

Energy Internet for Power Grid Enterprises



Overview

Energy Internet Energy Internet, sponsored by Chinese Society for Electrical Engineering (CSEE), and published by China Electric Power Research The Impact.

Key Takeaways

The Energy Internet integrates digital, communication, and energy systems to enable smart, resilient, and efficient power grid operations for enterprises. Concept and Framework

The Energy Internet is a multidisciplinary system that combines power and energy networks, information and communication technologies (ICT), artificial intelligence (AI), and advanced energy management to create a highly interconnected and intelligent energy ecosystem . For power grid enterprises, it enables the integration of multi-vector energy systems, including electricity, heat, hydrogen, and energy storage, while supporting smart cities, industries, and agriculture . Key components include energy routers, energy hubs, virtual power plants, and carbon flow tracing systems, which facilitate real-time energy distribution, monitoring, and trading .

Technological Pathways

Power grid enterprises can adopt the Energy Internet through several technological routes:



- **Digital Transformation and Industrial Internet Maturity:** Enterprises need to build a maturity evaluation model covering equipment networking, information infrastructure, supply chain management, and intelligent production. Methods like Analytic Hierarchy Process (AHP) and Entropy Weight Method (EWM) help quantify and optimize these systems .
- **Smart Grid Communication Networks:** Deploying mission-critical 4G/5G networks and private LTE networks allows real-time monitoring, remote control, and edge computing for substations and line sensors, enhancing resilience and operational efficiency .
- **Integration of Emerging Technologies:** Incorporating IoT, digital twins, blockchain, cloud/edge computing, and AI enables predictive maintenance, energy optimization, and secure data management .

Business and Operational Implications

The Energy Internet transforms traditional power grid operations by:

- Optimizing energy flow across production, transmission, and consumption networks.
- Enabling new business models, such as peer-to-peer energy trading, virtual power plants, and multi-energy market clearing mechanisms .
- Enhancing resilience and security, allowing grids to adapt to renewable integration, extreme weather, and cyber threats .
- Supporting clean energy transition, integrating hydrogen, carbon capture, and energy storage into the grid ecosystem .

Implementation Strategy

For power grid enterprises, the implementation involves:

- **Vertical and horizontal integration:** Collaborating with upstream and downstream partners while leveraging societal resource-sharing demands .
- **Digital infrastructure development:** Building robust ICT and edge computing platforms to support real-time data collection and control .
- **Pilot projects and scaling:** Starting with smart grid trials, virtual power plants, and energy hubs, then expanding to full-scale Energy Internet ecosystems .
- **Regulatory and market alignment:** Designing multi-energy and carbon markets, and establishing clearing mechanisms to support trading and operational efficiency . By following these pathways, power grid enterprises can transition from traditional grid management to a fully integrated, intelligent, and market-oriented Energy Internet, improving efficiency, sustainability, and competitiveness in the evolving energy landscape.

Article Content

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Key technologies and applications of collaboration between digital ...

1 INTRODUCTION Constructing a new power system with high penetration of renewable energy is the inevitable way

Energy Internet, the Future Electricity System: Overview ...

Energy Internet integrates small-scale renewable energy systems, electric loads, storage devices, and electric

The Use of Power IoT Technology in Power Grid Enterprises ...

In the pursuit of new quality productivity within power grid enterprises, Power Internet of Things (IoT) technology has been widely

Energy Internet, the Future Electricity System: Overview, Concept ...

The Internet of Energy ensures the optimization of the production, distribution, accumulation and consumption of all

Research on Core Development Capability of Energy Internet Enterprises ...

At present, China's economy has been transformed from a stage of high-speed growth to a stage of high-quality

Research on the Path and Technique Route of Power Grid

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Based on the characteristics of grid companies, conduct detailed research from six major energy Internet industries to

Business classification of Power Grid Enterprises in the

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