Photovoltaic module quality has remained high even as module prices have declined.

Scientists at the National Renewable Energy Laboratory (NREL) have analyzed the annual performance data from almost 50,000 photovoltaic (PV) systems that total 1.7 gigawatts of capacity installed in the United States from 2009 to 2012. The overall conclusion is that the vast majority performed as expected.

Since 2009, the price of PV modules has fallen dramatically—and with this drop has come concerns about whether the quality of modules and systems has decreased significantly. However, NREL’s analysis of Section 1603 of the American Recovery and Reinvestment Tax Act of field performance, reliability, and durability will enable investors and consumers to quantitatively assess any risk of subpar performance.

Significant findings include the following:

- About 90% of the systems with no reported issues produced more than 90% of the predicted electricity.
- Between 2% and 4% of all systems reported problems that caused some underperformance.
- Delays and interconnection issues dominated project-related issues—particularly in the first year—but were reported in less than 0.5% of all systems.
- Hardware-related issues were dominated by inverter problems (<0.4%) and unspecified repairs.
- Underperforming modules were reported in less than 0.1% of all systems.
- Many reliability categories showed a significant decrease in occurrence from Year 1 to subsequent years. This result emphasizes the need for higher-quality installations, as well as for improved standards development.
- Systems that used the NREL tool PVWatts to generate the predicted production showed significant overproduction, suggesting a more accurate default derate value of about 0.83.
- The data were consistent with the assumption of historical degradation rates of about 0.5%–1% per year, but not significantly higher.

In summary, NREL found that the vast majority of PV systems perform well despite recent declines in PV module prices.

Technical Contact: Dirk Jordan, dirk.jordan@nrel.gov