

REUNIWATT PRESS KIT

Excellence in Forecasting

2021



CONTENT

1 FOREWORD1
2 REUNIWATT, A DARING AND INNOVATIVE PATH2
3 REUNIWATT IN THE PRESS6
Reuniwatt: Innovation in the service of solar energy6
Joint efforts : Adapting solar applications to current challenges7
Hybrid: Energy transition for a rainforest community 11
Off-grid: Decarbonising industrial production
Reuniwatt multiplies contracts in solar forecasting 15
PARCS: Helping authorities map their energy transition 17
4 CONTACT US 19

1 FOREWORD



NICOLAS SCHMUTZ, FOUNDER AND CEO OF REUNIWATT

"At Reuniwatt, we are committed to offering cutting-edge cloud observation solutions adapted to current challenges. To do this, you have to dare to leave your comfort zone and think big.

Founded more than a decade ago, it was our goal as a pioneer in solar forecasting to develop the best skills in earth observation to provide solutions for a massive and secure injection of photovoltaics into the grid. Today, we are delivering cutting-edge technology for the solar industry through our monitoring and forecasting systems, from a few minutes, to a few hours, to a few days ahead. Sky InSight[™], our patented sky imager, has proven to be the best-in-class solution for local 5-minute ahead solar forecasting. We use satellite imagery to provide intra-day forecasts. To complete our services, we offer day-ahead (and up to one-week ahead) forecasts using meteorological models coupled with artificial intelligence.

Our proficiency is also requested by other sectors, such as Space & Defence and Atmospheric Sciences."

Nicolas Schmutz

2 REUNIWATT, A DARING AND INNOVATIVE PATH

Created in 2010 on Reunion Island, Reuniwatt has become one of the world leaders in cloud observation and forecasting. Our headquarters are located in Reunion Island with two offices in Paris and Toulouse. The company has 20 employees.



Thanks to its solid research work, Reuniwatt offers highly reliable and comprehensive services for a wide range of applications. Our core markets are renewable energy, atmospheric sciences, and defence and space.

Our continued investment in R&D, as well as our development of strong scientific partnerships (Mines ParisTech, Deutscher Wetterdienst...), have enabled us to achieve a high level of recognition in the evaluation and forecasting of renewable energies, while mastering the use of technologies such as meteorology, remote sensing, artificial intelligence and satellite data processing.

In our determination to support the construction of a more sustainable world through innovative ideas, Reuniwatt has taken up the challenge of assisting public players in the assessment of their initiatives in the field of renewable energies (and more particularly photovoltaic energy). We have consequently launched a new project: PARCS, a PV atlas for governments and local administrations. This innovative project has enabled Reuniwatt to be awarded the 6th call for projects proposals on "Energy and Climate" launched by IGN*fab* in 2021.



Innovation is the motor of success for Reuniwatt, which is why we have a firm commitment to invest in research and development.



More than 300 000 hours of R&D

More than 80 scientific publications



5 patents published

European Horizon 2020 champion





French Tech 120 label for two consecutive years (2020 and 2021)

Winner of the 6th call for projects launched by IGN*fab* in 2021 with the PARCS project



Our products and services allow to effectively manage a multitude of renewable sites from project development to operations.



SOLAR FORECASTING

Our proposal of irradiance forecasts ranges from 1 minute to 7 days in advance. Firstly, we propose the InstaCast^m intrahour forecasting service which is a software associated to one of our sky imagers, allowing to obtain irradiance and solar production forecasts for the upcoming minutes for a certain location. For longer forecasting time horizons, we propose HourCast^m (10 to 15 minutes to several hours ahead thanks to the processing of high-quality raw satellite images) and DayCast^m (from 6 hours to 7 days in advance thanks to a combination of numerical weather models and artificial intelligence to better take into account local weather phenomena).

When integrated within a smart energy management system, solar forecasts enable a better anticipation of energy flows. Thus, **the curtailment of solar power can be minimized to achieve an optimal exploitation of the solar potential** and reduce fuel consumption in diesel-PV hybrid installations. The use of solar



energy, which relies on weather conditions, sets additional challenges for grid operators,

which must adapt the existing energy structure to integrate an increasing share of renewable energy sources. **Forecasts are essential to achieve a smooth grid integration of solar power** while maintaining the same level of quality (voltage and frequency) and of reliability (avoiding blackouts) in supplying electricity. The forecasts also help improve energy trading activity's profitability.

Solar portfolio management can require real-time estimations of the solar irradiance over an ensemble of plants or plant-specific forecasts of the solar power generation, or health-checks of the solar assets to detect malfunction.



SOLAR DATA

We also provide satellite-based solar resource assessment solutions: SunSat[™] Time Series to get access to historical solar data worldwide, SunSat[™] live to obtain "live" irradiance/power production estimations and SunSat[™] Digital Twin to check the

performance monitoring of plants. Irradiance data represent a very useful KPI, because they are used to verify production, yield, availability and performance, and allow to optimally plan O&M activities.



3 Reuniwatt in the Press

Reuniwatt: Innovation in the service of solar energy

	Media Source: CNBC
	Date: May 10, 2019
	Author: Anmar Frangoul
	Title: A firm on an island in the Indian Ocean is developing cutting-edge solar tech
	Link: <u>https://www.cnbc.com/2019/05/10/a-business-in-the-indian-</u> ocean-is-developing-solar-forecasting-tech.html

The Sun has been around for roughly 4.5 billion years and is crucial to life on Earth, providing our planet with an abundance of light and warmth. As technology has developed, humans have come up with increasingly sophisticated methods of harnessing the Sun's vast energy.



Nicolas Schmutz in the interview with @CNBC Sustainable Energy

One such way is through solar photovoltaic systems, which directly convert light from the sun into electricity. While the potential of solar power is clear, there are undoubted challenges too. According to the U.S. Energy Information Administration, these "limitations" include the fact that "the amount of sunlight that arrives at the Earth's surface is not constant." The EIA adds that several factors — from location and the time of day to weather — influence the amount of sunlight on the Earth's surface. There are ways to overcome such issues, though. On Reunion Island, a French island located in the Indian Ocean, one firm specializes in solar energy forecasting and develops technology to "improve the short-term predictability of solar generation."

Called Reuniwatt, the business offers a range of services including day-ahead, intra-day and intra-hour solar forecasts. The firm has worked on experiments in the U.S. alongside the National Oceanic and Atmospheric Administration and its technology is also being used by solar projects around the world. In February 2019, for example, the Moroccan Agency for Sustainable Energy chose to use the firm's forecasting services for photovoltaic and concentrated solar power plants.

Caroline Lallemand is a geographic information system engineer at Reuniwatt. "In order to measure, then forecast, solar energy, Reuniwatt uses a multitude of data sources: satellite observations, weather models, ground sensor measurements and sky images," she told CNBC's "Sustainable Energy." "I design the pipelines to collect, clean, aggregate and share the data with the rest of the team," she added. "The goal is to make sure that the forecasts that we send to our clients are always the most accurate."

Joint efforts: Adapting solar applications to current challenges

Reuniwatt is part of the consortium of TRUST-PV, a 4-year EU-funded research project aiming to achieve better reliability of solar PV components and systems. The following article highlights the diverse expertise brought together in this 12 million Euro project.



Companies from the entire PV value chain will combine and digitalise their learnings in a holistic plan to raise power plant yields and reduce downtimes.



The European Commission is funding TRUST-PV with over 12 million Euro grant value

A new collaboration between PV companies in Europe looks set to raise standards for plant build and operations. The TRUST-PV initiative will bring together companies from the entire PV value chain to combine technology advances with industry learnings. Around 20 suppliers, developers, operators and data experts will work together to improve PV performance and reduce the levelised cost of energy (LCOE). The four-year project will last until 2023 and has received 12 million euros (\$14.5 million) from the European Union. The partners will use digitalisation to connect learnings in design, modelling, monitoring and inspections, David Moser, project coordinator at Eurac Research, told Reuters Events. This will allow the tracing of performance issues at a "single component level" and the creation of digital twins for better modelling, Moser said. 3D design and BIM (building information modelling) will be used to create more accurate yield assessments and improve inspection efficiency and fault prevention. The partners aim to increase the yield of solar plants by over 10% and reduce downtimes by 80%, he said. The project has been set up to foster collaboration between specialist domains. Experts in operations and maintenance (O&M) and asset management will be involved from the start of the supply chain process, Emanuel Vallarella, research engineer at technology group Huawei, another TRUST-PV participant, said. Reduced component degradation should also lengthen plant lifespans, compounding the benefits for plant owners. The gains made through the project should increase the internal rate of return (IRR) for large-scale plants by 50%, Moser said.

Conversion costs

The TRUST-PV participants will be responsible for different elements of the project and will feed results into a decision platform supported by AI. Costs will be assigned to actions and the AI will be "reinforced" by operator feedback, Moser said. Improvements in monitoring and diagnostics will reduce PV inverter costs, Carmelo Connelli, project manager at Enel Green Power, a plant operator and TRUST-PV partner, said. Inverters convert direct current (DC) from solar energy into alternating current (AC) for the power grid and represent 5 to 10% of utility-scale solar costs. Inverters are typically replaced at least once over the lifetime of the plant and make up around a quarter of O&M costs, according to data gathered by the US National Renewable Energy Laboratory (NREL) in 2018. Inverter suppliers are constantly improving their technology, offering higher voltage, improved access and better control functionality. The TRUST-PV partners will look to integrate automatic or semi-automatic diagnostics and field inspection processes in inverter hardware and software. Aerial imaging and other techniques will also be used to avoid disconnecting systems. Many large solar operators are now using drones to speed up inspections at large sites and reduce labour costs. The project partners will also aim to identify the optimal DC to AC ratio in terms of output and inverter reliability, Roland Huempfner, head of Huawei's European energy competence centre, told Reuters Events. A high DC to AC ratio increases inverter utilisation and can offer a more stable electricity injection but it can also impact inverter reliability, Huempfner said. "There needs to be further study on the stress that the inverter has with a high DC/AC ratio in different climate conditions - temperature, altitude, humidity,..." he said.

Predictable power

The research will also help operators manage intermittency as subsidies expire and wholesale market risks grow. Large fleet operators and utilities are increasingly turning to advanced forecasting and analytics solutions to mitigate swings in solar and wind resources. TRUST-PV partner Reuniwatt will use cloud forecasting to optimise short-term operations. The company uses images from infrared all-sky imaging cameras and analytics to improve intra-day solar forecasts. Historic data and algorithms are used to predict near-term production. "When you have clouds passing above a PV plant, production can drop by 80% in seconds, so it's crucial to know this in advance," Marion Lafuma, business development manager at Reuniwatt, said. Better forecasting of this power drop will improve plant management and the sizing of batteries on storage projects, she noted. Separately, Reuniwatt is using satellite data to forecast solar production up to six hours ahead and will feed these results into the project. The collaborative approach to TRUST-PV should also reduce the cost of capital and boost investments in new projects, Vallarella said. The new performance standards established by the project could "set the path to an ever-decreasing LCOE," he said.

Hybrid: Energy transition for a rainforest community

The power plant for rural electrification in Oiapoque, Brazil, has been a flagship for hybrid power plants worldwide, consisting of a 3.3MWp capacity PV power plant and a 12.5MW capacity thermal plant. Reuniwatt's sky-imager SkyCam Vision was installed at the site and provides forecasts every 30 seconds.



French companies Voltalia and Reuniwatt have partnered to make the maximum use of a solar plant owned by Voltalia in Oiapoque, Amapá, thanks to the imagery that will be collected using an all-sky imager by Reuniwatt.



Solar power plant for rural electrification in Oiapoque, Brazil

Reuniwatt has created a series of algorithms that enable advanced image analysis and consequently make solar forecasts based on the movement of clouds that interfere with the performance of a photovoltaic plant.

One example for this technology is the sky imager developed by the company, which is able to collect images and forecast solar irradiance and power production in the following minutes. With this equipment, Voltalia will begin using short-term solar forecasts that will help achieve greater photovoltaic penetration in its solar hybrid plant. In this particular case, Voltalia will use Reuniwatt's Sky Cam Vision™ camera, which takes pictures of the sky every 30 seconds.

Voltalia's solar plant in the municipality of Oiapoque has an installed capacity of 4 MW and is part of a hybrid project, which also includes a 12 MW thermal unit and will add a 7.5 MW hydroelectric plant in 2021. The Oiapoque solar plant provides electricity to the urban and rural areas of the municipality, optimizing the existing infrastructure and reducing the project's operating costs with a reduction in the use of diesel fuel.

The Oiapoque project will be the first hybrid system in the world to include three power sources and a sky camera for immediate weather forecasting (anticipated for the next several minutes). The Sky Cam Vision will provide information about current and upcoming local meteorological conditions. Therefore, during the day, the thermal generators will run at a partial load, reducing the consumption of fossil fuels needed to power the microgrid. The sudden shortfalls in solar output caused by cloud movement can be detected in time to optimize plant operations.

Off-grid: Decarbonising industrial production

Solar energy can substitute up to 30 to 40% of annual fuel consumption in off-grid installations. To achieve such penetration rates, the PV power plant at Fekola Mine in Mali is combined with storage and a forecasting system, which play a key role in the energy management of the hybrid power plant.



B2Gold's Fekola mine in Mali ranks as one of the biggest gold mines in Africa, producing around 600 000 oz of gold in 2020.



This article first appeared in Mining Elites in Africa 2021

It is powered primarily by three Heavy Fuel Oil generators but these will soon be supplemented by 36 MW of solar power. The solar project, which will include a significant battery storage component of 17 MW, is costing approximately US\$38 million and will result in one of the largest off-grid hybrid solar/HFO plants in the world.

When B2Gold announced last year (2019) that the project had been approved, it said the new installation - which will have over 92 000 solar panels and more than 1 100 trackers - would allow the HFO generators to be shut down during daylight hours, resulting in a saving of just over 13 million litres of HFO per year and a reduction in processing costs of approximately 7%.

Among the companies contributing to the project are Suntrace and its partner BayWa r.e, which have been contracted to assist B2Gold during the implementation phase with detailed engineering, procurement support and support during construction and commissioning. The Finnish technology group Wärtsilä has been selected to design and engineer the cutting-edge storage system which will be based on the company's GEMS energy management solution, now in its sixth generation. The GEMS technology will not only control the energy storage system but the 36 MW solar plant. In addition, it will continuously optimise energy production for the entire mine to ensure the lowest Levelised Cost of Electricity (LCOE) while at the same time securing grid stability and maximising uptime.

Solar forecasting is an important aspect of the project and this service will be provided by French company Reuniwatt. The forecasting system will continuously provide forecasts of the solar plant's power output using data from a locally installed high-class sky camera and advanced satellite-to-irradiance technology. The sky camera will be able to forecast sudden drops in solar radiation, allowing actions to be taken to ensure a stable power supply.

B2Gold was planning to have the solar project commissioned in Q3, 2020 but the project was delayed by a few months as a result of COVID-19. Remobilisation of the solar plant construction group began in mid-September 2020 (following a temporary suspension of construction activities in April 2020 due to COVID-19) and will continue to ramp up as camp space becomes available. The target date for completion of the solar plant is the end of the first quarter of 2021.

The new hybrid plant at Fekola will be B2Gold's second in Africa. In 2018 the company commissioned a 7 MW solar plant in Namibia, which it described at the time as "one of the first fully autonomous hybrid plants in the world."

Reuniwatt multiplies contracts in solar forecasting

	Media Source: Les Echos (Original language: French)
	Date: November 4, 2020
	Author: Bernard Grollier
	Title: Reuniwatt multiplies contracts in solar forecasting
LesEchos	Link: <u>https://www.lesechos.fr/pme-regions/outre-mer/reuniwatt-</u> multiplie-les-contrats-dans-la-prevision-solaire-1261839

The Reunion-based company has developed innovative solar forecasting methods for photovoltaic power plants, which have won it contracts all over the world.



Reuniwatt's know-how: Predicting the sunshine above solar power plants, and thus their production curve.

A few weeks ago, Reuniwatt signed a major contract with Enel Green Power, the world's third largest producer of photovoltaic electricity. The Reunion-based company (20 employees) had already convinced Terna, the Italian electricity distributor, and the Brazilian town of Oiapoque, in the Amazon, to supplied with electricity from the sun. It recently

equipped a 300-megawatt power plant in California and is participating in the piloting of Noor, the concentrated solar power plant in Ouarzazate, Morocco.

Good working order

Its business is forecasting the sunshine above the power plants, and therefore their production curve. These forecasts improve producers' chances of seeing their energy injected into the networks, and therefore paid for, and avoid load shedding for those who self-consume their electricity. The solar irradiance data, compared to the actual production, also allows to check whether the installations are working properly.

Reuniwatt was created ten years ago by Nicolas Schmutz, an energy engineer who had just participated in the launch of several power plants in La Réunion. His small team quickly acquired a unique expertise, developing sky observation methods, satellite data analysis methods and weather forecasting models. In 2014, Albioma put their trust in him: The startup equipped the first solar power installation on a hypermarket in Reunion. Having relied on a laboratory at the island's university, Nicolas Schmutz began recruiting engineers and opened a second office in Paris, while mobilizing all the possible support mechanisms for the firm's innovation.

Admission to the French Tech 120

Ten years after its creation, its turnover has exceeded one million euros. "We have achieved a technological lead protected by four international patents, but we are not resting on our laurels," he says. Reuniwatt is now focusing on artificial intelligence to get the most out of its data processing calculations. Its founder is delighted with his admission to the French Tech 120 list at the beginning of the year. It gives the company significant visibility at a time when he needs to convince investors to support the company's growth, even though this trend has been slowed down by the pandemic. However, there is no question of Nicolas Schmutz leaving his base in Reunion: in the South of the island, in Saint-Pierre, his team of engineers will continue to work just a stone's throw from the beach.

PARCS: Helping authorities map their energy transition

In 2021, Reuniwatt has been a proud winner of if the IGN's project accelerator IGNfab with their innovative solar power atlas PARCS. The Paris Est Marne&Bois territory has been the first territory in France to set up a pilot project with Reuniwatt and bring PARCS to life.

	Media Source: PV Magazine France (Original language: French)
	Date: February 4, 2021
	Title: Reuniwatt's "PARCS" project selected for the 2021 edition of the IGNfab
pv magazine	Link: https://www.pv-magazine.fr/2021/02/04/le-projet-parcs-de- reuniwatt-selectionne-pour-ledition-2021-de-lignfab/

For its 2021 edition, IGN*fab* - the geoservices project accelerator of the French National Institute of Geographic and Forestry Information (IGN) - has selected PARCS (Photovoltaic Atlas Remotely Captured from the Sky) by Reuniwatt, a mapping project to facilitate the monitoring of solar installations.



Reuniwatt's solar cartography PARCS

The French company Reuniwatt has developed "PARCS" in order to establish an accurate and up-to-date mapping of solar installations based on the processing of satellite and aerial images. The project's objective? To facilitate the monitoring of solar installations and, in the long term, to help local authorities better anticipate variations in photovoltaic production. Selected for the 2021 edition of the IGN*fab*, "PARCS" will thus benefit from the IGN's expertise, network support and #GeodataForTheClimate data. While this partnership will allow Reuniwatt to use IGN's data and techniques, Reuniwatt's expertise will help strengthen the institute's position as a recognized scientific hub and a key player in France's digital transformation.

PARCS, a cartography adapted to French territories

The PARCS project will provide the most complete, accurate and up-to-date map of solar installations in a selected area, with a methodology well adapted to French territories. Within the framework of deployment and performance monitoring, this atlas of solar installations will be exploitable in a standard GIS (Geographic Information System) format. It will allow: An overview of PV installations on the territory, an annual follow-up of the evolution of the solar park, as well as a decision support tool to identify priority areas for the penetration of renew territories.

4 CONTACT US

Headquarters 14, rue de la Guadeloupe 97490 Sainte-Clotilde - La Réunion Paris Office 73, Avenue de Paris 94165 Saint-Mandé Toulouse Office B612 - 3, rue Tarfaya 31045 Toulouse Cedex 5

Telephone: +33 977 216 150

www.reuniwatt.com





Webinars and further information are available on the Reuniwatt website.



Marion Lafuma

Business Development and Marketing Manager

marion.lafuma@reuniwatt.com

+33 7 54 39 14 20





