

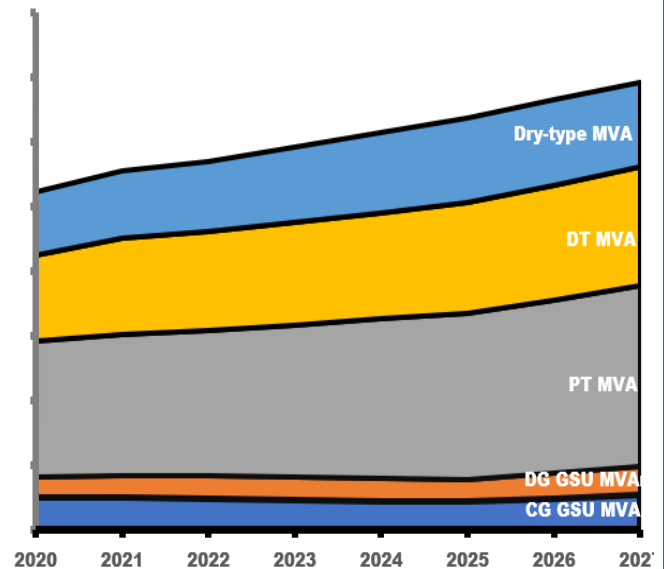
# Transformer Report Ed 10 2022 - Vol 1 & 2

## New Methodology - 3 Sizing & Forecasting models

With the start of the Covid pandemic, 2020 experienced the lowest sales of power and distribution transformers but 2021 saw a surge of 24% to \$49.3 billion. The forecasting model indicates that MVA capacity sales increased 6% in volume and 17% in price. The volume increase was due to recovery from Covid, while the larger price increase was due to increased costs of materials - CRGO, copper, transformer oil and hard steel as well as soaring energy costs - together with higher demand for materials in China, supply chain and transport blockages. The model plots the trend to 2027 for each country, in capacity (MVA) and value (\$).

These results are verified by reports from the market of transformer manufacturers announcing price increases of 8%-10% in May 2021, w.e.f. June 2021, with a warning that further increases may follow. Lead times have doubled and more. The US PPI records a production cost increase in 2021 of 36% for power and distribution transformers and 20% yoy July 2022.

There have been wide variations from country to country. For example, Chinese sales grew 28% in value in 2021, compared with 4% in India, after India suffered falls in domestic production of transformers of 19.2% in 2019 and of 22.7% in 2020.



**Vol 1** of the Transformer Report provides market data, including the tables of data and forecasts, with chapters of descriptive analysis of marketing issues. The tabulated data is itemised in detail on the next page. The main headings are as follows.

- ◆ Market analysis of transformer production, imports, exports, sales
- ◆ Sales of transformers in value (\$) and capacity (MVA), forecast to 2027
- ◆ Market shares of manufacturers of transformers
- ◆ Power generation, central and distributed
- ◆ The installed base of transformers
- ◆ International trade
- ◆ Top 35 importers and exporters of transformers

Vol 1 - 229 pages, 164 tables, 30 figures

Vol 2 - 110 pages, 13 tables, 50 figures

## Transformer Report Ed 10 2022 - Vol 1 & 2

		Year	Production	Import	Export	Sales	Forecast to 2027	Capacity
<b>Annual market in US\$ per country</b>	Total	2020*	X	X	X	X	X	
	by transformer type <sup>1)</sup>	2020	X	X	X	X		
	by application type <sup>2)</sup>	2020	X	X	X	X		
<b>Annual market in MVA per country</b>	total	2020	X	X	X	X	X	X
	by transformer type <sup>1)</sup>	2020	X	X	X	X		
	by application type <sup>2)</sup>	2020	X	X	X	X		
<b>Installed capacity in MVA per country</b>	total	2020						X
	by application type <sup>3)</sup>	2020						X
	by segment <sup>4)</sup>	2020						X
<b>Manufacturers market share</b>	for European, North American countries, Brazil, India	2020				X		
<b>Power generation</b>	central & distributed	1990-2030						X
<b>International trade of transformers</b>	oil-filled; by capacity	2020		X	X			
	dry-type; by capacity	2020		X	X			
	Top 35 by transformer type	2020		X	X			

\* Trade data not yet available for 2021 for all countries, including some of the Top 35.

<sup>1)</sup> The following types of transformers are distinguished: Power Transformer (PT) liquid-immersed ( $\geq 10$ MVA), Distribution Transformer (DT) liquid-immersed ( $< 10$ MVA), Dry-type MV ( $1 < 36$  kV), Dry-type LV ( $< 1$  kV)

<sup>2)</sup> The following types of applications are distinguished: Central Generation Step-up ( $\geq 36$  kV,  $> 10$ MVA), Distributed Generation Step-up ( $< 36$  kV,  $< 10$ MVA), Power Network Step-down ( $\geq 36$  kV,  $\geq 10$  MVA), Distribution Network Step-down ( $< 36$  kV,  $< 10$  MVA), Indoor after-the-meter step-down MV & LV. 2020 for countries, forecast to 2027 for regions

<sup>3)</sup> The following types of applications are distinguished for installed capacity: Central Generation Step-up ( $\geq 36$  kV,  $> 10$ MVA), Distributed Generation Step-up ( $< 36$  kV,  $< 10$ MVA), Power Network Step-down ( $\geq 36$  kV,  $\geq 10$  MVA), Distribution Step-down ( $< 36$  kV,  $< 10$  MVA) Utility and Industry

<sup>4)</sup> Two segments are distinguished for installed DT numbers of units: utility DT, industry DT

**Definitions:** Central Generation Step-up and Power Step-down Transformers  $\geq 36$  kV,  $\geq 10$ MVA

Distributed Generation Step-up and Distribution Step-down Transformers  $< 36$  kV,  $< 10$ MVA

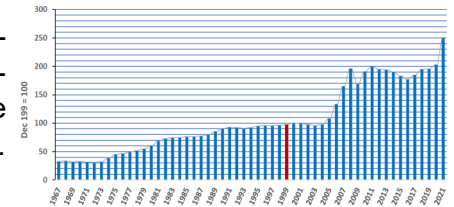
Dry-type MV  $1 < 36$  kV, Dry-type LV  $< 1$ kV

## Transformer Report Ed 10 2022 - Vol 1 & 2

### Prices and factors determining transformer prices

Transformer prices have been volatile and are now on the rise, together with lengthening lead times. The cost of materials is the single largest component in production cost. Future materials price trends are essential inputs to the new forecasting model for transformer demand. They are also important in planning substitution of materials.

Figure 14: Producer Price Indices for power and distribution transformers in the United States 1967 to 2022



### Long term demand trend

StatPlan maintains a historical database of generating and transformer capacity for every country, recorded from 1900 to 2022 and forecast to 2050. Transformer demand consists of current sales for new capacity plus replacements of old plant. The resulting chart plots new installations, replacements and total demand, distinguishing clearly between markets which are growing with new capacity and mature markets which have little new growth but which have high replacement volume.

### Production capacity and utilisation

Production capacity for transformer manufacturers in each important market is compiled from manufacturers' and other reports. In the last decade the transformer market has suffered from excess production capacity. This is being reduced and utilisation levels are increasing and contribution to cost reduction. Vol 2 discusses the Supply Chain and production of components for transformers,

### Competitive analysis

In addition to manufacturers' shares, the report contains detailed profiles of the major global and regional manufacturers, mostly based in Europe, North and South America and Asia Pacific, including companies which are expanding from a strong national base to regional sales and further. The report also lists several hundred companies with their main products.

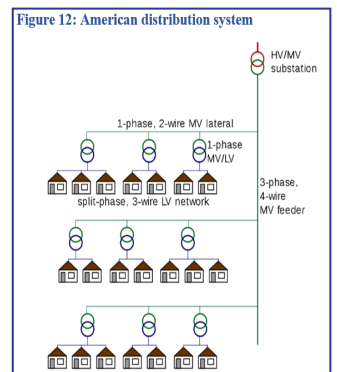
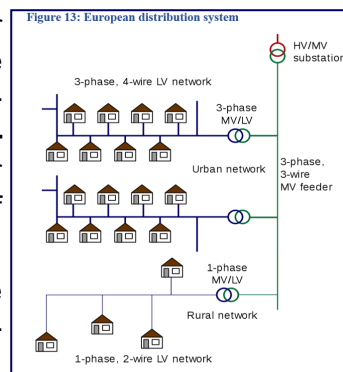
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**Vol 2 contains descriptive material about the transformer markets, products and the industry. This volume may be of less interest to professionals in the transformer industry but offers valuable insights to experts from other fields who are less familiar with transformers.**

**A full list of contents is contained in the Table of Contents.**

Topics include outlines of the many transformer types, background information about low voltage transformers, descriptions of the different distribution network systems of **Europe** and **North America**, and their influence on global practice and their impact on network designs and the penetration of low voltage transformers.

Overpage is a list of topics included in Vol 2. These are covered in detail, with descriptions and conclusions.



## Transformer Report Ed 10 2022 - Vol 1 & 2

### Topics included in Vol 2

- ◆ Transformer types - GSU, power and distribution, dry-type transformers
- ◆ Low voltage transformers background information
- ◆ Solar PV and transformerless inverters
- ◆ Network transformer layout
- ◆ Hosting capacity of distribution networks and DG penetration
- ◆ Smart transformers
- ◆ N+1 standard, N+2 and 2N, redundancy and replacement
- ◆ MEPS - Minimum Energy Performance Standards
- ◆ High efficiency transformers
- ◆ The supply chain
- ◆ Logistics
- ◆ Electrification

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Price for PDF 1 - 4 users... £4,250

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## Transformer Report Ed 10 2022 - Vol 1 & 2

### New Methodologies for the StatPlan Transformer Report, Ed 10 2022

**Three new models - forecasting the transformer market - sizing the installed transformer base - sizing and plotting the development of distributed and central generation.**

- 1. Forecasting the transformer market (USD and MVA)** - The demand forecast model has two stages. Sales in the base year are disaggregated into cost components; materials, labour and overhead and others), and 1) sales of each component are forecast at constant values based on the power consumption trend; 2) constant values of individual cost components are projected to nominal market values based on material price forecasts, inflation and productivity.
- 2. Sizing the installed transformer base (MVA)** - capacity is calculated in four segments with separate models; central and distributed generation, power network and distribution network. DT network capacity ( $< 10$  MVA,  $< 36$  kV) at the end user level in the distribution network is derived from GWh consumption and average load in each end user segment, calibrated by the network structure of primary and secondary substations and the number of transformations incurred. PT network capacity ( $\geq 10$  MVA,  $\geq 36$  kV) is derived from transmission utility data factored by the % of EHV and HV industrial and commercial users connected directly with the HV transmission system. Central and distributed generating capacity are calculated separately with the model below.
- 3. Sizing and plotting the development of transformer capacity for distributed ( $< 10$  MVA,  $< 36$  kV) and central ( $\geq 10$  MVA,  $\geq 36$  kV) generation** - MVA generator transformer capacity is calculated in four sub-groups; 1) renewables central generation, 2) renewables distributed generation, 3) non-renewables central generation, 4) non-renewables distributed generation. A spreadsheet of installed generating capacity (MW) was first created for every country (184 countries) with annual data from 1990 to 2022, forecast to 2030 for 18 categories (coal, oil, gas, multi fuel, pumped storage, conventional hydro, nuclear, wind onshore, wind offshore, concentrated solar, solar PV, biomass, MSW & other waste, liquid biofuels, biogas, geothermal, ocean/tidal, other). These were sorted into 23 groups and each of these was modelled separately for central and distributed generating capacity. Factors were applied to the installed generating capacity in each group to calculate transformer capacity.

### Market size

The markets in each country were sized in several ways, dependent on the data available. Wherever possible they were calculated as the sum of production plus imports minus exports. In some cases countries publish precise production data, and in other we have summed the output of the manufacturers, either with published data or best estimates. Import and export data was averaged over five years. In other cases it was impossible to obtain production data and in these cases we estimated demand as the sum of new installations of capacity plus replacements, based on installations in the year of installation, using our historical database of transformer capacity. .

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