



The changing patterns that are noticeable in global demand for transformers are of critical importance for each market player

Transformer market development

Demand and supply - Are they ever in balance

Historical development

Between 1960 and 1970 the world installed generating capacity grew from 475,000 MW to 1,230 GW; in ten years 750,000 MW was added to the global capacity. At this stage, there was very little to add to this by way of replacing retired plant; this is calculated to be in the order of 35,000 MW during

that period. The total demand for generator step-up (GSU) transformers to meet that capacity was 789,700 MVA (or allowing for the name plate over design 850,000 MVA). The annualised demand therefore grew from 66,000 MVA in 1960 to 82,000 MVA in 1970.

From these base figures it is possible to compute the total transformer demand for all generating, transmission and distribution network equipment. By 1960, most of the world was completing the re-building exercise post 1945 – production facilities for transformers, switchgear, generators, lines, cables and every other type of equipment could not be established quickly enough. The total demand for all types of transformers in 1970 had increased to just under 500,000 MVA per annum, having increased from just over 400,000 MVA in 1960 – which was a 20 % increase.

This was a golden age in electrical equipment manufacture. Every developed country had a number of manufacturers that could produce the largest transformers that were required at that time, plus a large number of distribution transformer manufacturers that had sprung up due to the relatively low cost of market entry. By the early 1970s, there were more than 40 manufacturers of transformers listed in Italy alone.

Each of the major international companies possessed their own specialist manufacturing units, and the principal ones are listed in Table 1.

Between 1970 and 1975, the world installed capacity grew from 1,230 GW to 1,556 GW. A total of 326 GWh was added to the global network or an average of 65,180 MW per year. This computes to a total transformer demand of just under 400,000 MVA of transformers each year. By 1985 this had increased to 550,000 MVA; by 1995 to 700,000 MVA; by 2005 to 1,100 GVA, and by 2015 to 1,500 GVA. The full trends are shown in Table 2.

Why winners and losers

The figures in Table 2 show the level of MVA demand annualised for each ten-year period. The figures were calculated in five-year periods, that is to say total demand for each five-year interval divided by five; this has the effect of smoothing out the peaks and troughs. For simplicity, Table 2 only shows each ten-year figure to reduce the

number of columns necessary to illustrate the point. It is a good way of expressing the demand trends over time. The percentage real growth increases paint a very good picture of a very healthy market place. On the face of it, this is good news for the companies supplying that demand; so why are so many of the names listed above no longer successful independent companies?

There are many facets to the answer to that question, some outside of the direct control of the players, but many have been the victims of their own actions and their inability to look further ahead than the next annual reporting period.

The overall trend in GDP over the period 1970 to 2015 is shown in Figure 1. This shows the overall global growth that has occurred during the period.

Real growth of transformers market paints a picture of a very healthy market place - so why are so many of the manufacturers no longer successful independent companies?

Table 1. Major international transformer manufacturers in the early 1970s

America	Australia	Austria	Belgium	Brazil	Finland
GE Westinghouse Kuhlman McGraw-Edison RTE Siemens-Allis	Tyree Wilson Baldwin	Elin Union	Pauwels ACEC	Toshiba TUSA	Stromberg
France	Germany	India	Italy	Japan	Netherlands
France-Trafo Alsthom-Savoisienne/CGE CEM	Siemens AEG Brown Boveri	BHEL Crompton Greaves Bharat Bijlee	IEL Italtrafo TIBB	Toshiba Mitsubishi Hitachi Nissin	Smit Nijmegen
Norway	Portugal	Spain	Sweden	UK	
National Industri	EFACEC Siemens	GEE Westinghouse Diestre	Asea	GEC Hawker Siddeley NEI	

Table 2. Annualised global transformer demand 1975 to 2015 - MVA

Annual demand MVA	1975	1985	1995	2005	2015
Power transformers	238,077	296,593	358,786	605,884	914,017
Distribution transformers	208,510	259,174	344,253	561,753	724,308
Total MVA	446,586	555,767	703,039	1,167,637	1,638,325
% Increase		24.45 %	26.50 %	66.08 %	40.31 %

GDP is used as an indicator because over a long time period – in this case 45 years - there is a well proven inextricable link between economic performance and the market for infrastructure capital goods. This issue has been discussed in previous columns; it is not the complete answer to forecasting electricity demand or transformer demand specifically, but clearly, every time there is a global economic recession, the market for capital equipment is affected.

The principal driver for capital equipment is growth and specifically electricity load growth. In one of the first editions of the Goulden Report on global transformer markets, which was published in 1982, this point was made in a more colourful manner in the summary to that report *“If every generator is at maximum output, transmission lines are dripping grease, every transformer is earning full copper losses but the electrical load is exactly the same as in previous years then the market for equipment is precisely zero – apart from a few fuses and some lighting fittings.”*

Capacity problems

So, returning to the rhetorical question posed earlier – why has there been such a contraction in the number of players and why have they not all flourished? In fairness to the manufacturing industry, which is more concentrated on the needs and planning cycles of their utility company customers than on the overall global situation, it is not always easy to see the big picture. However, even a superficial glance at Figure 2 shows the vagaries of the global economy over the last 45 years.

There have been three major recessions and two minor ones over that period. 1974/75, 1982 and 2009 were major shocks, whilst 1991 and 2001 were both years in which growth was below 2%. For capital plant manufacturers it is not only the depth of the recession that hurts, but more importantly, it is the duration of the dip that really causes the pain. Following the first oil crises in 1973, when growth had been consistently over 4% for the previous decade, growth fell to 0.9% in 1975, but it took two years to get back to over 4% again. The next downturn began in 1980 but did not recover to above 4% until 1984. Similarly, the whole of the decade 1990 to 2000 was not record breaking, but

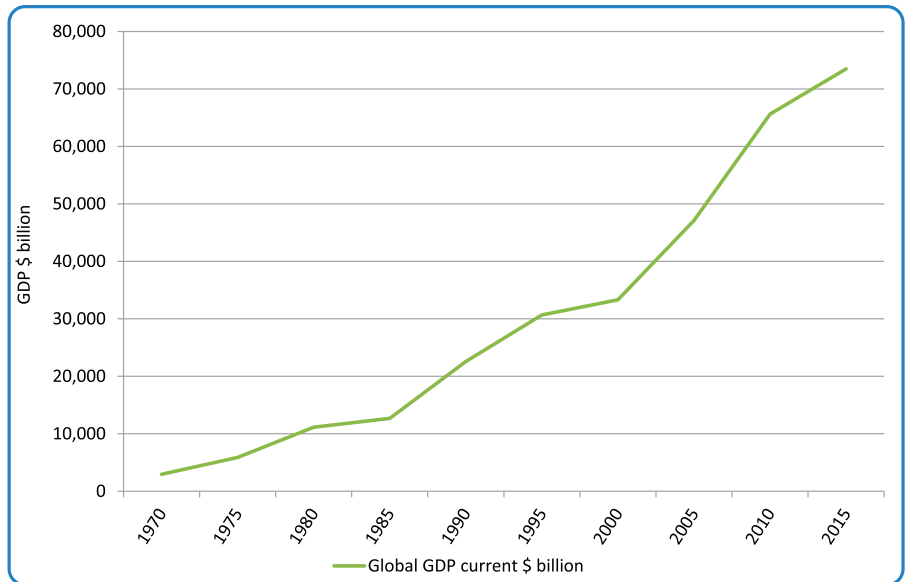


Figure 1. Global GDP growth 1970 to 2015

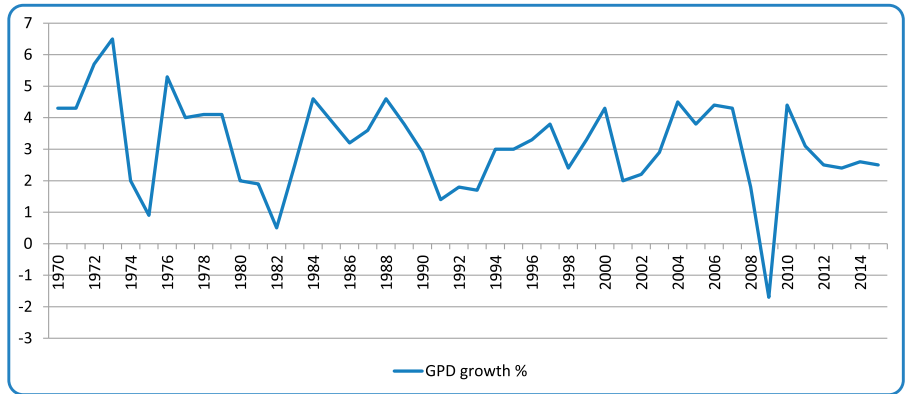


Figure 2. Global GDP growth 1970 to 2015

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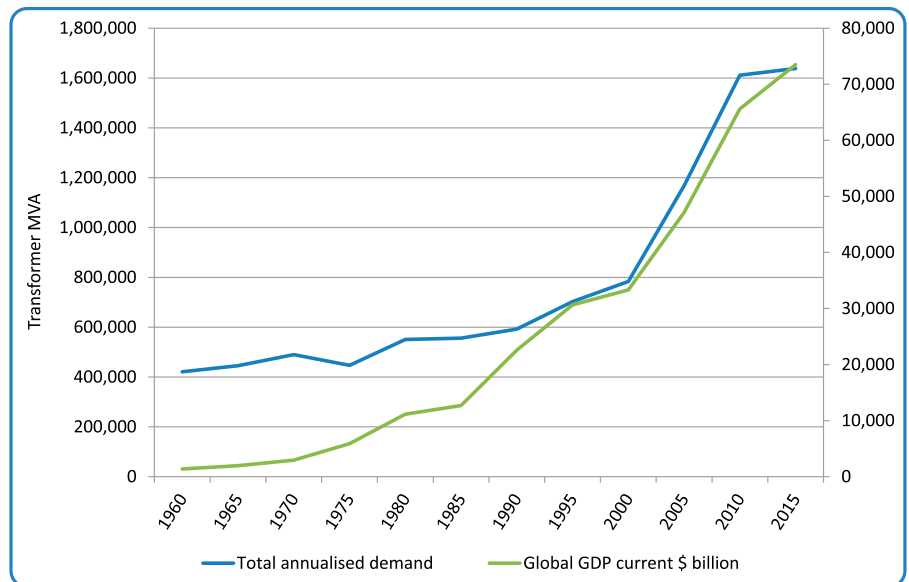


Figure 3. Global transformer demand and GDP 1960 to 2015

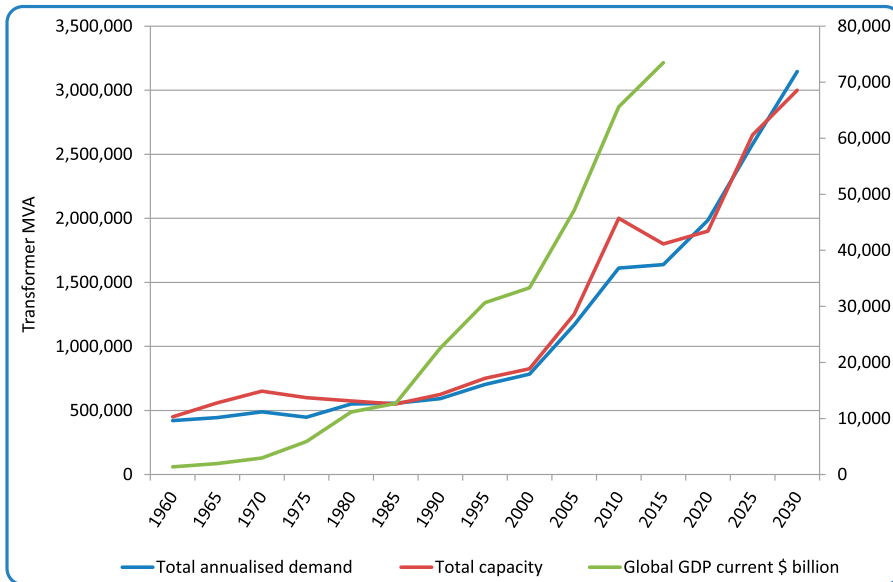


Figure 4. Global transformer supply and demand

Table 3. Regional annual MVA demand 1975 to 2025

MVA by region	1975	1985	1995	2005	2015	2025
Western Europe	102,618	123,031	155,683	195,709	135,205	161,152
Eastern Europe	26,649	31,890	17,376	19,812	46,583	63,139
FSU	68,789	85,735	80,925	53,480	63,069	176,153
Africa	11,385	29,560	28,863	22,379	51,577	100,090
Middle East	10,791	36,160	50,245	76,361	85,459	147,486
Indian Sub-continent	8,824	45,426	69,316	43,028	172,804	341,156
China	25,219	24,636	240,671	508,214	597,962	1,087,423
Rest of Asia	36,066	72,769	202,564	101,121	132,117	234,956
South & Central America	25,992	46,954	59,552	53,811	53,010	138,420
North America	110,906	160,552	194,075	191,741	229,774	288,519
Australia & Pacific	9,328	20,931	23,334	7,753	23,248	43,320
Total	436,567	677,643	1,122,605	1,273,410	1,590,808	2,781,814

Table 4. Percentage of global demand by region 1975 to 2025

% Demand	1975	1985	1995	2005	2015	2025
Western Europe	23.51 %	18.16 %	13.87 %	15.37 %	8.50 %	5.79 %
Eastern Europe	6.10 %	4.71 %	1.55 %	1.56 %	2.93 %	2.27 %
FSU	15.76 %	12.65 %	7.21 %	4.20 %	3.96 %	6.33 %
Africa	2.61 %	4.36 %	2.57 %	1.76 %	3.24 %	3.60 %
Middle East	2.47 %	5.34 %	4.48 %	6.00 %	5.37 %	5.30 %
Indian Sub-continent	2.02 %	6.70 %	6.17 %	3.38 %	10.86 %	12.26 %
China	5.78 %	3.64 %	21.44 %	39.91 %	37.59 %	39.09 %
Rest of Asia	8.26 %	10.74 %	18.04 %	7.94 %	8.31 %	8.45 %
South & Central America	5.95 %	6.93 %	5.30 %	4.23 %	3.33 %	4.98 %
North America	25.40 %	23.69 %	17.29 %	15.06 %	14.44 %	10.37 %
Australia & Pacific	2.14 %	3.09 %	2.08 %	0.61 %	1.46 %	1.56 %
Total	100 %	100 %	100 %	100 %	100 %	100 %

the confidence building trend was at least upwards over that time.

Combining the global economic growth and the transformer demand over a slightly longer period it is interesting to see in Figure 3 the correlation between the two sets of figures in macro terms.

The problem for the players has always been recognising and reacting to the balance between Figures 2 and 3. The one portrays a healthy growing demand; whilst the other shows a saw-tooth development with more broken teeth than good ones.

The overall position of the global manufacturing industry has been to react to

what they see before them. During those periods in time when demand is high – almost to the point of outstripping supply, they begin to lose orders to competitors because of the extended delivery times that they have to quote. So the answer is obvious: build more production capacity. Figure 3 clearly shows an increasing demand, so that is what has always happened.

Figure 4 illustrates what has happened adding the supply curve to the two other sets of data shown in Figure 3. The time frame is slightly longer and it includes a forecast period; this will be discussed later, but the first observation to note in this figure is the gaps that open up periodically between the supply and demand curves. When demand increases, additional capacity is added to the production base. Then a downturn occurs in the demand curve whilst the additional planned capacity continues to be added, which exacerbates an over-supply situation when the market is beginning to soften. It should be noted that the supply data (shown in red) is the most difficult to assess, and is also complicated by the fact that the total supply is not one homogenous mass; it encompasses different types of transformer, different regional situations, specifications, etc. However, despite these details, the major problem for all players in the industry is matching supply with demand.

That is the major reason why there have been so many mergers, acquisitions and failures over the years. When demand is increasing, all are profitable and invest in the future; in the downturn, those with the weakest balance sheets are the ones that are lost. It is the law of the jungle, survival of the fittest, the winners either buy up competitors to close them and reduce competition, or to rationalise their own product and production portfolios.

Figure 4 includes a forecast period through to 2030. There is little doubt that demand will increase over the period 2015 to 2030. The blue line will inevitably continue the upward trend – there will be much discussion as to whether that shown is too optimistic or too pessimistic; however, for the players involved the critical issue will be the relationship between the red and blue lines rather than their absolute position on the chart.



Regional demand

One other factor alluded to in the above analysis is the regional variations which affect the supply and demand relationships. This justifies a complete article dedicated specifically to that topic, and in due course that will be done, but there is one important point that deserves inclusion here as a part of a discussion on overall demand trends. The importance of the changing patterns that are noticeable in global demand for transformers are illustrated in Tables 3 and 4. Table 3 shows the MVA demand for each region over the period 1975 to 2025 (the years are selected to produce a table that makes the point without being too unwieldy).

It is fair to say that all regions have shown growth over the period and in particular

the demand in Europe and North America has continued to increase, which is reassuring for the players in those markets.

However, this is a classical case of increased business with reducing “market share”.

Table 4 by comparison shows the global “market share” by each region.

By comparing Tables 3 and 4, on first appraisal the developed markets of the world are still developing, but when the overall global importance is taken into account, their “market share” is falling dramatically. This trend is unlikely to reverse until the whole global market becomes a 100 % repair and replacement market. Therefore, where a company produces is likely to be as important as what they produce for the foreseeable future.

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