

**CWIEME**  
BERLIN

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MESSE BERLIN



# **Welcome to CWIEME Tech Talk:**

## **Insights into the European Transformer Market and Emerging Trends**

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# Insights into the European Transformer Market and Emerging Trends

*Analysis of the European Distribution & Power Transformer Market*

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## Founded in 2016

Owned and operated by researchers, analysts, and power engineers.

### Objective:

To understand the recent and upcoming changes to our electric infrastructure while identifying and communicating the best technologies and associated business models applied by industry leaders.

## COVERAGE



Power Grid

New Energy



# Holistic Coverage of the Market

Work is Highly Customizable to Fit Your Specific Requirements



# PTR's Electrical Infrastructure Research Capabilities



PTR's Research Capabilities in Terms of Off-the-Shelf Reports for Power Grid and New Energy Topics



**Transformers**  
(Distribution, Power)



**Substation Automation**  
(Dist. vs Cent.)



**EVCI (EV Charging Infrastructure)**  
(Public, Private, Passenger/Comm.)



**Switchgear**  
(HV, MV)



**Port Electrification**  
(Shore-to-Ship, Microgrid)



**Energy Storage Value Chain**  
(Utility Scale, C&I)



**Flexible AC Trans. Systems**  
(SVCs, STATCOMs)



**Smart Meters**  
(Power Quality, AMI)



**COHV**  
(BEVs, PHEVs, FCEVs, ICEs)



**HVDC Market Analysis**  
(VSC, LCC, Cables)



**Power Factor Correction**  
(Active, Passive)



**H<sub>2</sub> Hydrogen**  
(Tech., Demand, Value Chain)



**AI in Power Grid**  
(DERM, DR, VPP, & EVs)



**Grid Communication**  
(Private LTE, 5G)



**Impact of EVs on Power Grid**  
(Quantitative, Trafos, Switchgr.)



**Grid Investment Tracker**  
(TSOs & DSOs)



**Industrial Motors & Drives**  
(MV/LV - Custom)



**Financial Trackers**  
(Grid Investments,  
Company Financial Breakdowns)



**Grid Modernization & Flexibility  
Technology Leaderboard**

# Transformers (Power, Distribution)- Service Description

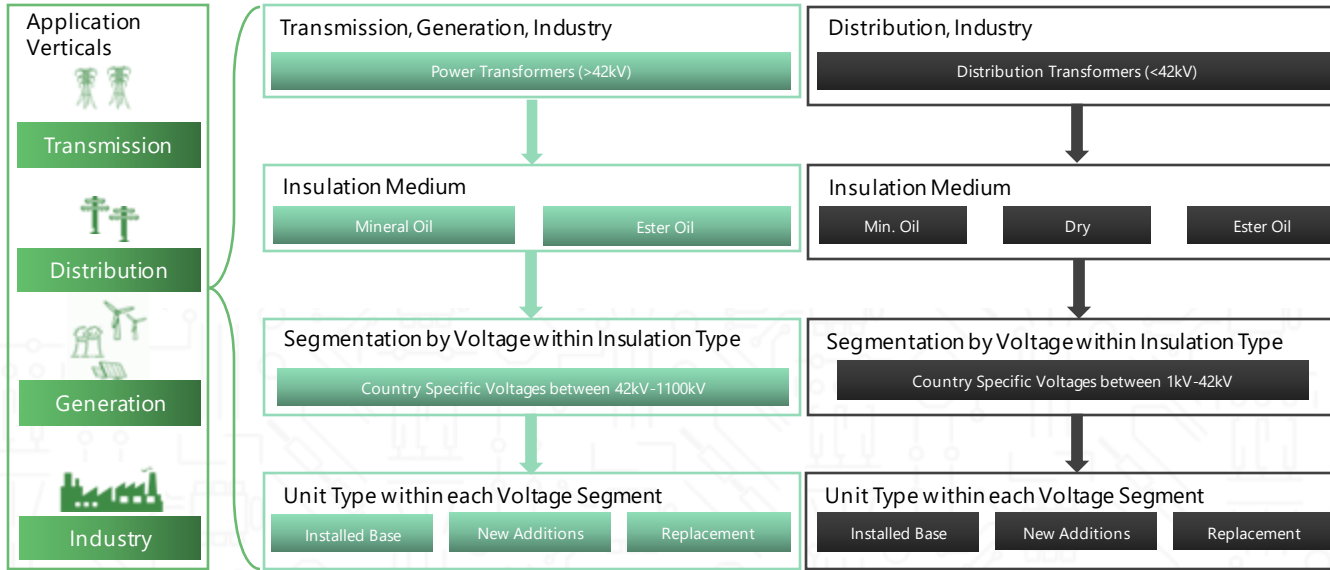
01



# Transformers (Power, Distribution)



Country-Specific Coverage of Transformers from 1kV and Above



## Service Description:

Transformers are a major spend item for utilities, especially in the mid-to-high voltage categories. They are the most crucial equipment in the substations, and also a key portion of the total spend of both transmission and distribution system operators. PTR sizes the opportunity for this critical equipment by looking at individual utilities (transmission & distribution) in the countries to analyze the upcoming greenfield and brownfield substation projects and loose components installations. This utility-specific approach allows us to understand the grid dynamics and analyze the market in more granular detail than most of our competitors and helps us convey a much deeper understanding of the market to our customers.

## Competitive/Qualitative Analysis:



Supplier Market Shares



Competitor Benchmarking & SWOT



Sales Channel Analysis



Product & Technology Trends



Country Specific Business Practices



Standards & Regulatory Landscape



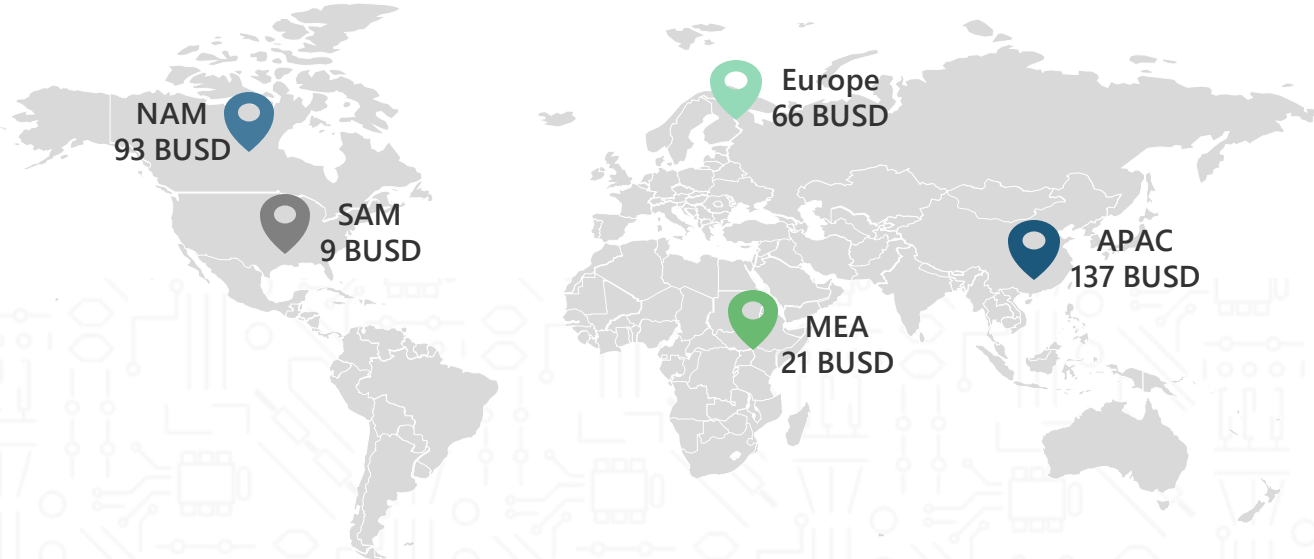
# Transformer Market Overview

02

# Investment in the Power Grid

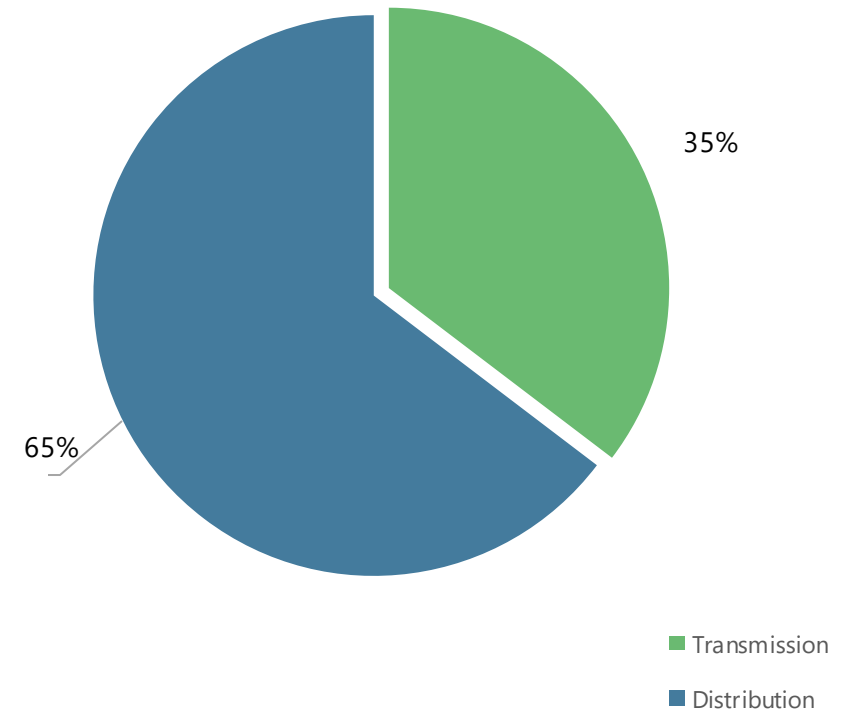
1/3<sup>rd</sup> Global Investment went to the Transmission Sector in 2023

2023 Power Grid Investment Split by Regions



- Global investment in electricity grids in 2023 was approximately 331 BUSD, with 42% coming from APAC due to its rapid industrialization and population growth, fueling the need for reliable electricity, directly translating to increased demand for transformers across the entire grid infrastructure.
- Investments in NAM and Europe are driven by renewable energy, EV adoption, and the replacement of old infrastructure.
- With SAM investments are driven by factors like urbanization, industrial expansion, and increasing adoption of electric vehicles.
- Increased investments in financial hubs, tourism, and non-oil exports in the Middle East drive infrastructure growth, leading to higher demand for transformers.

2023 Global Power Grid Investments



Source: IEA World Energy Investment Report 2023

# Grid Expansion & Modernization Plans



## Overview of Network Reinforcement Plans

- The Biden-Harris Administration has allocated 3.9 BUSD for the Grid Resilience & Innovation Partnerships Program, running from 2023 to the present.
- A total of 1.08 BUSD has been earmarked for Smart Grid Grants for the years 2024 to 2025.
- The Grid Innovation Program has received 1.82 BUSD in funding for the years 2024-25.



USA

- Amprion plans to invest 24 BUSD in increasing network capacity and upgrading a total of 3,900 km of power lines. 50Hertz has also announced to investment 9.4 BUSD in grid capacity to accommodate the continuing influx of renewable energy sources. The grid capacity investment will be made over the period 2023 to 2027



Germany

- India has expanded its transmission network capacity by 12% over the past five years and requires an investment of 80 BUSD for strengthening the grid transmission in the next five-year plan, as per IEEFA.
- Last year, POWERGRID announced India's plan to invest ₹2.8 trillion (34.2 BUSD) by 2030 to set up an interstate transmission network for evacuating renewable energy.



India

- Saudi Arabia will increase its HV transmission substations capacity by 214,000 MVAs by 2030. This will result in the construction of almost 560 transmission substations with a total of ~1,500 new power transformers by SEC.



KSA

- According to the latest report from the Brazilian Energy Research Company, Brazil will need to invest 11.17 BUSD in the next few years to reconstruct and expand transmission lines, including the construction of new lines, new substations, and the improvement of existing transmission projects.



Brazil

# Grid Expansion & Modernization Plans



## Overview of Network Reinforcement Plans

- By 2035, RTE plans to invest 14 BUSD in transmission and sub-transmission networks, 8.7 BUSD in replacing the old infrastructure, 7.6 BUSD in connecting marine energies, 3.3 BUSD in grid digitalization, and 2.2 BUSD billion in cross-border interconnection.



UK

- Hydro One announced an investment of 5.4 BUSD in 2023-2027 to renew both the high voltage transmission lines as well as equipment and upgrade infrastructure at 200 substations, including the replacement of 129 power transformers.



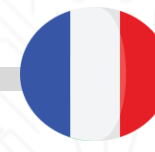
Canada

- The State Grid Corporation of China will maintain its annual investment budget at over 500 billion yuan (70 BUSD) in 2024. Its aim is to transmit 300GW by 2025 and 370GW by 2030 among its provinces and regions.



China

- By 2035, RTE plans to invest 14.1 BUSD in transmission & sub-transmission networks, 8.6 BUSD in replacing the old infrastructure, 7.6 BUSD in connecting marine energies, 3.26 BUSD in grid digitalization,



France

- Following a 23% renewable target by 2025, PLN plans to increase the capacity of its substation infrastructure by 76,662 MVAs and 47,723 km of new transmission lines, with an investment plan of 13.8 BUSD from 2021-2030.

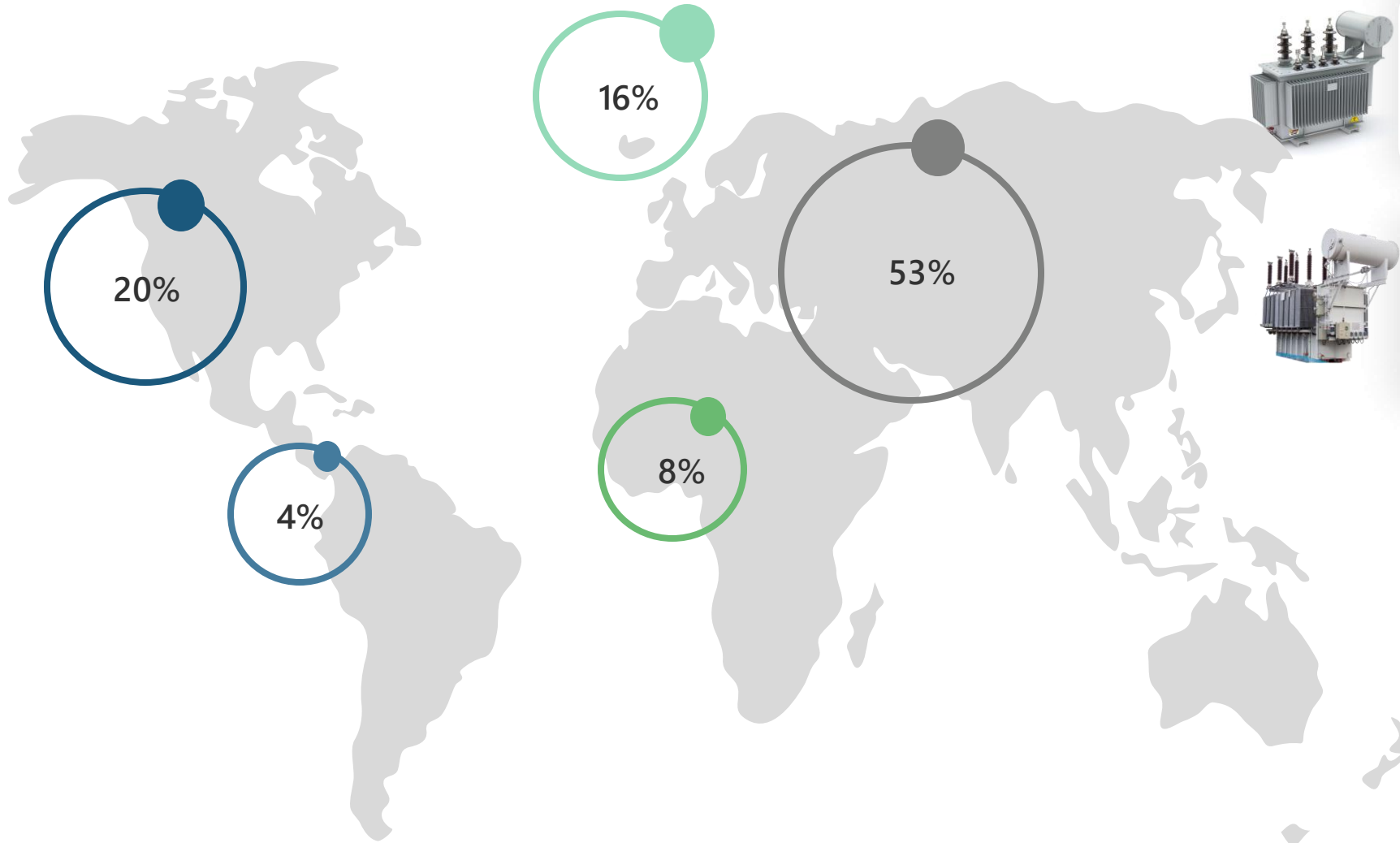


Indonesia

# Global Annual Transformer Market-2023



APAC Transformers Market is ~50% of the Global Market



## Global Distribution Transformer

- Market size – 26 BUSD
- CAGR – 6.3%



## Global Power Transformer

- Market size – 13.5 BUSD
- CAGR – 9.6 %

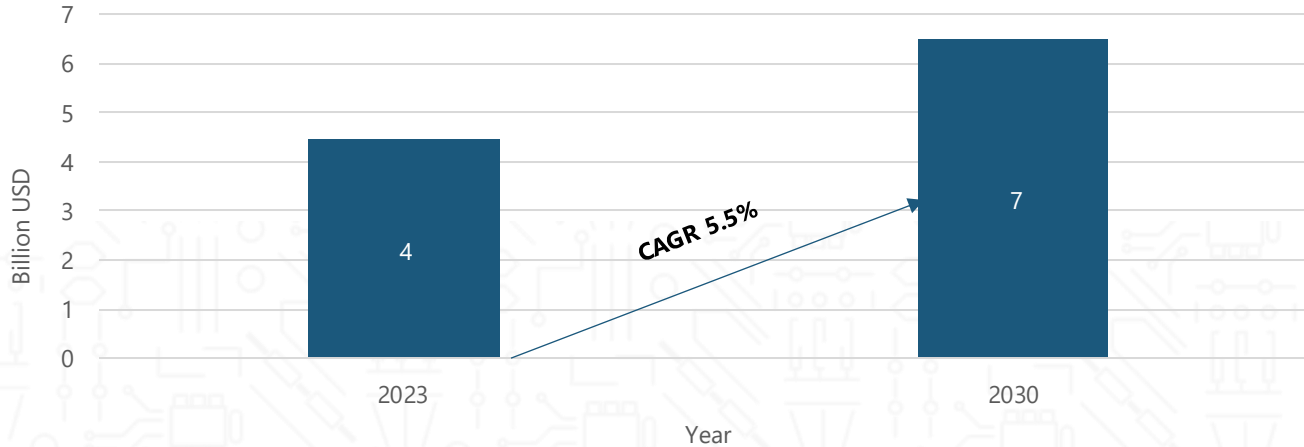
- APAC
- NAM
- SAM
- MEA
- Europe

# Distribution Transformers Market Overview



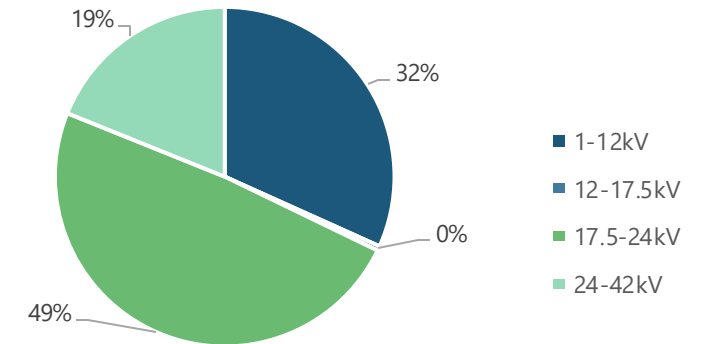
## Europe Market Snapshot

Distribution Transformer Annual Market - Europe

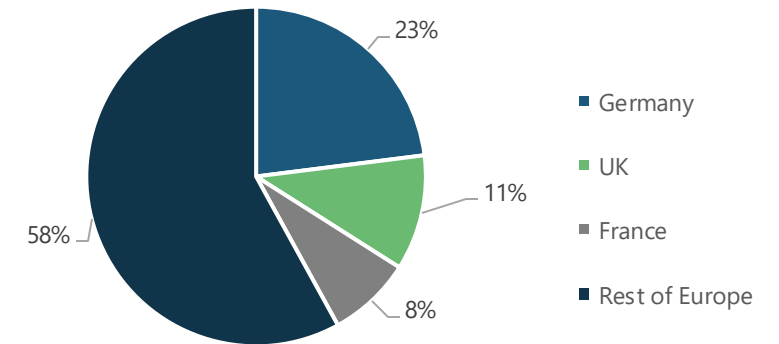


- The European distribution transformer market is poised for steady growth, with a projected CAGR of 5.5% over the coming years, driven by the twin forces of renewable energy and EV adoption.
- Almost half of the European DT market functions within the voltage range of 17.5-24kV, characterized by pad-mounted transformers averaging around 600kVA in size.
- While the total distribution transformer market remains dominated by mineral oil, a growing focus on sustainability and safety is driving a shift towards ester-based alternatives.
- Europe is nearly self-sufficient in meeting its annual market demand through local production.
- The European market has adequate supply capacity, maintaining lead times within a 16–18-week timeframe.

Europe's Dis. Trans Voltage Segmentation (2023)



Europe's Dis. Trans Key Markets (2023)

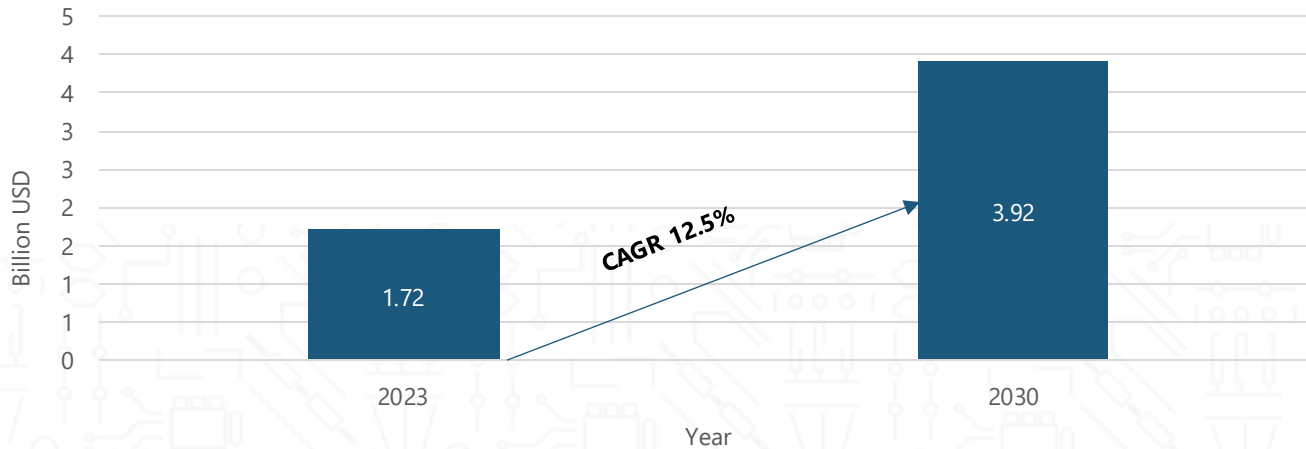


# Power Transformers Market Overview



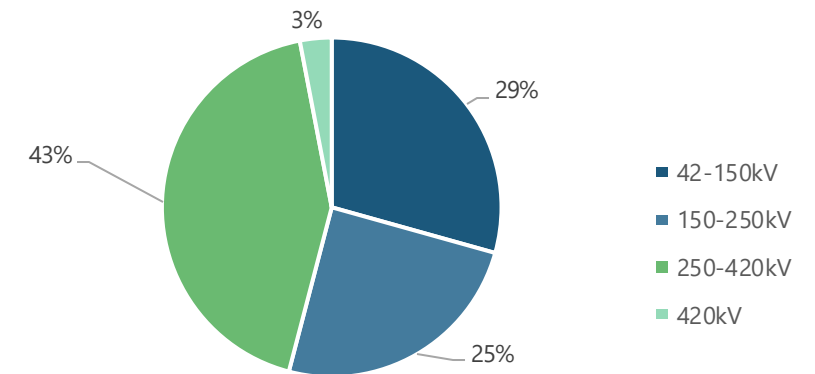
## Europe Market Snapshot

Power Transformer Annual Market - Europe

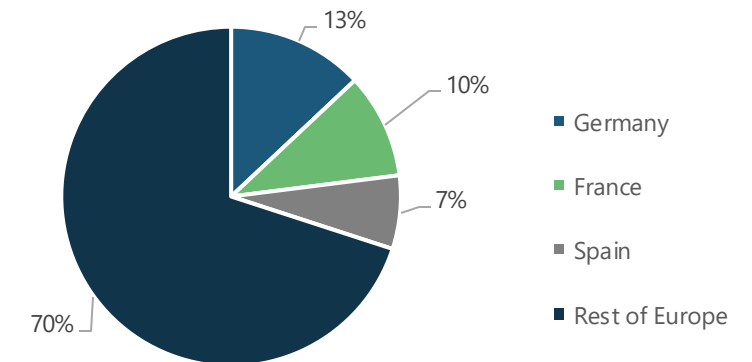


- The European region holds the second-largest portion of the power transformer market, representing around 13% of global revenue share.
- Integration of smart grid solutions such as digital monitoring and control fosters demand for advanced transformer technologies in the European market.
- Persistent supply chain struggles, compounded by post-pandemic demand, have led to full capacity utilization and a three-year lead time for power transformer manufacturers. Delays in grid interconnection for renewables are expected due to prolonged lead times.
- The EU is actively deploying ester-filled transformers as pilot projects for now, but they are anticipated to gain traction in the future.

Europe's Power Transformer Voltage Segmentation (2023)



Europe's Power Trans Key Markets (2023)





# Decarbonization Initiatives

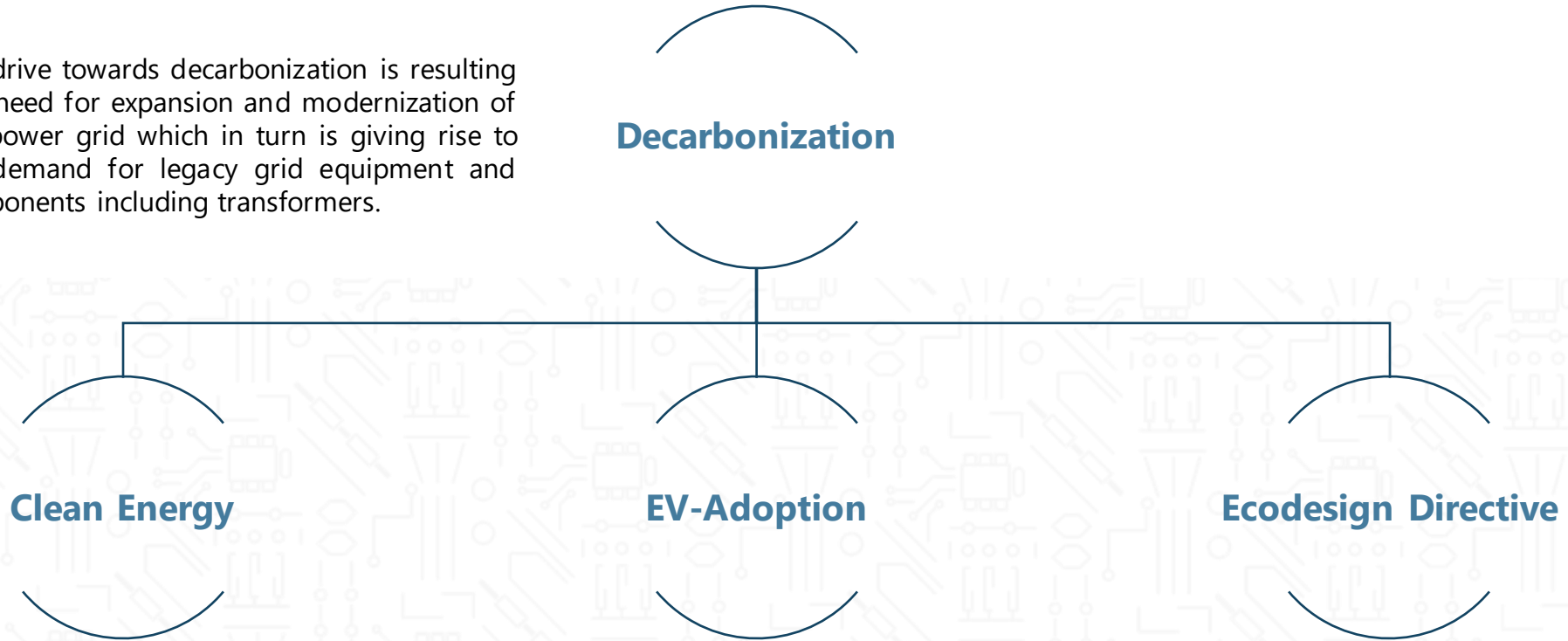
03

# Drive Towards Decarbonization



The Power Grid Expansion and Modernization are Inevitable to Achieve Net-Zero Targets

The drive towards decarbonization is resulting in a need for expansion and modernization of the power grid which in turn is giving rise to the demand for legacy grid equipment and components including transformers.



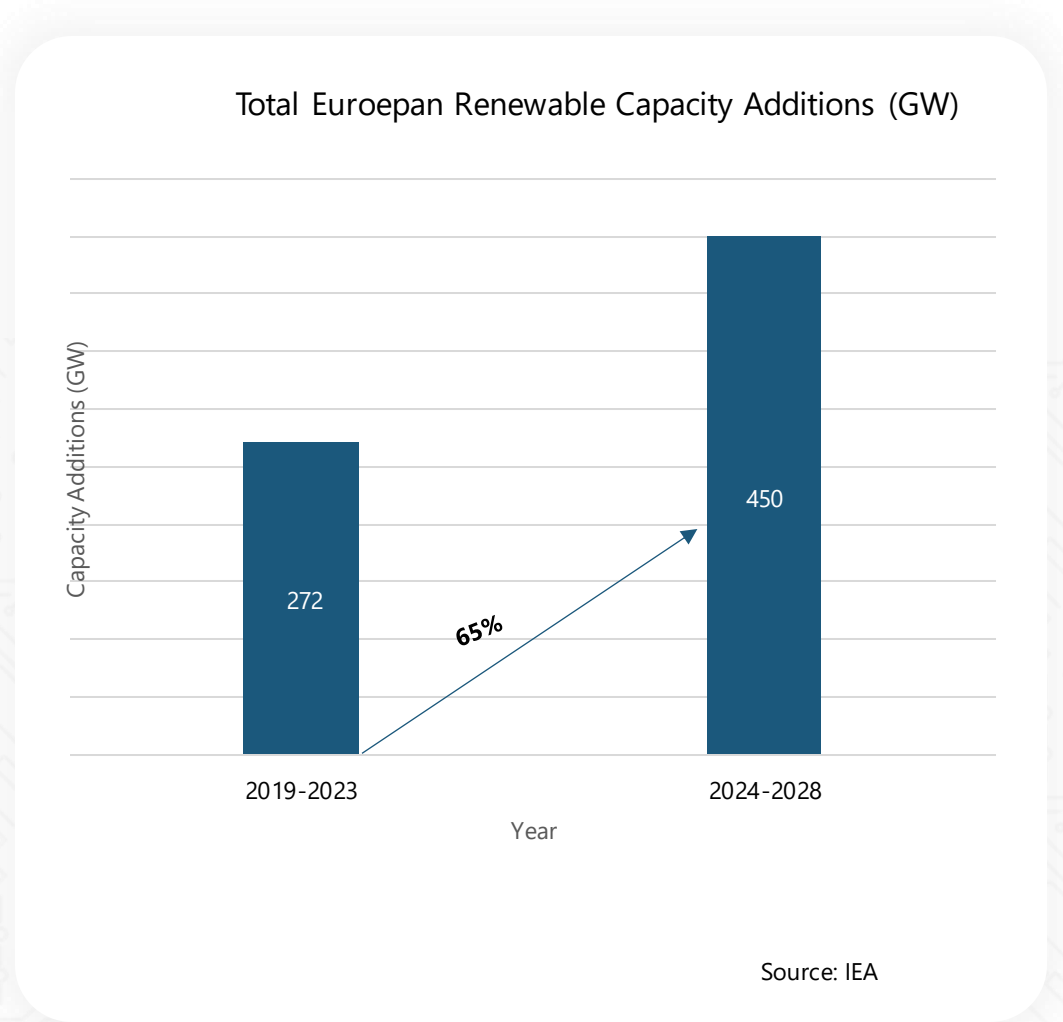
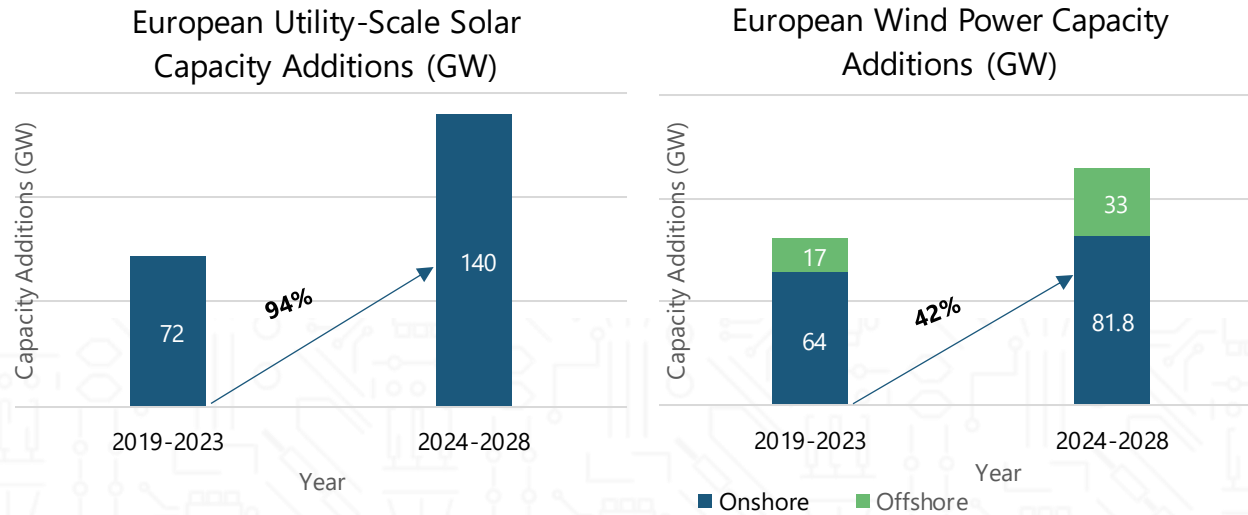
One of the key components of decarbonization is the increased adoption of renewable energy sources, driven by a desire to move away from fossil fuels and towards a more sustainable energy future.

The second major step toward decarbonization is electrifying the Transport sector. Increased adoption of electric vehicles to achieve the climate and Net Zero carbon goals is leading to a growing charging infrastructure network.

Ecodesign directive in the European Union promotes sustainable products by setting standards for energy efficiency, circularity, and resource use. It specifies design rules for transformers to enhance efficiency and minimize losses.

# Integration of Renewables

## Comparison of Historical and Forecast Years



- Renewable capacity additions are projected to increase by 65% from 2019-2023 to 2024-2028 due to the EU's ambitious targets to achieve a 45% renewable share in the energy mix by 2030 with 600 GW solar PV and 480 GW wind.
- Solar PV accounts for over 70% of the expansion, led by distributed systems, one-third more than utility-scale. Wind accounts for another 26%, led by onshore projects.
- Utility-scale growth is propelled by enhanced auction schemes accommodating increased developer costs, such as raised price ceilings in Germany and indexed contracts to inflation-related expenses in France. Accelerated corporate Power Purchase Agreement (PPA) adoption in Denmark further contributes to the upward trend.
- The forecast for offshore wind has been slow because of persistently long lead times and concerns over future projects' economic attractiveness.

# Integration of Renewables



## Renewable Energy Targets of Key Countries



### GERMANY

- Germany aims to have 100% of its energy from renewable sources by 2035.
- 215 GW of solar and 115 GW of wind capacity by 2030.



### FRANCE

- French law has set a target of 40% renewable energy in electricity generation in 2030.
- 60 GW of solar PV capacity by 2030.
- 18 GW of offshore wind by 2035 and 40 GW by 2050.



### United Kingdom

- The UK aims to generate 60% of its electricity from renewable sources by 2030.
- Aiming to achieve 50 GW offshore wind and 40 GW of solar capacity by 2030.



### SPAIN

- Spain aims to Install 76 GW of solar PV and 62 GW of wind power by 2030.



### ITALY

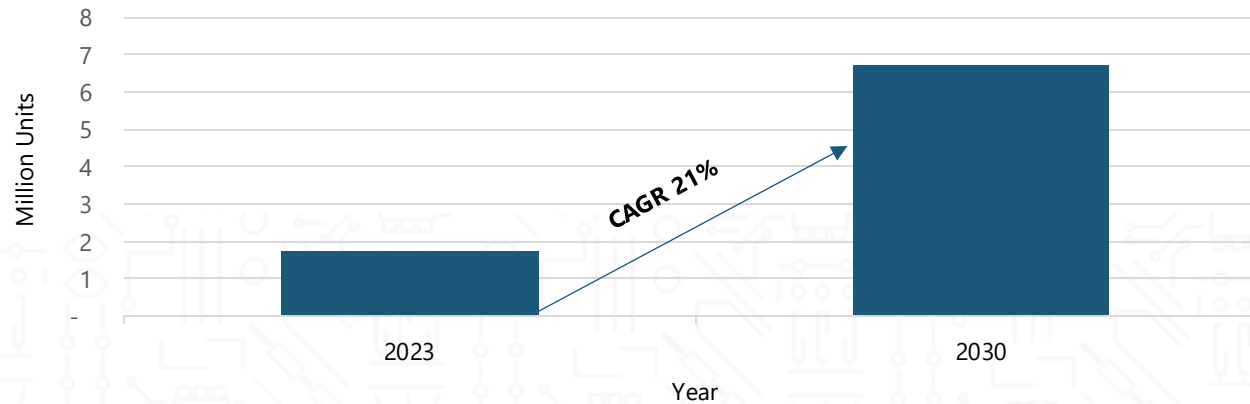
- Aims to generate 65% of its electricity from renewables by 2030,
- Expand its installed renewable capacity to 131 GW by 2030 with an addition of 80GW of solar PV by 2030.

# EVCI Market Growth-Europe



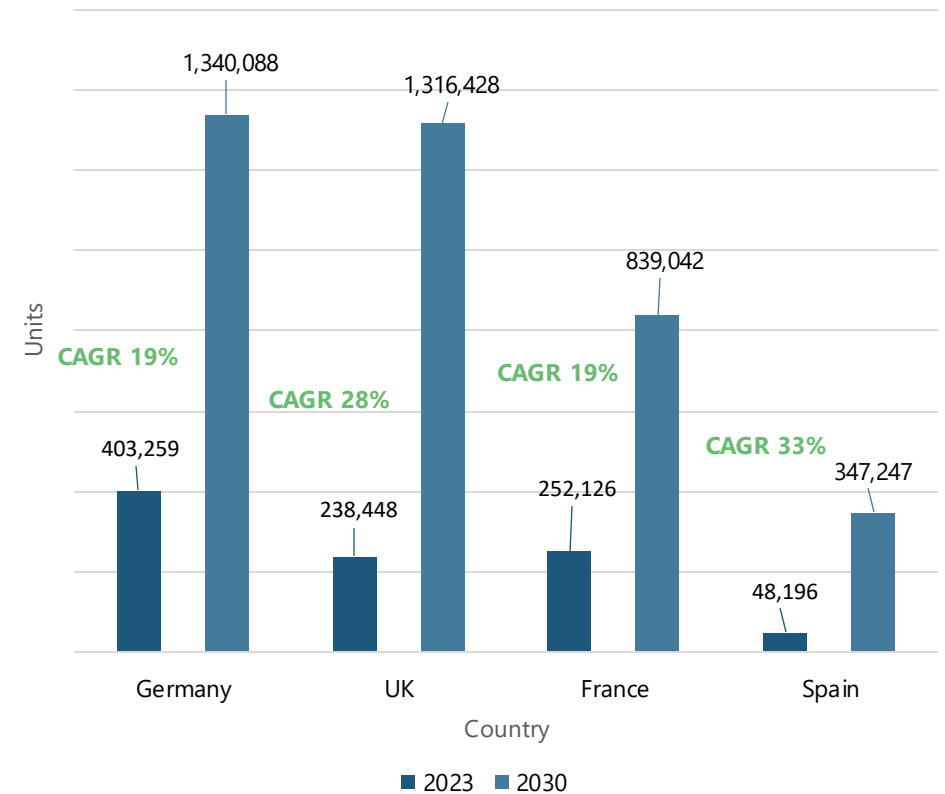
Charging Infrastructure will See Exponential Growth in the Coming Years

### European EVCI Annual Market



- The EU is taking significant steps to enhance EV charging infrastructure, such as a commitment to install charging stations every 60 km along the EU's main highways by 2026 and an EU green deal directive for new buildings to have chargers installed.
- In a major push for green transportation, the European Union has allocated €352 million to fund 26 projects developing alternative fuel infrastructure across the continent. The biggest beneficiary is Tesla, receiving a whopping €148 million to install over 7,000 rapid chargers at 687 locations in 22 countries.
- The competitive landscape of EVCI manufacturers varies throughout Europe. While regions like Nordics and DACH are concentrated by local EVCI players, other parts of the region have international EVCI manufacturers dominating the market.

### EVCI Key European Markets



# EVCI Targets, Policies & Incentives

EV Charging Market is Currently an Incentive-Driven Market

## Germany

- Germany commits significant funding: 226 MUSD for rapid charging infrastructure and 113 MUSD for standard AC charging by 2030.
- The Deutschlandnetz was approved by the EU Commission to subsidize 8500 HPC stations by 2024.

## Italy

- Subsidies for the purchase and installation of EV chargers.
- 110 % tax credit under Super bonus.

## Norway

An EVCI grant covers up to 20% of the purchase and installation cost, capped at NOK 5,000 (€450) per charging point and NOK 1,000,000 (€91,000) per housing association.

## France

- 2 million electric and hybrid cars domestically and 7 million charging points by 2030. 113 MUSD funding for fast-charging stations.
- Tax exemptions & reductions for residential, workplace, and public chargers.

## Spain

- Fuel supply facilities are obliged to install EV chargers, with limited exceptions.
- The National energy and climate plan aims to add 5 million EVs by 2030.

## UK

- The UK government plans to increase public electric car chargers tenfold by 2030, backed by 2 BUSD. This expansion aims to install around 300,000 charging points nationwide.
- Additionally, the existing Rapid Charging Fund targets 6,000 super-fast charge points along English motorways by 2035.

# Eco-Design Directive



Enhancing Energy Efficiency through Transformer Loss Reduction



## Transformer losses

According to a 2008 survey led by the EU Commission, annual transformer losses accounted for 2.9% of the total energy generated across the EU27 and the UK. This amounted to 93.4 TWh, equivalent to the electricity consumed in Denmark over three years.

## Tier-1

In July 2015, the ECODESIGN directive "2009/125/CE" was implemented to decrease annual losses to 16.2 TWh by 2025. The directive defines specific rules and minimum efficiency requirements for the design of distribution and power transformers and applies to all transformers placed in the market or put into service in the UK and the EU.

## Tier-2

A revision of this directive, "Tier2," was implemented in July 2021, with an aim to reduce energy waste by 10% compared to Tier 1 (2015) levels.

## Tier-3

Tier-3 of the ECODESIGN directive is under discussion and is anticipated to be implemented by 2027.



# Technological Developments

04

# Digital Transformers



## The Future of Transformers: Digitalization

- Europe leads the adoption of digital distribution transformers
- In 2023, Europe accounted for 28% of the global digital transformer market and is expected to grow at a CAGR of 22% by 2030.
- Majority of the end-users in Europe prefer the most advanced digital transformer and are willing to incur 20% additional cost

### Market Overview



### Growth Drivers

- Distributed Energy Resources (DERs) and EVs is compelling utilities to shift from model-driven systems to data-driven ones at the distribution level.
- The COVID-19 pandemic has helped in the realization of remote monitoring, control, and predictive maintenance.
- Awareness of end-users by Transformer OEMs

### Opportunities

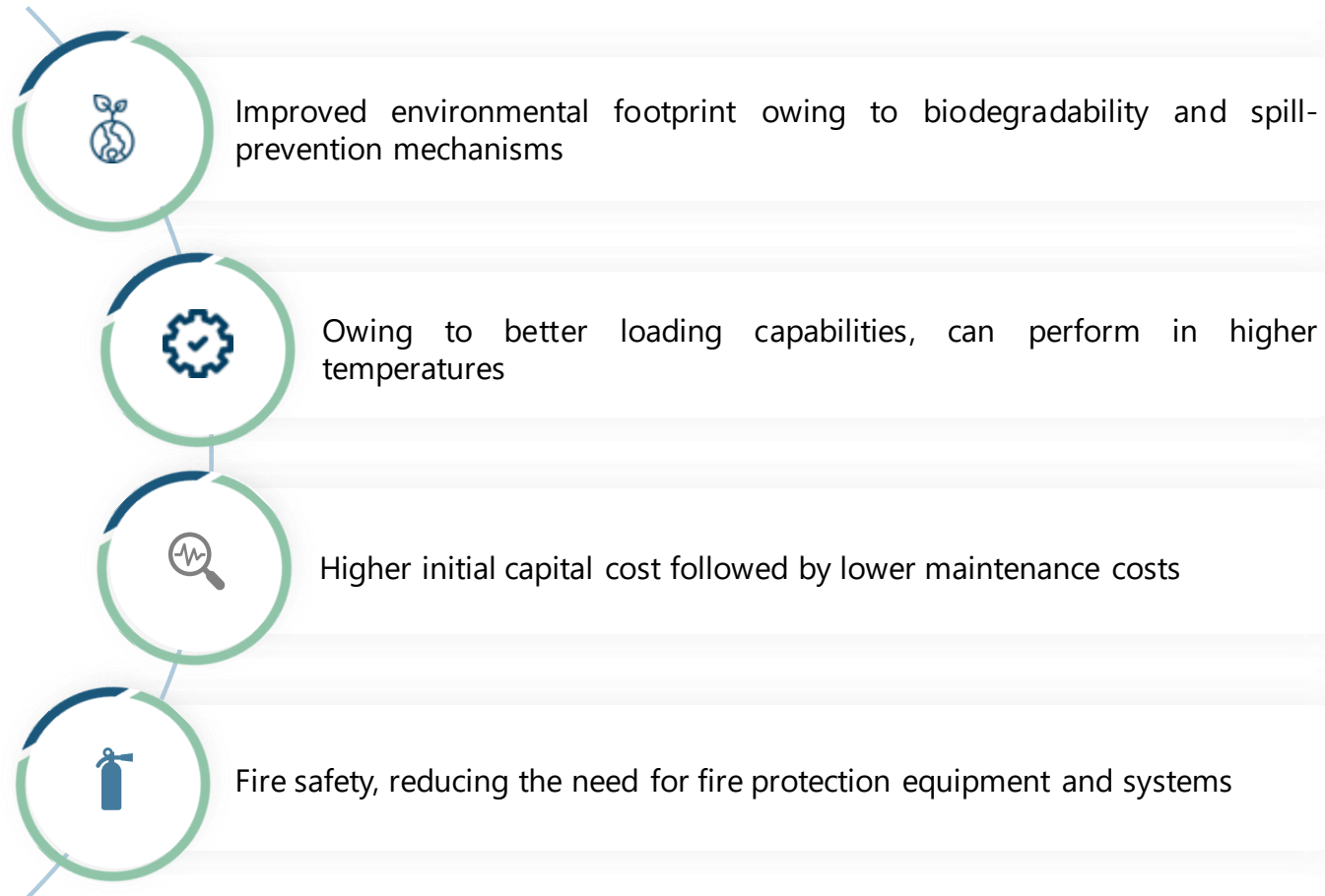
- Swift adoption of digital distribution transformers in greenfield projects. compatibility with existing systems becomes crucial, as utilities prioritize seamless integration without disrupting the current power supply.
- Type 3 digital transformers are preferred by end users, they are willing to incur 20% additional cost for type 3 transformers.

### Barriers

- High cost is a major barrier to the adoption of digital distribution transformers
- Easy replacement of distribution transformers.

# Ester-based transformers

European Market at the Forefront of Adoption



- Despite a small installed base, there is a clear trend in European countries for ester-based transformers.
- European utilities are more inclined towards installing synthetic ester-based transformers.
- The top markets for ester-based transformers in Europe are Germany, Sweden, the Netherlands, and Poland, which are driven by fire safety regulations. In the UK, some utilities are exclusively installing ester-based transformers.
- In the Nordic region, renewables are a considerably bigger application for ester-based transformers than the utility sector.
- Some transformer manufacturers are shifting from mineral oil transformers to ester-based transformers, eyeing the opportunity. For example, 80% of Westrafo's manufacturing capacity is for ester-based transformers.
- Due to the flourishing ester fluid market, Shell has also acquired MIDEL and MIVOLT from M&I Materials.

# Conclusion

Distribution Transformers-Analysis of  
European Market

# 05

# Conclusion



"Power Transformer Lead Time Increases-Renewable Energy Target Delays



## Pivotal Role of Transformers in Achieving Decarbonization

Efforts to achieve decarbonization, alongside EV and renewable energy adoption, drive critical upgrades in power grids and charging infrastructure. Transformers ensure grid reliability, efficiency, and capacity for higher loads. However, global transformer manufacturing operates at full capacity, resulting in a three-year backlog, particularly in solar. This surge in demand and prolonged lead times present significant challenges, potentially delaying renewable energy project grid connections.



## Transforming Towards a Greener Future

New transformer technologies offer a pathway to enhanced performance, safety standards, and reduced carbon emissions, aligning with global decarbonization goals. Digital transformers facilitate remote monitoring, control, and predictive maintenance, enhancing operational efficiency. Meanwhile, ester-based transformers contribute to improved safety standards and environmental footprints due to their higher flash points and biodegradability. Embracing these innovations empowers OEMs and end-users to make sustainable choices, driving toward a greener future.

**Questions?**

# Your Contacts at PTR



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