Tamil Nadu Research Park Foundation
URP Project Proposal Submission Details
Industry Problem Statements

Organization & Contact Personal Information	
Organization Name *	NIRT Renewable Energy Private Limited
Organization Address *	No.104/7, 1st Floor, SPC Bhawan, Manivannan Street, Opp.New Bus Stand, Salem- 636 004, Tamil Nadu, India.
Contact Name *	Dr. G. Khaja Nazeemudin Chief Operating Officer
Contact No *	+91 96 55 94 64 64
Contact Email *	coo@nirt.net
Sector *	Renewable Energy / Solar Power / Electrical Infrastructure
State	Tamil Nadu
District	Salem

Abstract of the problem (Max. 1000 words)

Large-scale solar parks, industrial rooftop installations, agricultural solar pumping systems, and residential rooftop solar deployments are expanding rapidly across India. In parallel, critical public utility assets—including Solar PV modules, inverters, transformers, distribution lines, protection systems, public sanitation infrastructure, and other electrical facilities—require robust and structured maintenance frameworks to ensure uninterrupted service delivery and infrastructure resilience.

Solar PV plants and associated electrical infrastructure operate under continuous electrical, thermal, and environmental stresses such as high irradiance, temperature fluctuations, humidity, dust deposition, harmonics, and load variability. Over time, these stressors lead to component degradation, insulation deterioration, hotspot formation, loose electrical connections, inverter efficiency decline, and protection coordination issues. Similar degradation patterns are observed in public utility assets due to aging, overloading, corrosion, and lack of real-time condition assessment.

Currently, maintenance practices in most installations rely on scheduled preventive maintenance (time-based inspection cycles) and reactive breakdown maintenance strategies. While periodic inspections and manual diagnostics are conducted, these conventional approaches are inherently limited because they do not incorporate continuous health monitoring or data-driven fault prognostics. As a result, early-stage anomalies—such as partial shading effects, string mismatches, transformer oil degradation, cable insulation weakening, thermal imbalance, or structural fatigue—remain undetected until they escalate into critical failures. Unexpected equipment breakdowns and unplanned shutdowns consequently occur, leading to:

- Reduced plant load factor (PLF) and energy yield
- Increased downtime and service unavailability
- Higher Operation & Maintenance (O&M) expenditure
- Revenue losses and contractual penalty risks
- Accelerated asset aging and reduced lifecycle performance
- Disruption of essential public services

The absence of predictive analytics and condition-based monitoring mechanisms prevents asset operators from estimating Remaining Useful Life (RUL), optimizing maintenance schedules, or planning component replacement proactively. Furthermore, technological obsolescence of components complicates system integration when replacements are required, creating synchronization and protection coordination challenges within existing infrastructure. The development of a new system will transition maintenance practices from reactive and schedule-based paradigms to data-driven, condition-based predictive maintenance, significantly improving operational efficiency, infrastructure resilience, and long-term cost-effectiveness.