Research | Analysis | Consulting

European Transformers Market – The Impact of Renewables and EV Charging Infrastructure

Analysis of the European Distribution Transformer Market

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PTR Inc.

The Three Pillars of PTR: Transparency, Diligence, and Digestibility

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.

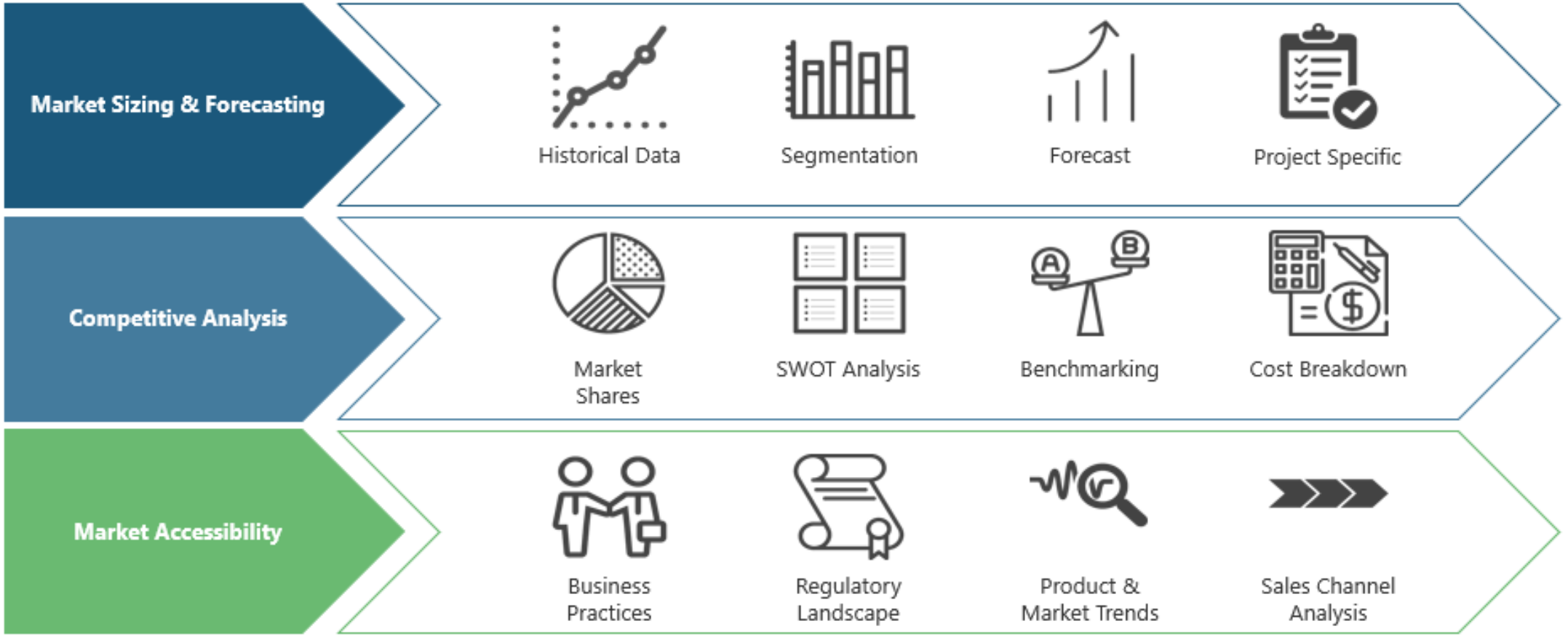
COVERAGE

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)

Switchgear
(HV, MV)

Flexible AC Trans. Systems
(SVCs, STATCOMs)

HVDC Market Analysis
(VSC, LCC, Cables)

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

Grid Investment Tracker
(TSOs & DSOs)

Substation Automation
(Dist. vs Cent.)

Port Electrification
(Shore-to-Ship, Microgrid)

Smart Meters
(Power Quality, AMI)

Power Factor Correction
(Active, Passive)

Grid Communication
(Private LTE, 5G)

Industrial Motors & Drives
(MV/LV - Custom)

Grid Modernization & Flexibility Technology Leaderboard

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

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

COHV
(BEVs, PHEVs, FCEVs, ICEs)

Hydrogen
(Tech., Demand, Value Chain)

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

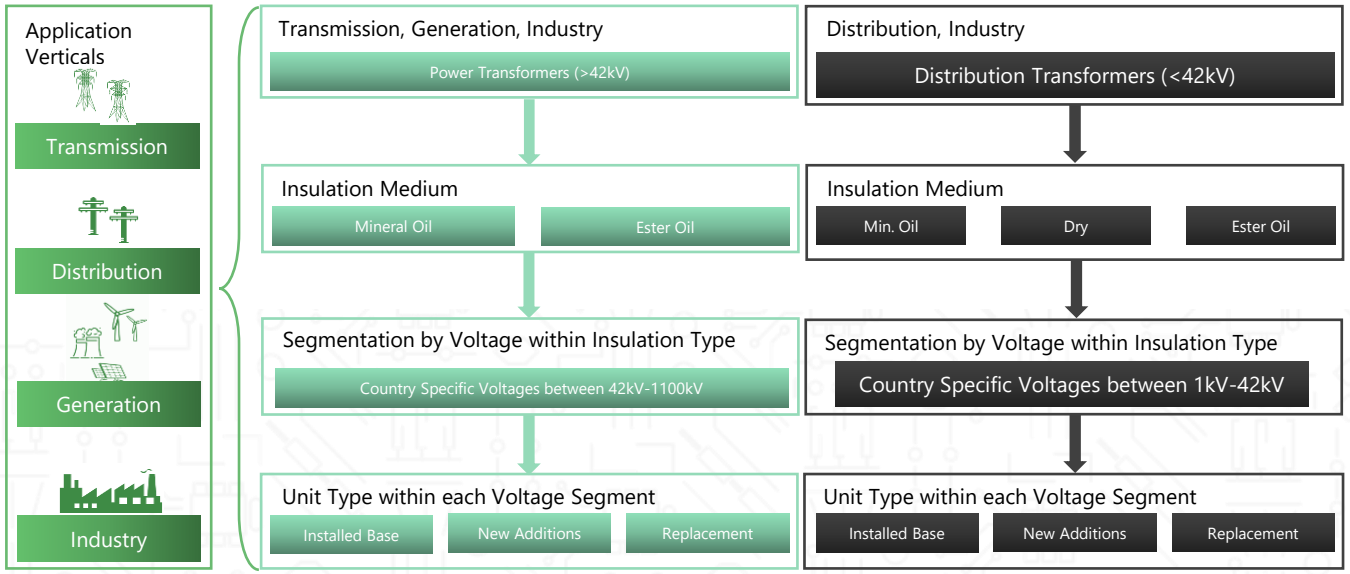
Financial Trackers
(Grid Investments,
Company Financial Breakdowns)

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

Power Grid Expansion-Backbone of Decarbonization

Distribution Transformers-Analysis of European Market

02

Drive Towards Decarbonization

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

1

Decarbonization

- Evolving targets of renewable energy.
- Increased penetration of electric vehicles, leading to a growing charging infrastructure network.

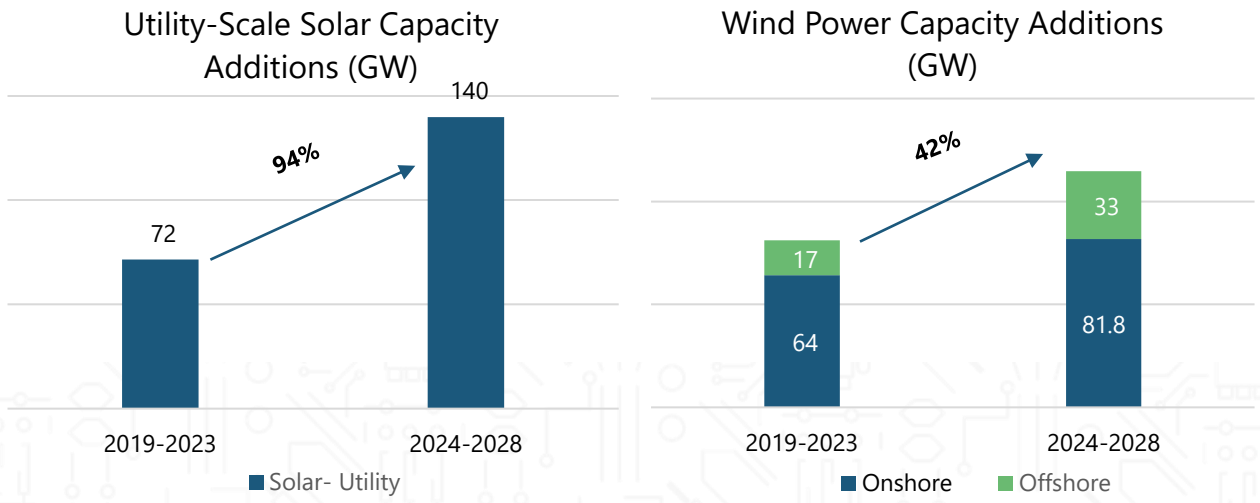
2

Grid Expansion

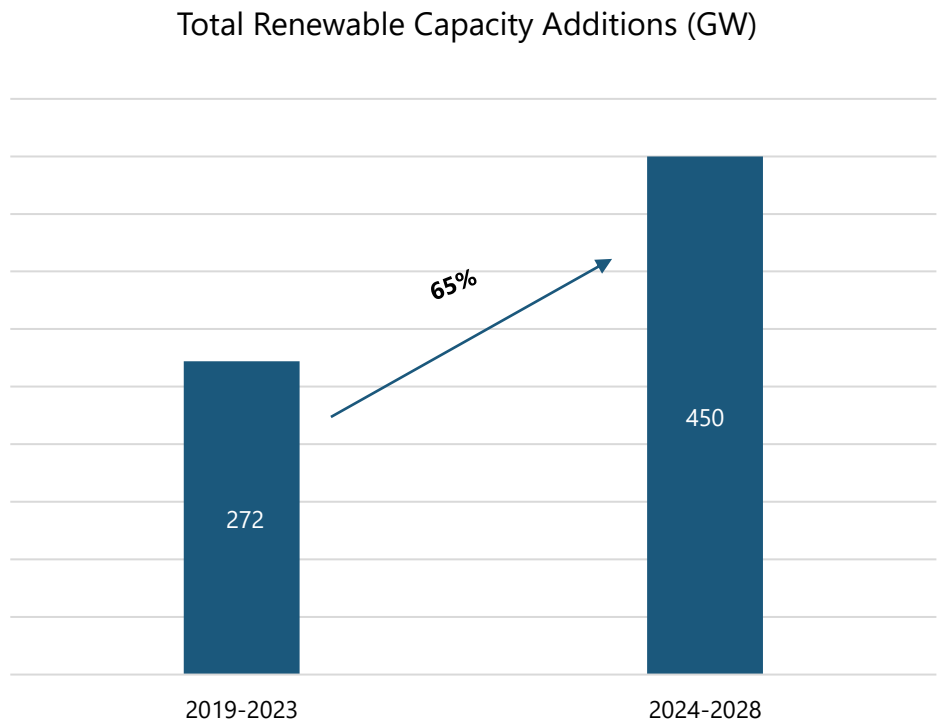
- The drive towards decarbonization is resulting in a need for expansion and modernization of the power grid, which in turn is giving rise to the demand for legacy grid equipment and components.

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.



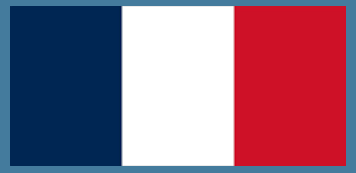
Source: IEA

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

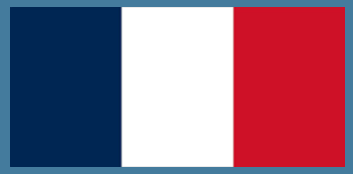
- Aims to generate 65% of its electricity from renewables by 2030,
- Expand its installed renewable capacity to 131 GW by 2030 with an addition of 80GW of solar PV by 2030.

EVSE Targets, Policies & Incentives

EV Charging Market is Currently an Incentive-Driven Market

GERMANY

- Plans to install 1 million public EV chargers by 2030 with an investment of 6.875 B USD.
- Govt. approved 6.3 billion euros till 2025 to scale up EV charging stations.



FRANCE

- 2 million electric and hybrid cars domestically and 7 million charging points by 2030. $ 113 million funding for fast-charging stations.
- Tax exemptions & reductions for residential, workplace, and public chargers.
- 100 M Euros to facilitate EV infrastructure "medium or rural density commune".

UK

- The UK is also expected to grow rapidly, with the announcement of 50,000 and 190,000 street chargers.
- £1.9 billion in charging infrastructure and consumer incentives.
- Smart Charger features regulation.

SPAIN

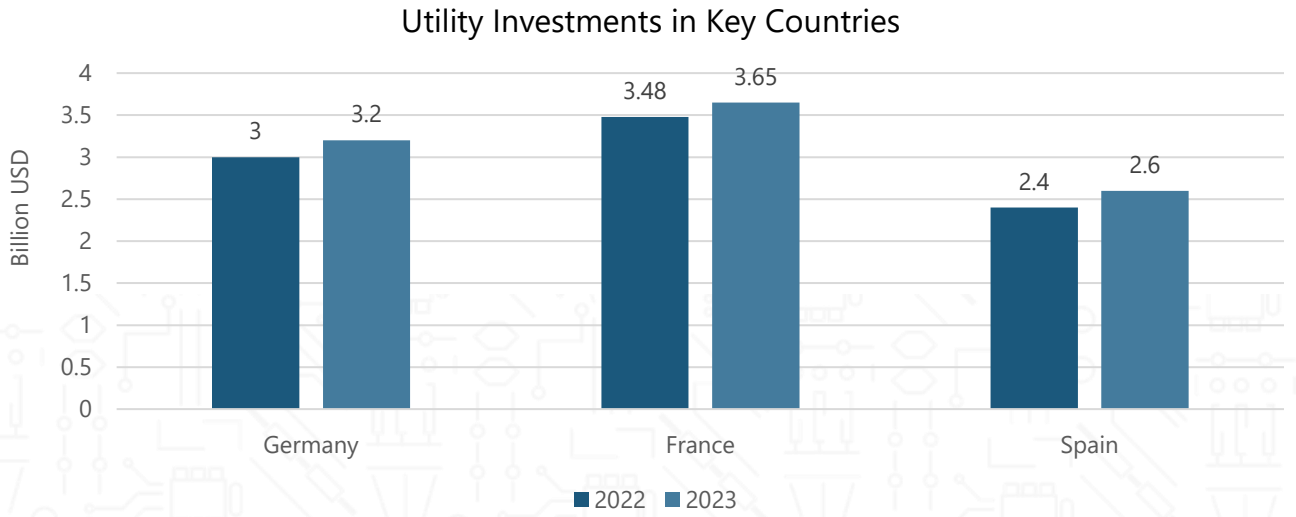
- Fuel supply facilities are obliged to install EV chargers, with limited exceptions.
- National energy and climate plan aims to add 5 million EVs by 2030.

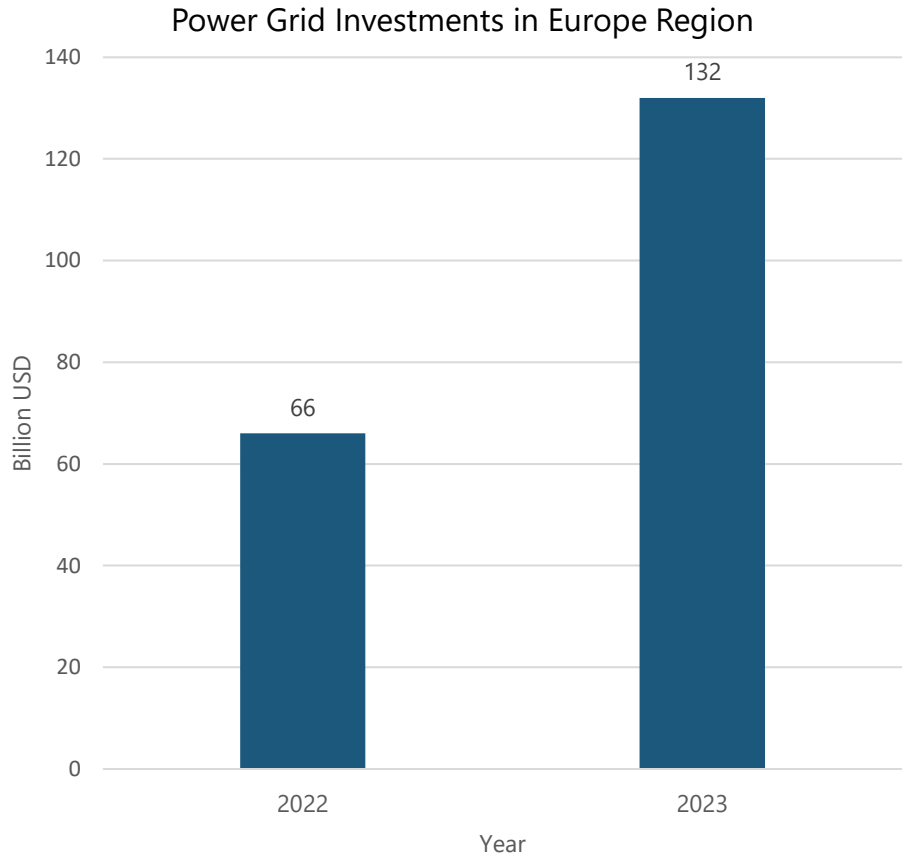
ITALY

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

Investment in the Power Grid

Investment in Grid Must Increase to Match the Growth of Renewables and Electric Vehicles





- Investment in the grid increased in 2023 compared to 2022. This increase is due to the need to expand and upgrade the grid infrastructure to account for growing generation capacity and charging infrastructure, among other factors.
- An upward trend is expected in the future, and the world will undergo an energy transition that will directly impact the power grid.
- EU plans to unlock €584B in grid investments by 2030 to Upgrading old infrastructure and increasing grid capacity .

Grid Expansion & Modernization Plans

Overview of Network Expansion Plans

40% of Europe's distribution grids are over 40 years old and need to be modernized. Industry estimates around EUR 375-425 billion of investment in distribution grids is necessary by 2030. Overall, the European Commission estimates that EUR 584 billion in investments are necessary for the electricity grids this decade.

The Recovery and Resilience Plans allocate around EUR 13 billion to grids, covering reforms and investments in grid infrastructure, smart energy systems, energy storage facilities, and digitalization of distribution and transmission networks

EU action plan "Digitalization of the Energy System" hopes to invest $633 B in the European electricity grid by 2030, with $184 B going towards digitalization, such as smart meters, automated grid management, and improvements to field operations.

By 2035, RTE plans to invest €13 billion in transmission and sub-transmission networks, €8 billion for replacing the old infrastructure, €7 billion for connecting marine energies, €3 billion for grid digitalization, and €2 billion for cross-border interconnection.

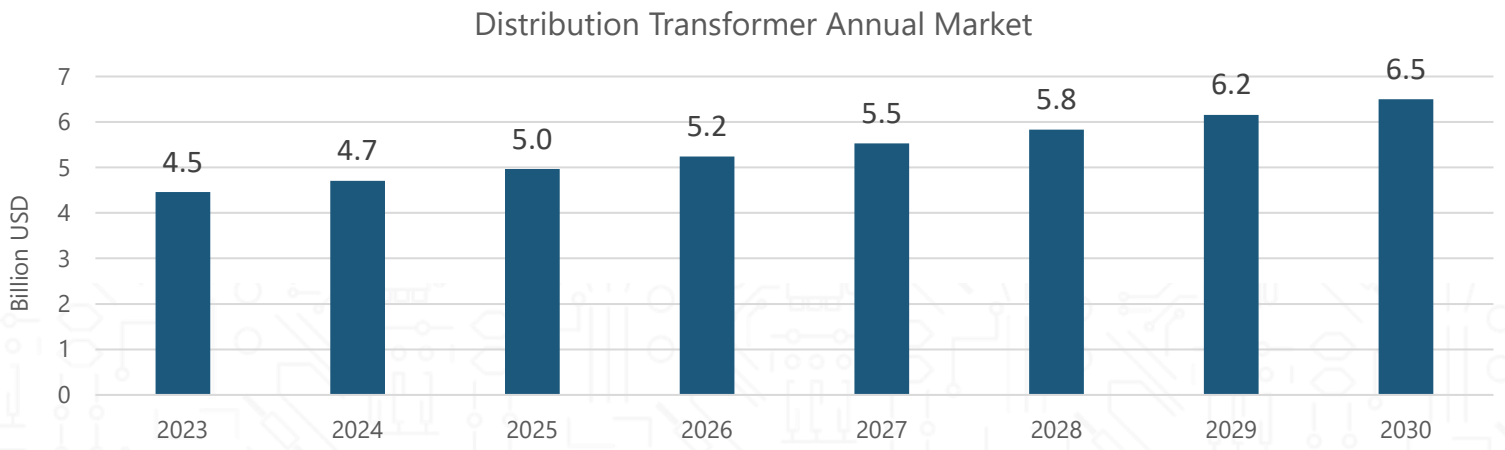
Market Overview

Distribution Transformers-Analysis of European Market

03

Distribution Transformers Market Overview

Europe Market Snapshot



Global DTR Market (2023)

$26 Billion

Europe DTR Market (2023)

$4.5 Billion

- The European 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.
- By 2030, Europe's yearly expenditure of 140 billion euros on clean energy will require robust grid infrastructure, including transformers, to manage the increasing flow of variable renewable energy.
- The growing electric vehicle (EV) market demands a corresponding expansion in charging infrastructure, with transformers playing a crucial role in distributing power efficiently.

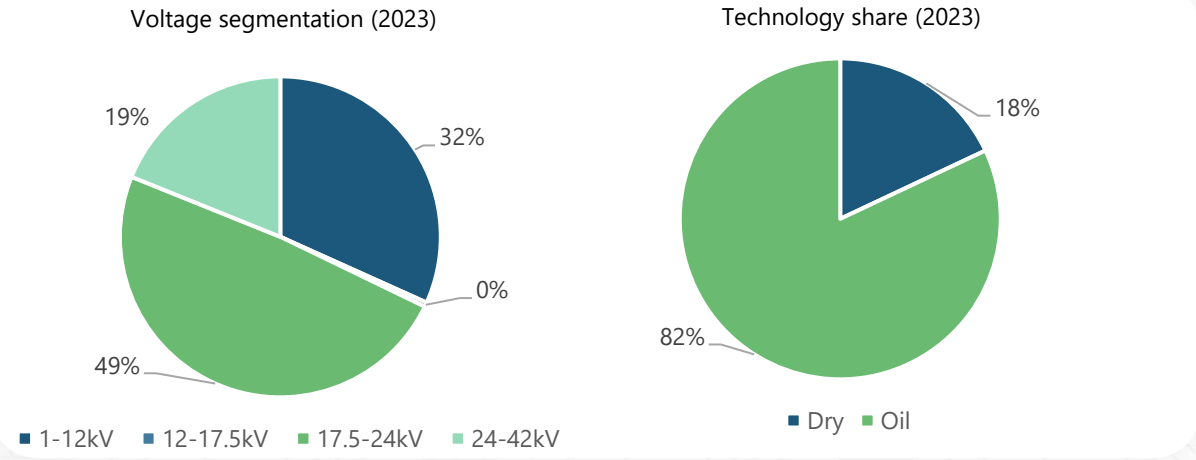
Distribution Transformers Market Split

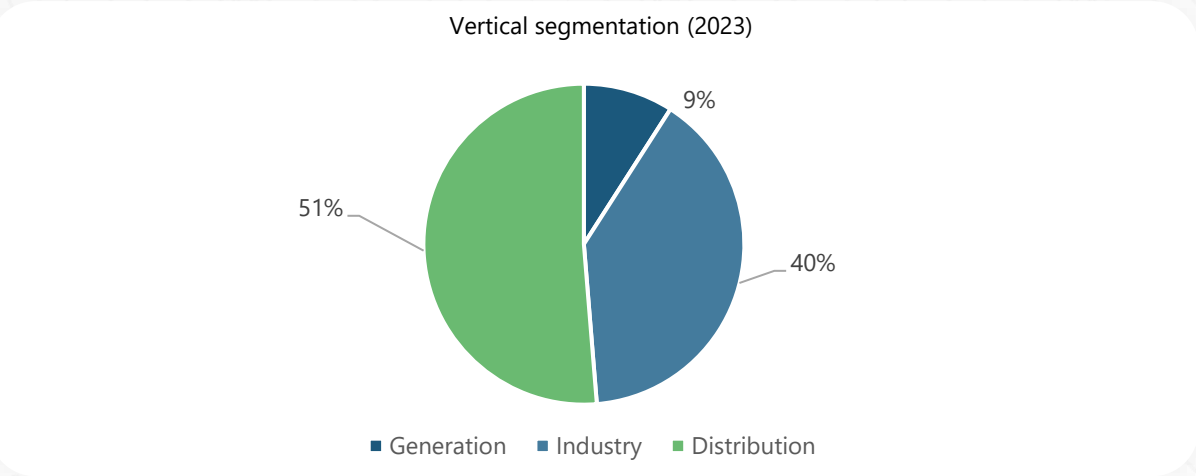
Equipment Level Analysis

- Approximately half of the European market functions within the voltage range of 17.5-24kV, characterized by pad-mounted transformers averaging around 600kVA in size.

- An important market trend is the prevalence of oil-type distribution transformers, which contribute an average of 82% to the total annual revenue. The EU is actively deploying ester-filled transformers as pilot projects for now, but they are anticipated to gain traction in the future. This will further reduce the market share of dry-type transformers in the coming years.

- The distribution sector holds the majority share at 51%, while the industry and generation sectors collectively account for the remaining half of the market. However, it is predicted that the generation sector will experience an increase in its market share by the end of 2030.





Transformer Market Landscape

A Spotlight on Key Country Markets

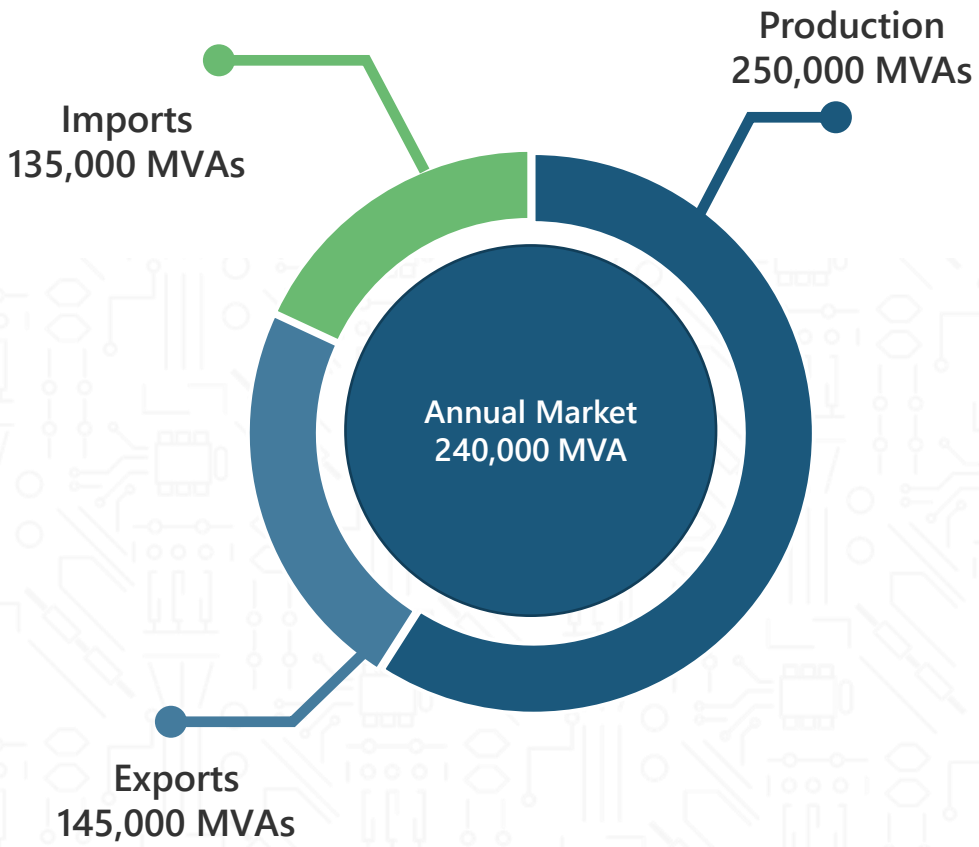
Supply Landscape

Distribution Transformers-Analysis of European Market

04

Import/Export Overview

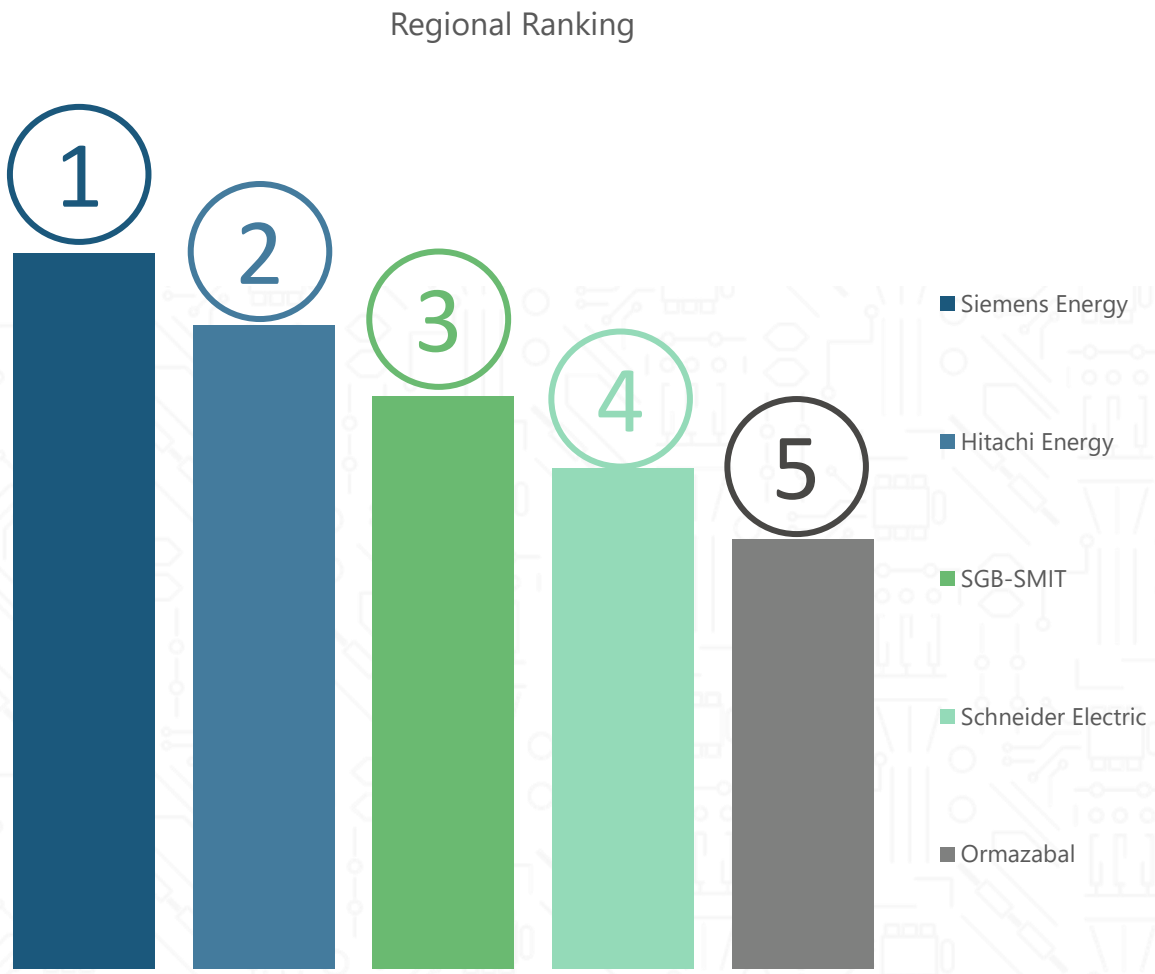
Annual Production of Distribution Transformers at Regional Level in 2022



- At the regional level, Europe has achieved near self-sufficiency in meeting its annual market demand through local production capacity. Notably, key manufacturing hubs within the region include Germany, Ireland, France, and Turkey.
- In 2022, Europe primarily sourced most of its distribution transformers from the Asia-Pacific (APAC) region, particularly India and China.
- Europe exported nearly an equivalent quantity of distribution transformers, measured in terms of MVA, as it imported from other countries, mostly to Latin American countries.
- In contrast to the US market, which is experiencing a significant transformer shortage resulting in lead times of 1-2 years, the European market boasts adequate supply capacity, maintaining lead times within a 16-18 week timeframe.

Suppliers Landscape

Top 5 OEMs in the Region



- Suppliers who manufacture locally in each country have the highest market share in those countries. This is not necessarily due to the local content requirements but rather due to the proximity to customers:
    1) In Germany, SGB-SMIT and Siemens Energy have the largest share of the market.
    2) In France, Schneider Electric and Ormazabal are the biggest players.
- Suppliers who are embedding their existing product portfolios with latest technology trends like digitalization and AI have also been able to penetrate the market more effectively:
    1) Hitachi Energy has enabled its TXpert™ transformer digitalization solutions with artificial intelligence in 2023.
    2) In 2022, Schneider Electric launched "EcoStruxture Transformer Expert, specifically designed for cost-effective and precise transformer monitoring.

Key Market Trends

Distribution Transformers-Analysis of European Market

05

Decarbonization of the Supply Chain

Reduced carbon footprint of transformers

Ecodesign Directive

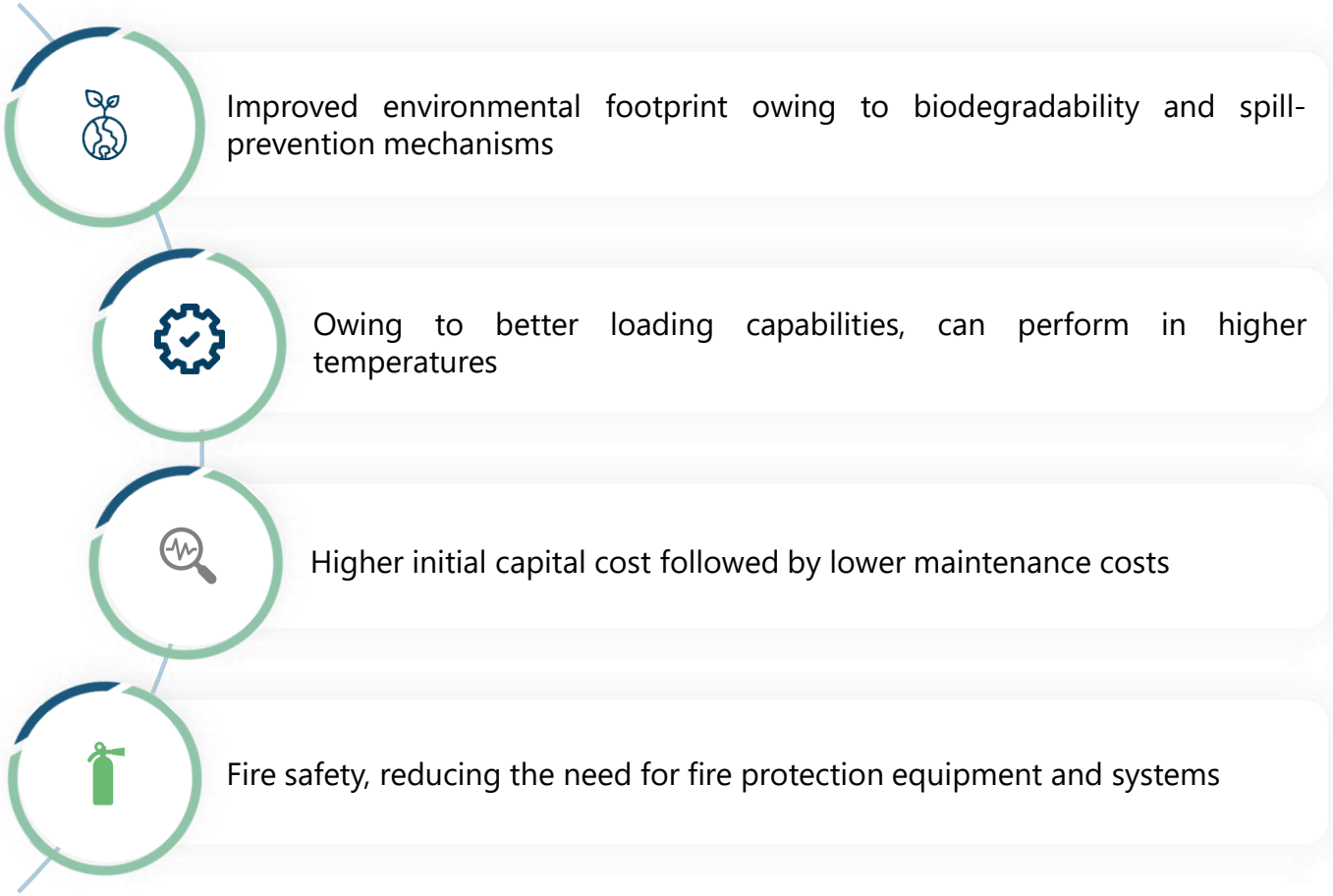
- According to a 2008 survey led by the EU Commission, annual transformer losses accounted for 2.9% of the total energy generated across the EU27 and the UK. This amounted to 93.4 TWh, equivalent to the electricity consumed in Denmark over three years.
- In July 2015, an ECODESIGN directive "2009/125/CE" was put into effect 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.
- 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 of the ECODESIGN directive is under discussion and is anticipated to be implemented by 2027.

Green Raw Materials

- When it comes to transformers' carbon footprint, the focus has been on CO2 emissions linked with the transformer operation (which directly translates into efficiency). This is also evident from the eco-design directives so far, which only have addressed transformer efficiency. Consequently, great strides have been made in achieving higher transformer efficiency, but other areas have remained neglected.
- Hence, there is a need to perform a life cycle assessment, and most importantly, the CO2 footprint of the transformers' manufacturing process (including raw materials) needs to be considered.
    - Ester oil
    - Green electrical steel
    - Recycled copper/aluminum
    - Cellulose-based insulation material

Ester-based transformers

European Market at the Forefront of Adoption



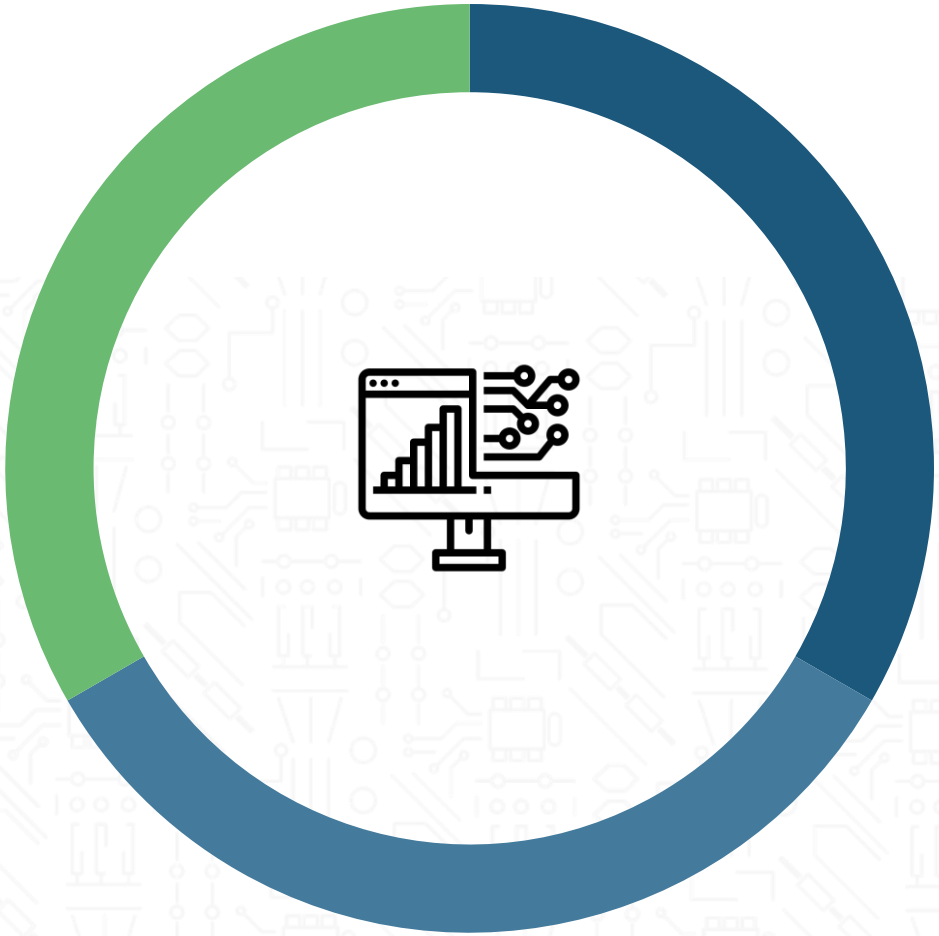
- Despite a small installed base, there is a clear trend in European countries for ester-based transformers.
- European utilities are more inclined towards installing synthetic ester-based transformers.
- The top markets for ester-based transformers in Europe are Germany, Sweden, the Netherlands, and 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.

Digital Transformers

The Future of Transformers: Digitalization

Market Overview

- 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.



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

Barriers

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

Questions?

Your Contacts at PTR

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