IEC 61850, DERMS and AT&C Loss Reduction for Indian DISCOMs in 2026

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How IEC 61850, DERMS and feeder automation can cut AT&C losses, improve DER integration and strengthen Indian DISCOM operations in 2026.

India's power distribution sector has spent the last few years discussing smart meters, SCADA roll-outs and ADMS control rooms. In 2026, the harder question is no longer whether utilities should digitalise, but how they should connect field devices, distributed energy resources and loss-reduction programs into one interoperable operating model. For DISCOMs, state utilities, franchisees and private licensees, the next layer of value sits at the intersection of IEC 61850, DERMS and targeted AT&C loss reduction.

This matters far beyond utilities. Large commercial and industrial consumers now rely on better distribution reliability for 24x7 operations. Renewable-energy developers need predictable interconnection and curtailment management as rooftop solar, open-access solar, behind-the-meter batteries and EV charging loads scale. Lenders want bankable network-upgrade logic tied to measurable reduction in technical and commercial losses. Policymakers are under pressure to deliver RDSS outcomes, improve supply quality and absorb rising distributed generation without destabilising local networks.

In this article, we focus on a distinct 2026 utility-digitalisation angle: how Indian DISCOMs can use IEC 61850-based substation and feeder interoperability together with DERMS-led control of distributed resources to reduce AT&C losses, improve hosting capacity and avoid avoidable capex.

Why this topic is urgent in India in 2026

India's distribution utilities still face material AT&C loss variation across states and circles. In better-performing urban circles, AT&C losses may sit below 10%, while in weaker semi-urban and rural pockets they can still exceed 20% or even 30%. The national direction of travel is clear: lower aggregate technical and commercial losses, better billing and collection efficiency, and higher quality of supply. Yet the operational challenge has changed.

Losses are no longer just a metering and collection issue. They are increasingly linked to:

- reverse power flow from rooftop solar and feeder-level DER
- overloading of specific transformers and outgoing feeders
- weak phase balancing and poor voltage profiles
- limited substation visibility below 33 kV and 11 kV layers
- manual switching practices that prolong outages and increase unserved energy
- poor interoperability between IEDs, RTUs, meters, relays and enterprise systems

At the same time, commercial and industrial customers are changing the shape of demand. Group captive procurement, open access, rooftop PV, energy storage pilots and EV fleets are creating more dynamic load curves. Utilities that still operate with fragmented device protocols and limited real-time analytics will struggle to keep losses down while integrating DER safely.

The practical 2026 answer is not one monolithic software purchase. It is a layered architecture: interoperable substations and feeders using IEC 61850, DER orchestration through DERMS, and a loss-reduction program tied to feeder economics, power quality and asset utilisation.

IEC 61850: the interoperability foundation Indian utilities need

IEC 61850 is often discussed only in the context of digital substations. That is too narrow for current Indian distribution needs. In practice, its value lies in standardised communication and data models that let protection relays, bay controllers, merging units, HMIs and station gateways speak a common language. For utilities scaling automation across multiple OEMs and EPC packages, this reduces vendor lock-in and simplifies integration.

For Indian DISCOMs, the economic case is straightforward.

First, multi-vendor environments are now the norm. A utility may have one vendor for 220/132 kV substations, another for 33/11 kV upgrades, a different provider for feeder RTUs and yet another for enterprise analytics. If each system needs custom protocol conversion, the lifecycle cost rises sharply. Engineering hours increase, testing becomes inconsistent and cyber-risk surfaces multiply.

Second, many state utilities are expanding or retrofitting substations under RDSS and state capex programs. If IEC 61850 is specified correctly at the tendering stage, utilities can create standard templates for new bays, event reporting, disturbance records, GOOSE messaging and gateway integration. This reduces future integration cost when ADMS, outage systems, DERMS or asset-performance tools are added.

Third, better event granularity directly helps loss reduction. Utilities often underestimate how much AT&C loss diagnosis depends on accurate technical-loss visibility. If feeder trips, voltage excursions, transformer loading and switching events are poorly timestamped or siloed, engineers cannot distinguish between genuine technical losses, theft-suspected anomalies and metering-data issues.

A robust IEC 61850 program should therefore include:

- standard substation automation architecture from 220/132 kV down to 33/11 kV where feasible
- naming conventions, data models and signal lists standardised across circles
- gateway design that supports upstream integration with SCADA/ADMS, DERMS and data historians
- event and disturbance recording suitable for fault analysis and protection coordination
- cybersecurity hardening, role-based access and patch management requirements
- FAT, SAT and interoperability testing across OEMs before commissioning

In Indian procurement, this is where many projects go off track. Tenders mention IEC 61850, but without detailed engineering specifications, interoperability matrices or lifecycle support obligations. The result is nominal compliance, not operational interoperability.

DERMS: from DER visibility to controllable grid support

Distributed Energy Resource Management Systems, or DERMS, are becoming relevant in India because distributed resources are no longer niche. Rooftop solar in commercial and industrial campuses, captive battery systems, EV charging hubs, demand-response capable loads and feeder-level storage pilots are all increasing. In high-solar urban feeders, the issue is not simply interconnection approval; it is operational management.

A DERMS sits above field and enterprise data layers to monitor, forecast and, where regulations and contracts permit, orchestrate DER behaviour. For Indian DISCOMs and private utilities, this has four practical applications.

The first is hosting-capacity improvement. Instead of denying new rooftop or behind-the-meter interconnections due to static assumptions, the utility can use feeder models and real-time data to identify where export limits, transformer loading or voltage rise are binding constraints. This can defer capex while allowing more DER capacity onto the network.

The second is voltage and reactive power management. Many Indian feeders experience low voltage at tail ends during peaks and localised voltage rise when daytime solar injection is high. A DERMS integrated with inverters, capacitor banks, OLTC transformers and feeder telemetry can improve voltage compliance without excessive manual intervention.

The third is peak-load management. In industrial belts, evening peaks can be compressed by using contracted flexible loads, storage dispatch or EV charging control. Even a 3% to 5% reduction in local feeder peak can avoid transformer overloading and reduce technical losses.

The fourth is outage resilience. Critical consumers such as hospitals, data centres, industrial parks and water systems increasingly have on-site generation or batteries. A utility with DERMS-linked visibility can coordinate restoration strategies more intelligently, especially where islanding or backup support frameworks evolve under future regulations.

For 2026 India, a realistic DERMS business case should not depend on speculative market participation alone. It should be anchored in measurable utility outcomes:

- reduction in technical losses on constrained feeders
- higher sanctioned DER capacity without immediate network augmentation
- fewer voltage complaints and reduced compensation exposure
- lower transformer failure rates from better load management
- improved renewable absorption at distribution level

How IEC 61850 and DERMS support AT&C loss reduction together

AT&C loss reduction is often treated as a billing, collection and smart-meter issue. That is incomplete. Smart metering is essential, but the highest-performing utilities combine commercial discipline with feeder engineering and operational visibility.

The combined IEC 61850-plus-DERMS model supports AT&C loss reduction in three layers.

The first layer is technical-loss diagnosis. Interoperable substations and feeder devices improve visibility on energy flow, voltage profile, outages, unbalance and overload conditions. Engineers can compare input energy at the substation, feeder output and downstream billing data more reliably. This helps segregate technical losses from suspected theft or metering inaccuracies.

The second layer is technical-loss reduction. DERMS-guided control of local resources can reduce feeder current, smooth peaks and improve power factor support. Since technical losses are proportional to I2R, even moderate current reduction on overloaded feeders can materially reduce losses. On selected urban-industrial feeders, a 1% to 2% technical-loss reduction can produce meaningful annual savings, especially where input power purchase cost is high.

The third layer is commercial-loss targeting. When feeder energy accounting is cleaner and event data is reliable, anomaly detection improves. Utilities can identify zones where billed consumption diverges abnormally from technical expectations, then prioritise inspections, DT metering audits, AMI exception analysis and enforcement resources.

Consider a simple illustration. If a DISCOM serves 1,000 MU annually on a cluster of high-loss circles, a 2 percentage-point AT&C loss improvement equates to 20 MU recovered. At an average cost of power purchase of, say, Rs 5.5 to Rs 6.5 per kWh, that translates into Rs 11 crore to Rs 13 crore of annual energy-value impact before considering carrying cost, delayed capex and collection benefits. If the improvement is concentrated in high-tariff urban or C&I-heavy zones, the realised financial impact may be higher.

This is why lenders and policymakers increasingly prefer digitalisation plans with feeder-level economics rather than generic automation narratives.

Use cases that matter for C&I consumers, developers and lenders

For C&I consumers, better distribution automation and DER integration mean fewer voltage fluctuations, faster fault isolation and a more predictable framework for rooftop solar, storage and EV charging. This matters in sectors where downtime cost is high, including metals, food processing, pharmaceuticals, textiles, logistics and IT parks. A one-hour unplanned outage can cost far more than the annual grid-charge delta created by smarter network operations.

For renewable developers, especially rooftop and distributed solar players, the key issue is interconnection certainty. Many projects stall because the utility lacks feeder-level hosting-capacity analysis or because approval officers have limited visibility into actual loading conditions. DERMS-supported planning can shorten decision cycles and reduce arbitrary restrictions.

For lenders, the attraction is measurable performance. Financing comfort improves when a utility or project sponsor can show:

- baseline feeder losses and billing efficiency
- expected reduction in technical losses from targeted automation
- capex avoidance from increased DER hosting capacity
- reliability metrics such as SAIDI and SAIFI improvement targets
- OEM interoperability safeguards that reduce stranded-system risk

For policymakers, the message is equally practical. India does not need every feeder to become a fully digital feeder overnight. The smarter path is to prioritise feeders and substations where the combined benefit is highest: high-loss urban fringes, industrial feeders with growing rooftop solar, EV-dense municipal areas, and distribution pockets with recurring transformer overloading.

Implementation roadmap for Indian DISCOMs and private utilities

A workable 2026 implementation roadmap should begin with loss economics, not technology branding.

Step one is feeder segmentation. Utilities should classify feeders by AT&C loss, C&I share, outage frequency, DER growth, overloading and collection performance. The top 10% to 15% of feeders by economic value often justify disproportionate digital investment.

Step two is substation and feeder interoperability design. Before procuring devices, the utility should define IEC 61850 engineering standards, communication architecture, time synchronisation, event retention, gateway requirements and cybersecurity controls.

Step three is DER visibility baseline. This includes mapping rooftop solar, open-access injection points, storage systems, EV charging hubs and major flexible loads. Many utilities still lack an accurate DER registry below the transmission interconnection level.

Step four is use-case prioritisation. Rather than deploying DERMS as a generic platform, select high-value applications first:

- voltage management on high-solar feeders
- peak reduction in transformer-constrained zones
- export management on reverse-power-risk circuits
- restoration support for critical-load clusters

Step five is energy accounting integration. Feeder metering, DT metering, AMI data and billing systems must support reconciliation workflows. Otherwise, improved field visibility will not convert into actual AT&C gains.

Step six is commercial governance. Loss reduction requires circle-level accountability, engineering-commercial coordination and periodic review of realised savings against feeder-level business cases.

In many Indian utilities, the biggest barrier is not software. It is organisational silos between planning, operations, metering, IT and finance.

Common mistakes to avoid in 2026 projects

Several pitfalls are recurring across utility digitalisation programs in India.

The first is buying platform software without clean field data. If feeder topology, asset naming and meter hierarchy are inconsistent, analytics output will be unreliable.

The second is treating IEC 61850 as a checkbox. Interoperability is achieved through engineering discipline, testing and lifecycle governance, not by citing a standard in the tender.

The third is overestimating immediate DERMS monetisation. In India, the strongest early value is operational and planning efficiency, not complex market revenues.

The fourth is ignoring tariff and regulatory context. Utilities must align digital investments with approved capital expenditure pathways, loss-reduction trajectories, quality-of-supply obligations and state commission expectations.

The fifth is failing to link automation to measurable outcomes such as:

- AT&C loss reduction by feeder and circle
- technical-loss reduction on overloaded assets
- outage-duration improvement
- voltage complaint reduction
- increased DER hosting capacity
- deferred transformer and feeder augmentation capex

Without these metrics, even technically sound projects may struggle to secure internal approval or financing support.

The 2026 outlook for utility digitalisation in India

In 2026, the distribution sector’s next winners will not be the utilities with the most dashboards. They will be the ones that translate interoperability and DER control into lower losses, better reliability and faster DER integration. IEC 61850 provides the communication foundation. DERMS provides the operating intelligence. AT&C reduction provides the financial logic that boards, regulators and lenders can all understand.

For Indian C&I consumers, this transition should gradually mean a distribution network that is more stable, more transparent and more capable of supporting on-site and open-access renewable strategies. For developers, it should mean fewer interconnection bottlenecks and better quality of technical approvals. For DISCOMs, it offers a realistic route to improve cash flow while modernising the network in a way that matches India’s distributed-energy future.

If your organisation is evaluating IEC 61850 architecture, DERMS use cases, feeder-level loss-reduction programs or utility digitalisation investment plans, contact Growthifye’s advisory desk for project structuring, technical due diligence, implementation strategy and lender-facing support.

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