THE ROLE OF QUALITY ASSURANCE IN SOLAR INCENTIVE PROGRAMS

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Why is Quality Assurance Important?

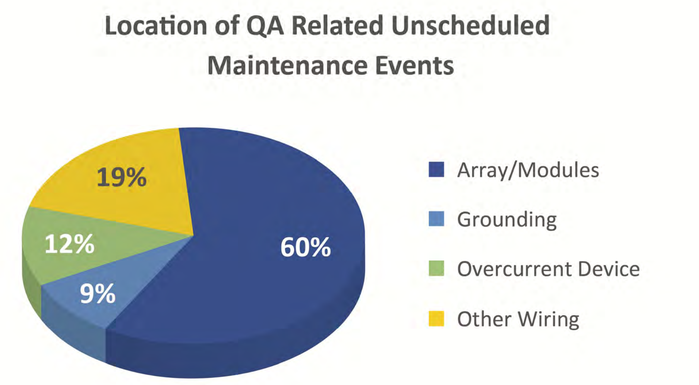
Solar incentive programs leverage public funds to support the installation of solarphotovoltaics. In general, these programs rely on projected savings for the full, 20+ year, life of funded PV systems to meet cost-effectiveness targets. A robust quality assurance program is critical to:

- Ensuring long-term savings
- Protecting customers
- Promoting a positive image for PV

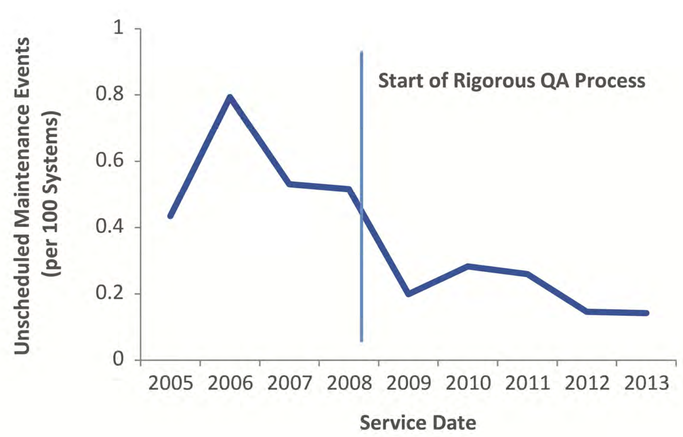
Quality Assurance Reduces O&M Costs

22% of unscheduled maintenance events reported to the Massachusetts Production Tracking System (PTS) were related to QA issues, such as:

- Array Wiring Not Secured Properly
- Modules Not Secured to Racking
- Blown Fuses
- Disconnected Array Strings
- Ground Faults
- Water Ingress/Leaks



The average QA-related maintenance event resulted in over 8 days of downtime and over $350 in repair costs. Since implementing a rigorous QA program in 2008, reported unscheduled maintenance events related to QA issues have been reduced by more than 50%. While there may be other factors contributing to this improvement QA likely plays a substantial role.

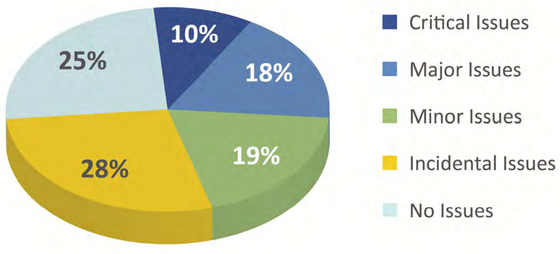


How Do You Rate Something Like Quality?

Each system is evaluated based on the severity of the issues observed. More serious issues, like improperly rated equipment or exceeding current limits on interconnection, can lead to hazards or system failures. Less severe issues may lead to hazards or failures over the long-term or under specific conditions.

Defect Category	Definition	Examples
Critical	Imminent hazard or system not operating	Modules on roof loose, busbars overloaded, Missing/inadequate OCPD
Major	Very likely to create a hazard or cause system to fail	Water collecting in enclosures, EGC/ GEC undersized, breakers undersized, component not grounded
Minor	May cause a hazard/ failure over time or under special circumstances	AC disconnect wired backwards, conductors touching roof surface, missing expansion joint, GEC not continuous
Incidental	Unlikely to cause a hazard/failure but not code compliant	Missing/incomplete labels, missing conduit indoor/outdoor air sealing, improper wire coloring

Nearly 50% of systems inspected have one, or more, issues likely to cause a failure or hazard within the life of the system.



Scoring Quality

In addition to classifying specific issues, it is important to be able to track overall installation quality. One way to do this is through assigning a QA score to the project. In some programs, a 5 point scoring system is used:

- 5-System meets all requirements
- 4-System meets almost all requirements, with only incidental issues observed
- 3-System meets most requirements but may have one minor or several incidental issues
- 2-System meets some requirements but has one major or several minor issues
- 1-System does not meet requirements and has critical or multiple major issues

QA Requires a Robust Inspection Process

Protecting the public investment in solar PV requires a thorough inspection process that targets the ways a PV system could fail to safely deliver the expected energy benefits.

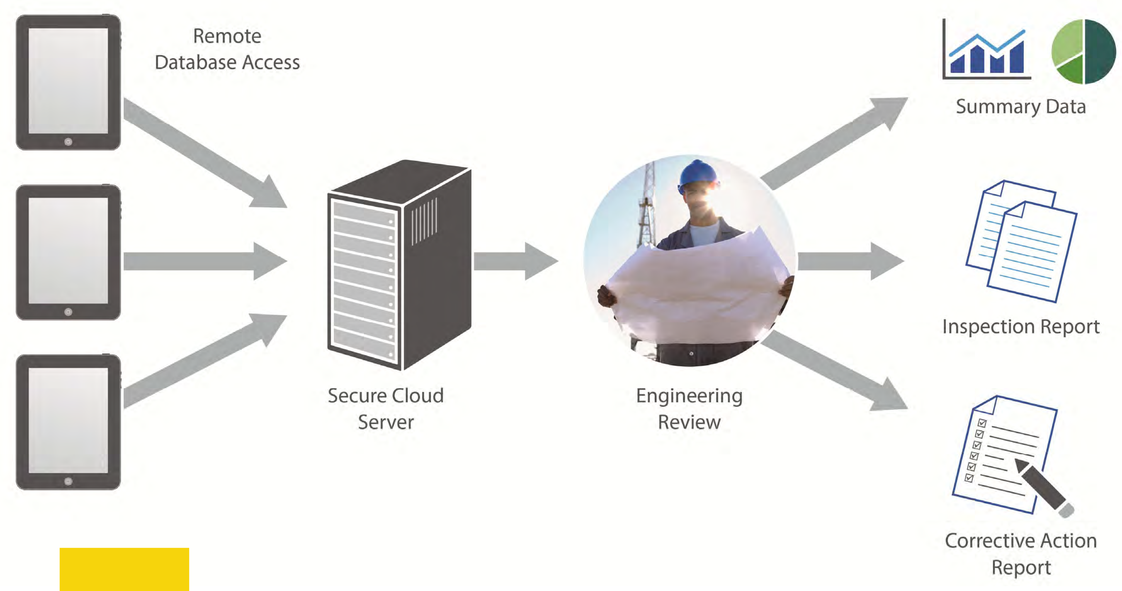
A thorough inspection should include:

- Adequate solar resource
- Code compliance
- Equipment Selection

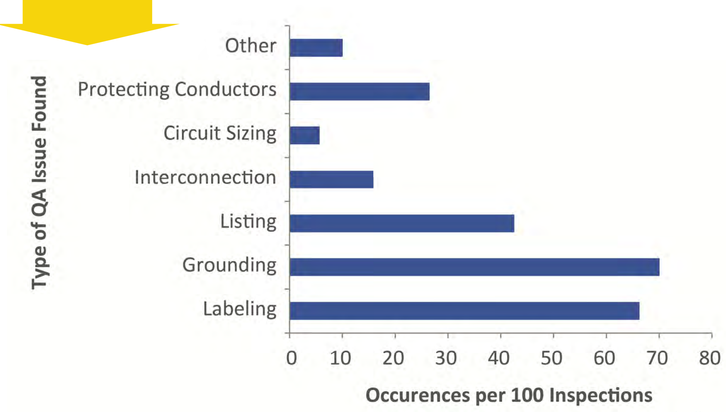
Beyond the Clipboard: The Role of Technology

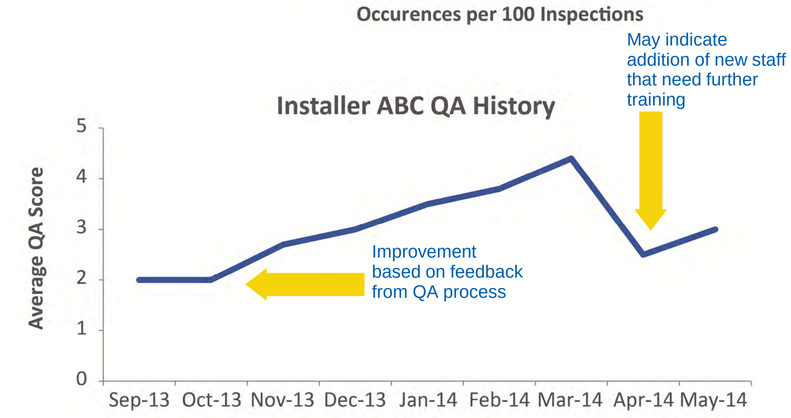
In this digital age, use of tools like online databases can provide many benefits that go far beyond generating basic inspection reports. Analysis of data trends can:

- Pinpoint installation issues that require more training
- Help installers focus internal QA process
- Identify installers needing extra support or disciplinary action

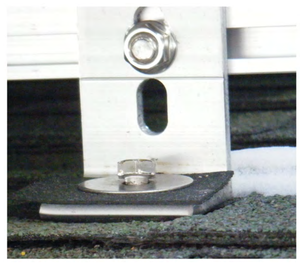


Advanced data collection tools can pinpoint common installation issues and guide feedback/training efforts





Improperly supported conductors can be damaged by wind, snow, ice, and pests.



Improperly connected and flashed racking can cause leaks or structural damage to the array and/or building it is attached to.

Components not listed for their use can quickly fail and leave systems without proper grounding.

WEEBs are a great way to bond array frames together for grounding but must be installed properly so all teeth make solid contact with module frames.

Conclusions

QA plays an important role in ensuring that incentive programs support safe and reliable PV systems that will continue generating for their full 20+ year life. In order to be most effective, though, QA programs need to include several key elements:

- A rigorous inspection program that looks at all aspects of the system
- A method of tracking performance and trends
- Training and feedback mechanisms to turn QA results into positive industry change

Bringing these elements together is an important step in ensuring safe, reliable, and cost-effective PV incentive programs.

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About the Author: Shawn Shaw is a Senior Associate withCadmus and has supported or led QA efforts on well over 2,000 PV systems under multiple incentive programs. Mr. Shaw has also worked extensively on renewable energy measurement and verification (M&V) and evaluation of incentive programs. Mr. Shaw can be contacted at Shawn.Shaw@CadmusGroup.com.

Acknowledgements: We would like to thank LisaWeil and Elizabeth Kennedy, of the Massachusetts Clean Energy Center (MassCEC), as well as Michael Levitz, Patrick O'Shei, and Kim Lenihan of the New York State Energy Research and Development Authority (NYSERDA) for the use of data presented in this poster.