduce the gap between P90/P50 ratio to optimize equity contribution
- ✓ Secure investment decision for banks and investors
- ✓ Calibrated data can be directly used by financial actors

## Our methodology is backed by academic research

### The satellite database used to estimate TMY are subject to uncertainty.

- ✓ Our study shows that uncertainty on irradiance estimate range between -3% to +5%
- ✓ High quality measurement campaign and data calibration can reduce it to 0.5%



### Errors in measurements of Solargis and SODA irradiance databases

Solargis and Helioclim irradiance satellite database measurements comparison vs. real on-site data from BSRN meteorological stations for 7 different sites in Europe. The graph shows that the measurements always differ between the databases for the same site, reflecting the inaccuracy in your assessment.



# Robust data calibration methodology

## 1. Data collection and Monitoring - Partnership with Campbell

CalibSun performs operational monitoring of data collected on-site by Campbell 's meteorological station for 12 months. Campbell's team provides on-site maintenance as well as regular cleaning to ensure high availability and quality of data.

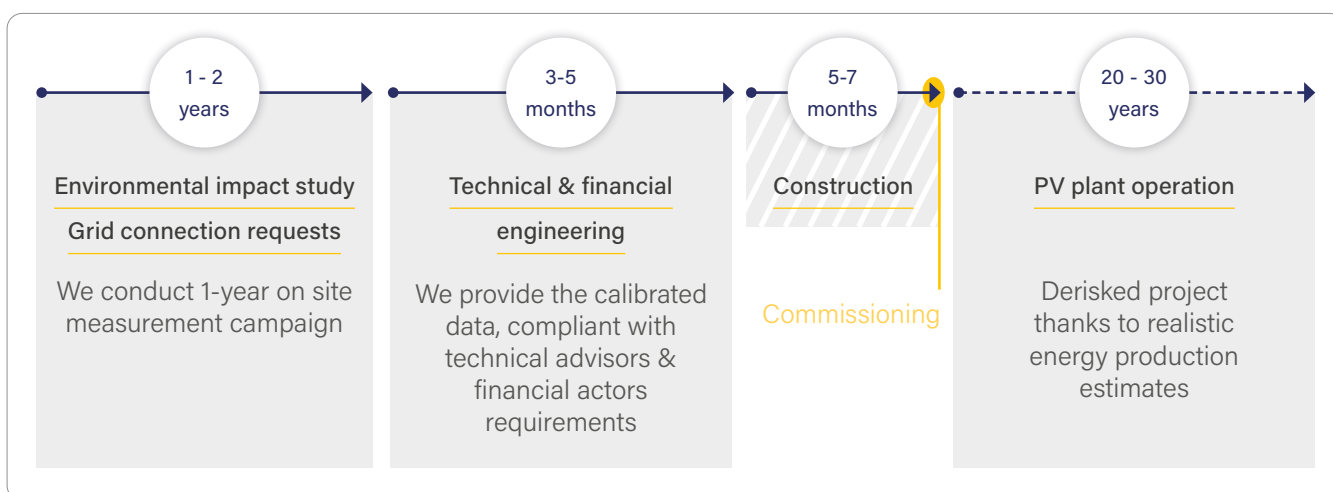
## 2. Quality Check

Multiple quality tests are applied, relying on proven methodology and tools. These tests include, for example, tests of extreme value limits, point shading by nearby horizon, outlier detection, etc.

## 3. GHI calibration

CalibSun has optimized performance for irradiance data, with a reduction in bias from satellite databases very close to perfection and documented it in published scientific studies.

### Our service during the lifetime of a PV project





# Campbell

in partnership with **CALIBSUN**



As a trusted provider of measurement solutions since 1974, Campbell Scientific has provided the information that helps mitigate the consequences of severe weather, facilitates data collection by scientists to better understand climate change and other human impacts on the environment, and supports countless organizations, institutions and national agencies to deliver more effective services to their populations. Our instrumentation equipment is renowned as the best in the industry. Our software services provide an unrivalled level of insight. Our expertise in project implementation combines both aspects to deliver a unique, integral solution with the potential to change the world.



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