

How large is the energy internet

Article Overview

The energy internet, encompassing global internet infrastructure, consumes hundreds of terawatt-hours annually and could account for up to 5% of global electricity by 2050, while conceptually it represents a decentralized, smart network integrating renewable energy and digital connectivity.

Quantitative Scope

The energy footprint of the internet is substantial and growing. In 2022, global internet infrastructure consumed approximately 800 terawatt-hours (TWh) of electricity, driven by 5 billion users generating 4.7 zettabytes of data traffic . By 2025, data centers alone are projected to use around 536 TWh, roughly 2% of global electricity, with AI and digital services contributing to rising demand . Some estimates suggest that by 2030, internet energy consumption could double, potentially reaching 5% of global electricity use by 2050 . For context, the internet currently uses more electricity than the United Kingdom and is responsible for roughly one billion tonnes of CO2 emissions annually . The main contributors to this energy use include:

- o Data centers: Servers, cooling systems, and storage facilities are the largest consumers .
- o Network infrastructure: Routers, switches, and transmission lines that transport data globally .
- o End-user devices: Computers, smartphones, and tablets, which collectively add significant energy demand .
- o The "last mile": Connections between networks and individual users, often less efficient .

Conceptual Scope: The Energy Internet

Beyond raw energy consumption, the energy internet is a vision for a smart, decentralized energy network that integrates renewable energy sources with digital connectivity. Proposed by Jeremy Rifkin as part of the Third Industrial Revolution, it aims to:

- o Enable multi-directional flows of renewable energy.
- o Support smart grids and digital manufacturing.
- o Reduce energy poverty and create millions of jobs globally .
- o Leverage big data and AI to optimize energy production, distribution, and consumption . This conceptual energy internet is not just about electricity usage but about transforming energy systems to be more sustainable, efficient, and responsive to real-time demand.

Summary

The energy internet is both massive in scale and strategically transformative. Quantitatively, it already consumes hundreds of TWh annually and could reach 5% of global electricity by mid-century. Conceptually, it represents a decentralized, intelligent network that integrates renewable energy, digital infrastructure, and

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smart grid technologies to reshape global energy production and consumption patterns .

Energy Internet (often reflects Internet plus energy) is a novel energy network that interconnects the power system

The benefits of the energy Internet, along with the challenges of its implementation on a large-scale distributed

The Energy Internet represents a transformative paradigm integrating advanced power systems, distributed

Energy Internet is the integrated use of the advanced power electronic technology, information technology and intelligent control

Electricity demand grew more rapidly than both overall energy demand and GDP, increasing by 4.3% in 2024. The absolute increase

The concept of Energy Internet has emerged from the limitless possibilities of energy sharing networks formed by

IDC forecasts \$3 trillion in global ICT infrastructure spending for the coming decade, all of which uses electricity.

Energy internet features are highlighted to enhance efficiency, security and reliability. Energy internet architectures and

Energy Internet is an innovative concept based on synergy of multi-energy systems including electricity, gas, cooling and transportation.

Abstract With the intensifying energy crisis and environmental pollution, the Energy Internet and corresponding patterns of energy

Renewable energy will play a key role in decarbonizing our energy systems in the coming decades. But how rapidly is our production

Energy Internet has caught an attention of the global academic community, and it is being implemented actively. This paper

This paper describes the basic features and the key structure of Energy Internet, proposes a hierarchical model, and presents key

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To realize renewable-energy-based electrification goals, a new concept the Energy Internet (EI) has been proposed, inspired by the

In this paper, we propose the redefinition of EI, based on a comprehensive literature review, some latest trends and

Abstract Energy Internet (EI) envisions a future energy system with sustainable concerns of efficiency, economy and

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