

## ABSTRACT

With Europe committed to decarbonizing its energy sector, significant investments are being made to upgrade the electricity grid and integrate renewable energy sources. Yet, a shortage of distribution transformers threatens to undermine these efforts, causing delays and escalating costs. This article discusses the factors contributing to the

transformer shortage, examines the unintended effects of the Ecodesign Directive, and suggests strategies for addressing these obstacles to ensure continued progress.

## KEYWORDS:

decarbonization, renewable energy, grid infrastructure, supply chain, ecodesign directive

# Powering down progress: The impact of distribution transformer shortage on green ambitions in Europe

Europe is pushing hard to deploy renewable energy to combat climate change, fulfil international commitments, and reduce reliance on Russian fossil fuels. The region is making significant investments in [electricity grid infrastructure](#) to accommodate the increasing flux of renewable energy sources. However, an acute shortage of distribution transformers poses a major threat to efforts focused on upgrading the grid.

This has delayed project completion and escalated costs that will eventually be passed on to consumers. This article explores the decarbonization goals and corresponding grid investments in Europe, followed by a discussion on the impact of transformer shortages and the Ecodesign Directive on decarbonization goals. It further sheds light on the regulatory and industry responses to the [distribution transformer shortage](#).

## Decarbonization goals and grid investments

Europe has set aggressive targets to deploy renewable energy, which will, in turn, reduce carbon equivalent emissions. By 2030, the EU plans to generate 45% of the electricity from renewable energy sources (initially, the target was to increase the share of generation from renewable energy sources to 32%).

To accommodate the increasing share of renewable energy in the generation mix, the EU plans to invest USD 638 billion in grid expansions and upgrades by 2030. In 2023 alone, Europe invested around USD 66 billion, which accounts for 20%

**The region is making significant investments in electricity grid infrastructure to accommodate the increasing flux of renewable energy sources**



## The majority of the EU's investments into renewable energy (around 60%) were earmarked for distribution networks

of the global investment in grid infrastructure.

Most of these investments (around 60%) were earmarked for distribution networks. One reason behind the extensive focus on the distribution grid was the region's aging distribution infrastructure. Over 40% of the distribution grid is over 40 years old and doesn't align with EU standards.

In leading European countries, utility investments increased year over year. France, Germany, and Spain invested USD 3.65 billion, USD 3.2 billion, and USD 2.6 billion in the utility sector in 2023, respectively. Despite the significant investments, Europe's push to upgrade and expand the grid faces a major roadblock.

### The impact of transformer shortages

Despite heavy investments, Europe's push to expand and upgrade its electricity grid infrastructure is facing a major obstacle

in the form of an acute distribution transformer shortage. Several factors have exacerbated the distribution transformer shortage, including geopolitical tensions and supply chain disruptions.

Europe's distribution transformer production capacity is already insufficient to meet its growing demand, but to meet strategic requirements, it had to export distribution transformers to Ukraine, which further strained the limited supply.

These shortages have far-reaching implications for renewable energy projects in the region. An increase in lead times is causing significant delays in project completion, which has led to increased prices across various industries. The lead time of distribution transformers has increased to 2 years. In Germany, for instance, transformer shortages can delay offshore wind energy projects by as long as two years, jeopardizing renewable energy targets.

The unintended consequences of the Ecodesign Directive

The transformer shortage in the region is expected to be further exacerbated by the upcoming Tier-3 of the Ecodesign Directive as it proposed the use of amorphous steel in manufacturing transformer cores. Although amorphous steel is comparatively energy efficient, it also comes with significant supply challenges.

Currently, Europe has a limited supply of amorphous steel, while more than half of it being supplied by China. In the short run, introducing a standard that mandates the use of amorphous steel will only increase the dependence on imports and worsen the shortage in the region.

On the other hand, the use of amorphous materials in the manufacturing of cores can make them noisy and weak. Improper handling of material can also pose health risks to workers, as small particles can be released into the air.

### Regulatory and industry responses

The EU, however, is actively trying to address the transformer shortages. Despite bookings until 2030, European manufacturers are reluctant to invest in new production facilities due to the uncertainty of transformer demand. A dearth of skilled workers and key components such as iron

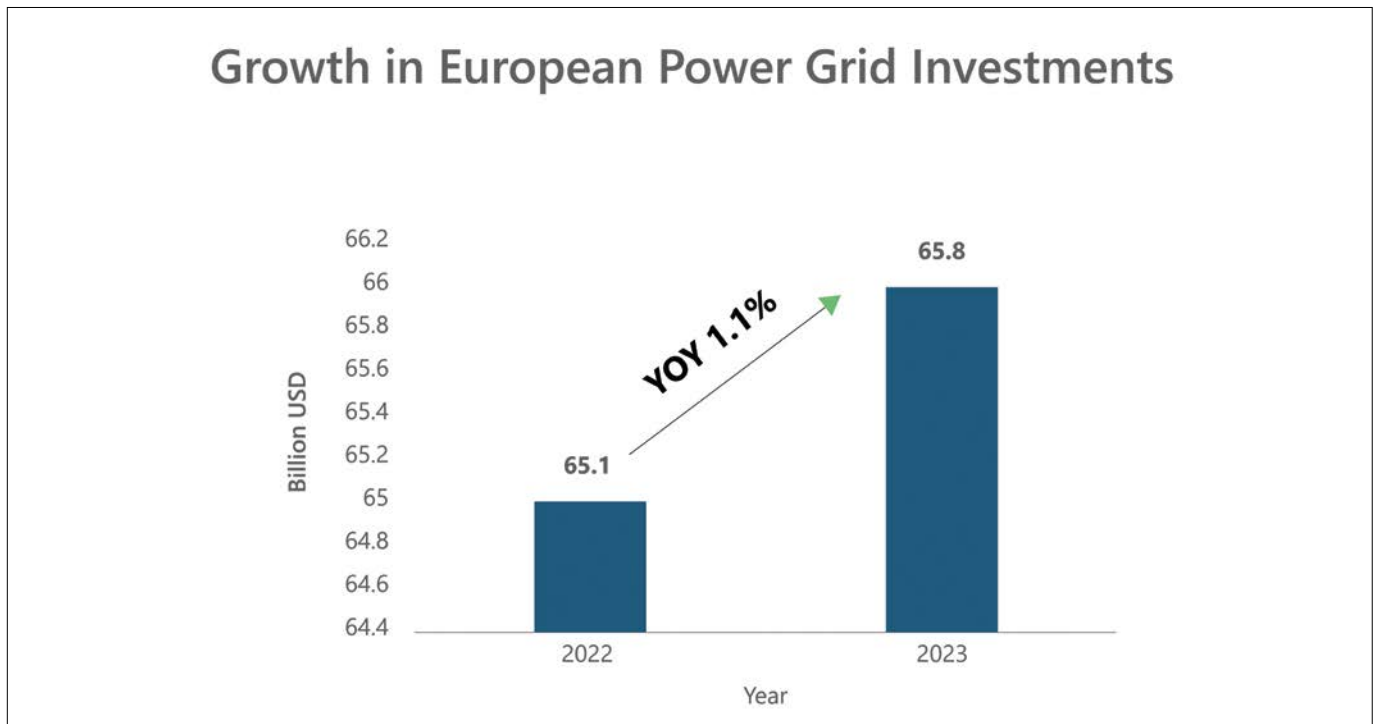


Figure 1. Growth in European power grid investments. Source: PTR Inc.

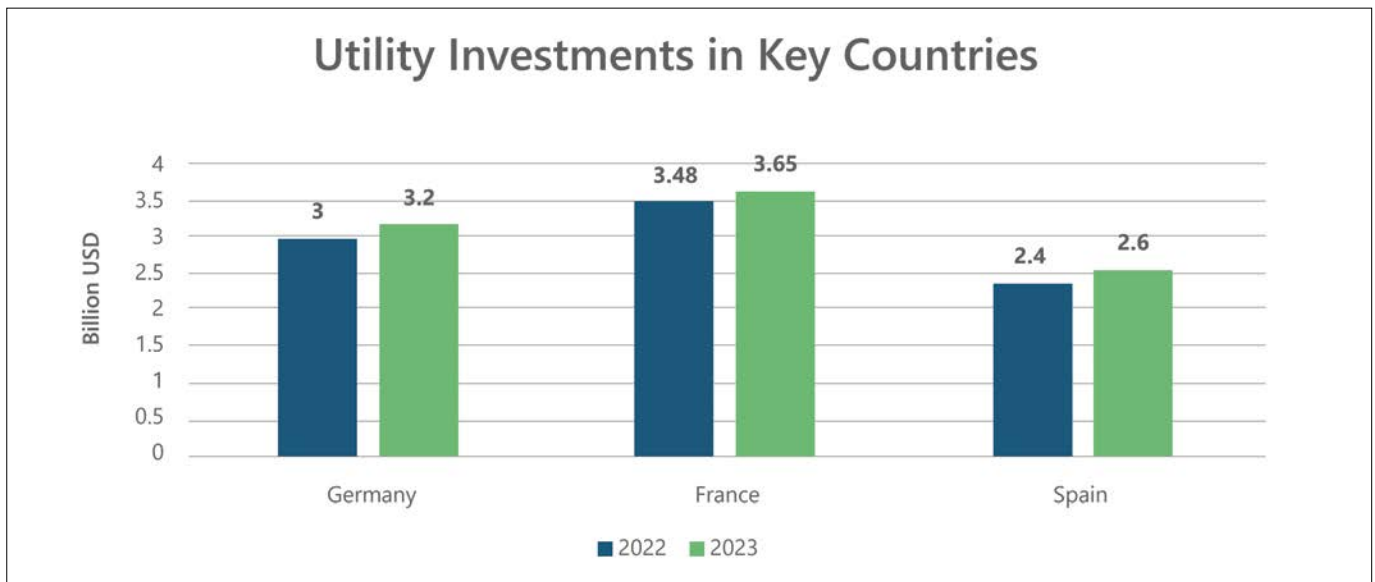


Figure 2. Utility investments in key countries. Source: PTR Inc.

## Despite heavy investments, Europe’s push to expand and upgrade the electricity grid is facing a significant obstacle in the form of an acute distribution transformer shortage

cores used in the manufacturing of transformers has also complicated the situation.

In order to deal with the crisis at hand, PTR recommends the following actions:

- **Increase Domestic Production Capacity:** European governments need to take policy measures to incentivize domestic transformer production. These could include financial incentives, tax breaks, and grants for setting up new manufacturing facilities.
- **Enhance Workforce Training:** The governments and private stakeholders in the transformer industry need to invest in training programs and apprenticeships in electrical and technical fields. This will help build a pool of skilled workers capable of meeting the industry’s demand for skilled workers.

**Addressing the transformer shortage is crucial for meeting Europe’s renewable energy targets and decarbonization goals**

### Looking ahead

Europe’s ambitious decarbonization goals are driving significant investments to upgrade and expand the electricity grid infrastructure, specifically the distribution grid. However, the severe shortage of distribution transformers is a major roadblock that threatens to derail these efforts. Addressing the transformer shortage is crucial for meeting Europe’s renewable energy targets and decarbonization goals. Europe can overcome these challenges by providing incentives to establish domestic transformer production facilities, investing in workforce training, and securing a sustainable, green energy future.

**About PTR**

With over a decade of experience in the Power Grid and New Energy sector, PTR Inc. has evolved from a core market research firm into a comprehensive Strategic Growth Partner, empowering clients’ transitions and growth in the renewable energy landscape and E-mobility, particularly within the electrical infrastructure manufacturing space.

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Eyman is an Analyst at PTR Inc., where she specializes in topics focused on transformers. Her professional journey began in the research sector at IDR, where she worked as a Market Research Analyst for the APAC region. After gaining a year of valuable experience analyzing market trends across various domains, Eyman moved to PTR as a Power Grid Analyst. Currently, her focus is on conducting thorough analyses and providing insights into the field of transformers. Eyman has a strong technical background, having earned a bachelor’s degree in electrical engineering.