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Improving the Quality and Safety of Solar PV Systems in India

PACE – D 2.0 RE is set out to formulate and implement a framework for enhancing DPV Quality and Safety for India. The aim is to ensure that the designed framework will not only ensure that the developers buy the right components but also certify that these components have been tested for quality and safety, and conform to the requirements set out under the desired standards.

BACKGROUND

In India, the quality and safety of rooftop solar photovoltaic (PV) systems—and their installation—have become a concern for investors, regulators, consumers, and distribution companies (DISCOMs). More and more engineering, procurement and construction contractors, installers and suppliers are cutting prices in order to be competitive and win jobs. As a result, contractors and installers often degrade the quality of the components, the systems, and the workmanship which comprises the amount of energy generated by the system and its lifespan, as well as endangers the safety of the distribution network.

Policymakers and regulators in India have already developed and prescribed standards for solar PV projects. However, existing standards only address component issues. They do not address issues with workmanship, installation, and grid integration. In addition to the gap in quality standards, there is a capacity gap. Most contractors and installers lack the proper knowledge or experience to produce quality systems and complete quality installations. Also, most consumers are unable to make informed decisions on the quality of solar PV rooftop installations. Consumers aren't able to effectively evaluate vendors' work due to the complexity of the installation process and the large number of system components. Similarly, the grid engineer who inspects the installation, may not be well equipped to advise installers and customers on the quality of the system.

Given the nature of these projects (small capacity and large numbers), Indian states, DISCOMs, and lenders have limited ability to monitor and enforce existing standards and guidelines for equipment and installation.

A NEED FOR QUALITY AND SAFETY STANDARDS AND AN IMPLEMENTATION FRAMEWORK

Performance and safety concerns reduce investor and consumer confidence, placing the success and sustainability of solar PV projects at risk. Given that 40 percent of India's national renewable energy targets of 20 Gigawatt (GW) of grid connected solar power by 2022 is to be attained through solar rooftop deployment, this lack of consumer confidence could also derail India's path to achieving its renewable energy goals.

A single national standard that addresses PV components as well as their workmanship and installation are needed to achieve the quality and safety of solar PV systems. A rigorous system of testing, monitoring and performance mapping is also needed.

Through the Partnership to Advance Clean Energy Deployment (PACE-D 2.0 RE) program, the U.S. Agency for International Development (USAID) developed the Quality Assurance Framework, which has three recommendations on how to improve the quality of solar PV systems, their components, the installation, operations and maintenance during the life of the system, and the safety of the financed energy systems.

The Quality Assurance Framework recommendations were laid out in a report by USAID and the National Renewable Energy Laboratory, "Distributed Solar Quality and Safety in India," which was released in May 2020. Recommendations in the report were informed by extensive interviews and surveys with developers, engineering, procurement and construction contractors, installers, suppliers, bankers, consultants, and manufacturers in India. The Quality Assurance Framework's recommendations were also informed by industry reports and desk-based research.

USAID QUALITY ASSURANCE FRAMEWORK

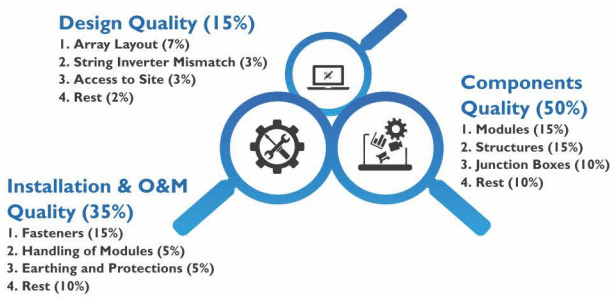
The Quality Assurance Framework creates quality and safety measures throughout the three stages of solar PV systems' deployment.

- In the pre-installment stage, inspection agencies will provide electrical safety quality assurance by conducting a set of tests on a random sample of the PV module assembly lines to ensure conformity to quality and safety requirements.
- In the installation stage, DISCOMs will conduct inspections to ensure PV module quality assurance. DISCOMs will be responsible for checking the STAAD certification of structures, ensuring that the junction boxes and the E&L Protection meet the required standards, and ensuring adequate site access.
- In the post-installation phase, a Vendor Rating Framework will require mandatory certification of installers and measure the compliance of the system against a specific set of standards to be determined by the Ministry of New and Renewable Energy (MNRE), the state regulatory commissions, and the DISCOMs. It will also create an online resource for consumers, investors and developers of solar PV rooftops that will monitor, evaluate, and rate vendors' work quality.

The Quality Assurance Framework will help raise consumers' awareness, ensure the use of quality products, and bring to light the importance of quality workmanship. The Quality Assurance Framework will help ensure the long term health of the renewable energy sector, grow the market and achieve India's ambitious policy targets.

UNDERSTANDING SOLAR QUALITY AND SAFETY ISSUES IN INDIA

According to the recent USAID and National Renewable Energy Laboratory report, most of the quality and safety challenges occur either at the component procurement stage (50 percent of stakeholder interview respondents) or the installation stage (35 percent of stakeholder interview respondents). Within the three stages, it was found that some specific areas caused a high proportion of challenges. For example, in the case of design quality,

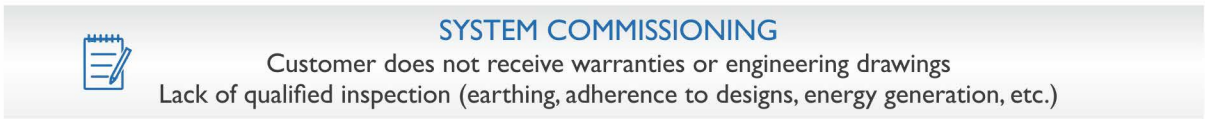


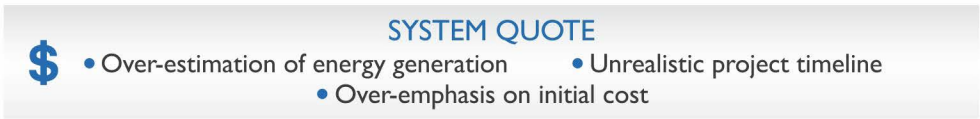
Occurrence of specific areas across each stage which result in quality challenges

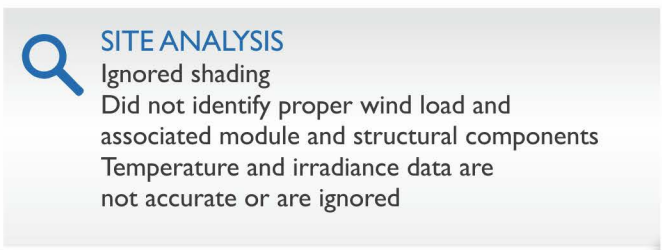
almost half the quality challenges stemmed from the array layout mismatch. In case of component quality, the major area of concern was the modules and the module mounting structures, and in the installation phase the main quality issues were related to fasteners, handling of modules and earthing.

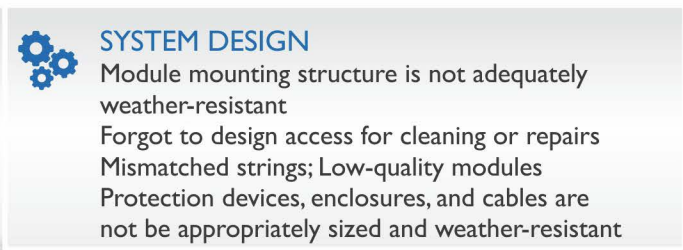
The National Renewable Energy Laboratory report identified major and frequently observed issues related to the quality and safety of grid connected solar rooftop PV systems in India. The diagram below captures some of the most severe and frequent solar quality and safety issues organized by category or stages of a PV system life. While some issues may have a relatively low impact on energy generation, their impact on safety can be high.

KEY CHALLENGES IN DISTRIBUTED PV QUALITY AND SAFETY
GOAL: HIGH ENERGY YIELD, LOW COST PV SYSTEM









PACE-D 2.0 REACTIVITIES

PACE-D 2.0 RE is in a partnership with the MNRE, DISCOMs, policy makers, and other stakeholders to turn the Quality Assurance Framework into a reality.

INSPECTIONS FOR ELECTRICAL SAFETY QUALITY ASSURANCE

To help ensure improved compliance with quality and safety standards prescribed in the regulations, PACE-D 2.0 RE will support the creation of mandatory safety parameters for each system and provide training to DISCOMs to conduct safety inspections and implement sanctioning procedures. PACE-D 2.0 RE will also develop an Android-based application that will enable DISCOM engineers to quickly certify requirements and generate reports online.

INSPECTIONS FOR PV MODULE QUALITY ASSURANCE

PACE-D 2.0 RE will design a module aggregation methodology and set up a protocol for module testing and certification. PACE-D 2.0 RE will help identify inspection and certification bodies that would work in tandem with module aggregators whereby costs of such certification would be feasible for small vendors and installers.

VENDOR RATING SYSTEM

PACE-D 2.0 RE will work with inspection agencies to develop a rating system based on criteria that is statewide, capacitywide, system-type wide criteria. PACE-D 2.0 RE will help put in place a rating methodology and key parameters to evaluate, rate and certify vendors based on their track record of designing, developing and deploying systems as well as their technical expertise and experience. We will help identify a Vendor Rating Agency that will be responsible for the rating of these vendors and train its staff. We support the creation of an IT application and help optimize its useability and market its use.

ABOUT THE PACE-D 2.0 RE

USAID supports India's transition to a more self-reliant future, powered by renewable energy. Through PACE-D 2.0 RE, USAID works with the MNRE to help national and state partners provide reliable clean energy to consumers at a lower price. PACE-D 2.0 RE partners with DISCOMs of Assam, Jharkhand and Gujarat to adopt innovative approaches to resource energy planning, develop profitable business models that accelerate the deployment of grid-connected solar PV technologies, and cost-effectively procure renewable energy. To fully unleash India's potential, the program will scale its solutions to non-partner state DISCOMs throughout the country, enabling better planning, quality and safety of solar PV by working with state and national governments to strengthen energy sector regulations. For more information, visit www.pace-d.com.

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