

Data disarray: Why solar is not fulfilling its potential

Big Data | Given the significant wealth of data available from an energy generation asset today, it's perhaps easy to overlook the availability and value from around the asset as well. Katie Applebaum, business development manager at Clir Renewables, explains why this 'data disarray' is preventing solar assets from reaching their full potential.



Credit: Huawei

Solar projects across the world are underperforming. In some cases, projects miss production budgets by more than 10%. Despite these startling figures, the underlying assumption that solar projects are doing 'just fine' persists within the industry.

While new solar capacity is being installed at a rapid rate, asset owners are continuing to realise much lower returns than if a project met its full potential. Addressing the disparity between the solar industry's potential and its current performance is key to furthering the technology's rise as a globally preferred generation type.

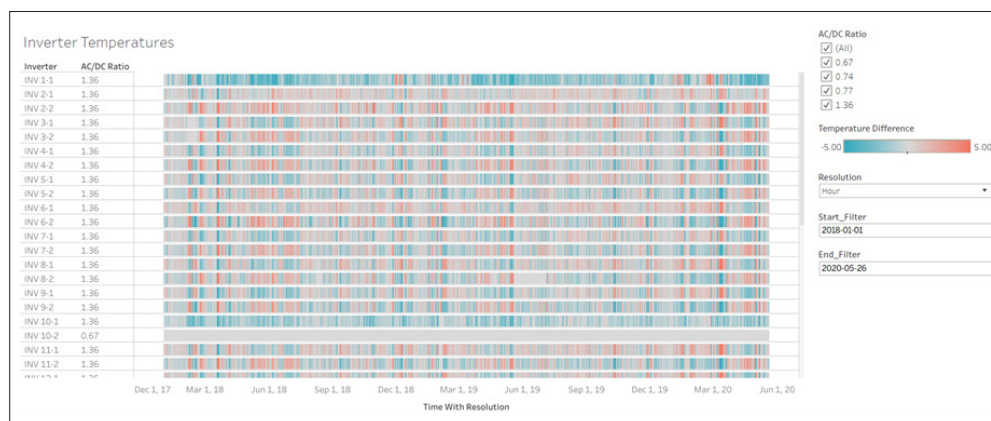
Renewable energy is typically considered difficult to assess for project losses due to the intermittency of resource. Energy production fluctuates in line with the strength of wind or solar irradiance, and this can overshadow the impact of small but consistent technical issues. However, even if these technical problems do not progress into more extreme damages, these quiet losses can ultimately build up and significantly impact revenue over the project's lifetime.

Solar is particularly prone to small but significant project losses due to the

Data from multiple sources can be valuable from an asset performance perspective.

passive nature of the technology. In wind projects, small electrical or mechanical issues are taken very seriously as many defects, particularly those present in rotating components, can result in catastrophic failure if ignored. On the other hand, solar assets tend toward less dramatic breakdowns, reducing pressure on the operator to promptly attend to issues.

Solar PV components can suffer from a range of technical issues, many of which may not necessarily result in downtime but will instead impact energy production - for example, tracker misalignment



A chart showing the fluctuation of inverter temperatures on an operational solar system over time.

can result in reduced power generation at specific times of day. An additional, subtle cause of underperformance is poor electrical health – inclusive of voltage, signals, and temperatures.

There are also physical influences on-site that can hinder the performance of solar panels. For example, the growth of vegetation nearby, hot-spot failures, and severe weather can reduce performance over time without the owner realising their assets are actively being damaged. These failures are not picked up directly by faults or statuses in the SCADA system and so can often be mistaken for simple fluctuations in resource.

Often, solar underperformance does not come down to a single point of failure but is caused by the interaction of the environment, electrical health, and component errors across the PV module or array more widely. This means that understanding the root of the issue and the actions required to solving it demands analysis of multiple data sources.

Multiple data sources

To identify, quantify, and ultimately fix solar underperformance at a project level, owners must analyse data across the entire system in that project in the context of data from the surrounding environment. Not only does this mean gathering multiple data streams, but it also means gathering data that has been recorded in different formats or “languages” – a discrepancy that is common due to differing formatting preferences between OEMs. In order to enable accurate comparisons of performance, these disparate data streams must first be “translated” into a uniform dataset.

In practice, this disparity has resulted in a concerning degree of inattention when it comes to realising the benefits of data analytics. When owners dedicate in-house resources to assess project or portfolio data, the many hours of collating, translating, and finally analysing data from all asset types and sources can often exceed the potential gains in returns that optimisation can bring.

Without the technology or resources to effectively translate, integrate and analyse this data quickly, owners are left in the dark as to whether their asset is performing as it should be.

This has the potential to impact project financing, as while a reluctance to address the data challenges behind performance inefficiencies exists, owners are unable to reduce uncertainty around the forecasted energy output of their sites. With unnecessary performance losses accumulating, there remains a concern that potential investors cannot have full confidence in projected gains from solar projects.

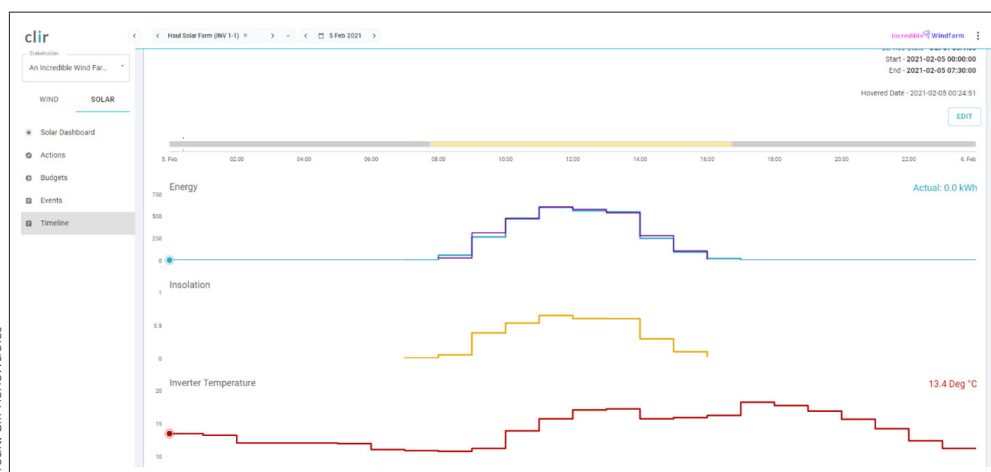
Clir is working with a number of owners and operators to pull data from projects into a common model for analysis and generation of optimisation insights. This includes consideration of:

- Current and historical meteorological data,
- Surrounding forestry and vegetation,
- Operational and grid activities,
- Device-specific SCADA data from the individual asset.

Once all this data is translated into the common data model, we use machine learning to compare assets on a like-for-like basis. From this analysis, we can pinpoint not only instances of underperformance but the root causes, providing owners with the information needed to increase energy production, target O&M activities and validate financial decisions around the asset.

It is important to note that while asset owners are limited to comparing performance across the sites or assets in their portfolio, we are able to accurately benchmark their assets across their full portfolio of solar farms onboarded. With the use of data analytic techniques such as machine learning, the platform gets “smarter” the more data it ingests, enabling more rapid identification of underperformance and likely causes based on an ever-increasing bank of global solar PV module, array, and portfolio data.

The outlook for solar power is optimistic, and once owners harness the latest technology to monitor, assess, and optimise their assets – regardless of manufacturer – they will be able to unlock the full potential of the technology as an energy and revenue generator.



An example of the analysis undertaken on a site-by-site basis, indicating performance and inverter temperature in a single view.