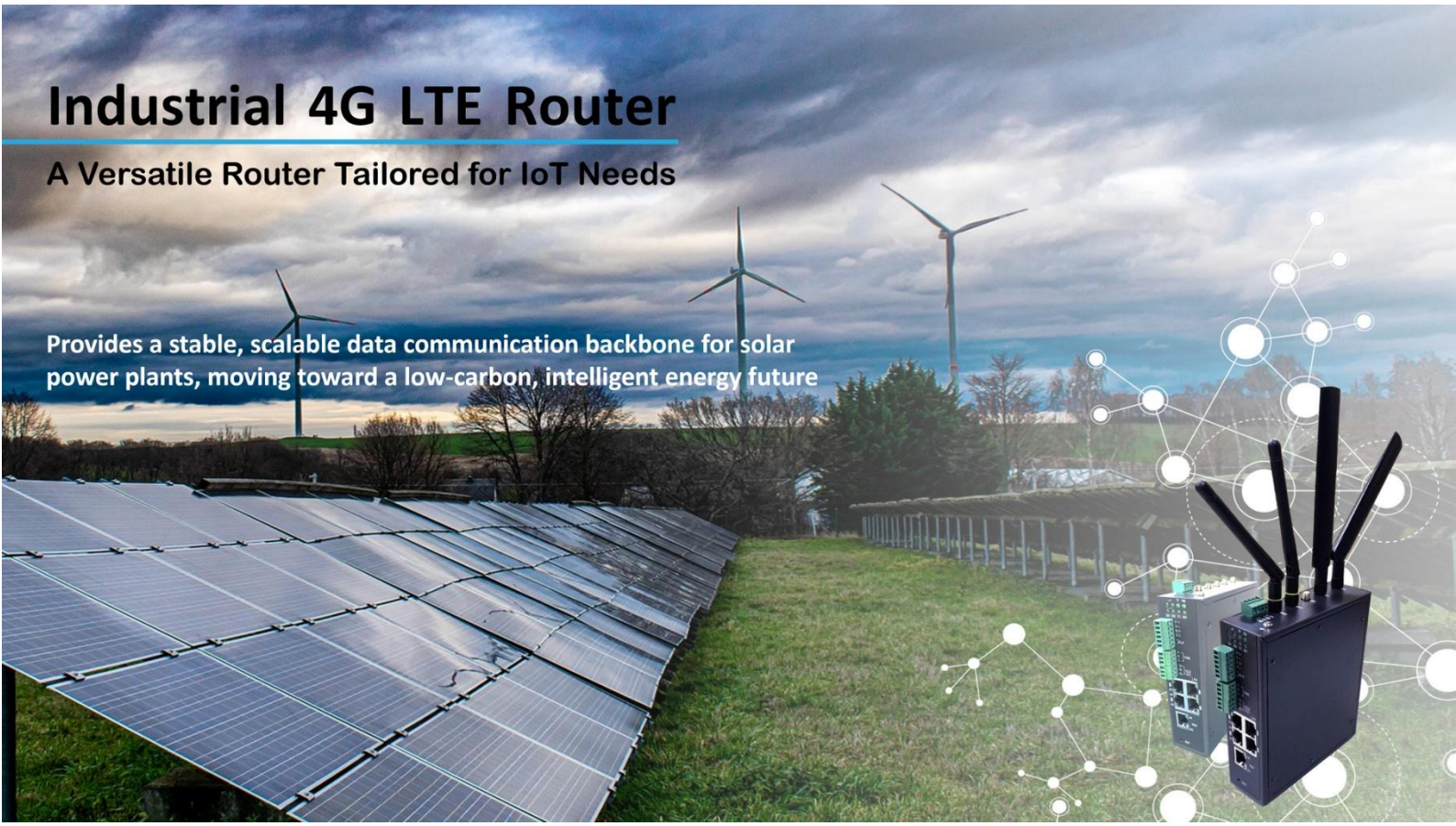

Smart Grid Solar Power Solution

Driven by the global energy transition and carbon neutrality drive, solar energy has become one of the most critical renewable energy sources in smart grids. With the widespread adoption of distributed power generation and energy storage technologies, ensuring real-time data transmission, secure management, and stable system operation have become core issues in integrating solar power plants with the grid. TAINET has developed an industrial-grade 4G LTE router to address this need. This router combines high-speed mobile communications, industrial protocol support, and remote management capabilities to provide a reliable solar field connectivity solution.

Smart Grid Challenges and Requirements

In smart grid architectures, solar power generation must provide real-time feedback on power generation, equipment status, temperature, and voltage, enabling cloud-based monitoring and predictive maintenance. Because power plants are often located in remote areas, traditional wired network cabling is costly and difficult to maintain. Therefore, communication solutions based on mobile wireless networks are becoming increasingly popular.

Smart grid applications place multiple demands on network equipment：

- High stability and uninterrupted communication
- Support for multiple protocols and integration of various sensing and control devices
- Withstand harsh environments such as high temperature, humidity, and electromagnetic interference
- Security protection mechanisms prevent data tampering and network intrusion

Stable, Reliable, and Secure Management

TAINET IAD200 Industrial 4G LTE Router supports dual SIM redundancy and automatic failover, ensuring that field data automatically switches to the backup network if the primary connection is lost, maintaining uninterrupted monitoring. Its low power consumption (<10W) and dual 9-48V DC power inputs ensure stable operation in temperatures ranging from -40°C to 70°C, making it suitable for outdoor substations, energy storage cabinets, or monitoring stations. Built-in Modbus TCP/ UDP and RTU over TCP (Transparent) enable direct communication with industrial equipment such as inverters, electricity meters, and temperature and humidity sensors, enabling data centralization and remote control without the need for additional gateways, simplifying system architecture.

Smart grids demand stringent security. Support for TACACS+ AAA access control, IPsec VPN encryption, and HTTPS/ TLS 1.3 secure transmission protocols effectively prevents unauthorized remote access and data tampering. Multi-layered security measures (Firewall, MAC/ URL Filtering, WAN Ping blocking, etc.) create a closed and monitorable communication environment. Administrators can perform remote monitoring, batch configuration, and firmware upgrades via the web, Telnet, SSHv2, or TR-069. Support for TFTP/HTTP automated deployment allows for easy integration into energy monitoring systems (EMS) or SCADA platforms, providing real-time status insights for solar power plants across the globe, reducing maintenance costs and increasing utilization rates.

Application Architecture and Benefits

With its industrial-grade design, flexible communication interfaces, and comprehensive security mechanisms, the IAD200 provides a stable and scalable data communication backbone for solar power plants. Each power module transmits data to the IAD200 via RS485/ Modbus, which is then transmitted to the energy management platform via LTE. At the same time, MQTT communication applications can also be integrated to incorporate solar energy systems into the IoT platform and connect them with other smart grid components such as energy storage systems, charging stations, and smart meters to form a data-interconnected energy network, achieving true smart grid monitoring and moving towards a low-carbon, intelligent energy future.