India Solar QA/QC 2026: EPC Quality, ALMM Compliance and Yield Assurance

By Sudarshan Karweer · 25 August 2026 · growthifye.com

Expert guide to solar EPC QA/QC in India 2026: ALMM compliance, factory audits, site testing, commissioning and yield-risk control.

India's utility-scale and C&I solar market in 2026 is no longer constrained only by module prices or land availability. Project outcomes are increasingly determined by execution quality: whether modules match approved BOMs, whether structures meet design assumptions, whether cable routing and terminations are done to standard, whether testing records are lender-grade, and whether the plant that gets commissioned is actually the plant that was modelled. For developers, C&I buyers, lenders and utilities, QA/QC has moved from a back-office function to a bankability issue.

This matters even more in India because the 2026 market combines ALMM-linked procurement discipline, state-specific CFA and subsidy conditions for eligible segments, tighter lender due diligence, and rising stress from heat, dust, humidity, high wind zones and weak-grid pockets. A 1-2% avoidable yield loss from quality defects can erase a large share of EPC savings. On a 50 MW AC plant with a CUF of 23%, even a 1% generation shortfall means roughly 1.0 million units a year of lost energy. At a realised tariff or savings value of Rs 3.0-4.5/kWh, that is around Rs 30-45 lakh annually, before considering downtime, liquidated damages, inverter replacements or insurance disputes.

A robust QA/QC framework therefore needs to cover the entire project chain: design review, approved vendor control, ALMM and documentary compliance, factory inspections, inbound material checks, civil and structural quality, electrical installation quality, pre-commissioning tests, performance validation, punch-point closure and defect-liability monitoring. This article focuses on that QA/QC angle, which is distinct from broader EPC cost, commissioning, module procurement and inverter-selection topics.

Why QA/QC is now a first-order project risk in India

Three trends define the 2026 quality environment.

First, procurement has become more complex. Developers are balancing ALMM-compliant sourcing, DCR-linked conditions where applicable, domestic content preferences in some tenders, and changing lead times for modules, transformers, SCBs, HT switchgear and BESS-adjacent electrical packages. Whenever procurement pressure rises, substitution risk rises too. The gap between datasheet claims and delivered equipment can widen unless contract controls and inspections are tight.

Second, Indian projects are increasingly built to aggressive schedules. Fast-track execution compresses drawing approvals, geotech interpretation, pile testing, cable trenching and testing windows. In practice, rushed sites show recurring issues: under-driven piles, poorly torqued module clamps, non-uniform earthing layouts, inadequate gland sealing, mixed connector lots, inconsistent polarity checks and incomplete as-built documentation.

Third, financing and offtake are less forgiving. Lenders now ask for stronger evidence on design margins, supply-chain traceability, test certificates, warranty alignment and independent engineer sign-offs. C&I buyers and open-access consumers are scrutinising performance guarantees because settlement economics are tighter and banking/wheeling structures vary sharply by state.

© Growthifye · Vriddhim Business Advisory LLP · info@growthifye.com · +91 99676 45323

In this setting, QA/QC is not about ticking boxes. It is about protecting yield, warranty enforceability and debt service.

ALMM compliance and supply-chain traceability: where many projects still slip

For solar EPC projects in India, ALMM compliance is often treated as a procurement matter. That is a mistake. It is a QA/QC matter too, because compliance must be tied to exact product identity, manufacturing source, BOM consistency and dispatch-level documentation.

A practical QA/QC protocol for ALMM-sensitive procurement in 2026 should include:

- Verification of the exact manufacturer and model against the applicable ALMM listing at the time relevant to procurement and project eligibility
- Mapping of purchase order, approved technical datasheet, BOM declaration, flash test format, serial number structure and pallet labelling
- Review of factory quality systems, including traceability from cell or wafer input to finished module where relevant to contractual commitments
- Sampling-based cross-checks between approved BOM and actual production records
- Dispatch inspection to confirm module ratings, binning, glass/backsheet or glass-glass configuration, junction box, connector type and frame details
- Receipt-stage inspection for breakage, microcrack indicators, packaging damage, moisture ingress and serial reconciliation

The same discipline applies to inverters, transformers, cables, structures and switchgear. With inverters in particular, QA/QC should verify firmware version control, grid-protection settings, harmonic performance declarations, SPD configuration and communication hardware compatibility with SCADA and meter architecture.

For subsidy- or CFA-linked projects in eligible segments, documentation quality is critical. Mismatches in make, model, serial records, inspection reports or commissioning evidence can delay claim processing or trigger disputes. Even where CFA is not central to utility-scale economics, the discipline imposed by scheme documentation is useful across all projects.

Factory audits and pre-dispatch inspections: the cheapest risk control in EPC

The most cost-effective quality intervention usually happens before material reaches site. A factory audit or pre-dispatch inspection costs far less than rectification after erection.

For modules, pre-dispatch QA/QC typically covers:

- Visual inspection per sampling plan
- Verification of nameplate, serialisation and rating binning
- Flash test review and consistency checks
- EL testing of sampled modules to detect cracks, finger interruptions or cell defects
- Dimensional checks and frame quality
- Connector compatibility and pull checks
- Packaging robustness for long-haul Indian road transport

For module mounting structures, QA/QC should not stop at section thickness on paper. It must verify actual steel grade, galvanisation or coating thickness, hole alignment, tolerances, weld quality where relevant, and bolting hardware specifications. In high-wind states such as ■■■■■■, Tamil Nadu, Rajasthan and coastal corridors, inadequate structural quality can translate into recurrent clamp loosening, misalignment and damage during storm events.

For cables and balance-of-system items, common factory-stage failures include inadequate conductor sizing versus approved design, insulation thickness deviations, weak gland kits, poor lug quality and undocumented brand substitutions. Small-ticket BOS substitutions often create disproportionate failure rates later.

Developers and lenders should insist that the inspection hold points are written into contracts. A useful structure is to link milestone payments to documentary closure of hold points such as approved drawings, FAT/PDI reports, dispatch clearance, site receipt inspection, installation sign-offs, test packs and as-built submission.

Site QA/QC: civil, structural and electrical defects that reduce yield

Most energy-loss and reliability problems originate on site, not in PowerPoint design packages. Indian solar sites in 2026 still show a familiar defect pattern.

Civil and geotechnical quality issues include:

- Inadequate topographical control leading to drainage problems and waterlogging near inverter stations
- Pile refusal not handled through approved redesign or additional testing
- Foundation concrete quality variation due to poor batching control at remote sites
- Incomplete compaction on internal roads and equipment pads, causing later settlement

Structural and mechanical issues include:

- Torque values not recorded or not achieved consistently across module clamps and structural fasteners
- Rail alignment errors that create module stress and long-term frame distortion
- Mixed fastener grades on the same structure
- Improper treatment of cut edges in coated members
- Tracker installation deviations in projects using single-axis systems

Electrical QA/QC issues are even more material for plant performance:

- String polarity mistakes and uneven stringing
- DC connector mismatch across brands or lots
- Cable bends below manufacturer minimum radius
- Cable trays overloaded or poorly supported
- DC cables laid in ways that increase abrasion and thermal stress
- Earthing pits installed without target resistance validation and seasonal review
- Inadequate segregation of power and communication cables
- Gland sealing failures that later cause moisture ingress in AJBs, SCBs or inverter rooms
- Transformer oil handling and filtration not documented to standard

Each of these defects can show up later as lower PR, repeated inverter trips, insulation resistance alarms, thermal hotspots, nuisance outages or safety incidents. A high-quality EPC process uses checklists and

digital evidence at every stage: geotagged photos, torque logs, string maps, trench inspections, megger records, relay-test reports and punch-point trackers.

A practical benchmark for owners is that site QA/QC should be led by personnel independent of daily execution pressure. If the same team that is chasing schedule also signs off its own quality closure, defect leakage rises.

Testing, commissioning and acceptance: move beyond minimum compliance

Many projects treat commissioning as the point at which power starts flowing and invoices can be raised. That is too narrow. Acceptance should confirm that the plant is safe, compliant and reasonably capable of meeting the modelled output.

In 2026, a strong commissioning QA/QC package for Indian solar EPC should include, at minimum:

- Verification of approved single-line diagrams, protection philosophy and final equipment ratings
- Continuity, insulation resistance and polarity tests for DC and AC systems
- Inverter functional tests and protection-setting validation
- Transformer routine checks, ratio/vector verification and oil test records as applicable
- HT panel, breaker and relay testing with documented settings and secondary injection reports
- Metering and CT/PT verification aligned with utility requirements
- SCADA point-to-point checks, time synchronisation and data integrity validation
- Earthing system resistance measurement and touch-potential safety review where required
- Thermography after initial loading to identify hot joints, fuse issues or poor terminations

Plant acceptance should ideally be linked to both technical completion and an initial performance assessment. For utility-scale and open-access projects, owners often rely on a provisional acceptance followed by final acceptance after a defined operation period. The quality of this transition matters. If punch points remain open, warranty starts are vague, and baseline defects are undocumented, owners lose leverage quickly.

Where lenders are involved, an independent engineer’s acceptance framework should test whether the as-built asset deviates from the financial model assumptions. Examples include lower DC/AC ratio than planned, different module watt classes, altered evacuation layout, missing reactive capability features or lower-than-assumed transformer redundancy.

Yield assurance: converting QA/QC data into performance protection

The best QA/QC systems are tied directly to yield assurance. They do not stop at defect identification; they quantify generation and revenue impact.

For example:

- A recurring 0.5% string outage rate due to connector or fuse quality should be translated into monthly energy loss and EPC recovery claims where applicable
- Excessive mismatch from uneven module binning should be assessed against expected DC-side losses
- High module temperature from poor rear ventilation or layout congestion should be reflected in generation sensitivity
- Transformer and cable losses should be checked against design assumptions and guaranteed values

Owners should require a commissioning dossier that supports future root-cause analysis. This dossier should include final string maps, serial number mapping, inverter-wise capacity allocation, protection settings, test certificates, EL images where available, spare inventory records, warranty documents and approved as-builts. Without this, later disputes on underperformance become anecdotal rather than evidentiary.

From a lender perspective, quality-linked yield protection is especially relevant in a market where many projects are bid aggressively. A project that saves Rs 0.08-0.15/Wp at procurement or construction stage can lose far more over operating life if quality discipline weakens. On a 100 MWp project, even Rs 0.10/Wp of nominal savings is Rs 10 crore. But a persistent 1.5% generation underperformance over 25 years can outweigh that by a wide margin, depending on tariff structure and degradation path.

What developers, C&I buyers and lenders should ask EPC contractors in 2026

A good QA/QC conversation is specific. Stakeholders should ask EPC partners for evidence, not assurances.

Key questions include:

- What is the project-specific inspection and test plan, and who approves hold points?
- How are ALMM compliance, serial traceability and BOM consistency verified at dispatch and receipt?
- Which materials require factory audits or third-party pre-dispatch inspection?
- What are the acceptance criteria for piles, structures, cable works, earthing and inverter installation?
- How are torque, megger, polarity and relay-test records captured and archived?
- What is the protocol for handling non-conformities and root-cause corrective action?
- How are weather, soil and corrosion conditions reflected in QA/QC standards for the site?
- What performance test defines final acceptance, and what exclusions apply?
- How are warranties aligned across modules, inverters, structures, transformers and installation workmanship?

For C&I buyers procuring behind-the-meter or group captive/open-access solar, these questions are just as relevant. Their business case depends on actual delivered savings, not just EPC completion. A rooftop or ground-mounted C&I system with repeated tripping, poor cable management or weak earthing can disrupt operations and weaken board-level confidence in renewable capex.

For utilities and policymakers, the message is straightforward: faster capacity addition must not come at the cost of defect-prone assets. Standardised QA/QC templates, digital commissioning records and better field inspection norms can improve asset reliability without materially slowing deployment.

The 2026 takeaway for Indian solar EPC

In India’s 2026 solar market, quality is no longer an optional premium. It is a prerequisite for bankability, subsidy compliance where relevant, insurer comfort, warranty recovery and long-term yield. ALMM compliance alone does not guarantee plant quality; it must be integrated into a broader QA/QC system spanning procurement, factory control, site execution and performance validation.

The winners in this market will be developers and C&I buyers who treat QA/QC as a commercial discipline, not merely an engineering formality. They will lock in traceable procurement, independent inspections, measurable site controls and evidence-based acceptance. The result is lower defect leakage, stronger lender confidence, better PR stability and fewer surprises after COD.

If you are planning a solar or solar+BESS project and want independent support on EPC quality strategy, ALMM compliance, factory inspections, commissioning protocols or lender-grade due diligence, contact Growthifye’s advisory desk.

ABOUT THE AUTHOR

Sudarshan Karweer — Chief Executive Officer, Growthifye

Over 23 years in management consulting — concept to scale — building and scaling new-age digital and energy businesses. An EY alumnus, Sudarshan leads Growthifye's renewable energy & storage advisory, EPC, transmission engineering and green-financing practices for developers, utilities and C&I consumers across India.
Contact: info@growthifye.com · +91 99676 45323 · growthifye.com

This article is for general information only and does not constitute engineering, financial or legal advice. © Growthifye. Sharing with attribution is welcome.