



Evolving Landscape of Power Systems in the EU and Beyond



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The landscape of power systems across the globe is undergoing a significant change that is more pronounced in advanced economies than in developing economies. Compared to developing economies, advanced economies have the required fiscal space to invest in renewable generation and electric vehicles, followed by the mandatory upgradation and expansion of electricity grid infrastructure.

The shift is primarily driven by climate change as increasingly frequent and severe weather events, from hurricanes to wildfires, pose substantial challenges to the reliability and stability of power systems worldwide. Weather extremities can potentially damage grid infrastructure

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and disrupt the supply chain of fuel (for conventional generation) and power grid equipment, in turn leading to power outages affecting millions of consumers. The vulnerability of electricity grid infrastructure to climate change requires power system planners to reassess their entire strategy.

The major challenge for the electricity grid operator is the inherent vulnerability of conventional power sources, including fossil fuels and nuclear power plants, to climate-related disruptions. Furthermore, the widespread integration of renewable energy with the electricity grid and the adoption of EVs has introduced another layer of complexity in grid management.



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There is an urgent need to move towards resilient and adaptive power systems that can navigate these challenges, unlike traditional power systems, which are at greater risk. This requires reinforcing the physical electricity grid infrastructure against climate-related disruptions and deploying advanced technologies, especially artificial intelligence-based solutions, that increase the grid's resilience.

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This move has pushed the original equipment manufacturers of power grid equipment to adopt sustainable practices and move towards utilizing environmentally friendly substances during the manufacturing process. The phased elimination of gases with a significant global warming potential aligns with the broader efforts to move towards cleaner and sustainable energy solutions. The regulations are being enforced at voltage levels where the alternative technology is available, but it is expected to either allow conventional technology or revise the deadlines in case the alternative is unavailable. This has also created room for innovation in the power grid equipment industry, leading to the invention of environment-friendly gas mixtures that can be deployed in the

switchgear for a certain voltage level while research is being conducted for gas mixtures that can be used in switchgear operating at higher voltages.

The regulations are crucial in steering the industry toward an environment-friendly and sustainable future. However, the entire transition will be subject to compliance and commercial availability of alternative technologies. The landscape of power systems is rapidly evolving in the advanced economies, specifically in the EU member states, but as alternative technologies become available and their prices drop, stringent regulations are likely to be introduced in developing economies as well.