


# On top of the world

## From one extreme to another





Derek Jones, Renewable Energy Group Manager at Campbell Scientific, speaks to PES about their measurement systems. They use the latest, best technology, to provide the most accurate data to the solar industry. They have a full range of solutions which can be tailor made for clients and cover an extreme range of temperature.

**PES:** Welcome to PES Solar, Derek. It's lovely to have you with us. To kick-start the interview, it would be good to learn a little bit about the background to Campbell Scientific. Could you give us an overview of when the company was founded and the services you offer?

**Derek Jones:** Campbell Scientific has been a trusted leader in measurement systems for over 40 years. Our top priority has always been to provide the most accurate, reliable data for research and industry.

We design and manufacture instruments using state-of-the-art technology, and we make them rugged, so they are reliable in harsh environments. For example, Campbell Scientific weather stations are currently on many of the highest mountain peaks in Europe (Mont Blanc), South America (Tupungato), and Asia (Mount Everest), and on August 16, 2020, a Campbell Scientific station recorded the hottest temperature on Earth, 54°C (130° F) at Furnace Creek, Death Valley, California, USA. So, as you can see, we go from extreme cold to extreme hot, and everything in between.

Campbell Scientific was organized in 1974 by two brothers, Eric and Evan Campbell, in Logan, Utah, USA.

The first product we marketed was the CA-9 Path-Averaging Laser Anemometer in 1974. The laser anemometer was followed in 1975 with the company's first data logger, the CR5 Measurement & Control System. Since the introduction of the CR5 in 1975, Campbell Scientific has manufactured and delivered more than 400,000 data loggers, also called data acquisition systems.

Building on decades of experience, we have developed increasingly powerful data acquisition systems that have achieved worldwide use in solar energy applications. Over the years, Campbell Scientific has also established itself as a reputable manufacturer of numerous related product lines for the measurement field, including a wide variety of sensors, as well as devices and software for the collection, storage, communication, and retrieval of data.

Through innovative product development, the manufacture of high-quality products,

and excellent customer support, Campbell Scientific endeavours to meet the instrumentation needs of our customers.

**PES:** Focusing on solar energy in particular, what solutions do you provide?

**DJ:** Campbell Scientific offers a wide range of solutions for the solar energy market. By using the rugged, reliable, and flexible data loggers we offer as the core to our systems, we can design for many different applications. We provide systems for solar resource assessment, power performance, and operational monitoring. Industry researchers also use our data acquisition systems for their research projects to advance the industry.

Recognized in the renewable energy markets for years, we have used the incredibly versatile and powerful CR1000 datalogger. Although now upgraded to the CR1000X, the platform retains the characteristics that made the CR1000 popular to begin with and adds many features that make it even more well suited to the solar energy market.

A few years ago, we released an industry-specific data logger, the MeteoPV, for use in systems that require a lower cost solution and have limited technical requirements. The MeteoPV, with its intuitive user interface, configurable nature, and POE capability is an ideal solution for making distributed measurements.



Derek Jones





**PES: Do your engineers provide customised solutions as well as off-the-shelf products and how does this work?**

**DJ:** Yes, we do. One of the strengths of Campbell Scientific is the versatility of our CR1000X and MeteoPV platform. As such, we are often designing custom systems for our clients. We commonly are asked to provide monitoring solutions for R&D arms of companies and research organizations that are working on cutting-edge products and industry innovations.

That being said, we have recently been leveraging our market knowledge and experience to develop customizable standard monitoring systems. Standardization will be beneficial to us and our clients by reducing design work and custom documentation, ultimately resulting in a system customized to the project needs at a lower cost with shorter delivery dates.

This standardization will also benefit clients with a large portfolio of Campbell Scientific systems as they will be more consistently similar across different projects.

**PES: Could you talk us through your product range briefly?**

**DJ:** Certainly. One such standard, yet customizable, system is the SunScout. This is a station we have developed for solar resource assessment (SRA) campaigns. It is a station designed with an eye toward easy field deployment, everything from installation to final site configuration. With our understanding of the requirements for SRA stations, we have been able to balance best practice measurement techniques with smart and efficient power supplies.

Earlier we mentioned the MeteoPV, a purpose-built PV resource data platform, ideal for distributed PV monitoring and functioning as a plane-of-array (POA), albedo, and soiling secondary weather station. We will continue to develop similar systems that incorporate industry best practices while being economical and easy to deploy.

We also provide a full line of meteorology, solar radiation, and back-of-panel temperature sensors and data tools that support data display and management, both PC- and Cloud-based.

**PES: What makes Campbell Scientific stand out from the competition? What benefits can your clients look forward to from working with you?**

**DJ:** The reason our systems have been selected by organizations across the world for both research and operational applications in the most extreme conditions is simply the reliability.

Our equipment was selected to monitor the weather from Mount Everest because of reliability; to monitor the flooding conditions of Harris County, Texas, USA because of reliability; to monitor the world's longest sea crossing, the Hong Kong-Zhuhai-Macao Bridge, because of reliability; to monitor the solar energy applications across the globe because of reliability—reliability that the data is accurate and reliability in the people at Campbell Scientific who you will be working with.

**PES: You mentioned your resource assessment station, the SunScout. What is this and when would someone need this type of station?**

**DJ:** Prior to procuring funding for a solar installation, the investors or bank want to know if the investment will pay off or if the loan is secure. Of course, this is very dependent on the harvestable solar energy at the site. Solar project stakeholders need the SunScout, an SRA station designed to provide the high-quality data required to justify investment in a large solar power installation.

We have been providing these stations to customers for many years as custom solutions. With the SunScout, we have taken the most commonly requested configurations and industry standard sensors, and built them into a single package that is easily configurable for most customers' requirements and sensor preferences. This versatility is possible because it is built on the backbone of the CR1000X datalogger.

**PES: Campbell Scientific is headquartered in the USA, but do you operate on a global level and, if so, in which countries?**

**DJ:** To better serve our customers worldwide, in 1980, we began to open offices across the globe. Today, we have offices in Australia, Brazil, Canada, China, Costa Rica, France, Germany, India, South Africa, Spain, Thailand, the United Kingdom, and the United States. With this global footprint, we have successfully executed solar energy monitoring projects worldwide.

**PES: How do the territories you operate in differ from each other? Do they have their own specific set of challenges and characteristics?**

**DJ:** We operate as a global company. Our renewable energy operations are directed and managed out of our corporate headquarters in Logan, UT, USA.

There are unique challenges to many different regions. However, having regional offices spread across the world allows us to be sensitive to regional and local conditions,

regulations, and specific needs.

Some regions of the world are just beginning to explore solar energy, where others are much more experienced. In both cases we can provide assistance to help the projects be much more successful.

**PES:** We've seen from your case studies that you have been involved in some exciting and wide-ranging solar projects in the past. Do any stick in your mind as being particularly challenging or interesting that you would like to share with us?

**DJ:** We have certainly been involved in many very interesting and exciting projects. One that comes to mind is a project in Chile. Solar energy resource assessment projects were conducted in many different territories by Solar Millennium AG, a global project developer for solar thermal power plants.

The developer's task entailed gathering radiation and climatological data to assess the suitability of particular locations. Their assessment task was complicated because the sites that Solar Millennium had to research and test were often in remote and inaccessible desert locations. Any equipment used to gather the data had to be rugged enough to withstand the harsh, remote environments.

In addition, because it was impractical and hazardous to retrieve the data manually from these locations, the equipment needed to have low-maintenance requirements, and the data needed to be remotely retrievable through a reliable and secure connection.

One location that Solar Millennium researched was in the Atacama Desert in Chile. For this solar energy resource assessment project, a variety of sensors were used: pyranometers, anemometers, wind direction vanes, temperature sensors with radiation shields, and tipping bucket rain gages.

To supply the necessary wireless communication solution, Solar Millennium contracted with Wireless Innovation. Wireless Innovation is a global provider of satellite solutions to the telemetry marketplace, has worked extensively in the renewables market, and has experience providing communication solutions that integrate with Campbell Scientific data loggers and LoggerNet software.

For the Atacama Desert project, Wireless Innovation designed and employed a communication solution that operated via the Iridium Low Earth Orbit (LEO) satellite network and a MiChroSat 2403 satellite modem. The Iridium satellite network provides complete coverage of the earth, enabling communication services to and from remote areas where other forms of reliable communication are not available or feasible. The MiChroSat 2403 modem allows data-logging solutions to be deployed securely and reliably in remote and hostile

locations where general packet radio service (GPRS) coverage is poor.

For their satellite data solution, Wireless Innovation integrated a number of our CR1000 dataloggers into the Iridium network. The CR1000 dataloggers were rugged enough to withstand the harsh, remote environment of the Atacama Desert, offered low-maintenance requirements, and integrated seamlessly with the satellite solution. Data retrieval via email was aided by the use of Campbell Scientific's LoggerNet software. Consequently, Solar Millennium was supplied with the detailed radiation and climatological measurement data they needed for their site suitability assessments.

**PES:** 2020 was a challenging year for everyone, but how has the pandemic impacted Campbell Scientific? Thinking of

**the solar industry generally, do you foresee any long-lasting changes as a result of the past year or so?**

**DJ:** In spite of the challenges, 2020 has been exceptionally good for solar energy and for Campbell Scientific. We have worked on several very successful projects this past year and see many more coming in the near and long-term future. There have been brief supply chain challenges in 2020, but mostly we have seen very positive growth.

We see no reason to believe that the industry as a whole will not continue to grow. Certainly, at Campbell Scientific, we have invested into this market and it is a key part of our long-term commitment.

**PES:** Much greater focus is being given to the potential for solar energy in creating more energy efficient and green-thinking



MeteoPV implementation





Roger Smith by station with solar panel

**societies. Have you seen this focus shift in the last five years or so and what do you think is driving this?**

**DJ:** Certainly, there is a drive toward more renewable energy sources to minimize our carbon footprint. But even with a more green-thinking society, success of alternative renewable energy sources is supported and made possible by reduction in costs. A recent report\* indicated the price of electricity from solar declined by 89% from 2009 to 2019. I think this is a huge driving factor. It's a better investment for producers.

**PES: What do you think the future holds for solar energy?**

**DJ:** Climate change is the defining issue of our time. The impacts are global in scope and unprecedented in scale. Irreversible, catastrophic changes to global climates and ecosystems are happening. Without drastic action, these effects will continue to become more pronounced and far reaching.

Obtaining energy from renewable sources, such as solar energy, is an important element in our fight against climate change.

As we continue to see decline in the cost of material for PV solar energy due to increased funding in technology, there continues to be

increased certainty of returns through maximized energy yield and controlled operational costs needed to convince governments and financiers that solar energy is a future worth investing in.

At Campbell Scientific, we are very optimistic that solar energy is a very viable source of renewable energy that will continue to develop.

**PES: And with the future in mind, what's next for Campbell Scientific? Can you share with us any current projects you are working on, or any plans for new services and solutions you may have?**

**DJ:** Without sounding too boastful, we can say without hesitation that we have mastered the art of making measurements. Now we are focussing our attention on providing actionable insights from these measurements.

This is easier said than done as our core products are used in a wide array of fields from environmental science, climate science, renewable energy, and micrometeorology to infrastructure monitoring. We are developing cloud-based systems where the measured data can be stored, processed, and accessed at the click of a button.

**PES: Finally, is there any particular aspect of the business or services that we haven't covered that you would like to focus on?**

**DJ:** Let's discuss the importance of accurate data. It can often be tempting to sacrifice data accuracy for lower cost equipment. A MET station is the least expensive item on a solar or wind energy farm. A great deal of attention is given to the quality of the sensors. And there are standards written covering what type of sensors should be used. Often, they fail to address the data logger.

Sensor quality alone is not enough if the data logger cannot measure the signals reliably and accurately or if its accuracy shifts with temperature or relative humidity, etc. It is in every stakeholder's interest to reduce the uncertainty in every measurement and this starts with the data logger.

This is the main area we take pride in. Our data loggers are not only rugged and reliable in extreme conditions. The accuracy specification provided for our data loggers are over a wide temperature range, making them the optimal choice for monitoring on solar energy installations anywhere.

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