Case Study:

OREGON NATIONAL GUARD, CHRISTMAS VALLEY

System Stats

System capacity	149.9 kWp
Type of system	Rooftop 10° fixed tilt module
Product	SW 235 poly
Date of Commissioning	November 2011
Location	Oregon National Guard; Christmas Valley, OR

This 150 kWp rooftop system serves the Oregon National Guard in Christmas Valley, Oregon. The system stands on three emergency response support facilities and has been performing well above expectations during the first seven months of operation. Actual energy output has exceeded predicted energy output by 12%.

Seven month energy yield (kWh/kWp)	757
Performance ratio	92%
Actual/predicted energy output	112%

NOTE: Values above are based on monitoring data spanning 7 consecutive months in service. Normalization based on measured irradiance values was used in the analysis. SolarWorld is not responsible for the O&M of this system.

The Key Metrics of Solar

The revenue generated from a PV system is wholly dependent upon its energy output, over the full 25-year lifespan of the system. Therefore, the key metrics for evaluating a PV system and a solar panel should be based on:

- Energy output
- Real-world performance

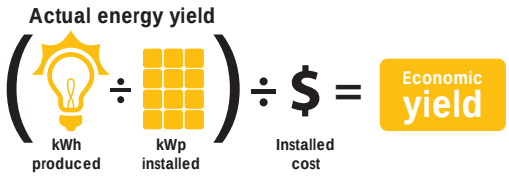
Two key parameters that provide this information are the **Energy Yield** for a particular site and the **Performance Ratio** of a solar panel or system. Both of these measures are based on data collected from systems in the real world, and both measures account for energy produced—not power measured at standard test conditions. By using standard performance parameters and system ratings based in reality, it is easier for investors to evaluate different proposals and technologies, giving them greater confidence in their own ability to procure and maintain reliable, high-quality systems while generating expected project returns.

Energy Yield

The rooftop system in Christmas Valley has delivered an average energy yield of 757 kWh/kWp during its past seven months of service. For every watt of power installed, on average, almost 0.76 kWh of energy were produced.

About Energy Yield

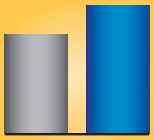
The value of a project is driven by the amount of energy that can be produced from the amount of power installed. Energy Yield (kWh / kW) is a proven metric to evaluate system performance, and compare the predicted and actual energy produced by PV systems of differing size for a given site. It is based on real-world conditions, with site-specific solar radiance and weather conditions taken into account, which makes it a better predictor of true performance than efficiency measured in laboratory conditions. The yield on energy has a direct impact on the financials of a project and can be used to calculate the "Economic Yield" of the system:



Performance Ratio

The Christmas Valley PV plant performance ratio with the SW 235W modules is 92% over seven months. This outstanding achievement is considered "first in class" by today's industry standards.

Current industry standards – 80%



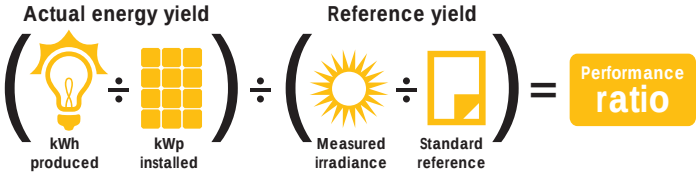
SolarWorld modules (7 month exposure) – 92%

About Performance Ratio

Another good measure of real-world performance is the Performance Ratio (PR). The PR essentially normalizes the Energy Yield for a system over the irradiance measured at the location of the system. This allows an investor or EPC to compare systems that may differ in design, technology and geographic location.

By normalizing the data with respect to the actual irradiance, it quantifies the overall effect of losses on the rated output potentially caused by inverter inefficiency, wiring, soiling and more. Unlike efficiency, PR uses real-world data to judge the performance of a module and power plant. Because of this, PR provides more confidence in ultimate financial returns when selecting solar panels for a project.

The industry standard for a high-performing system is up to 80%. The closer the PR value is to 100%, which cannot be achieved due to unavoidable losses, the more efficiently the PV plant is operating.

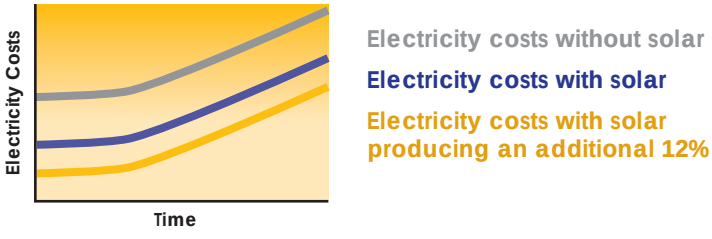


Predicted vs. Actual Performance

Engineering, procuring and constructing a large-scale PV system is a complex undertaking. It also comes with a certain level of risk in terms of delivering on the expected energy output and revenue. Sound system design that follows industry best practices and the selection of reliable equipment for each project are paramount to meeting stakeholder expectations.

Over the past seven months, the Christmas Valley system on average has outperformed the predicted design by 12%. This incremental, extra output of energy:

- Provides additional unexpected revenue
- Improves the ROI for the project
- Reduces the payback period



SW-02-5155US-CHR 7/12