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Key impacts of integrating distributed energy resources into the power grid

As the world's energy systems move toward a more decentralized, multidirectional model, integrating modern advanced grid support distributed energy resources (DERs) such as photovoltaics (PV) solar and battery energy storage have become imperative. Within this evolving framework, testing and certifying products to established standards and certifications is critical to supporting safety, reliability and efficiency.

Enhanced grid reliability, stability and security

Up to
30%
increase in grid resilience against outages by diversifying energy sources and reducing reliance on centralized power plants.

A potential
40%
reduction in the frequency and duration of power outages from DERs and microgrids.

Improvement by about
25%
in global energy security metrics, increasing resiliency and reducing weaknesses related to centralized grid failures.

An increase of up to
15%
in operational efficiency from DERs, particularly smart inverters.

Reduced emissions

Through the take up of low-emissions sources, notably solar, wind and battery storage, a
30%
reduction in fossil fuel could be achieved.

By integrating DERs across the EU, an emissions reduction of up to
60%
could be achieved in part by 2030.

Expanded deployment of battery energy storage systems could help reduce up to
2.5
million tonnes of CO_2 emissions annually.

Depending on how they are integrated with renewable energy sources, microgrids can reduce emissions up to
50%.

Lower cost of electricity

DERs could help generate operational savings of
10%–20%
for utilities

Average cost per outage event could drop by
$1,400 (USD)
by adopting DERs, enhancing reliability and stabilizing power supply during outages.

DERs can help stabilize electricity prices, potentially saving
5%–10%
on consumer electricity bills due to operational efficiencies and reduced fossil fuel reliance.

Aggregated DERs could save ratepayers up to
$3.6 billion (USD)
by 2030 through enhanced efficiency, use of existing resources, and avoiding or deferring new power plant build.

Greater market growth and adoption

The global distributed energy generation market is projected to grow from
$133.5 billion (USD)
in 2022 to
$241.6 billion (USD)
in 2028.

Renewables will account for almost half of global electricity generation by 2030, with the share of wind and solar PV doubling to
30%.

Renewable energy consumption in the power, heat and transport sectors is anticipated to increase nearly
60%
between 2024 and 2030.

The potential for grid services will play a role in driving behind-the-meter storage to become a
6.2 gigawatt-hour
annual market by 2025.

New cybersecurity concerns

In 2024, U.S. utilities faced a jump in cyberattacks of nearly
70%
compared to the previous year.

Vulnerabilities from DERs and connected devices could lead to a
50%
increase in potential threats.

Cyber threats remain the top business risk, identified by
75%
of CISOs as a moderate or serious risk in an October 2024 Pulse Survey.

In a 2024 breach linked to a common EV charging application, a threat actor exposed about
116,000
records of sensitive data from multiple charge point operators around the world.

Balancing innovation with safety on the power grid

Evaluating, testing and certifying to effective standards are more than just regulatory checkpoints; they represent essential enablers of innovation. By investing in and adhering to these frameworks, grid stakeholders can harness the power of DERs to achieve a cleaner, more efficient and more secure energy ecosystem.

At UL Solutions, we help bridge the gap between innovation and safety testing, assessing and certifying to standards aligned with new energy technologies. We sit on 1,300+ standards panels and other technical committees to keep pace with technology and innovation.

Our rigorous testing and certification processes evaluates and tests whether new products comply with applicable safety requirements and regular follow-up to confirm continued compliance.

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