EMPOWERING SOLAR OPERATIONS

End-to-End Energy Management Solution

- Hardware
- Software
- Cloud Enablement

SASONE

Industry Context & Challenges

Problem Areas in Solar Energy Management

Energy Loss due to lack of real-time monitoring and analytics

Manual Operations leading to inefficiency and delays

Disconnected Systems with no central control or data integration

Why Smart Energy Management Solution (SEMS) is Critical

30% of solar systems lose efficiency due to lack of real-time monitoring.

SEMS can reduce energy consumption by 10–30% (U.S. DOE).

Buildings consume 40% of global energy, SEMS helps reduce this significantly (IEA).

SEMS boosts solar self-consumption by up to 40% (EU PV Studies).

Lack of predictive maintenance increases equipment failure risk by 20–25% (McKinsey).

AI-powered SEMS can forecast energy demand with 90%+ accuracy (IBM).

What is an Smart Energy Management Solution (SEMS)?

An SEMS is a combination of software and hardware used to monitor, control, and optimize energy usage for improved efficiency and reduced waste.

Purpose:

- Minimize energy loss
- Improve operational efficiency
- Manage energy flow intelligently

Smart Meters & Key Components:

Sensors: Capture real-time data (voltage, current, usage).

Data Acquisition System: Transfers data to the SEMS for analysis.

SEMS Software: Analyzes data, provides control and reporting tools.

Communication Network: Ensures secure data transfer across devices.

User Dashboard (HMI): Visual interface for monitoring and control.

Why Integrate SEMS with Solar Panels?

1. Maximize Solar Utilization

Prioritize self-consumption of solar energy Reduce grid dependency and electricity bills.

2. Real-Time Monitoring & Insights

Track solar generation, consumption, export/import Identify performance issues and inefficiencies

3. Smart Load Management

Schedule heavy loads during peak solar hours Avoid wastage or underutilization

4. Maximize Solar Utilization

Battery & Backup Optimization

Seamless control between solar, grid, and battery Improve battery life through intelligent charge cycles

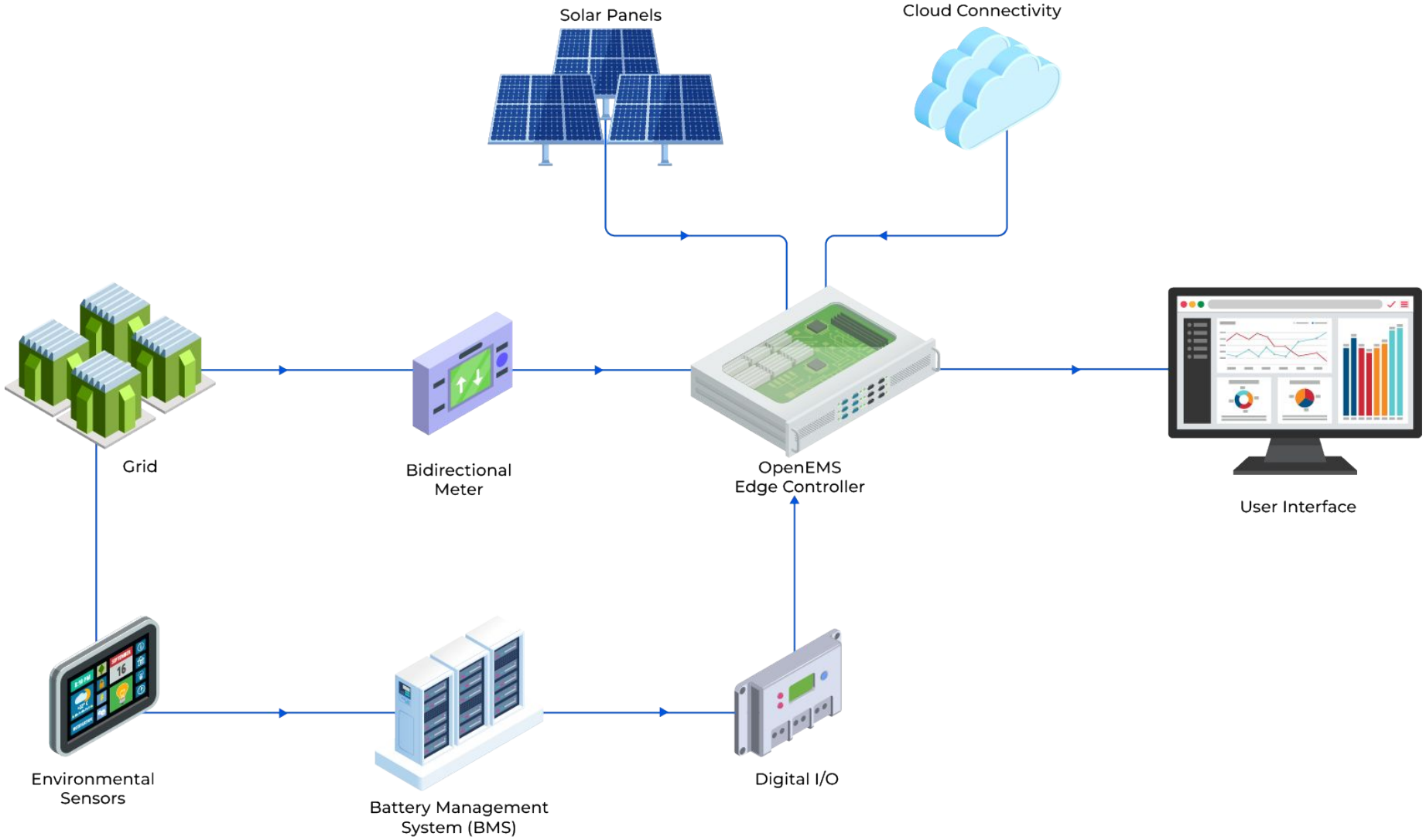
5. Cost Savings & ROI Acceleration

Optimize tariff usage (e.g., peak vs off-peak) Boost ROI on solar investment through energy intelligence

6. Sustainability & Compliance

Reduce carbon footprint Align with green building or ESG goals

End to end architectural overview



Components of SEMS

Component	Description
Edge EMS Controller	Hardware board installed at site to collect and process data from solar panels and meters and power control system
Communication Gateway	Sends data securely to cloud servers using Wi-Fi, 4G, or Modbus/RS485
Cloud Backend	Stores, analyzes, and processes energy data with APIs and dashboards
Dashboard Interface	Web & mobile apps to view reports, alerts, control systems remotely
Optional: Battery Interface	Integrates with batteries to manage storage and load shifting
AI/Analytics Engine	(Advanced) Predicts failures, optimizes usage using machine learning

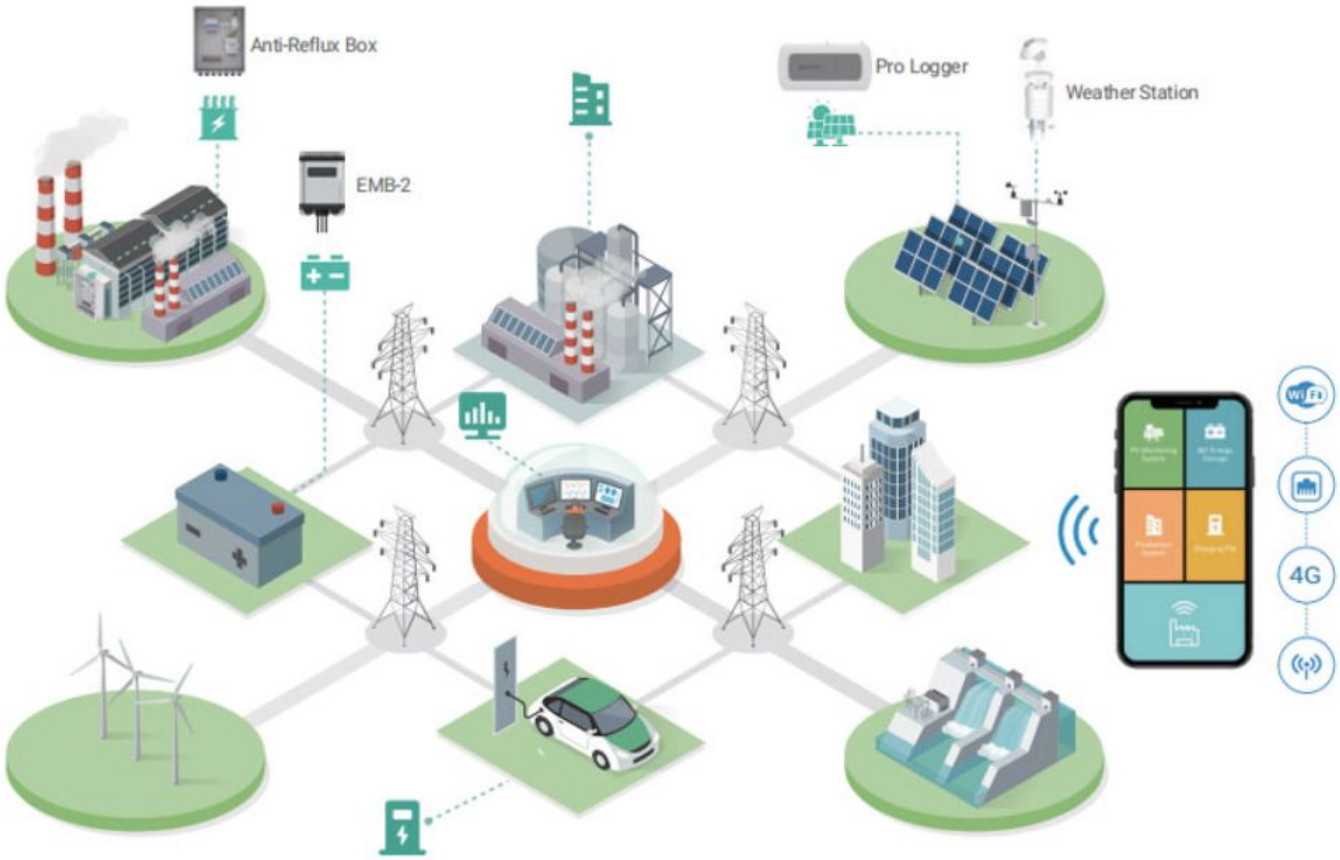
Core layers of SEMS

i.MX 8M Plus
Multiple displays Neural Processing Unit

Hardware Board Details	Software & Analytics Layer	Cloud Enablement & Connectivity
Compact Board Specifications: • Real-time metering • Modbus/RS485/Wi-Fi/Bluetooth • Onboard storage / failover safety • Edge AI features (load forecasting, failure prediction) (optional)	Smart Features: • Load profiling • Live dashboards • Alerts & Notifications • Integration with billing software (optional)	Scalable Backend: • MQTT/WebSocket-based data pipeline • API-based integration for partners • Role-based access control • AWS/Azure-based hosting or client-side hosting (optional)

Application Features:

- Protects solar microinverter from fluctuations in grid voltages by relay disconnect
- Offers high temperature operation with high reliability as mounted under solar Panels



Reference Design Features:

- Input Voltage : 195Vac to 264Vac
- RMS Current: Up to 15A (through the relay)
- External Relay Connect/Disconnect Signal
- Input Power Measurement
- Optically Isolated Digital signals for control and status

Benefits of SEMS

Real-Time Energy Monitoring

Reduced Energy Costs

Smart Control of Equipment

Improved Operational Efficiency

Supports Sustainability Goals

SAS PINAAK uses AI to Optimize Energy Intelligence

- ## Predictive Energy Analytics

  AI learns from your usage patterns, weather data, and occupancy trends to forecast energy demand, enabling smarter planning and cost reduction.

- ## AI-Driven Solar Forecasting

  Our ML models predict solar generation in real-time using weather, irradiation, and panel performance data. Helping you prioritize clean energy usage.

- ## Anomaly & Fault Detection

  SAS SEMS continuously scans for irregular patterns or equipment failures and catching issues before they become costly problems.

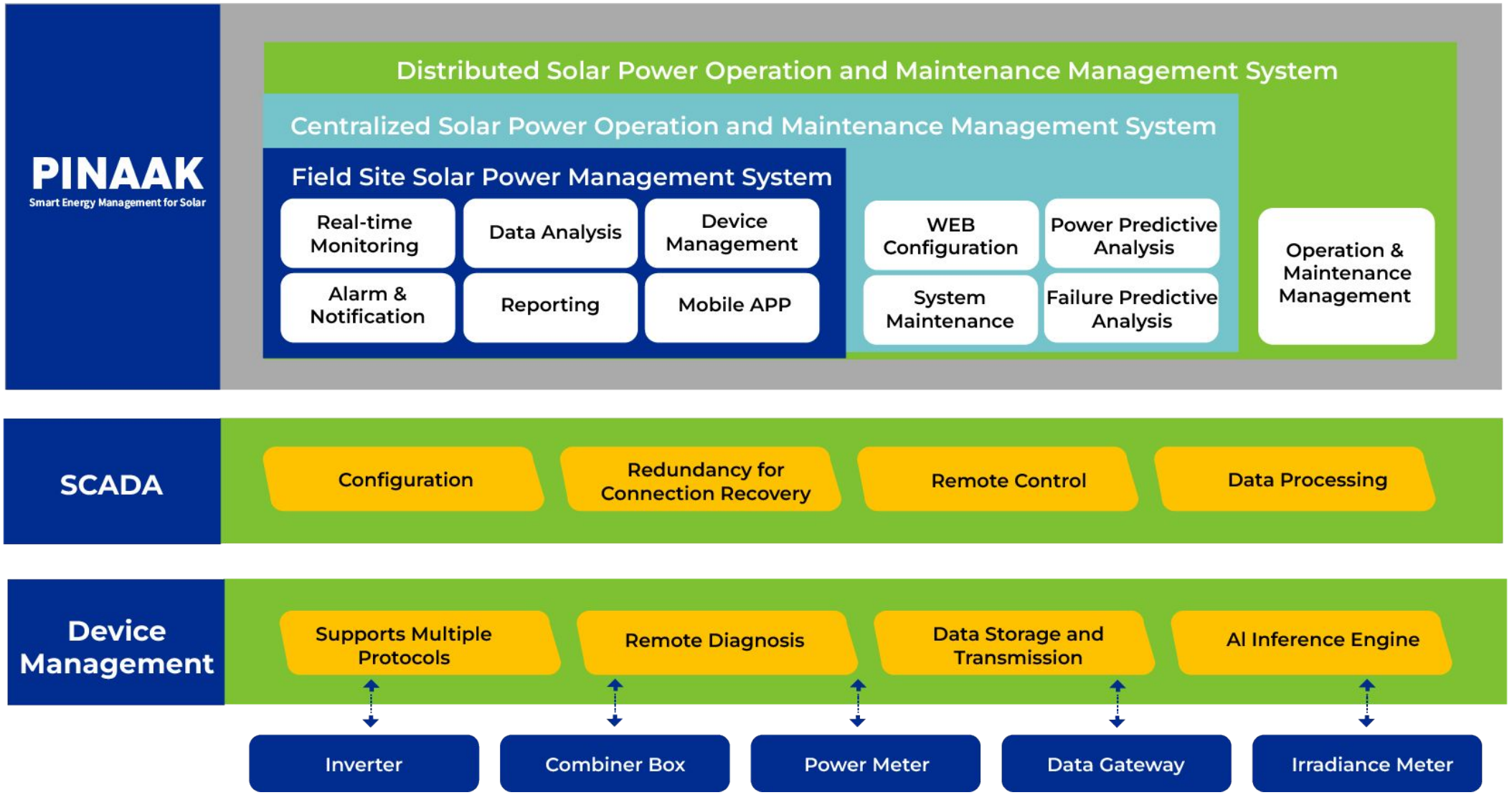
- ## Adaptive Load Optimization

  AI auto-adjusts loads, prioritizes critical systems, and balances energy flows across grid, solar, and battery. All in real-time.

- ## Self-Learning System

  The more you use it, the smarter it gets. SAS SEMS adapts to your facility's evolving energy behaviour to deliver continuous efficiency gains.

Software Diagram



System Architecture

Cloud-based Monitoring & Operating Platform

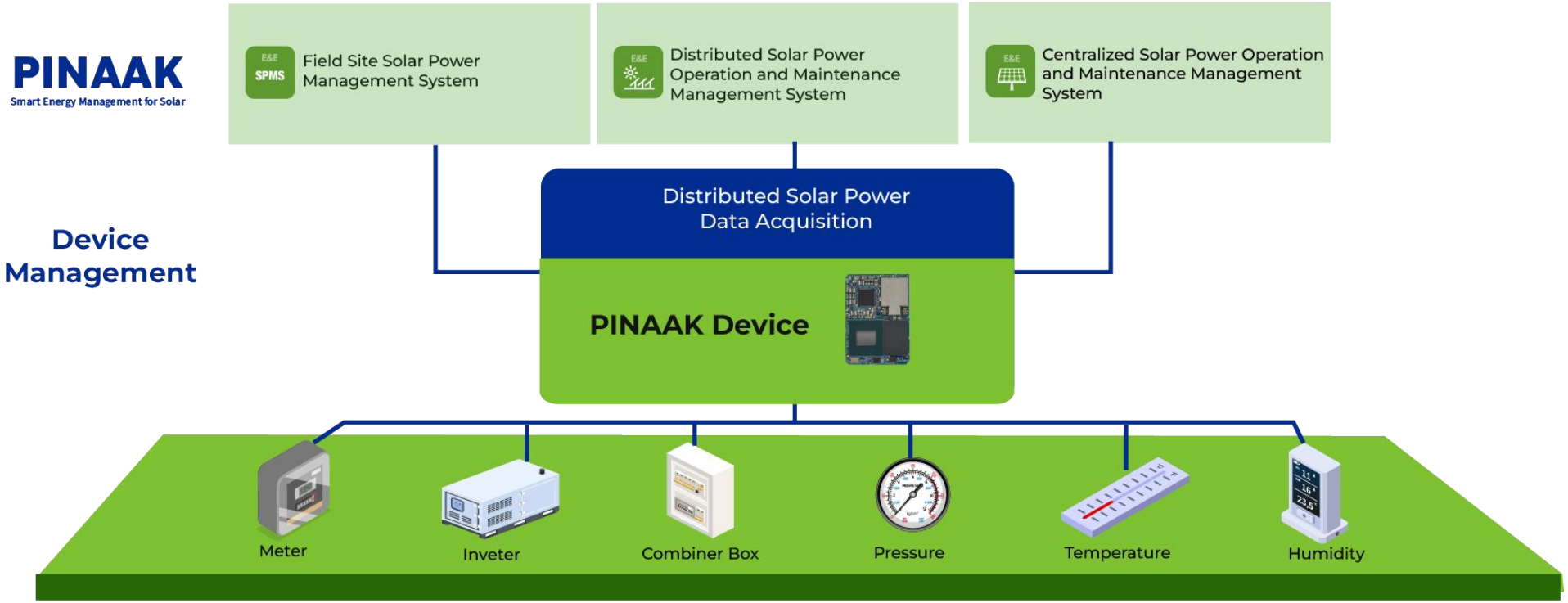
- Operation & Maintenance optimization
- Comprehensive equipment management
- Key data visualization

Situation Room Key Indicators

- Each has their own situation room scene, which can get the most concerned information.

Complete System Hierarchy

- System designed according to the needs of the platform vendor, system vendor, and end user. Corresponds to industry standards and easily managed.



About SAS ONE

- A complete product innovation and product realization company. We collaborate with our customers throughout the complete product lifecycle to accelerate their growth and capture value.
- Built to deliver tailored end-to-end embedded engineering solutions.
- We collaborate with global partners to accelerate innovation and drive product development.

Industries Served

- Medical & Life Science
- Aerospace & Defence
- Automotive
- Real Estate
- Technology
- Media & Events

1500+
Employees

7+
Locations

SAS ONE

$80+
Million
Revenue

50+ Years of
Excellence

PINAAK
Smart Energy Management for Solar

Certifications & Quality assurance

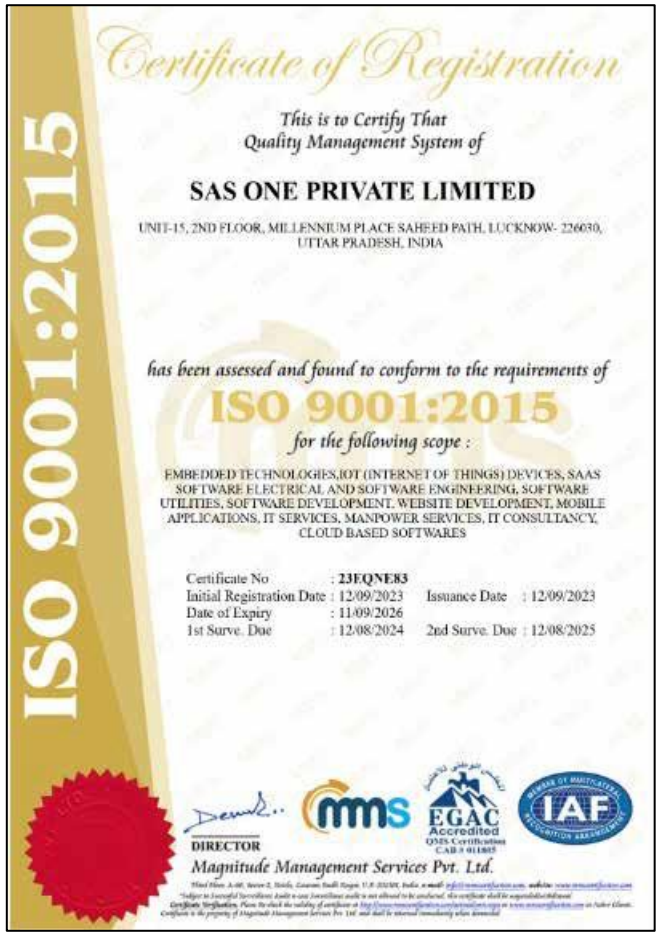
We're committed partners, helping industries evolve. More than just problem solvers, we drive progress and innovation through collaboration. At SAS One, we shape and define technology's future across various sectors.

Quality Assurance

- PRODUCT ASSURANCE
- DOCUMENT CONTROL
- CHANGE MANAGEMENT
- INSPECTION, MEASUREMENT, & TESTING
- PERFORMANCE EVALUATION & IMPROVEMENT
- QUALITY RECORDS
- AUDITS

Certifications

- ISO 9001:2015
- ISO/IEC 20000-1:2018
- ISO 27001:2013
- ISO 13485:2016



Contact Us

Our offices at Lucknow and Bangalore are strategic hubs for pioneering embedded solutions, electronics, and cutting-edge IT innovations. Reach out to us for transformative technology experiences.

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THANK YOU