



Global Energy Review 2026 –
**Implications for Grids, Transformers &
Protection Technology**
from the Perspective of a Fuse and Component Manufacturer

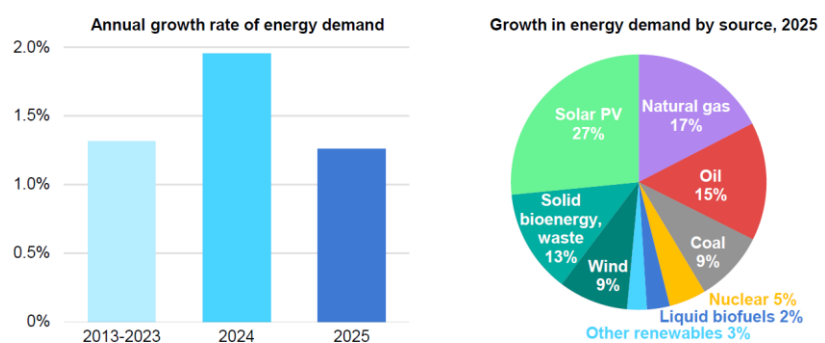
Introduction

The transformation of the energy supply and the associated expansion of renewable energy are creating new challenges for planners, operators, and system builders: electrical systems are becoming more powerful, decentralized, and complex. At the same time, requirements for safety, availability, and cost-effective operation are increasing. Anyone who plans or operates photovoltaic systems, battery energy storage systems, charging infrastructure, data centers, or industrial power distribution systems must therefore consider protection technology as an integral part of the overall system from an

early stage. The following article examines market developments and explains why high-voltage fuses and semiconductor fuses (ULTRArapid®) are playing an increasingly important role in modern energy systems. It is intended

for technical decision-makers, planners, operators, and system builders who want to protect electrical installations reliably and effectively reduce the risk of failure.

Global energy demand: average annual growth, 2013-2025, and share of growth by source, 2025



IEA. CC BY 4.0.

Note: "Other renewables" include hydropower, solar thermal, geothermal and biogases.

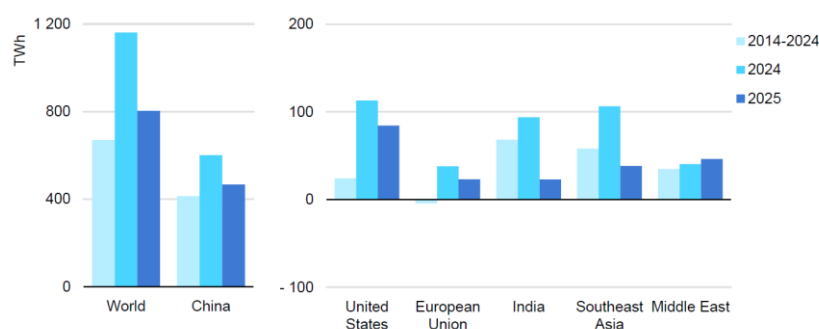
Strong Growth in Electricity Demand

The global energy economy is undergoing a profound transformation. Key figures from the IEA Global Energy Review 2026 show that global electricity

demand grew by around three percent in 2025, continuing to outpace total energy demand, which increased by only about 1.3 percent. This development

confirms a structural trend: electricity is becoming the dominant energy carrier in modern economies (IEA Global Energy Review 2026, pp. 5, 23).

Average annual change in electricity demand by region, 2014-2025



IEA. CC BY 4.0.

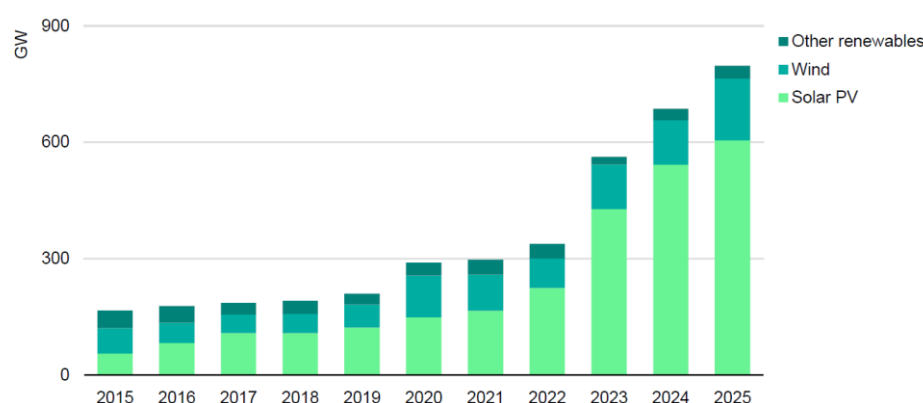
This growth is being driven primarily by new electrical applications. In addition to the ongoing electrification of industrial processes and buildings, data centers and electric mobility are becoming increasingly important. In the United States, for example, data center expansion accounted for about half of the growth in electricity demand (IEA Global Energy Review 2026, p. 23). At the same time, more than 20 million electric vehicles were

sold worldwide, representing roughly one quarter of all new vehicle registrations.

At the same time, the generation mix is undergoing a fundamental shift. In 2025, solar PV was the largest single source of global demand growth and accounted for more than 25 percent of the additional energy demand. Approximately 800 gigawatts of new renewable capacity were installed in total, with solar

energy representing the dominant share (IEA Global Energy Review 2026, pp. 5, 11). This development is being complemented by a major expansion of battery storage: with 108 gigawatts of newly installed capacity and growth of about 40 percent year over year, battery storage ranks among the most dynamic technologies in the energy system (IEA Global Energy Review 2026, p. 36).

Total renewable capacity additions by technology, 2015-2025



IEA. CC BY 4.0.

Notes: 2025 values are based on both actual and estimated additions for regions where full-year data is not yet available. "Other renewables" include hydropower, bioenergy, geothermal, concentrating solar power and marine energy.

Market Development and Structural Change

These figures indicate not only growth, but also a profound structural transformation. Energy generation is becoming increasingly decentralized while system complexity continues to rise. A major driver is the integration of variable renewable energy, which

requires flexible, fast-responding systems. Battery storage plays a key role in this context and is increasingly regarded as a fundamental building block for security of supply and grid stability (IEA Global Energy Review 2026, p. 36).



Infrastructure challenges are also emerging. The report explicitly points to delays in grid connections and supply-chain bottlenecks. As a result, many systems are temporarily operated in decentralized or hybrid configurations (IEA Global Energy Review 2026, p. 11). These developments are fundamentally changing the requirements for the

planning, operation, and protection of electrical systems.

In practice, this transformation means that protection concepts must safeguard not only individual components, but also the interaction among generation, storage, conversion, and distribution. Particularly in applications with high power

levels, dynamic load profiles, and DC components, the right protection technology determines whether faults can be controlled and limited while critical infrastructure remains available.

Technical Implications for Protection Systems

The transformation described above is creating new technical conditions. Of particular relevance are rising short-circuit power levels, higher voltage levels, and the growing use of power-electronic systems.

In the event of a fault, battery storage and inverter-based applications can generate very high currents within an extremely short time. At the same time, DC systems lack natural current zero crossings, which makes interruption significantly more

difficult. DC voltages of up to 1,500 volts have also become established in modern photovoltaic and storage systems, substantially increasing the requirements for dielectric strength and arc extinction.

System complexity is increasing as well. Decentralized feed-in, bidirectional power flows, and hybrid operating modes require protection concepts that operate not only reliably, but also selectively. Faults must be isolated in a targeted manner

without affecting larger sections of the system.



The Role of High-Voltage Fuses within the Overall System

Against this backdrop, high-voltage fuses are becoming increasingly important as part of modern protection concepts. They perform a central function in protecting critical infrastructure

and make a significant contribution to the stability of electrical systems.

Typical applications include transformers, grid connection points for renewable generation facilities, and

utility-scale battery energy storage systems.

They are also an established part of the electrical protection architecture in industrial applications with high power requirements.

Their relevance stems from several technical characteristics. High-voltage fuses have a high breaking capacity and can safely interrupt even extreme short-circuit currents. At

the same time, their defined time-current characteristics allow precise coordination within multilevel protection concepts. This is particularly important in complex systems with multiple feed-in points.

Another advantage is their robustness under thermal and electrical stress. Modern energy systems are

characterized by dynamic load profiles that subject protective components to continuous stress. High-voltage fuses must therefore operate reliably not only during a fault, but also remain stable in continuous service.

The Role of Semiconductor Fuses within the Overall System

As photovoltaic systems, battery storage, and charging infrastructure expand worldwide, the importance of high-performance protection concepts is growing. These applications increasingly rely on power-electronic components that are especially sensitive to short circuits and overloads because of high power densities and rising voltages and currents. At the same time, these components are among the most expensive and critical elements of modern energy systems.

Semiconductor fuses perform a central protective function in these applications. They are specifically designed to safely interrupt fault currents within a few

milliseconds, before power semiconductors or adjacent system components are damaged. They must meet a wide range of requirements: reliable protection in short-circuit and overload conditions, management of high current peaks, and continuous exposure to dynamic load profiles and frequent switching, charging, and discharging cycles. High cycling capability, precise coordination within selective protection concepts, and consistently stable performance under demanding operating conditions are equally important.

Battery storage systems, photovoltaic inverters, and charging systems combine high DC voltages, high currents, and complex operating

conditions. Protective components therefore require high breaking capacity and precise operating characteristics. Semiconductor fuses make a significant contribution to protecting people, equipment, and investments. They minimize consequential damage, reduce unplanned downtime, and help ensure the availability of critical energy infrastructure. Failure of central power electronics can have far-reaching consequences, ranging from costly repairs and loss of revenue to restrictions on grid stability and the availability of storage and charging systems.

Technological Context and Industrial Perspective

The requirements described above are reflected in the continued development of industrial protection solutions. Manufacturers such as SIBA, which specialize in high-performance, high-voltage, and semiconductor fuses, address these developments through targeted product adaptations and application-specific solutions.

The focus is on fuses with high breaking capacity, stable performance under demanding operating conditions, and precisely defined operating characteristics. At the same time, the ability to provide solutions for different system architectures is becoming increasingly

important, from conventional AC grids to modern DC applications in photovoltaic and battery energy storage systems. Application expertise is another decisive factor. The increasing complexity of modern energy systems requires a deep understanding of the relevant operating conditions. Manufacturers with experience in key growth areas such as renewable energy, energy storage, and industrial power distribution can make an important contribution to designing reliable protection concepts.

This creates a direct link to the customer's specific questions: Which fuse is suitable for which system architecture?

How can selectivity be ensured? What requirements result from short-circuit power, voltage level, installation environment, and operating profile? In many projects, these questions cannot be answered in general terms, but require an application-specific assessment.



Conclusion

Current developments in the energy sector make it clear that electrical infrastructure is changing fundamentally. The combination of growing electricity demand, the rapid expansion of renewable energy, and increasing system complexity is creating new requirements for planning and operation.

In this context, high-voltage fuses and semiconductor fuses (ULTRArapid®) are central elements of modern protection concepts. They enable rising short-circuit power levels to be managed safely, support the

stability of complex systems, and contribute to the availability of critical infrastructure.

For operators, planners, and system builders, this means that protection technology must be considered early and in an integrated manner. In an increasingly dynamic energy system, it is becoming a decisive factor for safety, efficiency, and long-term system stability.

If you are planning a new project, optimizing existing installations, or designing protection

concepts for photovoltaic systems, battery energy storage systems, charging infrastructure, power distribution, or industrial applications, SIBA can support you in selecting and evaluating suitable fuse solutions. Together with you, we assess the technical parameters of your application and develop an appropriate solution for a reliable, safe, and cost-effective protection concept.

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Sources:

IEA, Global Energy Review 2026, in particular pp. 5, 11, 23, and 36