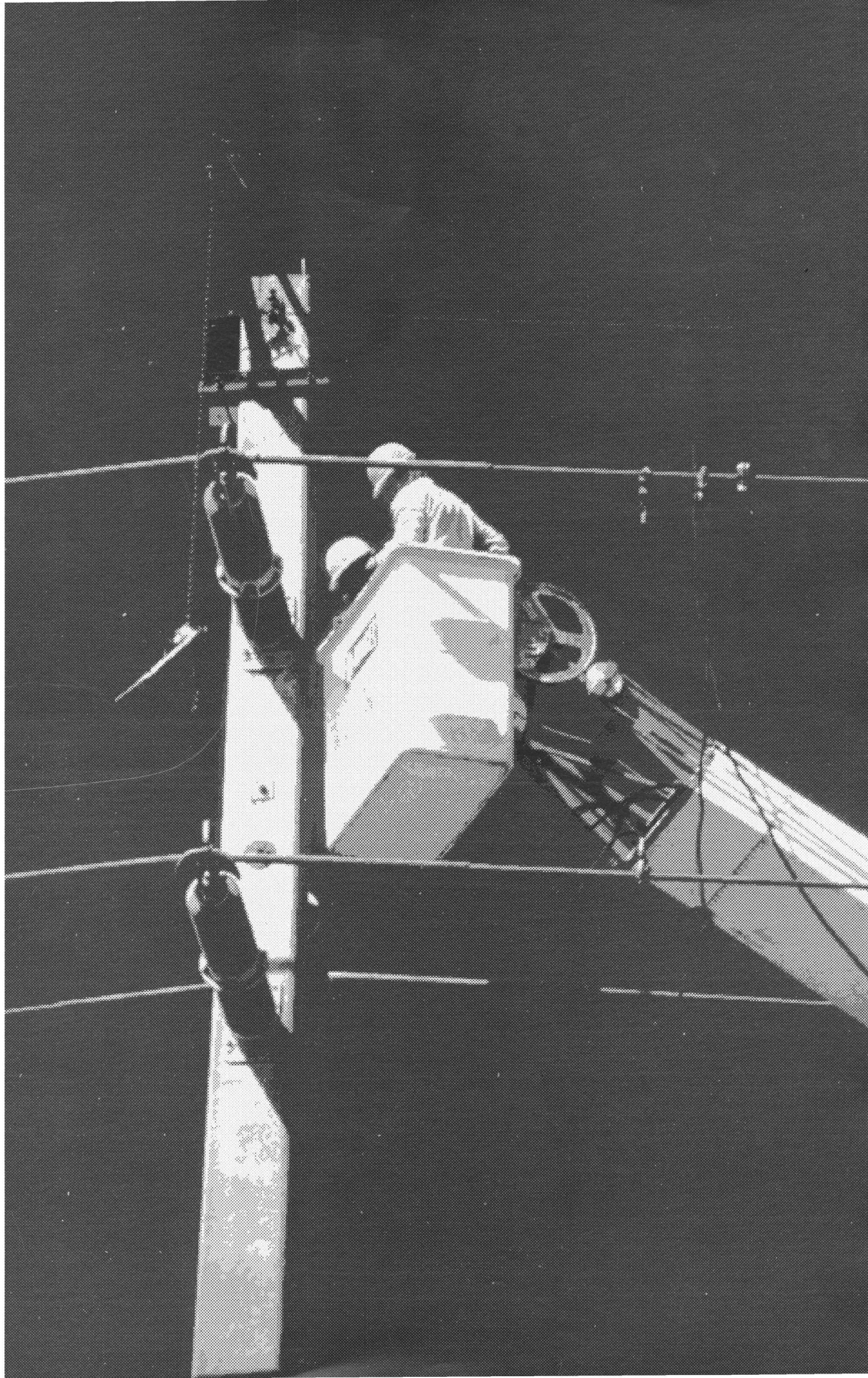


# Electrical engineering

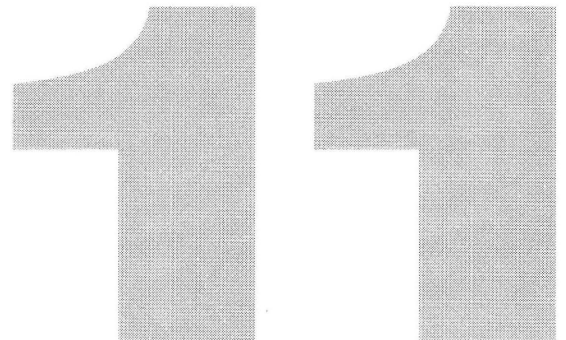


After the slump in world demand and the major restructuring in the early 1980s, the electrical engineering industry posted a good performance in 1988 and 1989. Strong price competition and the emergence of the powerful South East Asian producers however, have deteriorated the external position of the EC, and will continue to force manufacturers to keep costs down. The outlook for the industry remains favourable, as the potential growth for information technology and environmental protection related products and equipment is large. The outlook for the sector in Europe will also be influenced by the liberalisation of the EC market, and the harmonisation of standards, as well as by technological progress, especially in electronics. Major structural changes have taken place and will continue to occur, especially as a result of the opening of the Eastern economies.

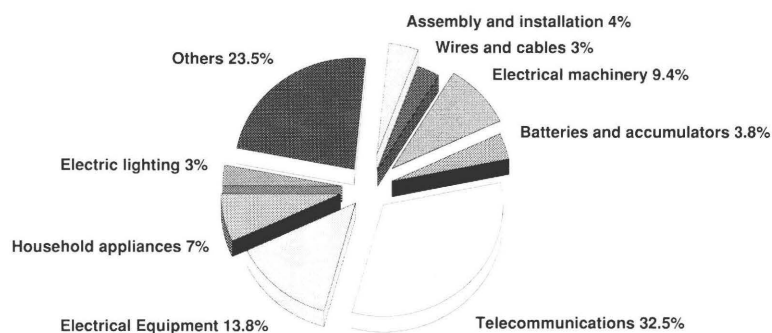
### Description of the sector

The electrical engineering sector, which corresponds to the NACE code 34, covers the manufacture of insulated wires and cables, electrical machinery (including electric motors, electricity generators, transformers, switches, switchgear and other basic industrial electrical equipment), electrical apparatus and appliances for industrial use, batteries and accumulators. The manufacture of domestic electrical appliances, electric lamps and other electric lighting equipment is also included, as well as the assembly and the installation of electrical equipment and apparatus. The NACE code 34 also includes the manufacture of telecommunications equip-

ment, electrical and electronic measuring recording equipment and electro-medical equipment (NACE 344) as well as the manufacture of products generally regrouped under the name of "consumer electronics": radio and television receiving sets, sound reproducing and recording equipment and of electronic equipment and apparatus, gramophone records and pre-recorded magnetic tapes (NACE 345). These industries will be analysed in the following chapter. Due to the difficulty in separating these sectors statistically, the description below covers both the electrical and electronics industries. In-



**Figure 1**  
**Electrical engineering**  
**Composition of the industry**  
**% of value added in 1989**



Source: Eurostat, DRI Europe

deed, since most companies in this sector usually have a foothold in both types of activities, it is difficult to isolate the structural factors that apply only to "electrical" engineering production. Moreover, the distinction between electrical engineering and electronic products is increasingly difficult to make, as most electrical products include electronic parts or components. The electrical engineering industry supplies capital, consumer and intermediate goods to a large variety of users. Capital goods are dominant, and account for about two-thirds of production, while consumer goods account for about one fifth of production. These go directly to households, so that their demand is linked to the general trend in consumption in the economy. An important share of electro-technical products is also used as primary

or intermediate input by the electrical engineering industry itself (electric motors, command and measuring devices). Investment demand represents more than 30% of total sales of electrical equipment in certain countries, such as the Federal Republic of Germany or Italy. The most important client sectors, apart from the electrical engineering sector itself, and the transportation equipment, mechanical engineering, construction and office and electronic data processing sectors.

### Current situation

The electrical engineering industry accounts for less than 5% of manufacturing production in most Member States (except in the Federal Republic of Germany, where it is more than 8%). However, it is a central player in the European economy, and employed 2.36 million people in 1989.

The size of the European electrical engineering market was valued around ECU 200 billion ECU in 1989, or about one fifth of the world market. This is almost twice the 1980 level. The EC production level is about the same figure, which compares to production in the US of 250 billion ECU in 1989, and in Japan of 335 billion ECU. The trend in production in these regions has however been quite different since 1985. While Japanese production grew by more than 50% (in value), US production fell by 10%. In the EC, production also increased, but more slowly than in Japan: between 1985 and 1989 the production grew by 24%. In constant prices, this represents an 8.3% increase between 1985-89, and 2.8% for 1989 alone. The rise in exports was however much slower than that of imports, so that the EC's terms of trade deteriorated seriously. The deficit doubled compared to 1988 and reached 3.8 billion ECU. This compares with a surplus of more than 6 billion ECU between 1980 and 1985.

### Production

In the early 1980s, the power equipment industry faced a collapse in world demand, which led to an escalation of competition and severe over-capacity. This put strong pressure on prices and margins. The domestic appliances industry suffered

**Table 1**  
**Electrical engineering**  
**Main indicators, 1980-90**

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Apparent consumption	100 291	107 874	117 087	124 829	139 282	154 027	162 581	172 240	189 458	203 681	220 254
Net exports	6 305	6 231	6 703	6 680	6 612	6 938	5 683	2 075	- 1 642	- 3 805	- 4 388
Production	106 596	114 105	123 790	131 509	145 894	160 965	168 264	174 315	187 816	199 876	215 866
Employment (thousands)	2 705	2 570	2 472	2 388	2 381	2 396	2 393	2 406	2 386	2 358	2 368

Source: ZVEI

**Table 2**  
**Electrical engineering**  
**Production and external trade, 1980-90**

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Production in current prices											
EC	106 596	114 105	123 790	131 509	145 894	160 965	168 264	174 315	187 816	199 876	215 866
Index	66.2	70.9	76.9	81.7	90.6	100.0	104.5	108.3	116.7	124.2	134.1
USA (1)	105 274	140 316	167 144	197 283	261 730	277 124	217 651	195 973	201 220	249 637	N/A
Index	38.0	50.6	60.3	71.2	94.4	100.0	78.5	90.0	72.6	90.1	N/A
Japan (1)	75 990	112 268	120 788	157 766	218 304	222 032	237 571	249 232	310 912	335 130	N/A
Index	34.2	50.6	54.4	71.1	98.3	100.0	107.0	122.2	140.0	151.0	N/A
Production in constant prices											
EC	145 244	142 761	142 467	143 327	152 242	160 965	163 309	164 320	169 536	174 345	183 062
Index	90.2	88.7	88.5	89.0	94.6	100.0	101.5	102.1	105.3	108.3	113.7
EC trade in current prices											
Exports extra-EC	20 489	23 573	26 729	28 908	33 398	36 416	35 041	35 997	37 211	39 253	40 823
Index	56.3	64.7	73.4	79.4	91.7	100.0	96.2	98.9	102.2	107.8	112.1
Imports extra-EC	14 184	17 342	20 026	22 228	26 786	29 478	29 358	33 922	38 853	43 058	45 211
Index	48.1	58.8	67.9	75.4	90.9	100.0	99.6	115.1	131.8	146.1	153.4
X/M	1.44	1.36	1.33	1.30	1.25	1.24	1.19	1.06	0.96	0.91	0.90
Imports intra-EC	18 323	19 558	21 966	24 083	28 331	32 079	35 700	36 602	40 525	44 297	46 069
Index	57.1	61.0	68.5	75.1	88.3	100.0	111.3	114.1	126.3	138.1	143.6

(1) Census of Manufactures and Eurostat estimates  
Source: ZVEI

from similar trends. Although there have been some cuts in capacity, competition has not weakened, and has even been reinforced by "Europe 1992" effects. Reduced trade barriers, more open procurement practices and a move to common standards are forcing companies to pay more attention to their competitors. Price competition has intensified this year, and may cause trouble for several producers, especially in the UK and the United States. The emergence of competitors from Eastern Europe on the low-market segments will accentuate the competitive pressure.

Since 1983, the electronic sector has become quite important. It is the fastest growing segment of the industry, together with telecommunications. It expanded rapidly over the eighties and its production is currently higher than that of the conventional electrical engineering sector.

Recently, the electrical equipment industry has regained some strength. In the four major EC countries (West Germany,

France, Italy and the UK), the electrical engineering sector grew by an estimated 5.5% in 1990, twice the manufacturing average. Growth was more moderate for domestic appliances, which only grew by 1.6%.

The Federal Republic of Germany, France and Italy are posting the best performances, while the industry is facing some difficulties in the UK: although the British electrical equipment sector is performing quite well, production of domestic ap-

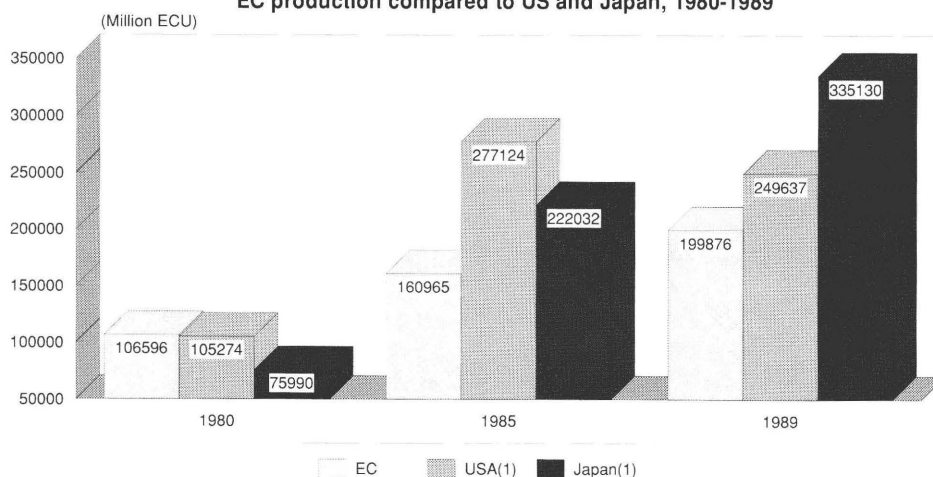
pliances fell by about 4% this year.

The countries most specialised in electrical equipment, the Federal Republic of Germany and Italy, are also the ones which posted the best performances over the last five years.

### Employment

After two years of decline in 1988 and 1989, employment increased in 1990, though by less than 1%. It is thus still 12% below the 1980 level. Strong price

**Figure 2**  
**Electrical engineering**  
**EC production compared to US and Japan, 1980-1989**



(1) Census of manufactures and Eurostat estimates  
Source: Eurostat, DRI Europe

**Table 3**  
**Electrical engineering**  
**Employment**

(thousands)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990 <sup>(1)</sup>
EC	2 705	2 570	2 472	2 388	2 381	2 396	2 393	2 406	2 386	2 358	2 368
Belgique/België	74	69	64	62	62	61	61	59	55	54	54
Danmark	32	29	29	29	31	34	35	36	35	35	35
BR Deutschland	944	918	881	845	855	898	934	942	950	953	965
France	440	429	427	413	404	389	370	356	340	330	333
Hellas	16	16	16	17	17	17	16	16	15	15	14
España	102	98	95	93	92	92	94	93	93	92	92
Irèland	13	14	15	14	15	15	16	15	16	15	15
Italia	268	258	245	229	205	198	198	196	193	192	190
Luxembourg	1	1	1	1	2	2	2	2	2	2	2
Nederland	117	112	112	109	110	116	117	121	120	120	121
Portugal	33	32	31	31	31	29	28	28	27	26	27
United Kingdom	665	594	556	545	557	545	522	542	540	524	520

<sup>(1)</sup> Estimated  
Source: ZVEI

competition and weak demand have made companies extremely cautious. Employment fell significantly during the first half of the 1980s and, although it seemed to stabilise between 1985 and 1987, it fell again in 1988 and reached its lowest level in 1989. Technology improvements which allowed for large productivity gains, but also the general restructuring of the industry, explain this evolution. The Federal Republic of Germany is the largest employer in the EC, and accounted for 40% of the total employment in this sector in 1989, a percentage almost equivalent to its share of production. The United Kingdom and France follow, with respectively 22% and 14% of total employment.

Preliminary estimates for 1990 shows a slight decrease in employment in the UK and Italy, in parallel with a small rise in the Federal Republic of Germany and France. The Federal Republic of Germany and the Netherlands are the only two countries for which the electrical engineering industry has contributed to general employment growth during the 1980s. As a matter of fact, in both countries, the employment level has risen continuously

since 1983.

The need to incorporate microelectronics in processing and changes in the products themselves creates a need for highly qualified workers such as engineers, technicians and software specialists, as the industry tends to relocate the manufacturing of components in low-wages countries, and focuses on assembly and development of new products and applications in Europe. This trend is likely to be reinforced in the future.

### The EC in the global market

World trade of electrical engineering products (excluding electronics) has grown substantially during the 1980s. EC exports grew by about 7% between 1982-88, in current ECU. However, the EC's share of world exports fell from 21.6% in 1982 to 13.4% in 1988, while the countries of the Pacific Rim (Japan, mainly) and South East Asia (South Korea being among the most dynamic) increased their presence on world markets. The countries of the rest of the world have also emerged as powerful competitors, even if their share of world exports is still less than 5%. Their exports

have grown by more than 20% per year throughout the 1980s.

Intra-EC trade doubled between 1982 and 1988, to reach 26 billion ECU, which is to be compared with extra-EC exports of 19.9 billion ECU in 1988. Electrical engineering accounted for 5% of total intra-EC trade in 1988 (compared to 3.9% in 1982) and is the seventh sector in importance.

The EC's trade balance for electrical products, excluding electronics, was still slightly positive in 1988, but its level has declined over the 1980s. EC trade with Pacific Rim countries, South East Asia and the other countries in particular has deteriorated. Trade vis-à-vis the other regions has marginally improved.

Imports of electrical engineering (excluding electronics) represent approximately 5% of the total EC merchandise imports. The breakdown of EC imports, shows that the main suppliers of the EC market are North America, the Pacific Rim, EFTA and South East Asian countries, which together account for about 87% of the total. All regions have improved their presence on the European market, especially the rest of the world. Although exports from the "rest of

the world" are still comparatively small, their growth rate averaged 49% annually between 1986 and 1988 (in current ECUs).

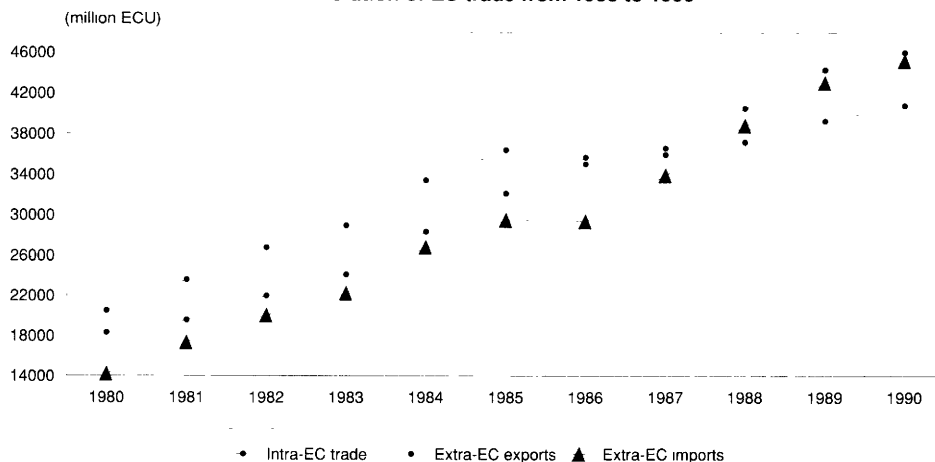
The EC mainly exports to the rest of the world (30.9% of the total in 1988, electronics being excluded) and to the EFTA countries (28.8%), but large quantities are also shipped to North America (17.4%) and South East Asian countries (11.3%). EC exports amounted to 19.9 billion ECU in

1988, and grew by about 7% per year on average between 1982 and 1988. During

that period, the EC increased its exports towards other industrialised nations. However, between 1986 and 1988, as demand for electrical engineering goods grew only slowly in the EFTA and North America, European producers succeeded in diverting some of their shipments to the expanding markets of South East Asia and of the Pacific Rim countries.

The participation of the Eastern bloc in electrical equipment world trade is quite limited. The region is, however, a significant producer of basic appliances such as refrigerators, vacuum cleaners and washing machines, and exports some of these to Western Europe. With market liberalisation in the East, trade flows in both directions are expected to increase. The Eastern bloc products are usually lower priced and, although they are inferior in terms of quality, they compete directly with Western manufacturers on basic, inexpensive models. Although Western companies will have greater access to markets in the East, short term opportunities are limited as these economies are expected to enter a recession period. Moreover, given the low living standards at present, the population does not have sufficient resources to buy non-essential products.

**Figure 3**  
Electrical engineering  
Evolution of EC trade from 1980 to 1990



Source: ZVEI

Among the four largest EC countries, the UK and France are the most open to external trade. Their export intensity ratios (i.e. the share of production which is exported) amounted to 37.6% in 1989, while imports represented respectively 48.7% and 42.5% of their domestic sales.

As a whole, the European electrical engineering industry has lost some competitiveness over the last two years. The export/import ratio has fallen continuously during the 1980s, from 1.44 in 1980 to 0.91 in 1989. For the EC as a whole, the import penetration ratio was 21.6% in 1989, while the share of production that was exported amounted to 19.6%. Both imports and exports increased in 1989 but the rate of growth of imports (10.8%) was twice that of exports. Intra-EC trade was multiplied by 2.4 between 1980 and 1989, the increase being particularly important over the last two years.

These global trends in the trade balance, mask different situations among the sub-sectors. The lighting industry for example is running a trade surplus, as well as the household appliances and power transformers sectors. These surpluses have been decreasing throughout the 1980s, but the

situation was reversed in 1989. On the other hand, the batteries and accumulators industry along with the welding equipment sector saw a sharp worsening of their deficit in 1989.

### Structure of the industry

Table 4 shows the world ranking for power equipment sales in 1989 and the predominance of Japanese producers. Beside the large and well established corporations, many younger companies have grown in this sector, expanding rapidly in terms of number and variety of products. The major businesses still dominate, however, and account for about one third of the EC market. Firms with less than 200 employees produce less than one fifth

**Table 4**  
Electrical engineering  
Largest companies sales, 1989

(billion ECU)	
Asea Brown Boveri (Sweden/Switzerland)	12
Mitsubishi (Japan) (including Mitsubishi Heavy Industries and Mitsubishi Electric)	6
Hitachi (Japan)	7
General Electric (USA)	6
GEC Alsthom (UK/France)	5
Siemens (Fed. Rep. of Germany)	4
Toshiba (Japan)	4
Westinghouse (USA)	3
Framatome (France)	3

Source: Prudential-Bache Capital Funding

**Table 5**  
**Electronic and electrical engineering**  
**Production shares**  
**by Member countries, 1989**

	Share(%)
Belgique/België	2
Danmark	1
BR Deutschland	40
Hellas	0
España	6
France	15
Irland	0
Italia	11
Luxembourg	0
Nederland	6
Portugal	1
United Kingdom	18

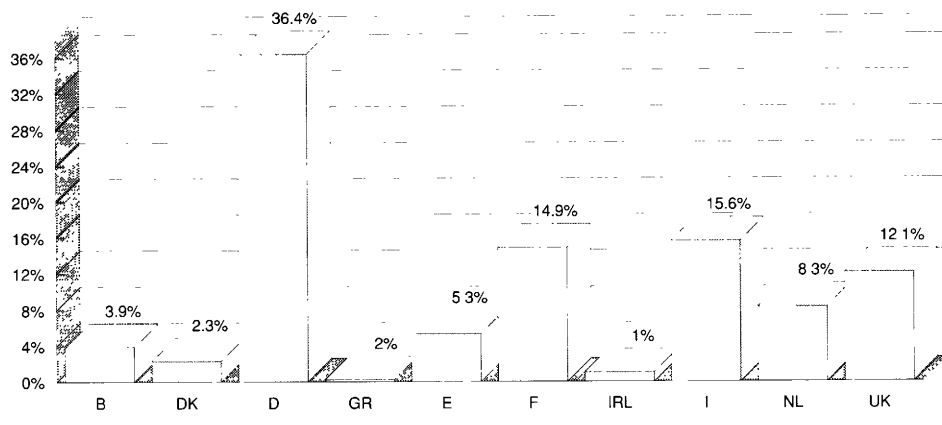
Source: ZVEI

of total production, although they represent 90% of the total number of companies. The household appliances sector is dominated by a few large companies in the EC, although there are over 300 manufacturers in Europe. Another example is the lighting industry which is highly concentrated worldwide and where recent acquisitions point to even higher concentration. Economies of scale are especially important for electrical equipment. Among the 1,500 German establishments (employing over 20 persons), 70% produce electrical motors, power generation equipment and wires and cables, while 15% manufacture lamps and less than 1% produce batteries and accumulators. Altogether, 80% of the

output is accounted for by companies with more than 500 employees.

The industry has gone through a restructuring phase, to focus on profitable line businesses and rationalise employment. The electrical equipment sector has also expanded through mergers and acquisitions in order to achieve economies of scale but also to strengthen its market position and financial background. Direct capital ventures at the EC or more international level, cooperation and association agreements for research and standardisation purposes have overall flourished. Agreements on technology transfer or cooperation for product distribution have become quite common. The fact that these alliances often group producers from different countries also reflects the will to build up positions on foreign markets. Another important aspect is the high level of investment in research and development. The American and Japanese producers have been eager to establish or acquire manufacturing facilities in Europe, to reduce transport costs. Several of them are now present in the EC but the trend is likely to be reinforced during the 1990s.

**Figure 4**  
**Electrical engineering**  
**Shares of value added by Member States, 1989**  
**(Excluding telecommunications and consumer electronics)**



Source: Eurostat

## Geographical characteristics

The Federal Republic of Germany is by far the largest EC producer, and accounts for 40% of the total EC production. The four largest EC countries represent 84% of total production. Another 12% is manufactured in Spain and the Netherlands, while the contribution of the other countries is very small.

Within each Member State, production is generally concentrated in certain regions. The states of Baden-Württemberg, Bavaria and North Rhine-Westphalia in the Federal Republic of Germany, the Paris Basin in France, the North of Italy, and the South-West, West Midlands and North-West regions of the United Kingdom, are equally important areas.

In the domestic appliances sector, the Federal Republic of Germany is the leader, followed by France and Italy. The Federal Republic of Germany and Italy are relatively more specialised in electrical equipment.

## 1992

In the past, varying standards across EC Member States contributed to protect local manufacturers, whose production was mainly directed towards the domestic market, from external competition. The harmonisation of norms and technical standards is likely to lead to greater cross border consolidation.

The liberalisation of public procurement is also expected to reinforce competition in the electrical equipment sector. Products are usually highly technical, and require large investments. That is why the cost of bidding can be high and past successful contracts are likely to limit the gains of a more competitive bidding procedure. Pro-

tected public markets also tend to limit specialisation and intra-sectoral trade.

Eastern Europe is considered to be a good location for low-cost manufacturing, and a likely source of growth opportunities in the coming years. ABB has acquired Zamech, a Polish turbine manufacturer and has established close links with Skoda Engineering in Czechoslovakia and a joint-venture with Bergmann-Borsig, an East German steam turbine manufacturer. These joint productions of operations will first target the domestic market but will later aim at export markets. Moreover, transport costs should not be a barrier to trade for basic products as is the case for US or Japanese products.

### **Environmental protection**

The electrical engineering sector is expected to be one of the largest beneficiaries of a move towards tighter environment protection measures. The main problem that the sector itself poses to the environment is the use of chlorofluorocarbons (CFCs), which destroy the ozone layer. They are used to clean printed circuit boards and can be released into the air during the manufacturing or scrapping of cooling appliances such as freezers or refrigerators. Air conditioners and refrigerators account for about 30 to 40% of the world's use of CFCs. Chemical companies are developing CFC substitutes, which usually require new types of compressors, and thus additional investment. The price of cooling appliances is thus likely to increase in the coming years, following the decision of the Montreal protocol to phase out CFCs by 2000. However, on the demand side, a "greener" Europe should provide large opportunities

for the electrical engineering sector, which contributes to the production of pollution monitoring and control systems, pre-catalysers for the automotive industry, more energy-efficient household appliances and other electrical equipment.

Within the sector itself, some product shift may occur as for example, in the battery industry. The power equipment sector is directly linked to electricity production and distribution. In general, more energy-efficient products will be favoured but the transition should be smooth, as this has been an objective of the industry for several years now.

### **Outlook**

The liberalisation and standardisation of markets in the EC, and technological progress will continue to determine the structural environment of the industry. The use of electronics is likely to continue its rapid expansion, as exceptionally vast and innovative applications are still being developed for a large variety of users and for the electrical industry itself.

While some products should not experience such a boost in domestic demand, as their consumption in Europe is close to saturation level (this is the case for some domestic appliances, as well as welding or power transformers in the Western countries), foreign markets will remain attractive. This is also true for some electrical equipment supplied to the electricity industry, which will mostly be replacement investment during the next few years. Here again, extra-EC exports and exports to Southern European markets will drain growth.

High quality and technology development and manufacturing are the main assets of European producers. That is why they are

mainly competitive in high-range products, while the lower end of the markets has been invaded by cheaper producers.

For the electrical industry as a whole, a 5% volume growth rate of production in the EC is forecast for 1991 and a 4.4% increase for 1992. For the 1993-96 period, production is expected to grow by a 4.5% annual rate. The telecommunications and electrical equipment sectors will be the fastest growing in the coming years, with rates ranging from 3.6 to 5.5%. The average growth rate for domestic appliances is expected to be around 2.6% between 1989 and 1993 and 2.7% for the three following years. British production of electrical appliances is the slowest growing but is expected to regain some strength after the bad performances registered in 1989 and 1990. France is the best performing EC country in this segment, while Germany and Italy lead the electrical equipment production.

The US market for electrical transmission, distribution and industrial equipment industries is expected to register a 2% volume growth in 1990 and annual compound growth rate of 2% for the 1990-94 period. In the short term, the growth will come from the switchgear, motors and generators sector.

**Written by: DRI Europe**

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**01**





The European Community has a large production capacity in all types of insulated wires and cables, extensively distributed across all Member States. There are over 100 companies making cables in more than 250 manufacturing facilities, with a workforce in 1989 of 110 000. EC cable makers are well able to meet domestic requirements both technically and in terms of volume: in a sector characterised by an enhanced commodity in a mature market with well-established local manufacture, there is already a high degree of interaction with a well-developed system of intra EC trading. The EC cable industry uses large quantities of two strategic raw materials: copper and aluminium.

#### Current situation

European cable-makers are amongst world leaders in innovation, technology and investment, which enables them to maintain a strong base in traditional products and markets. 1989 continued to show a vigorous domestic market in all Member States. The short-term outlook however is now uncertain due to evidence of a slow-down in some economies and considerable uncertainties resulting from the international situation. The unification of Germany is expected to have a positive effect which at time of report is impossible to quantify. The newer applications particularly in information technology continue to show the most dynamic characteristics. Export prospects are limited by competition

and the availability of credit, while imports continue to make substantial inroads (although still constituting less than 10% of domestic demand). European cable-makers expect to maintain their strong position and the trade balance should remain favourable. The structure of the market, within and outside the Community, is gradually changing, with significant recent moves by major players. West European cable-makers are most active in helping to restructure the industry in Eastern Europe and the need for rapid build-up of the infrastructure will provide many business opportunities. Substantial potential for rationalisation remains across the whole of Europe.

**Table 1**  
Insulated wires and cables  
Main indicators, 1985-91

(million ECU)	1985	1986	1987	1988	1989	1990 <sup>(1)</sup>	1991 <sup>(1)</sup>
Apparent consumption	7 521	8 292	8 909	10 490	11 236	11 102	11 230
Net exports	816	676	433	307	285	274	317
Production	8 337	8 968	9 342	10 797	11 521	11 377	11 547
Employment (thousands)	115	114	114	111	110	108	107

<sup>(1)</sup> Estimated

Source: Europowercab, Eurotelcab and European Enamellers Council

## Description of the sector

Markets for insulated wires and cables are extremely diverse: they have applications in virtually every aspect of modern life, from the winding wire in the electric shaver to the optical fibre providing the basis of the telephone call. Behind all this there is the basic infrastructure of energy generation, transmission and distribution. The family of cable products is similar in the manufacturing process but differs in technology, markets and industrial structure.

Electrical energy cables are fundamental to all industrial and commercial activities and to domestic life in all parts of the Community. Wires and cables supply energy from the electricity generation centres to the individual point of utilisation. Markets are generally well developed with cables at a high level of technology.

Within the Community the level of demand is highly sensitive to increases in demand for power, requirements of new generating/transmission facilities, demand related to finalisation of infrastructure in less-developed areas and the ever-present need

for replacement and upgrading.

Winding wires are used in all forms of electrical equipment where a magnet is required. Thus every electric motor, dynamo, etc., requires a magnet or winding wire that is enamelled or otherwise insulated. Most products are marketed to OEMs.

Information cables have two main outlets: in telecommunications, where current demand is strong, reflecting the massive surge in demand for new telephones as well as the more complex requirements of the new communications systems in commerce and industry; and the multifaceted area of cables for electronic data/control applications and broadcasting, which is experiencing strong growth in response to the increasing demand for IT systems. Telecommunication cables are crucial to many of the latest developments in information technology. Ranging from simple wires connecting telephone handsets to the wall, to armoured cables, coaxial cables and submarine cables, this group covers a large variety of products.

## Production trends

Europe's production capacity is well above current demand. Improvements in technology, better production techniques and diminishing export opportunities have generally led to under-utilisation of capacity. However, European cable manufacturing is a highly dynamic industry:

- ❖ through R&D activity (based on an estimated 5% turnover), Europe has achieved a world lead, drawing from a wide gamut of technology (non-ferrous metallurgy, insulation physics and rubber chemistry, high-tech materials, superconductivity and electrical engineering for power cables with optical-fibre cables technology for telecommunications cables);
- ❖ optical-fibre cables probably represent about 20% of the output of telephone cable-makers. Manufacture is based on cable-making, not on glass-making or copper-drawing or telecommunications equipment manufacture, all of which require different technologies. All optical-fibre cable-makers in Europe also produce copper

**Table 2**  
Insulated wires and cables  
Production by type of product

(million ECU)	1986	1987	1988	1989	1990 <sup>(1)</sup>	1991 <sup>(1)</sup>	1992 <sup>(1)</sup>
Energy cables	6 269	6 524	7 423	7 839	7 872	7 993	8 043
Telecommunication cables	2 062	2 196	2 548	2 756	2 615	2 663	2 735
Winding wires	637	623	825	925	890	892	899
Total	8 968	9 343	10 796	11 520	11 377	11 548	11 677

<sup>(1)</sup> Estimated

Source: Europowercab, Eurotelcab and European Enamellers Council

**Table 3**  
Insulated wires and cables  
Production by country

(million ECU)	1986	1987	1988	1989	1990 <sup>(1)</sup>	1991 <sup>(1)</sup>	1992 <sup>(1)</sup>
Belgique/België, Danmark and Nederland	854	854	988	988	975	959	959
BR Deutschland	3 055	3 288	3 728	3 780	3 747	3 801	3 892
Hellas, Ireland and Portugal	252	260	272	283	295	304	304
España	434	440	549	590	611	625	633
France	1 588	1 494	1 702	1 758	1 739	1 740	1 757
Italia	1 231	1 398	1 652	2 143	2 074	2 093	2 133
United Kingdom	1 554	1 608	1 906	1 979	1 936	2 025	1 998

<sup>(1)</sup> Estimated

Source: Europowercab, Eurotelcab and European Enamellers Council

telecommunications cables and most also make energy cables.

### Main technological developments

**INFORMATION CABLES** The introduction and development of optical-fibre technology in the market-place has been rapid and such links are now installed on most of the busy inter-city networks in Europe. A recent estimate indicates that about 70% of all long-distance calls in Europe are now transmitted by means of optical-fibre over a part of their distance. Although predominant in long-distance connections, optical fibres are less viable over short distances despite the continuing decrease in the price of fibre.

**ELECTRICAL ENERGY CABLES** At present, the main areas of technical development in cables in Europe are concerned with improving manufacturing techniques, improved insulation, improved safety in use (fire and fume hazard), better materials utilisation, and technology barriers

(e.g. superconductivity).

**Strategic raw materials** Cables for all outlets require two important raw materials for which there is no European Community source: copper and aluminium. Across all applications, usage of these two strategic metals is as follows: copper - over 1 million tonnes; aluminium - about 150 thousand tonnes. The cable industry and the cable market are, therefore, vulnerable to the availability of these materials and the instabilities created by fluctuating prices.

Insulation materials, plastics and elastomers, as well as aluminium, steel and tin/lead are needed also in substantial quantities to service the cable industry.

### Consumption

**TELECOMMUNICATIONS CABLES** Over the past decade, consumption of telecommunication cables in Europe in money terms has risen from about 1500 million ECU in 1980 to 2750 million ECU in 1989, an increase of about 5% per year. This fig-

ure does not include Ireland, Portugal and Greece, which could add around 5% to the total. The number and length of communication channels provided during the period has increased enormously, but as technological developments have reduced the cost per channel equally dramatically, the total revenue of cable-makers has generally remained in line with price inflation.

Most of the market for telecommunications cables is accounted for by the national public telephone network operators (PTTs). The strongest growth is in trunk (long distance) traffic, where technological developments have substantially reduced cable costs. In local networks, which depend on more conventional cable, the market is static. Given the preceding factors and the reduction costs due to improved production technology, sales are likely to grow at less than 4% per year over the next few years.

**DATA CONTROL CABLES** Demand for

**Table 4**  
Insulated wires and cables  
Consumption of strategic materials

(thousand tonnes)	1985	1986	1987	1988	1989	1990 <sup>(1)</sup>	1991 <sup>(1)</sup>	1992 <sup>(1)</sup>
Copper	993.9	958.3	1 001.8	1 037.8	1 105.9	1 102.6	1 108.9	1 116.7
Aluminium	127.6	138.3	138.4	146.7	150.8	153.9	155.5	155.1
Copper equivalent	1 249.1	1 190.9	1 278.6	1 331.2	1 407.5	1 410.4	1 419.9	1 426.9

<sup>(1)</sup> Estimated

Source: Europowercab, Eurotelcab and European Enamellers Council

**Table 5**  
Insulated wires and cables  
Employment

(employees)	1985	1986	1987	1988	1989	1990 <sup>(1)</sup>	1991 <sup>(1)</sup>	1992 <sup>(1)</sup>
Belgique/België, Danmark and Nederland	8 904	8 773	8 718	8 212	7 980	7 830	7 800	7 775
BR Deutschland	38 800	39 500	40 700	40 500	40 000	40 000	40 000	40 000
Hellas, Ireland and Portugal	5 103	4 941	4 736	4 569	4 361	4 169	4 169	4 169
España	5 825	5 825	5 850	5 775	5 700	5 750	5 750	5 750
France	16 700	15 400	14 800	14 000	13 800	13 500	13 500	13 400
Italia	15 250	14 950	14 300	14 000	13 700	13 400	13 100	12 800
United Kingdom	25 000	24 750	24 500	24 250	24 150	23 500	23 000	23 000
<b>Total</b>	<b>115 582</b>	<b>114 139</b>	<b>113 604</b>	<b>111 306</b>	<b>109 691</b>	<b>108 149</b>	<b>107 319</b>	<b>106 894</b>

<sup>(1)</sup> Estimated  
Source: Europowercab, Eurotelcab and European Enamellers Council

electronic data and control cables is expected to continue in line with a steadily rising trend;

ELECTRICAL ENERGY CABLES Overall demand in Europe for energy cables has reached a plateau. Home markets are mature and the current basic infrastructure well established. Basic demand is likely to keep pace with growth in the GDP with occasional boosts from new generating capacity and the extension of the Eurogrid. The rise in the standard of living will increase demand while, simultaneously, installations based on old (insulation) technology will require replacement.

## Trade trends

**Exports** EC cable-makers have always been the world's most important source of cables, with average exports over the past decade topping 1000 million ECU. The past few years have seen diminishing export opportunities coupled with substantially increased imports. Many former principal export markets are now self-sufficient and sluggish markets in the Middle East oil-producing countries are exacerbated by a tendency to greater home production. Opportunities still exist for EC cable-makers in countries where the level of technology required is beyond the domes-

	BICC	Cable de Lyon	Draka	NKT	Pirelli	Siemens
Belgique/België		2				
Danmark				1		
BR Deutschland		2	2			1
Hellas		2				2
España	2	2			2	
France		1			2	
Ireland						
Italia	2	2			1	
Nederland			1			
Portugal	2	2			2	
United Kingdom	1		2	2	2	2

1: Home base  
2: Local manufacturing base  
Source: Europowercab and Eurotelcab

**Table 7**  
Insulated wires and cables  
Outward investment

	Area of investment
Belgique/België	-
Danmark	Norway
BR Deutschland	Austria, Turkey, Argentina, Nigeria, Bangladesh, South Africa
Hellas	-
España	-
France	Argentina, USA, Canada, Norway, Australia, Lebanon, Morocco, Sweden
Ireland	-
Italia	Brazil, USA, Canada, Mexico, Argentina, Peru, Ivory Coast, Australia
Nederland	USA, Singapore
Portugal	Mozambique, Angola
United Kingdom	USA, Canada, South Africa, Trinidad, Kenya, Australia, Malaysia, New Zealand Hong Kong

Source: Europowercab and Eurotelcab

tic production capacity. In addition, non-EC cable makers are in need of capital and technical expertise which the EC is in a position to supply. The Community remains a net exporter of cables, with an exports-to-imports ratio of

1.8 to 1 expected in 1990. Nevertheless, overall prospects for European producers in export markets cannot be regarded as encouraging.

**World competition** Yugoslavia and Finland are major extra-EC European suppliers,

while major producers outside Europe are the USA, Japan, the Republic of Korea and Taiwan, with Australia making significant progress. A number of other countries such as the Gulf States, Turkey, Brazil, Malaysia and India now have their own production units, but they have tended to concentrate on import substitution and so far, have not had a significant impact on export markets.

**ELECTRICAL ENERGY CABLES** Production of cable in major countries in the mid-1980s is estimated as follows: Europe (35%), Japan/Far East (26%), USA/South America (28%), others (11%).

**TELECOMMUNICATIONS CABLES** There are more copper telecommunications cables made in the EC than in any other area of the world; but while the USA dominates optical-fibre cables, Europe has a powerful position in world markets. The world production of telecom cables is estimated to be: Europe (33%), Japan/Far East (14%), USA/South America (43%), others (10%).

### Employment

The production of cable is essentially capital-intensive; machines run automatically and produce large quantities of one type of cable. Employment in the industry is, therefore, comparatively low. Increased productivity over the past 10 years in particular has been associated with higher turnover and a steady decrease in employment. Technological development in cables and the methods of producing them are such that with the stable market the trend is downward.

### Investment

There has been substantial rationalisation and cross-fertilisation within national boundaries and the last three years have witnessed a substantial increase in

**Table 8**  
Insulated wires and cables  
Inward investment

	Source of investment	Product area
Belgique/België	-	-
Danmark	Sweden	Information cables
BR Deutschland	Switzerland, Sweden and USA	Energy and information cables
Hellas	-	-
España	Canada, USA, Sweden and Switzerland	Energy, information, vehicle wiring, winding wires
France	USA	Information/data cables
Ireland	Japan, Sweden	Vehicle wires, energy and information cables
Italia	Switzerland	Winding wires
Nederland	Finland	Energy and information cables
Portugal	USA and Japan	Vehicle wiring
United Kingdom	USA and Japan	Energy, information, winding wires

Source: Europowercab and Eurotelcab

cross-border investment within the Community. Large multinational companies with bases in France, Italy and the United Kingdom have developed strong bases in other Member States, while smaller companies have also moved to seek opportunities outside their own boundaries:

- ❖ There is a strong presence of European Community cable investment in territories outside the Community; and Europe's major companies are now active on all continents;
- ❖ The European Community has also attracted inward investment from other nations, the details of which are illustrated in the following table.

### Environment

Generally speaking, cable manufacturing does not despoil the environment. The manufacturing process is clean and the materials used are normally non-toxic; those posing potential risks are strictly regulated. The cable-makers have taken a decision to eliminate the use of the 'drins' (aldrin, dieldrin, lindane) - used up to now for imparting anti-termite properties. Henceforth, in those (mainly tropical) applications where it is required, cable will be pro-

tected mechanically. An important area in which the cable industry has taken a lead in responding to environmental concerns is in looking at the usage of raw materials and in considering the potential hazards of the locations in which cables are installed and used. Specially designed cables with reduced fire propagation properties in case of fire are available, there are already acceptable alternatives to PVC and other compounds in areas with fire risks. Cables stripped without halogens emit little smoke, corrosive gases or fumes when subject to fire. These are particularly important in public areas, in transport and warehouses as well as any place frequented by people or housing combustible goods.

### Outlook

**SHORT-TERM OUTLOOK** In 1989 production was up by 4% overall, but the figures for 1990 have not reflected the confidence previously expressed. In the last few months of the year, the slow-down in some nations, the opportunities and problems presented by the unification of Germany, and the changes in the rest of Eastern Europe have led to substantial uncertainty.



This situation overlaid by the dramatic fluctuation, in oil prices coupled with the events in the Gulf, makes short and medium prognosis impossible with any degree of confidence.

**MEDIUM-TERM OUTLOOK** If the trends of the last few months in Eastern Europe are consolidated, the opportunities for cable-makers should be most attractive. The EC

industry is very well placed with excellent products and adequate capacity to meet any of the demands likely to arise. In particular EC cable-makers will make and are already actively seeking, alliances with Eastern Europe, helping to lay foundations for long-term cooperation. Competition in the whole of Europe is expected to intensify particularly in the low technology field.

**EUROPACABLE: European Confederation of Associations of Manufacturers of Insulated Wires and Cables. Address: Rue du Luxembourg 19-21, B- 1040 Bruxelles; tel: (32 2) 513 06 12; fax: (32 2) 513 07 33**

**and**

**EUROTELCAB: European Conference of Associations of Telecommunication Cables Industries**

**Address: Postfach 100645, Pippinstrasse 16, D-5000 Köln 1 tel: (49) 221 204 62 10; telex: 8881342; fax: (49) 221 204 62 48.**

**Reviewed by: European Research Associates**

The production of transformers has pursued a downward path for a number of years now and the prospects for the future continue to be poor. The industry is pursuing the comprehensive policy of rationalisation and concentration it launched in 1986, but competition from non-Community countries has become an increasing threat. Demand remains stagnant and only the replacement of existing transformers and the development of the electrical industry abroad have managed to provide new markets for the manufacturers of the EC.

### Description of the sector

Transformers are stationary electrical machines whose function is to raise or lower the voltage level in an electrical circuit carrying an alternating current, without reducing the frequency of that current.

They play a vital part in the transport and distribution of electrical energy.

The operating voltages of electricity generating equipment do not exceed some twenty thousand volts of alternating current, yet the movement of large amounts of electrical power over long distances can only be achieved economically when done at very high voltage, up to hundreds of kilovolts.

It is therefore essential to install "step-up" transformers in the immediate vicinity of generating plants and "step-down" transformers at the points of electricity supply.

There are also transformers used primarily for measuring electric variables and whose operating principle is identical with that of high performance transformers but whose characteristics are very different in size and scope.

Transformers occupy a relatively unimportant segment of the Community's electrical industry as a whole: in 1988 it represented 0.8% of the total value of the electrical industry's production in the Community (including electronics).

### Current situation

Considerable changes came about in the transformer industry in the EC between 1980 and 1987.

During this period a number of factors affected the downward trend in the demand for liquid dielectric power transformers.

The entire electrical equipment industry suffered a continued downturn through the Seventies and to the mid Eighties, the main causes of which were the general slackness in demand, the increasing competition by firms outside the EC and the huge overcapacity of production inside the Community.

A slight recovery was seen in 1984 and since then the industry has enjoyed sustained growth, especially since 1989.

For transformer manufacturers, however, the trends are generally far slower and

**Table 1**  
**Power transformers**  
**Main indicators, 1983-88**

(million ECU)	1983	1984	1985	1986	1987	1988
Apparent consumption	1 095	1 286	1 569	1 653	1 497	N/A
Net exports (1)	443	352	293	264	218	192
Production	1 538	1 638	1 862	1 917	1 715	N/A

(1) 1980 EC 9, 1981-1983 EC 10  
 Source: Eurostat-Dafsa

have been distinctly less favourable over recent years.

## Consumption

The main source of demand for transformers comes from expansion and maintenance operations in the electrical industry. While up until recently the consumption of electricity grew at a faster rate than the level of GDP, since 1988 growth in the electricity sector has slowed down as a result of the fall in the prices of fossil fuels and the effects of saturation.

Recourse to energy saving measures, especially in industry, has also had a negative impact on the sector.

The electricity distribution companies have undertaken very substantial investments in infrastructure in most countries of the European Community, and so there are at present ample reserves available.

Current trends in the consumption of electricity in most countries of the EC do not call for any further expansion in the capacity of distribution grids nor for new transformers as a consequence.

Despite the upturn in the economic activity of the EC and the encouraging prospects for the next few years, the capacity of existing networks will probably continue to be quite adequate for the years to come.

Investments will therefore be restricted to replacing old equipment, especially in the northern countries of the EC.

Only Greece and Ireland should make investments on a broader scale.

The demand for high voltage transformers is in general terms heavily dependent upon public investments in the energy sector and is therefore relatively unstable as a result.

The structure of the electricity generating and supply industry is fairly diversified in the EC, ranging from state monopolies that exist by law (France, Greece, Ireland) or de facto (as in the Federal Republic of Germany where contracts are signed with local authorities), to systems of decentralisation and mixed ownership (Belgium, Denmark) with or without state predominance. In the United Kingdom, the privatisation of the electricity industry is now entering its final phase.

The transmission network is currently operated by local bodies who are responsible for supplying power to the end user.

This means that the procedures whereby transformer supply contracts are allocated to the electricity distribution companies are relatively different from country to country.

The liberalization of public contracts will therefore have a particular effect on certain countries of the Community in which such contracts are awarded to national manufacturers as a matter of priority.

## Production

**Under 5 KVA** The Federal Republic of Germany is the premier manufacturer of low voltage transformers.

Other major producers are Spain, the United Kingdom, Turkey, Syria, Sweden,

South Africa and Yugoslavia.

In 1986 the EC produced some 42 million transformers rated at under 5 KVA. A little over 2 million units were manufactured in Asia (including the Middle East countries), 1.6 million in South America, 800,000 in EFTA and 94,000 in the countries of Eastern Europe.

**5 KVA and over** As regards the production of transformers of 5 KVA and more, Germany is way ahead with approximately 97% of total production in the EC in 1986 (a total equivalent to 2.33 million units). Japan (576,314 units in 1986), Canada, the United Kingdom (49,668 units in 1985), South Africa, Brazil and Australia (50,365 units in 1985) are classed among the most important producers.

They are followed by a large number of countries (in EFTA and Eastern Europe in particular) who have an average production of 10 to 15,000 units (in 1986).

In that same year production by Asian countries totalled 605,181 units compared with 214,391 units in North America, 44,563 in the countries of Eastern Europe and 43,653 for Oceania.

An analysis of statistics expressed in KVA nevertheless reveals a slightly different structure that reflects the specialization by some countries in high voltage transformers. In terms of voltage the USSR is effectively the Number One world producer with 168 million KVA in 1986, followed by Japan (109 million) and China (80 million). With the exception of the USSR, Asia is therefore dominant with 211 million KVA produced in 1986.

Then comes the EC (62 million produced mainly by France, Portugal and Spain), followed by Eastern Europe (Poland, Roumania, former East Germany and



**Table 2**  
Power transformers  
EC Trade at current prices (1)

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Extra-EC exports Index (2)	375.7 87.9	475.1 111.2	585.7 137.0	545.8 127.7	488.7 111.3	439.1 100.0	421.2 95.9	376.3 85.7	412.4 93.9	481.6 109.7
Extra-EC imports Index (2)	61.6 43.4	85.2 59.7	92.4 64.7	102.5 71.8	137.0 94.0	145.7 100.0	157.6 108.2	158.8 109.0	220.1 151.1	268.6 184.4
X/M	6.1	5.6	6.3	5.3	3.6	3.0	2.7	2.4	1.9	1.8
Intra-EC trade Index	119.0 68.5	126.9 72.8	134.7 77.3	132.3 75.9	190.4 102.1	186.5 100.0	211.6 113.5	219.1 117.5	248.7 133.4	301.8 166.6
Share of total(%)	23.7	20.9	18.6	19.4	28.0	29.8	33.4	36.8	37.6	38.5

(1) 1980 EC 9, 1981-85 EC 10

(2) Allowing for changes in the number of EC member countries.  
Source: Eurostat (Comext)

Czechoslovakia) with a total of 44.3 million and North America with 37 million (most of which is produced in Canada). Apart from this position of domination on the part of the USSR, China and Japan in high voltage transformers, it is also possible to discern differences in the structure of transformer production from one country to another.

In Germany for instance we have seen over the past decade that the proportion of solid insulation transformers and spare parts has grown at the expense of transformers with fluid insulation. In France, interest has clearly concentrated on transformers of low and medium power.

### Foreign Trade

The unabated drop in demand from domestic markets has persuaded the Community's transformer industry to intensify its export efforts with the aim of making its existing production capacity more profitable. While sales are poor inside the EC, a number of countries are still making substantial investments in the electrical energy sector, which in turn stimulates the demand for transformers.

However world capacity does show a broad surplus of supply over demand and is therefore unable to keep all manufac-

turers fully occupied.

The battle to win new markets abroad is very tough as a result, and will continue to be so during the coming years.

Since 1985 the Community's transformer manufacturing industry has been hard hit by a loss of international competitiveness due principally to the emergence of low-cost foreign producers.

Asian and Eastern European suppliers have in effect won substantial market shares.

The chronic shortage of foreign exchange among the countries of the third world has also involved a slowdown in demand. This is an added handicap which results from the creation of local transformer production facilities set up to meet local needs.

While the EC trade balance remains positive it has still been on a downward curve since 1982, the year it attained the highest level for the entire decade.

In 1989 net exports amounted to 213 million ECU, an increase of 11% compared with the 1988 level. Still, compared with 1982 this represents a decline of around 57%. Except for a slight improvement in 1989 the balance of trade has therefore deteriorated sharply since 1982 owing to the drop in export levels and the ever in-

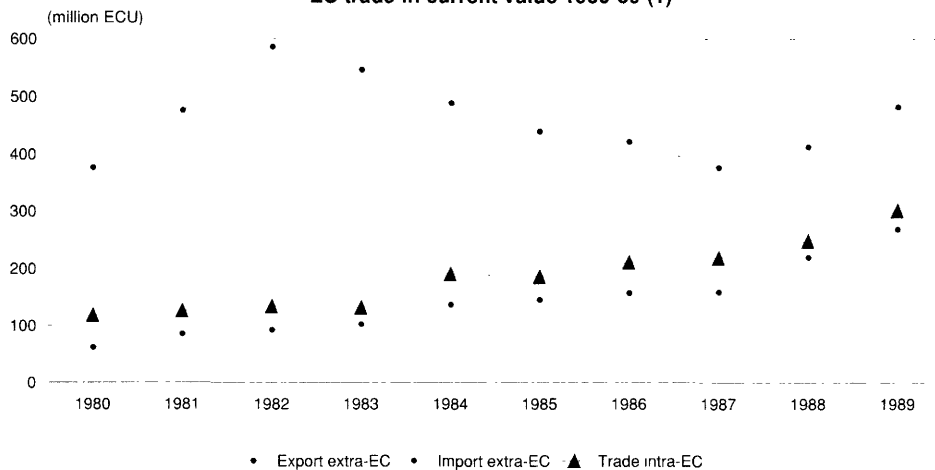
creasing inroads made into the Community market by imports. From attaining their peak in 1982, EC exports quickly lost ground in real terms down to 1987. This unfavourable tendency in the field of exports has had a particular effect upon the manufacturers of transformers in those EC countries where the domestic markets are relatively limited, because they are still heavily dependent on exports. For two years however exports have again been on the upward gradient.

For their part, imports have grown throughout the period, more than quadrupling between 1980 and 1989, corresponding to an average annual growth rate of 17.8%. As a result, the rate of import coverage has dropped from 6.1 to 1.8.

Intra-EC trade has developed strongly during the course of the decade. On average it has increased by 10.9% per annum (20% in 1989) and attained 301.8 million ECU in 1989, an amount that represents nearly 40% of the total exports by members countries.

The industrialised nations are generally speaking exporters of electrical transformers. The slackness in demand on their internal markets for a number of years now, and the attendant need to identify fresh

**Figure 1**  
**Power Transformers**  
**EC trade in current value 1980-89 (1)**



(1) 1980 EC 9, 1981-85 EC 10  
 Source: Eurostat

outlets, has compelled them to look abroad. Many countries in the course of industrialisation are on the other hand in an investment situation and have a substantial demand for transformers.

The same goes for countries that have experienced very rapid economic expansion such as Singapore, Hong-Kong or Korea which are classed among the major world importers.

Of the major industrial nations only the United Kingdom and the United States are net importers, while Japan and Germany have a large surplus of supply over demand. The Americans are the world's primary importers.

Although American exports have increased sharply since 1988 (primarily to Canada and Mexico), they still lag behind imports.

France, Germany and the United States are some of the largest exporters but a major breakthrough by Asian countries has been observed, primarily by Japan (now the world's largest exporter) and Korea.

The members of EFTA, in particular Switzerland and Sweden, also export a substantial share of their production.

So far as liquid dielectric transformers are

concerned, Japan again leads the field of exporters. In addition to the countries already mentioned for electric transformers, we also find Austria and Finland in this sector. The main importers of liquid dielectric transformers are to be found in the Persian Gulf (Saudi Arabia, Iran, Iraq and Kuwait). The United States, Canada, Sweden as well as Brazil and Venezuela are also among the largest importers.

### Structural changes

The general weakness in demand has brought about numerous structural changes over the past few years.

Prompted by the problems of excess production capacity, many of the Community's producers of transformers have been forced to close production units and to rethink their product ranges.

A brief review of the more important changes that have taken place in some countries of the EC in recent years will serve to illustrate the extent of the adjustments that have been necessary for the Community's industry:

- In Belgium one of the two national transformer manufacturers was compelled to cease trading in 1986 as a result of the

pressure from world pricing competition that has greatly damaged exports. In fact 25 to 30% of the Belgian market is supplied by foreign manufacturers. The inherent weakness in demand is however less pronounced in Belgium than in its French and German neighbours;

- the decline in industrial activity in France has necessitated a number of reorganizational measures such as mergers, plant closures, rationalization and above all the concentration of production sites;
- three German manufacturers have gone into liquidation while others have closed down certain of their plants or subsidiaries and the level of activity in general has dropped considerably. This shrinkage in capacity is ongoing: a certain number of corporate mergers and take-overs took place during 1988. At the present time Germany has 7 manufacturers of transformers, 5 of whom are large (and two of these belong to foreign-owned groups);
- Italy has experienced the opposite tendency with the arrival of a number of new manufacturers on the market. The Italian companies are relatively powerful, but they have not escaped the problems associated with overcapacity and changes will probably be inevitable in the coming years;
- the Dutch market has always been one of the most open. The six national manufacturers face keen competition from the major Community producers, all of whom are present on the domestic market. Demand in the Netherlands is relatively stable compared with other countries. Here again, Dutch manufacturers have been compelled to carry out a certain amount of rationalisation and to intensify their export efforts to offset falling prices.

- extensive reduction in both production capacity and employment has been seen in Spain during recent years;
- there are at present 15 national manufacturers but extensive rationalisation is still needed in order to adapt to the fall-off in demand;
- the United Kingdom on the other hand was one of the first members of the EC to implement structural changes. Despite a drop in production capacities and employment between 1980 and 1987 the number of manufacturers has stayed the same, although they have not had an easy time maintaining their competitive position. Their exports have tended to fall off while foreign products make inroads on the domestic market.

### **Industrial strategy**

It is interesting to note the contract signed in 1988 between Westinghouse Electric Corporation (the premier producer of transformers in the United States) and Asea Brown Boveri, the Community's giant in electrical engineering.

This accord initially resulted in ABB buying 50% of Westinghouse's electrical distribution subsidiary. ABB then purchased the entire subsidiary for a total amount of approximately 700 million dollars.

This take-over should ensure important outlets in the United States, Canada and other areas of the world for ABB products, especially for transformers which in 1989 represented 21% of the group's revenue. Asea Brown Boveri have pursued quite a successful strategy in the transformer field.

The number of employees per unit of production has been increased in order to reduce the number of production facilities working in parallel.

This has enabled ABB to cut the time needed to manufacture transformers and to better achieve and even improve on delivery times to clients.

ABB say that this strategy has enabled them to win a certain number of contracts. The large firms who are increasing in number given the growing concentration in the sector prefer in general to secure long-term market shares rather than to take advantage of short-term profits.

In this sense diversification is important because the internationalisation of the market necessitates an ability to respond to demands that are often very varied in terms of standards.

EC companies have strengthened their ties with the countries of Eastern Europe and the USSR since the opening of the borders. Poland, former East Germany and Czechoslovakia are the countries with whom relations are most highly developed. On the one hand these countries are seen as the likely sites of relatively low cost production units in years to come, and on the other, thanks to the modernisation of their equipment and infrastructure their demand for electrical equipment in general and transformers in particular should grow rapidly. Nevertheless we should not forget that these countries are themselves important manufacturers of high voltage transformers (Poland, former East Germany, Bulgaria and Czechoslovakia in particular). Thus the demand addressed to the countries of the Community will probably be concentrated on the less powerful transformers.

### **Technological progress**

In terms of technological advance the development of amorphous core transformers will probably have a major impact on the

running costs of electricity distribution systems. Large quantities of amorphous metal used in the production of core transformers which are very efficient in the conservation of energy are currently being produced and gradually put on to the market. This metallic material, similar to glass, has a noncrystalline molecular structure. It is produced by the cooling of metal alloys cast at more than one million degrees per second, a process that imparts exceptional magnetic properties and makes it possible to reduce the core's electricity losses from 40% to 70%.

### **Outlook**

The likely rise in demand on the part of industries and households will not bring about an expansion of the electricity network given the existing reserve capacities. The completion of investments in the extension of grid capacities might even herald a slight downturn in transformer sales in some countries.

In France, for instance, the programme of construction of nuclear power stations and their attendant distribution networks by EDF is now virtually complete. The demand for replacement equipment should remain steady over the next few years given the development of electricity distribution systems in most of the member countries. However this should only facilitate the maintenance of existing levels of production as "primary" demand will continue on its downward trend.

Over the coming years it is forecast that the demand for electricity will continue to rise, albeit more slowly than in the past. The healthiest growth rates will be recorded in Southern Europe and Ireland. The absence of high tension electrical links between Ireland and Greece and the

rest of the Community is seen as a priority problem by the European Commission, as is the existence of monopolies and exclusive rights. Important changes are likely to come about as regards the utilisation of the interconnected electricity transmission systems (the "common transport" concept), and this will also encourage an additional demand for the replacement of existing transformers.

In the United States the industry has enjoyed some degree of recovery in activities since 1987, even if production there has stayed below the level of 1985.

The Americans predict an average annual growth rate of some 2% in value between 1989 and 1993.

In real terms however production looks set to fall by 2% per annum. Trends will be scarcely any different in the Community or the EFTA countries.

The share of Asian producers and developing countries should continue to grow however.

As regards the long-term strategy, trends in the prices for other sources of primary energy are certainly fundamental for the electricity generating industry.

The sharp rise in oil prices will no doubt bring about renewed interest in electricity as a source of power.

Given the investments in infrastructure implemented during the Eighties and the substantial spare capacities inherent in the system however, it is unlikely that fresh investments will be initiated in the immediate future.

The pressure to hold down prices should persist and additional streamlining measures will no doubt become necessary in the next few years.

In order to form some indication as to the

direction that the transformer industry might pursue in order to survive, we can take the example of the United States, where an extensive process of concentration has been observed in the course of recent years.

In the area of transformer distribution, just five corporations currently meet 80% of demand while in the European Community 50 manufacturers hold the same share of the market.

This may well suggest that a reduction in the number of manufacturers is essential for the survival of the transformer industry in the EC.

So far as the introduction of the Single European Market in 1992 is concerned, three factors will have a decisive impact upon the transformer industry: the disappearance of trade barriers (in particular administrative barriers and monopolies), the creation of common standards (especially as regards the high voltage connections between Greece and Ireland with the other EC members) and the liberalisation of state contracts.

A substantial share of demand by the sector will depend on public investment, and the liberalisation of state contracts should bring about greater openness as regards prices and an intensification of competition, which will in turn risk accelerating the process of restructuring.

Environmental concerns will have only a limited impact on the transformer industry. Emphasis will be placed on transformers that are more efficient and which involve fewer energy losses, but the additional demand (replacement of existing transformers by others more advanced) will be moderate and should not bring about abrupt changes in the industry.

The development of transformers with amorphous cores will make it possible to achieve substantial reductions in losses of electricity through the core.

**Written by: DRI Europe**

**The sector is represented at Community level by: COTREL: Comité des Associations de Constructeurs de Transformateurs du Marché Commun. Address: c/o ZVEI, P.O. Box 700 969, Stresemannallee 19, D-6000 Frankfurt/Main 70. tel: (49 69) 630 22 32; telex: 411035; fax: (49 69) 630 23 17.**

The production and trade of high-voltage switchgear in the Community do not yet follow an area-based logic.

They are dominated by the Federal Republic of Germany, France, Italy and the United Kingdom, whilst the other Member States are of little significance.

The Community market is still largely the juxtaposition of national markets. Although growing yearly, intra-Community trade, which is partly sustained by trade within firms, appeared to be relatively low in 1988 in relation to world commerce.

In addition, since industry and the electrical networks are widely developed on the national markets and companies producing high-voltage switchgear cannot anticipate relying on the alternative energy markets, the sector cannot hope for strong growth based on local activity. Consequently extra-European exports, which account for 68% of Community exports, remain the key to success for the electrical industry, which has to build up a solid position to cope with Japanese or American competition.

### Description of the sector

High-voltage switchgear forms part of the electricity sector, in which it holds a distinctive position at all stages of the production-transport-distribution chain.

It fulfils various functions, the main ones being protection and control, upstream and downstream, for high-voltage electrical machinery.

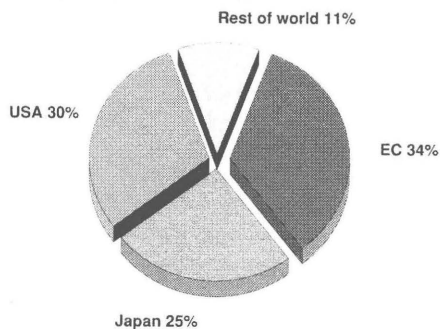
The most widely known category of products is that of high and medium-voltage circuit breakers.

The term "high-voltage" for practical reasons will cover high and medium-voltage (1 kV) in this study. There is no uniform logic used in the European Community to distinguish between these two categories which would allow products to be grouped and compared coherently.

The use of national distinctions, with the necessary qualifications is not, however, completely eliminated during country-by-country analyses.

On the other hand, there is an administra-

**Figure 1**  
**High-voltage switchgear**  
**Composition of world production in 1988**



Source: CAPIEL

tive definition at Community level for the concept of electrical switchgear in general, given by a Council directive (19 February 1973) which distinguishes alternating-current electrical switchgear (50 - 1000 V) and direct-current switchgear (75 - 1500 V).

## Production

**World production** Total world production of high-voltage switchgear amounted to 6.1 billion ECU in 1988, a marginal increase from 1987 and is distributed as follows:

- ❖ The USA is the largest producer country in the world and has the largest national market; where energy consumption is 1.8 times higher than in the other OECD countries, due to an increasing share of electricity;
- ❖ Japan also relies on a large national market due to its high population density, which necessitates a very high level of protection for the networks. In addition, its production is based on a strong export

drive;

- ❖ The other major producers are grouped together in Europe and make the EC the third largest production block, particularly since the European manufacturers are specialised in this type of equipment.

The contribution of the rest of the world includes that of major producers such as Sweden or Switzerland, but also the increasing share of newly industrialised countries, particularly Brazil, India and the countries of South-East Asia.

As a trend, it can be seen that the proportions have remained virtually unchanged and balanced since 1980 between the three major producer areas.

The slight downward trend shown by American production is due to the reduction in investment in electrical equipment on the national market. However, the decline in high-voltage switchgear has been partly compensated by investments in maintenance and improving network efficiency.

The Japanese share of production increased until 1987. Its share then appears to have contracted in 1988, but this statement should be qualified, firstly due to the dollar/yen exchange rate and secondly because of Japanese involvement in American production. The Community share remained stable during the period, but increased towards the end.

**Community production** The Federal Republic of Germany and France share two-thirds of Community production, with the former advancing against the latter. The last third is dominated by Italy, 3% ahead of the United Kingdom.

The four dominant countries leave only 9% of the supply for the other three producers in the Community, among whom only Spain has a noticeably sufficient wide production base.

As a trend, the lack of statistics for Spain during the 1980s prevents us from drawing conclusions on the basis of CAPIEL's findings. However, it is possible for us to ascertain the variations for the other six Member States.

The ranking order found in 1988 does not show any major changes compared with that for 1980, only minor variations are apparent. Only France and the United Kingdom have shown any major change from their original positions, recording an increase of 4 to 5%.

In terms of value, the level of world production thus rose by 10% between 1980 and 1983 and by 30% between 1983 and 1988. This second rise, which is reduced if we take account of inflation, occurs in a period when the European countries developed nuclear programmes for their markets and abroad, replaced part of their equipment and aimed to increase

**Table 1**  
**Share of production of high-voltage switchgear**  
**between the three largest producer zones**

(%)	1980	1983	1987	1988
EC	36	36	36	34
USA	35	34	33	30
Japan	29	30	31	25
Others	0	0	0	11
Total	100	100	100	100

Source: CAPIEL

their world market shares.

## Foreign trade

**International trading** In 1988 the value of world commerce in high-tension switchgear amounted to 1.4 billion ECU, or 22.8% of world production.

This share may appear small in an analysis based on the logic of international specialisation coupled with intra-branch trade in gear for electrical machinery, but this specialisation is less pronounced than for other types of equipment, chiefly due to the existence of protected public markets. The share of high-voltage switchgear exported consequently remains relatively small.

The shares of the major producers are as follows:

- ❖ EC: 58%
- ❖ Japan: 26%
- ❖ USA: 7%
- ❖ Rest of the world: 9%

The export percentages of each (exports/production) are as follows:

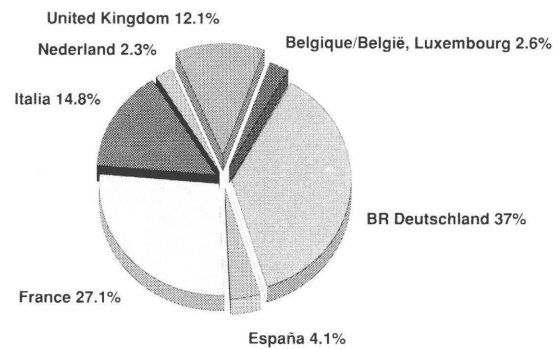
- ❖ EC: 39%
- ❖ Japan: 24%
- ❖ United States: 5%
- ❖ Rest of the world: 19%

The Community holds more than half the world market shares, with a relatively high export percentage which is greater than the world average (23%). In addition, as shown in the country-by-country analysis, this 58% comprises both intra-Community trade (12.5% of the production of the Member States) and developing countries.

The export efforts of the EC are aimed at improving its export percentage with the emphasis on dynamic and financially profitable markets.

This quality-related effort is successfully made by Japan, due to its ability to enter

**Figure 2**  
Share of production of high-voltage switchgear in the EC (1988)



Source: CAPIEL

foreign markets with products integrated into industrial units. It was able to arrive first on the rapidly expanding Asian markets, benefiting from its geographical proximity.

The USA has a very low export percentage which, together with its top position in world production, enables it to cover 7% of the market. It is commercially active in Latin America and South-East Asia.

Finally, given the level of industrialisation required by this type of equipment, the performance achieved by the "rest of the world" group is concentrated on a few industrialised countries such as Sweden, Switzerland and Canada.

**Community trade** Intra-Community exports amount to 18.7% of world trade, or 32% of total EC exports. The increase in the share of exports made to Community partners underlines the extent of the progress made in synergistic relationships among spe-

cialists in Europe.

The performance achieved by the Federal Republic of Germany in foreign trade appears to be quantitatively close to that of Japan (26% of international trade). The share obtained by France is greater than that of the USA (7% of international trade) whilst its production is around a third of that of the United States (30.7%).

The other two Community countries with a notable production performance on the world market are the United Kingdom and Italy. The United Kingdom is maintaining its fifth position in world trade, whilst it produces considerably less than Italy. British exports continue to find outlets in some Commonwealth countries.

Although intra-Community trade is not considerably large in relation to total world trade, the main flows in Europe are noteworthy.

This distribution is not surprising as the

**Table 2**  
High-voltage switchgear  
Development of Share of Production by Country

(%)	1980	1983	1987	1988
Belgique/België, Luxembourg	3,7	3,4	2,7	2,7
BR Deutschland	41,9	50,6	39,6	38,6
France	28,0	26,2	32,7	28,3
Italia	13,6	9,0	15,4	15,4
Nederland	4,0	2,7	2,2	2,4
United Kingdom	8,8	8,1	7,4	12,6

Source: CAPIEL

**Table 3**  
High-voltage switchgear  
Share of extra-EC exports  
by country, 1988

(%)	1988
Belgique/België, Luxembourg	4,7
BR Deutschland	36,1
España	1,2
France	29,6
Italia	12,6
Nederland	1,2
United Kingdom	14,6
EC	100

Source: CAPIEL

**Table 4**  
High-voltage switchgear  
extra-EC exports by country  
as a percentage of world exports, 1988

(%)	1988
EC	58
Belgique/België, Luxembourg	1,5
BR Deutschland	21,1
España	0,9
France	17,4
Italia	7,5
Nederland	0,9
United Kingdom	8,7

Source: CAPIEL

**Table 5**  
High-voltage switchgear  
Share of intra-EC trade by country, 1988

(%)	Exports	Imports
Belgique/België, Luxembourg	9,6	32,9
Danmark	0,0	4,2
BR Deutschland	29,3	9,2
Hellas	0,0	1,5
España	2,3	6,2
France	36,6	9,0
Ireland	0,0	1,9
Italia	4,8	13,3
Nederland	1,6	2,8
Portugal	0,0	1,3
United Kingdom	15,8	17,7
EC	100	100

Source: CAPIEL

four major suppliers in intra-EC trade are also the main producers. However, this must be qualified as the share of these four countries differs from those noted in production.

France and the Federal Republic of Germany share the leading position in exports, France holding a larger share in export in production. The United Kingdom is the third largest intra-Community supplier. Italy, which accounts for 5%, concentrated more on markets outside the EC in 1988. The Belgo-Luxembourg Economic Union (BLEU) holds a significant share of exports, but the most characteristic feature in its trade is the volume of imports, which is the highest in Europe. There are fewer marked differences in the distribution of imports due to the nature of the production structure throughout the industry.

Comments on the Community market as a whole are supplemented by an analysis which takes account of the characteristics of each national market.

## Geographical characteristics

The Federal Republic of Germany supplies more than a third of EC production. The national market is characterized by region-

alisation. Demand is decentralised and diversified by numerous producers and distributors of electricity (around 600 companies) divided between the public and private sectors.

The Federal Republic of Germany produces 36.1% of all EC exports and 29.3% of intra-Community exports. This traditional emphasis on foreign trade has long been forced on the country, particularly by the lack of captive colonial markets. German exports are widely dispersed. However, the main customers are industrialised countries, including the USA and the EFTA countries, particularly Switzerland, as well as the countries of the Middle East. The Federal Republic of Germany also exports, to a lesser extent, to the countries of Eastern Europe.

Its strong position in exports gave a trade surplus of 224 million ECU in 1987, including 50 million in the EC.

Around 12,000 persons are employed, divided between some forty companies. In the long-term this trend declines. Value added investments in relation to value added are lower than the Community average, which is around 10%, but are high in absolute terms.

France supplies 27% of Community high-voltage switchgear production. The national market is characterised by its dominance of EDF (Electricité de France), the market is currently affected by the reduction in investments in nuclear electricity production. Until 1983, the market decreased and has now advanced due to the commissioning of power stations, and because of the circuit-breaker replacement programmes and the strengthening of the transport and distribution infrastructures. In international trade France produces 29.6% of all EC exports and 36.6% of intra-Community exports. Outside the EC, France often exports to the "rest of the world", particularly to newly industrialised countries and OPEC members. The increase in the share of industrialised countries in total French exports should be noted.

Exports fell between 1983 and 1986, due to the financial difficulties faced by their consignees: the drop in oil prices and austerity programmes imposed on the Latin American countries by the IMF. The prospects for demand from these countries have been more favourable since 1986, and the potential demand remains high. France is the second EC member to



achieve a trade surplus in 1988. The surplus amounts to 195 million ECU, 70 million of which is achieved within the Community. Only two main manufacturers of high-voltage switchgear remain in France, employing a workforce of 7,500. These companies have an investment rate (FBCF/VA) which is higher than the Community average owing to a high level of automation which was necessary due to the rapid replacement of EDF stocks of high-voltage gear for electrical machinery. Finally, Research and Development outlays represent some 4 to 6% of turnover. Italy in 1988 supplied 14.8% of Community high-voltage switchgear production. The distribution of turnover between medium and high-voltage indicates the former to be dominant (69% of Italian production). The national market is dominated by ENEL (Ente Nazionale Per l'Energia Elettrica, a centralised public body), which is not the sole contributor but is the most active, in both medium and high-voltage. Its investments are made for both replacement and new installations. In international trade, Italy accounts for 12.6% of all EC exports and 4.8% of intra-Community exports. Developing countries acquire most of its exports. The introduction of major manufacturers of electrical equipment on Italian territory strengthens its re-exporting activities, particularly to France and the Federal Republic of Germany, its main trading partners. Apart from these two countries, Europe is virtually absent from the market shares held by Italy. Japanese and American exports remain limited to less than 5% of Italian imports. Italian foreign trade in high-voltage switchgear showed a surplus of 56.2 million ECU

in 1988. High-voltage switchgear manufacturing in Italy employs around 3,500 persons, whose productivity is equivalent to the European average. The level of investment is slightly below the Community average, and is showing an increase. The United Kingdom supplies around 12% of Community production. The share of medium-voltage in production has been increasing steadily against high-voltage since the early 1980s. It now stands at almost three-quarters. Until 1989 the national demand came from several public bodies, the main one being the CEGB (Central Electricity Generating Board), which was responsible for production and transmission, leaving distribution to twelve other companies (the area boards). Privatisation has led to changes in the structures of the production-transport-distribution chain. Whilst the United Kingdom ranks fourth behind Italy in production, this is not the case for trade. The United Kingdom makes 14.6% of EC exports and 15.8% of intra-Community exports. This industrial sector employs around 6,500 persons, a decrease of some 15% since the start of the 1980s. This reduction is likely to continue, although at a much slower rate. Labour productivity is slightly below the European average and is likely to improve as a result of the resumption of investment since 1988. Spain has a production base which enables it to supply a relatively significant share of 4.1% of Community production. This production originates from foreign multinationals. The national market is characterised by the presence of a national net-

work owned by several private or mixed companies whose willingness to invest could remain high given the industrial growth which has been in operation for a few years, since this country entered the EC. The BLEU has a network mainly run by three private companies through mixed companies. The production of equipment has always been aimed at export due to the small size of the national market and the policy of free trade. Changes in the world market and the gradual opening-up of Europe is increasingly directing exports towards the large European market and towards the small markets of which it is made up, to the detriment of exports outside Europe. Since 1987: Medium-voltage from 1 to 70 kV High-voltage 70 kV The Netherlands has a modest share of 2.3% in Community production. Its trade is chiefly with the Federal Republic of Germany, with which it maintains very close economic ties. On the national market, businesses producing high-voltage switchgear stand alongside a large number of companies operating in the electricity production-transport-distribution chain. The other four Member States on the Community high-voltage switchgear market have similar characteristics and they will be grouped together in the remainder of this survey. These countries do not hold a significant share of Community production; they are therefore chiefly present on the market as buyers. They obtain supplies from outside the EC in the same proportions as the producer countries, namely around a third of their total imports.

Alongside these major common features, each country is nevertheless distinguished from the others on its own market:

- Denmark is tied particularly to the Federal Republic of Germany and the Netherlands for its imports. Its electricity network is run by several firms;
- In Greece the electrical network is wholly owned by a public company: DEM (Electricity Company of Greece);
- In Portugal the electricity production-transport-distribution chain is almost the sole responsibility of a State-controlled company, EDP (Electricidade de Portugal);
- Ireland differs from the remainder of the Europe in the trading links it maintains with the USA, which accounts for 22% of its imports.

## Outlook

The Community industrial fabric in electrical equipment is being restructured by the forging of international alliances. These concentrations are intended both to benefit from economies of scale in the basic pro-

ducts and to meet national specifications better through greater proximity to users. The companies are thus in a better position to make their activities profitable and strengthen their competitive position. The prospect of the opening-up of the internal market also favours and speeds up moves towards industrial concentration started by companies in the EC.

At world level, growth will be modest over the next few years. The developed countries are contenting themselves with improving and maintaining their networks, the OPEC countries will stay at a limited installation level, and the less advanced countries will be unable to invest.

Only the newly industrialized countries (NICs) offer any potential for development, but only in the short term, in that some these NICs could become competitors as soon as they have reached a certain level of industrial maturity. For the time being, they have a demand for products, capital and training. Alongside the change in the

industrial fabric and markets, the nature of the products is changing. There are increasing numbers of integrated systems with monitoring, control and new operating and protection devices in which "heavy current" and "light current" are combined. The new products will revive demand by offering better quality of transmission and distribution for electrical energy, which will thus encourage new exports.

**CAPIEL: Comité de coordination des Associations de Constructeurs d'appareillage industriel électrique du MC, Address: rue Hamelin 11, F-75783, Paris Cedex 16, France, tel: (33) 1 45 05 70 70, fax: (33) 1 47 04 68 57**

**Reviewed by: European Research Associates**

The European Community is the world's leading producer of low-voltage switchgear. Within the Community, four countries have consistently dominated production and trade: the Federal Republic of Germany, France, the United Kingdom and Italy, with the Federal Republic of Germany taking the major part.

The other European countries occupy a fringe position around the four leaders, both in terms of their respective market shares and trade links with abroad. This structure may intensify with the opening of the Single Market. However, the increased presence of the United States and Japan should be taken into account, through their multinational firms mainly in markets of average importance.

#### Description of the sector

Low-voltage switchgear refers to all control protection material related to machinery with the overall electricity chain. These basic types of equipment, which are used in great number and manufactured by numerous companies, make it possible to implement industrial processes from the simplest to the most complex.

A broad share of production is exported, although, as an integral part of large machinery or factories, exports are very difficult to assess.

Moreover, in the NACE applied in 1988, the level of analysis was not detailed enough for them to be identified within NACE 342 ("manufacture of electrical plant material").

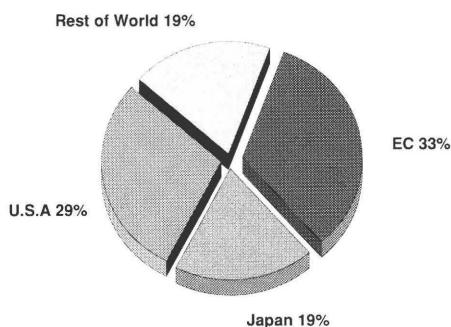
Nevertheless, low-voltage switchgear can be estimated as representing about 20% of NACE 342 in its entirety.

#### Current situation

Trade between the EC and the two other dominant zones is insignificant: the United States and Japan receive barely 8% and 2% respectively of Community exports, and supply it with 10 and 7.1% of its imports. The EC is, therefore, relatively independent from the two other zones in this business sector. The Community market is not truly homogeneous and its distribution networks, customs, and so on, are broadly diverse in character.

In fact, the zone divides into two subsidiary markets: the first in northern Europe, essentially around the F.R.G., the second encompassing the countries of Mediterranean Europe around France and Italy. Moreover, the zone is divided between builders and users of great variety and strength. This partitioning is not permanent and is evolving, with a number of indus-

**Figure 1**  
**Low-voltage switchgear**  
**Composition of world production in 1988**



Source: CAPIEL

trial re-alignments today aiming to redistribute production capacities.

## Production

**World production** Total world production of low-voltage switchgear stood at 17.2 thousand million ECU in 1988, a growth rate of about 8% compared to 1987, comprising the following:

This composition shows the combined strength at present of the "Rest of the World" in the manufacture of this type of material. However, 19% of this share is essentially provided by a few newly-industrialized countries such as Brazil, India, and the four "dragons" of South-East Asia (South Korea, Taiwan, Hong Kong and Singapore), as well as industrialised countries such as Sweden, Switzerland, Canada, etc...

The relative weakness of Japan should also be noted. Although its share of world production continued to grow for ten years,

Japan above all remains a specialist in high-voltage and industrial electrical gear, content to sub-contract a share of its low-tension switchgear production to partners in Asia. For its part the United States, which concentrates mainly on rotating machines and industrial equipment, nevertheless provides one-quarter of world production, placing it just behind the EC. Lastly, low-voltage switchgear is an area of strength for the Community, which specialises in this type of product and is therefore ranked first in the production league with around one-third of total production. The evolution of the three major industrialised zones' shares reveals that the force ratios have changed little since 1980 and that EC specialisation has held up in comparative terms during this period..

The performance of the United States in 1983 was due to the replacement of the electricity distribution network, which in-

**Table 1**  
**Share of production of low-voltage switchgear**  
**between the three largest producer zones**

(%)	1980	1983	1987	1988
EC	48	40	40	33
USA	38,6	44	37,5	29
Japan	13,4	16	22,5	19
Rest of World	0	0	0	19
Total	100	100	100	100

Source: CAPIEL

involved large investment in order to meet the strong increase in demand for electrical energy.

In the case of Japan, its orientation towards the expanding markets of the Pacific zone, and the growing degree of product sophistication, explain why its share of world production is increasing.

**Community production** compared with the share of national industrial GDP within the EC, 1988. The comparison of national shares in the production of low-voltage switchgear and Community industrial GDP shows a certain correlation within the EC, as there is for the world as a whole. The dominant position of the F.R.G., with 42.7% of Community production, is affirmed. France only achieves a performance of 24.4% of Community production. Italy and the United Kingdom have equivalent shares that are less than half of France's (9.8 and 10% respectively). The eight other Members States share 13% of the Community's offer. Among them, only Spain has kept a significant and growing position. Greece's share is, in all probability, the weakest of all in the zone and does not affect the world rankings. Nothing has occurred to dramatically affect the well-established hierarchy, while the developments recorded have been modest. The dominant position of the F.R.G. has in recent years become stronger and is confirmed by the country's prominence in exports, which has ensured its growth over the entire period. France has a similar profile, while Italy maintained a position of near stability until 1986.

The British decline was corroborated by the decline in industrial activity until 1987, but its position began to revive in 1988.

## Trade

**International trade** Total world exports of

low-tension switchgear came to 5.1 thousand million ECU in 1988, that is to say 29.3% of production. The respective shares of the major producers were as follows:

- ❖ EC: 48%;
- ❖ United States: 16%;
- ❖ Japan: 23%;
- ❖ Rest of the world: 13% and are completed by the export levels for each (exports/production):
- ❖ EC: 43.1%;
- ❖ United States: 15.8%;
- ❖ Japan: 35.2%;
- ❖ Rest of the world: 20.1%;

If trade among Member States is put aside, the EC's export level amounts to only 20.5%, leaving it with 23% of international flows.

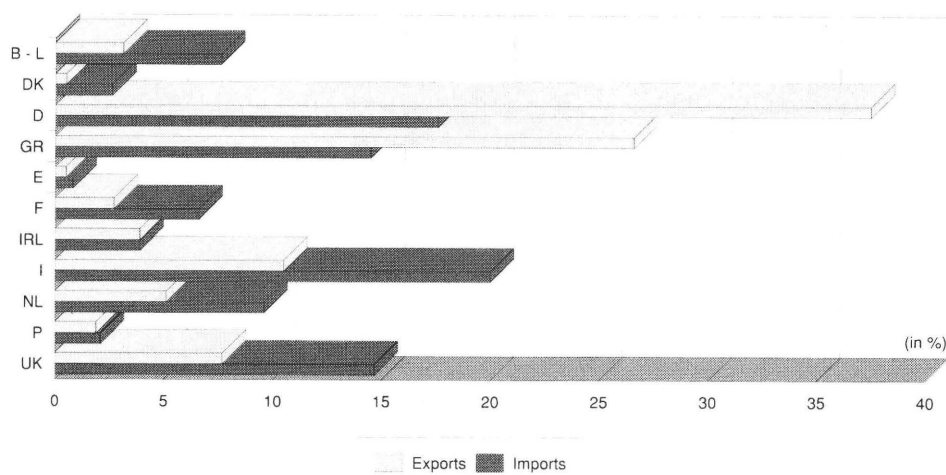
The United States has concentrated on its domestic market even more so than the EC, and only has a relatively low share of the external market compared to its position in world production. Conversely, Japan has a market share above its share of production and exports more than one third of its manufacturing output.

**Community trade** Although the EC has a dominant position both in world production and market shares, the Community on the other hand remains virtually absent from South-East Asia, a market in which Japan and, to a lesser degree, the United States exert their own domination (about 75% and 15% respectively of local market shares).

This market is not entirely inaccessible to the Europeans, particularly since the N.I.D.'s are trying to reduce the strength of Japan and the United States.

The market door is, therefore, partly open for EC products, on the proviso that Community firms use overall strategies enabling them to adapt themselves to local

**Figure 3**  
Low-voltage switchgear  
Share of intra-EC trade by country, 1988



Source: CAPIEL

demand, and that they maintain a permanent presence.

Furthermore, a significant share of exports from the EC goes to developing countries, which represent a large potential market, insofar as industrial development requires heavy investment in electrical equipment. However, their occasional insolvency places the completion of contracts in jeopardy.

The F.R.G. ranks second in the world behind Japan (23%), while France ranks fourth, slightly behind the United States (16%). These two positions are a reflection of the fine performances of EC firms.

The EC's share of total world exports is 48.3%, divided between Member States as shown by table 4.

In trade between Member States, the breakdown of trade flows reveals the following composition:

Three groups of countries can be distinguished:

- ❖ The two leaders are the F.R.G. and France, generating about two-thirds of trade between Member States. The F.R.G. has retained its dominant position in exports and ranks second as regards imports, behind Italy.
- ❖ Italy and the United Kingdom are the two

**Table 2**  
Low-voltage switchgear  
Share of production by country

(%)	1980	1983	1986	1987	1988
EC (*)	100	100	100	100	100
Belgique/België, Luxembourg	3,4	2,9	2,8	1	1,2
Danmark	1,2	0,9	1,1	0,8	0,8
BR Deutschland	40,3	40,1	41,2	44,5	42,7
España	4,4	4,2	5,6	7,5	7,8
France	21	21,7	22,6	24,7	24,4
Ireland	0,8	0,9	1,2	1	1
Italia	11,6	11,5	11,3	10	9,8
Nederland	1,5	1,7	2,3	2	1,8
United Kingdom	15,8	16,1	11,9	8,5	10

(\*) Excluding Greece and Portugal  
Source: CAPIEL

**Table 3**  
**Low-voltage switchgear**  
**Share of extra-EC exports**  
**by country, 1988**

(%)	1988
EC10	100
Belgique/België, Luxembourg	2,3
Danmark	0,7
BR Deutschland	39,9
España	2,1
Hellas	0,4
France	25,3
Ireland	2,7
Italia	10,7
Nederland	4
Portugal	1,3
United Kingdom	10,6

Source: CAPIEL

**Table 4**  
**Low-voltage switchgear**  
**extra-EC exports by country**  
**as a percentage of world exports, 1988**

(%)	1988
EC10	48,3
Belgique/België, Luxembourg	1,1
Danmark	0,3
BR Deutschland	19,3
España	1
Hellas	0,2
France	12,3
Ireland	1,3
Italia	5,2
Nederland	1,9
Portugal	0,6
United Kingdom	5,1

Source: CAPIEL

other countries with an electrical equipment industry that allows them to play a relatively important role in exports outside the Community. However, their imports, which represent over one-third, are not fully offset by their exports.

As for other trading partners, their diverse structures and varying levels of industrial development are such that their trading capacities are more limited compared to Europe as a whole.

Overall, all countries are both exporters and importers, although a large part of activity is concentrated around the EC's four major players: the F.R.G., France, the United Kingdom and Italy.

Beyond the overall analysis, it is worth analyzing the national components of the Community market.

### Geographical characteristics

The F.R.G. provides 42.7% of total Community production.

Aside from panels and conduits, the biggest posts in the production of annual German turnover in low-tension switchgear are, firstly, contactors, followed by control switches and relays.

This production relies upon a dense industrial structure, of which the chief feature is strong activity in mechanical engineering which requires a sustained level of investment. The low-voltage switchgear industry is therefore supported by an extensive national market.

As with production, the F.R.G. ranks highest in the league of European exporters, producing 39.9% of total European exports and 37.5% of exports between Member States.

Apart from its three main partners - Italy, France and the United Kingdom - the main areas of influence for the F.R.G. are the United States, the world's leading market, and the countries of northern Europe, into which the F.R.G. is expanding its base market.

In addition, the F.R.G. is the leading western partner of countries with planned economies in eastern Europe and is discovering trade outlets there.

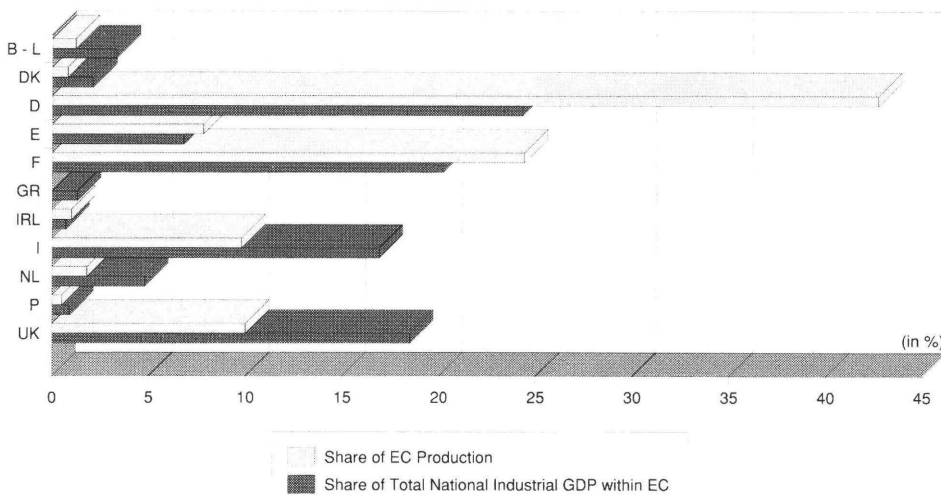
Regarding imports, France is the F.R.G.'s largest supplier, followed by bordering countries, the United States and Japan.

The German low-voltage switchgear industry employs the largest European workforce, with 48,000 people. This is attributed the production structure which comprises a few large major players and around a hundred medium-sized firms. These represent 95% of annual turnover and maintain great consistency in their market shares.

Finally, German firms are the most dynamic in the field of research and development, devoting on average 6 to 7% of their annual turnover to these purposes.

France provides 24.4% of total Community production. The chief production posts are panels and conduits, contactors and circuit

**Figure 2**  
**Low-voltage switchgear**  
**Share of production by country compared with the share of national industrial GDP within EC 1988**



Source: CAPIEL

breakers, two posts whose growth cycles run in parallel.

However, control switches, which make up the third largest post in annual turnover, have a developing position.

This production cannot rely on a mechanical engineering industry which is losing ground. Thus, in spite of a level of investment relatively higher than that of its chief partner, France invests less than the F.R.G. in value.

Alternatively, the buoyancy of the market for restoration partly compensated for the absence of any real upturn in the new building sector until 1987.

France produces 12.3% of world trade, totals 25.3% of European exports and 26.6% of exports between Member States.

France's chief trading partners are to be found mainly in the Community, with the F.R.G. in ranking highest. However, the role played by the United States, mainly as a supplier, is also significant.

The French low-voltage switchgear industry employs around 19,500 people distributed between thirty or so firms producing 95% of annual turnover, five or six of which take the major part of all production, with the exception of a few specialist products such as relays and fuses.

Workforce productivity is slightly above the European average. The United Kingdom produced 10% of Community production in 1987, registering a noticeable downward trend compared to 1980.

This fall in Britain's share of production is mainly attributed to relative deindustrialisation due to firms moving to a financial, rather than industrial policy to achieve profitability in the first half of the 1980s.

However, the squeeze in the national market should end, as estimations of profit-

able investment were seen to be more favourable in 1987, 1988 and 1989: industrialists, whose profits are at their highest since 1973, stated at the end of 1987 their desire to increase investments by over 15% in value in 1988. British involvement in Community production has since risen.

The composition of production does not reveal any form of specialisation that is particular to the United Kingdom. The main production posts are those for fuses and contactors, and have been so over the entire period.

Despite its fifth world ranking in exports (a little over 5% of world exports), the United Kingdom has a trade deficit which is partly attributable to a certain loss of market independence, as many international firms, Community or otherwise, have set up subsidiaries on British territory.

The United Kingdom exports appear relatively widespread, due to the existence of close commercial ties with Commonwealth countries. Taking this into account, the main EC producers still prove to be the country's foremost customers.

Conversely, in imports, the countries of western Europe remain its main partners, along with the United States.

To a lesser extent, Japan is also one of the main suppliers and may increase its market shares in years to come.

The low-tension switchgear industry in Britain employs 9,600 people whose productivity is slightly below the Community average.

Italy provides nearly 10% of EC production, displaying relative stability over the past decade. As is the case in the F.R.G., the low-voltage switchgear industry in Italy is able to rely on a fairly strong mechanical engineering sector. However, this market

cannot be termed a "leader", as it has surrendered some of its decision-making independence to large foreign firms located within its national boundaries. Italian production is typified by having a large share for circuit breakers behind panels and conduits; followed by relays, and then conductors.

The concentration of production on a few posts means that Italy behaves in an uncharacteristic way for the Community: its exports represent a sizable share of EC exports, yet are broadly offset by high imports. Its chief partners are the countries of western Europe and the United States. Italy plays an important role in trade between Member States, and also appears to be attempting to broaden its world market shares in the Middle East.

The low-voltage switchgear industry in Italy employs 7,800 people, whose productivity is well above the Community average. The Netherlands, "BLEU" and Denmark respectively make up 1.8%, 1.2% and 0.8% of Community production, with the shares for the Netherlands and Denmark holding relatively stable throughout the period.

The privileged links which these countries maintain with the F.R.G. mean that it is their main trading partner in trade in low-voltage switchgear between Member States.

The other European partner of significance in this zone is France.

Lastly, excluding the Netherlands, these countries have little trade with the United States.

Ireland provides 1% of Community production and is characterised by an industry which essentially uses sub-contracting controlled in part by American and Japanese

groups. The latter are aiming to penetrate the Community market via their direct implantation in countries such as Ireland and Spain, where they are able to take advantage of tax benefits.

Within the EC, Ireland's two main customers are the Federal Republic of Germany and the United Kingdom, the latter also being its chief supplier. Greece has a modest electrical materials industry, essentially geared to the production of low-tension material.

Even without production statistics, it is possible to attribute Greece with a very low level of production in relation to the EC. This weakness leaves it highly dependent on abroad.

Spain supplies 7.8% of European production, with a recently noticeable growing trend. As in Italy and the United Kingdom, many Spanish firms are part of European, Japanese or American transnational firms. On the domestic market, despite a strong expansion in investment (investment in

capital goods rose by 46% by volume during the last three years), the production capacity utilisation rate remains high. With domestic demand remaining high, and export opportunities increasing due to the modernisation of production machinery and profitable investment demand for low-voltage switchgear should continue to grow at a rapid pace. Within the EC, Spain's chief partners are the F.R.G., France and Italy. In general, with the opening of the Community market and the growth in its industrial activity, its trade in low-voltage switchgear with EC countries has grown in value.

### **Outlook**

Over the next ten years, the analytical approach will be transformed at the same time as the production structure: the industrial concentration, which began a few years ago in Europe and was accompanied by the dislocation of production sites, will continue, producing with it analyses no longer made nationally, but by large firms.

Moreover, products are being modified due to the growing constraints imposed by electronics in the sector.

Supply and demand are, therefore, undergoing a total change, although an estimation of the extent and speed of these changes is proving to be difficult.

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After a long, difficult period the years 1988 and 1989 were relatively good for the welding equipment industry. Technical evolution and intense competition have pushed a great number of companies to undertake restructuring throughout the 80's. An upturn in demand from the main sector customers (and of world steel production which has had a positive impact on the welding sector) has enabled favourable results to be obtained.

### Sector description

The welding equipment sector comes under the NACE code 343 which includes usable electrical material as well as batteries and accumulators. The sub-sector NACE 343.10.3 is the subject of the following analysis. It comprises various machine types: welding converters and transformers (rotary or static); arc, resistance and ultrasound welding machines as well as other welding machines, assemblies and spare parts for machines and electrical welding apparatus. Growth in this sector is matched to that of welding filler materials as the two markets are closely linked to each other for technical reasons. The main welding filler materials are CO<sub>2</sub> wires, coated electrodes, flux, submerged arc wires, flux-cored wires and MIG wires. Some statistics on welding filler materials are now included.

From the point of view of sales, CO<sub>2</sub> wires represented, in 1988, almost half of the filler material market.

Coated electrodes formed another third of the market and the remainder was spread between flux, submerged arc wires (for submerged arc welding), flux-cored wires

and MIG wires.

### Current situation

The main outlets for industrial welding equipment are shipbuilding, off-shore construction, pipelines and electrical power plants. All these sectors had less than sparkling results in the 1980's but a certain upturn is becoming apparent since 1988.

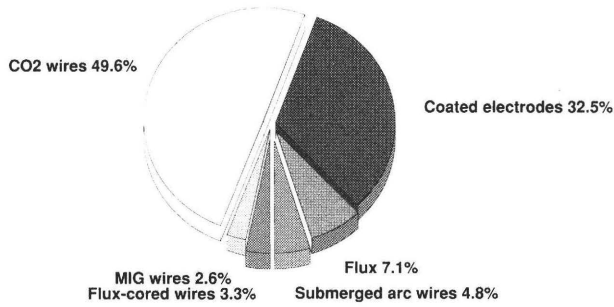
The welding filler product market increased by 5% in 1988. Whilst a certain stagnation was noted in Belgium and the Netherlands, very rapid growth was observed in Great Britain, Italy and Spain. Production plants are concentrated in the larger Western European countries such as France, Italy, the U.K., the German Federal Republic and Sweden. These countries supply their domestic market and export a considerable proportion of their production.

### Consumption

Total sales within the 6 EC countries of welding equipment for which data is available (German Federal Republic, France, Italy, U.K., Netherlands and Spain) represented, in 1988, 871 million ECU.

In terms of electric welding equipment sales volume, the German Federal

**Figure 1**  
**Welding equipment**  
**Welding consumables market, 1988**  
**(volume in %)**



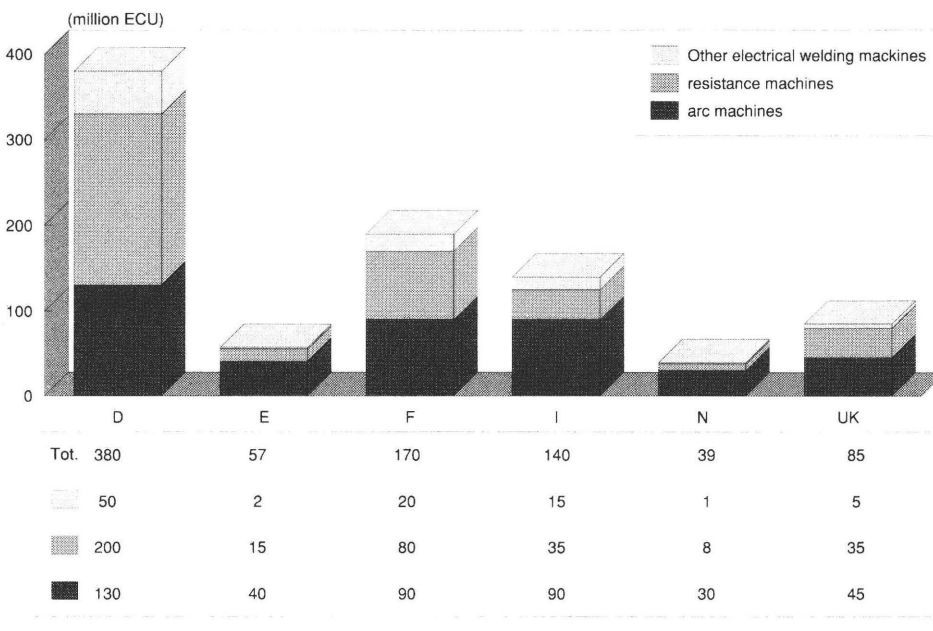
Source: EWA

Republic is the foremost consumer country, with 1988 sales of 380 million ECU, which correspond to 43.6% of the total, whilst this country represents only 25.5% of the EC's Gross Domestic Product.

The other more important markets are; France (170 million ECU or 19.5% of the total; a similar figure to its contribution to the EC G.D.P.), Italy (140 million ECU or 16% of the total, for 17% of the G.D.P.), the United Kingdom (85 million ECU or 9.7% of the total, whilst its G.D.P. contribu-

tion represents 17% of the total EC G.D.P.) and Spain (57 million ECU or 6.5%, for a G.D.P. share of 7.2%). These countries are followed by the smaller ones, such as the Netherlands and Belgium. Statistics are not available for other Community countries. However, considerable expansion has been noted on the Portuguese market and to a lesser extent on the Greek market since the beginning of the 1980's. Within the total sales volume by country it can be noted that the sales of coated electrodes are proportionally highest in Spain,

**Figure 2**  
**Welding equipment consumption**  
**in the 6 EC countries, 1988**



Consumption = domestic production + imports  
 Source: Estimations by EWA

Belgium and the Netherlands.

The sales of CO<sub>2</sub> wires are higher in the German Federal Republic, Italy, Spain and France. Data covering the welding equipment sector is incomplete for some countries, the last figures available dating from the middle of the 1980's. A sales analysis by product between 1983 and 1989 (estimates) shows relatively varying evolution according to country.

Coated electrodes (light steel) are decreasing everywhere, except in Portugal and Greece.

The situation varies considerably according to country for medium or high alloy electrodes; sales increasing in France, Spain, Greece, Portugal and the U.K. but declining in the Netherlands, Italy and, to a lesser extent, in the German Federal Republic. CO<sub>2</sub> wires are becoming more popular in the majority of countries, particularly in the German Federal Republic, Italy, Switzerland, Portugal and the Netherlands. As for MIG wires, the market is also expanding, along with that for flux-cored wires, for which the market has more than doubled in the German Federal Republic, Norway and Sweden; even more so in Portugal, where sales have increased twenty-fold between 1983 and 1988.

On the other hand, sales of submerged arc wires are declining (except in Portugal and Switzerland).

As for welding consumables, stick electrodes continue to decline, whilst other products, such as MIG/MAG wires, flux-cored wires and submerged arc wires increase.

This evolution is attributed to progress within the field of automatic welding.

The number of submerged arc automatic welding factories in which robots are used has increased, for example, by more than

11% in 1988. The total market for electrical welding equipment is estimated as being between 600 and 800 million ECU.

### Structural changes

A few large companies dominate the American market. In Europe, however, small manufacturers have the majority of the market. In France, for example, more than 70% of the companies in the sector have fewer than 20 employees.

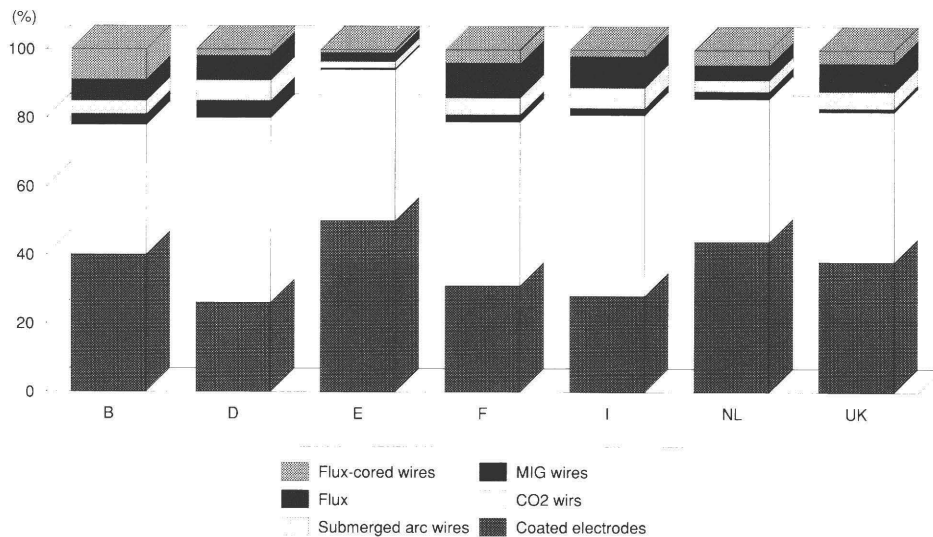
During the 1980's, the welding sector went through deep restructuring, which gave rise to a reduction in the number of production units. A certain number of mergers, acquisitions and production factory closures took place in order to improve the competitive nature and the financial situation of companies. Major changes will probably continue over the coming years, but at a slower pace.

New rationalisation measures are necessary to confront competition from Eastern Europe and East Asia. Western European manufacturers, however, still remain high performers in the areas of quality and technical progress. In the field of technological innovation, robots play an essential role, especially in the automobile industry and spot welding. The use of semi-automatic welding equipment and the complexity of mechanisation increases each year. Major progress in welding techniques has also been achieved thanks to plasma technology for cutting and for welding itself.

The use of lasers is also becoming more widespread. For several years an acceleration in change to electrical processes, to the detriment of gas-welding techniques, has been observed.

Taking into account the lack of representative statistics for this sector, it is very difficult to evaluate the consequences of

**Figure 3**  
Welding equipment  
Sales shares of coated electrodes and wires, 1988  
(volume in %)



Source: EWA

the current restructuring measures on employment. However, it is probable that the level of employment should not vary to any noticeable degree, as sales, and consequently production levels, are only going to increase slightly during the next decade. Furthermore, increasing competition from non-Community producers is going to force companies to become more competitive and the increased use of new production techniques should enable gains in productivity to be made.

The present situation for foreign trade and employment is linked to production and sales. Even if the latter remain weak since the major decline at the beginning of the 1980's, they are progressing very slowly.

### Foreign trade

Community exchanges have multiplied by a factor of 2.5 between 1980 and 1989, corresponding to an annual growth rate of 10.6%. During the same period, imports have increased to the tune of 10.8% per annum, whilst the export growth rate has not exceeded 5.3%. However, the balance of trade remains positive, but the surplus

in 1989 is at its lowest level since 1980, being 61.8 million ECU, whilst it was 174 million ECU in 1986. Exports outside the EC have in fact dropped by more than 15% in 1989, after having reached the highest level in the decade in 1988.

The electrical equipment industry in the main will probably benefit from the opening up of the Eastern European countries, taking into account the considerable investment which will be required over the coming years.

The generally high level of energy prices and the fact that they will have to be adapted to market prices in these countries is, however, going to slow down infrastructure investment (such as steel production which, as an industry, is a large energy consumer).

### Outlook

The prospects are relatively good for the welding consumables and equipment industries. Unless there is a major recession in the EC and the USA, sales should continue to increase, although at a slower rate than that of the two previous years.

**Table 1**  
**EC-trade at current value 1980-1989<sup>(1)</sup>**  
**Welding equipment**

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989 <sup>(2)</sup>
Export extra-EC Index <sup>(2)</sup>	208,1 68,7	200,2 66,0	247,2 81,5	262,6 86,6	276,7 89,4	309,4 100,0	340,6 110,1	333,1 107,7	394,0 127,3	332,6 107,5
Import extra-EC Index <sup>(2)</sup>	107,4 65,7	103,2 62,3	132,8 80,2	139,2 84,0	167,1 95,9	174,3 100,0	167,4 96,0	201,2 115,4	250,2 143,5	270,8 155,4
X/M	1,9	1,9	1,9	1,9	1,7	1,8	2,0	1,7	1,6	1,2
Intra-EC trade Index	171,9 64,5	177,6 66,6	227,1 85,2	193,8 72,7	255,4 95,2	268,4 100,0	294,3 109,6	291,2 108,5	392,4 146,2	427,3 159,2
Total (%)	43,6	43,5	38,4	40,7	47,9	46,4	46,3	46,6	49,9	56,2

<sup>(1)</sup> 1980 CE9 1981-85 CE10

<sup>(2)</sup> Allowing for changes in the number of EC member countries

<sup>(3)</sup> Estimated

Source: Eurostat (Comext)

The development of new applications and new technologies should open new markets and allow for productivity gains. Increased international competition and currency exchange rate evolution will, however, become more and more essential factors in the balance of power between producers. The fall in the dollar will probably encourage American manufacturers to pursue an even more aggressive marketing policy to gain market share before the creation of the single market in 1992. Asiatic manufacturers such as Korea and

Japan are also becoming more and more powerful players on the international scene. At Community level, the German market should continue its expansion, due to slight increases in its steel industry and a strong upturn in the construction sector. In France and Italy, sales will stagnate, whilst the British market will contract slightly. The winning of export markets and the ability to adapt to structural changes by the Community welding material manufacturers will determine to a great extent the future of the industry.

Revised by: DRI Europe

The industry is represented at EC level by:

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The development of more and more powerful and compact consumer batteries should allow the industry to grow in the years ahead. Technical advance is vital, given the intense competition in the market and the need to allow for technical requirements and environmental problems. Although battery consumption meets very diversified needs, a growing preference can be seen for certain types of product such as rechargeable batteries.

### Definition of the sector

In the present monograph, batteries are understood to mean primary dry-cell batteries (alkaline-manganese or zinc-carbon batteries) and rechargeable batteries (mostly based on the nickel cadmium principle), all with a volume of less than 300 m<sup>3</sup>. The Community battery industry can be divided into two main sectors:

- ❖ primary batteries
- ❖ rechargeable batteries and storage batteries, including batteries for industry, starter batteries and portable storage batteries.

In both cases, electrical energy output is based on an electro-chemical reaction which is reversible in the case of rechargeable batteries.

### Structure of the industry

Competition is strong in the world industry. The American Duracell group is the leader with 41% of the world alkaline battery market. The other major groups are:

- ❖ the Japanese, Sanyo and Matsushita;
- ❖ The German, Varta (an unusual European firm producing both batteries and storage batteries);
- ❖ the American, Ralston (operating in Eu-

rope through the takeovers in France of Wonder, Mazda and Ucar);

- ❖ the Dutch, Philips,
- ❖ the American, Kodak,
- ❖ Saft and CEAC, subsidiaries of the French, CGE. Fifteen companies producing primary batteries share the Community market between them.

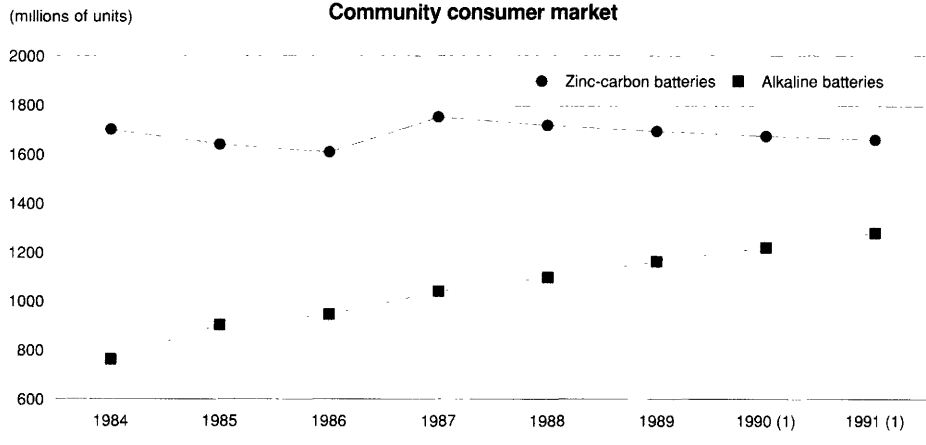
The biggest is Varta, which has 35 subsidiaries spread over the FRG, the rest of the EC as well as other regions of the world such as Latin America and the Far East. The group achieves 23% of its turnover in storage batteries for industry, 27% in starter batteries and nearly 40% in portable storage batteries. Most firms producing batteries trade under their own name or under the brand names of distributors.

Certain makes are represented throughout the whole of Europe, while others are only found very locally.

Despite growing demand, there is a surplus in world production, and competition is strong within the industry, marked by downward pressure on prices.

Community firms are channelling more and more resources into the development of new markets by setting up subsidiaries

**Figure 1**  
Primary dry-cell batteries  
Community consumer market



(1) estimated  
Source: Europile

abroad, for example, Varta in Finland, Argentina, Mexico, Brazil, Singapore, and Saft (CGE) in Korea and Finland, from where it hopes to penetrate markets in the East. Technology transfer and co-operation agreements are becoming more and more frequent with countries whose markets are difficult to penetrate.

## Consumption

**Primary batteries** During the 1980s, the market volume in primary batteries grew on average by 2% a year. The main areas of consumer application are as follows:

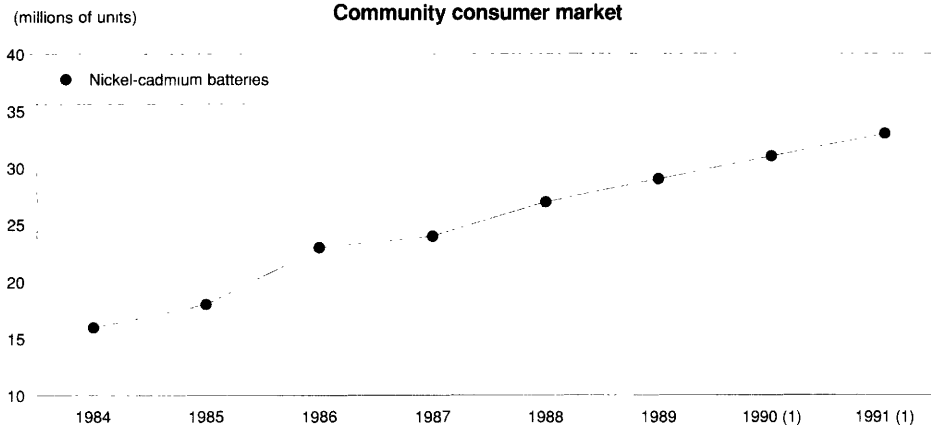
- ❖ hi-fi equipment (50%);
- ❖ lighting (11%);
- ❖ watches and alarms (11%);
- ❖ photo equipment (8%);
- ❖ games (20%), particularly during winter

months.

There are different types of primary battery:

- zinc-carbon batteries and manganese bioxide alkaline batteries, which are the biggest sellers in the world. This market has continued to grow, although at a slower rate than for rechargeable batteries (see infra).
- alkaline batteries which have swept through the market for traditional saline batteries, given that they last three times longer at a price which is around 90% higher. At present, they account for around 43% of the Community market.
- lithium batteries, which are gaining more and more importance.

**Figure 2**  
Rechargeable batteries  
Community consumer market



(1) Estimated  
Source: Europile

## Rechargeable batteries and accumulators

Like other types of battery, rechargeable batteries are used in portable applications (telephones, computers, cameras, tools, games, domestic electrical appliances...). They are particularly attractive for use in large consumers of energy such as electronic equipment. Since 1985, rechargeable storage batteries have been on sale to the general public.

This boom market has been estimated at 800 million amperes/hour. The annual growth rate in world sales varies between 15 and 20%.

Technological advances are being actively pursued in this field, and numerous changes are expected in the years to come. They will certainly have a bearing on costs, if merely through the development of mass production and the use of new materials. The most widely used system for rechargeable batteries is the nickel-cadmium principle. These batteries are lighter and last longer (5 to 10 years) than traditional lead storage batteries. In 1989, the total market was estimated at 9 million units in Europe. The rechargeable battery market was in virtually constant upward progression during the past decade. 7% growth has been predicted for 1990.

## Industrial and car batteries

There are three types of battery:

- drive batteries. These are used mainly in motor vehicles (internal combustion engines and electric motors) and in handling equipment, half of which in Europe runs on batteries;
- starter batteries. This market has close ties with the car industry. The number of vehicles on the road, vehicle life expect-

**Table 1**  
**Starter batteries, 1980-88 (1)**  
**Western Europe (1)**

(thousands)	1980	1981	1982	1983	1984	1985	1986	1987	1988
Domestic Sales by Western European producers (2)									
- to car manufacturers	11 299	10 410	9 337	9 649	9 452	10 035	10 198	10 745	11 032
- to other customers	20 406	19 650	20 434	21 035	19 922	21 731	20 955	22 159	20 554
Imports (3)	6 335	6 820	9 502	9 993	10 707	11 256	11 495	12 888	12 880
Total sales	38 040	36 880	39 273	40 677	40 081	43 022	42 648	45 792	44 466

(1) Austria, Belgium, Denmark, Germany, Spain, France, Great Britain, Italy, Norway, Netherlands, Portugal, Switzerland, Finland and Sweden

(2) Including imports by battery manufacturers

(3) Excluding imports by battery manufacturers

Source: EUROBAT

tancy and climatic conditions are the determinant factors;

- stationary batteries, which are mainly used as help, alarm or control systems in industrial plants. This market is tied to industrial equipment and telecommunications services;
- sales of industrial storage batteries are influenced, on the one hand, by the relatively cyclical trends of manufacturing industry and, on the other, by structural evolution in favour of electric motors especially, for handling equipment. The three previous years of strong growth have given way to two years of slight narrowing in the market.

During the 1980s, total sales of starter batteries within the EC market rose by 16.9%, moving from 38 to 44.5 million units between 1980 and 1988. More than half the starter batteries sold go to motor vehicle manufacturers. Sales of Community producers rose hardly at all during the 1980s, with producers outside the Community taking advantage of market expansion. Total consumption of batteries and storage batteries reached 46.2 million in 1988, i.e. an increase of 15.7% compared to 1988 levels. The 1988 figures show a slight fall compared to 1987, which recorded the highest figures over the whole period. This drop in sales has, moreover, had rapid

repercussions on production levels.

### Production

The countries in the world producing the most batteries are the United States, the Federal Republic of Germany, Italy, the United Kingdom and Japan. Other countries also have large production plants: Belgium, Denmark, Greece, Portugal, Spain, Austria, India, Mexico, Republic of Korea and Indonesia. In Eastern countries, production is concentrated essentially in Poland and Hungary.

Total zinc-carbon and alkaline-manganese type battery production in the Community was around 2.8 thousand million units in 1989, which represented an increase of 14% compared to 1985 levels. Zinc-carbon batteries accounted for nearly 60% of total production.

The French company, Saft (CGE), is the Community's leading producer of rechargeable batteries. The biggest producers in the world are the Japanese, Sanyo and Matsushita.

Batteries for motor vehicles are produced in 70 factories in the EC. However, only 75% of production capacity is being used at present. The biggest producing countries are Germany, Spain, France, Italy and the United Kingdom. Some small German and British firms also specialise in the produc-

tion of batteries for motor vehicles, with the aim of marketing along more regional lines (replacement batteries).

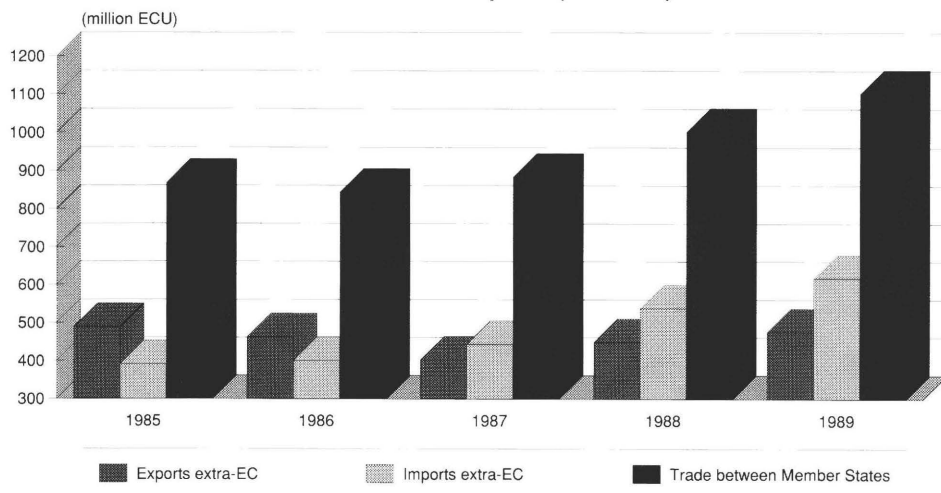
### Trends in employment

In 1985, the battery sector employed around 16,000 people in Europe in a total of 30 companies including Belgium, the Federal Republic of Germany, France, Greece, Italy, Portugal, the United Kingdom and Denmark. Since then, total production of dry-cell batteries has experienced low growth. Because of the growing efficiency of production lines and increasing concentration of companies, a fall is expected in the number of people employed in the dry-cell battery sector.

### External trade

Trade between Member States reached 1.1 thousand million ECU in 1989. This represented an increase of around 30% compared to 1985 levels. In 1988, this area of trade accounted for 28% of output. Since 1987, there has been a balance of payments deficit. Despite an increase of 6% in value in 1989 to reach 476 million ECU exports remained below the levels reached in 1985. On the other hand, imports grew rapidly over the entire period. In 1989, they reached 618 million ECU i.e. growth of around 60% compared to 1985. In 1988, only Germany, Switzerland and

**Figure 3**  
**Batteries**  
**EC trade in current prices (1985-1989)**



Source: Eurobat

Belgium recorded export surpluses (by value).

Most imports from outside the EC come from the United States and Asia (especially Japan and South Korea). Imports from Asia are continuing to grow rapidly, which is bringing greater pressure to bear on the industry.

In the starter batteries market, Community imports doubled between 1980 and 1988, rising from 6.3 million to 12.9 million units. However, this rise would appear to have levelled off during the past year.

### Environmental protection

Mercury has been used for a long time in saline and alkaline batteries. Two directives (82/176/EEC and 84/156/EEC of the Coun-

cil) show the Commission's determination to make large reductions in mercury waste.

Major progress has already been made.

Thus, from 1988, one of the largest European producers replaced 75% of the mercury contained in alkaline batteries with a totally harmless organic compound (perfluoropolyethoxide). Mercury has also been successfully removed from saline batteries.

Since 1985, the primary battery industry in the Community has cut by half the amount of mercury discharged from batteries into the environment, and has undertaken to reduce this by a further 84% between now and 1992. This reduction in waste is being brought about as follows:

- ❖ Firstly by eliminating 97.5% of mercury

**Table 2**  
**Consumer batteries**  
**EC trade in current value**

(million ECU)	1985	1986	1987	1988	1989
Exports extra-EC	489.2	462.6	402.5	448.6	476.4
Index	100.0	94.6	82.3	91.7	97.4
Imports extra-EC	391.8	401.1	443.9	538.5	617.8
Index	100.0	102.4	113.3	137.4	157.7
X/M	1.2	1.2	0.9	0.8	0.8
Trade intra-EC	867.9	843.6	883.7	1 002.7	1 102.8
Index	100.0	97.2	101.8	115.5	127.1
Share of total (%)	60.2	60.8	59.5	64.4	64.8

Source: EUROBAT

from alkaline-manganese batteries compared to 1985 levels (their very low mercury level should then remove the need for them to be collected separately);

- ❖ Secondly by replacing (where possible) mercury oxide batteries (containing 30% mercury) with zinc-air batteries (around 1% mercury) and lithium batteries, which contain no mercury at all.

The only economic interest is in the recycling of silver from silver oxide batteries.

Mercury oxide batteries can be recycled, but the viability of the process depends on mercury price fluctuations. Some Member States in the Community have now introduced separate waste collection for primary batteries containing excess mercury. Rechargeable nickel-cadmium batteries, which rely on nickel and cadmium price fluctuations, can be recycled on a near neutral cost basis. By contrast, storage batteries have always been recycled in great numbers (80-90% for lead and 40% for nickel-cadmium storage batteries).

In the United States, lead storage batteries are classed as hazardous waste, and regulations to protect the environment have raised prices sharply. The most efficient solution being contemplated at present is recycling.

### Research and development

Research is concentrated on the development of longer lasting and less pollutant batteries, on the discovery or adaptation of types of application and on problems of loss of power during storage. The use of lithium is, for example, an area of intense research. Its useful life of up to seven times more than ordinary batteries, 10-year storage capacity and low weight (35% lighter) make it a product of the fu-



ture which is especially suitable for rapid discharge appliances (cameras). Advances in electronic and miniaturisation could also generate promising markets.

## Outlook

The perspectives for the battery industry are good, since there is strong demand for these products. The intense competition within the industry will continue to put pressure on prices. The restructuring began in the sector in 1989 will continue, possibly leading to job losses.

In terms of products, different trends are being witnessed:

- In the primary battery sector, interest will shift from zinc-carbon batteries towards alkaline batteries using manganese dioxide. However, saline batteries will continue to have a place in the market for a while, as they are ideally suited to certain types of usage and remain cheaper.

The volume of sales in alkaline batteries is set to reach close on 1.4 thousand million units in 1991, which is almost double the 1984 volume.

- The mercury content of batteries should fall progressively. Rapid growth is also expected in the lithium battery market. Large orders for lithium batteries have al-

ready been placed for military uses (telecommunications, torpedos) and civilian applications (micro-informatics).

- Between 1984 and 1989, it has been estimated that the total Community market in consumer rechargeable batteries more than doubled. This growth is set to continue over the next ten years. However, the strong growth in sales, which has reached 30% in some years, should slow down.

A new replacement product is being developed, based on a nickel-hydrogen principle. It shows major advantages with its lower price and greater volume capacity, while its manufacturing process is very similar to the one for nickel-cadmium batteries. The first examples should appear on the market in 1990, with repaid penetration of the portable market predicted for between now and 1995.

- Because of the increasingly elaborate miniaturisation of applications, R6 pen batteries and other small formats will become more important in primary battery and rechargeable battery production. The storage battery market will be focussed on towards watertight products which do not have to be topped up with

water and require little maintenance.

The current recession in the United States automobile market and forecasts of stagnation in the European market (except in Greece, Spain and Portugal) mean that limited expansion can be predicted for starter batteries. However, the market has benefitted from major growth following five years of rising car sales in Europe, which should enable it to feed demand for replacement batteries over the next few years.

Written by: DRI EUROPE

This sector is represented at EC level by:  
**EUROPILE: Association of European Electric Battery Manufacturers, and EUROBAT: Association of European Dry-cell Battery Manufacturers Address: Waisenhausplatz 25, P.O. Box 5032, CH - 3001 Bern.**  
tel.: (41) 31 22 87 81; fax: (41) 31 21 19 58

The Community domestic appliances industry finally overcame the downward trend in production which it had long been affected by since the beginning of the 1980s. Due to far-reaching restructuring and revival in demand, this industry has once again become largely profitable and has just seen two years of strong growth in 1988 and 1989. However, competition remains intense and the need is evident for better use of capacity and greater productivity.

### Description of sector

Category 346 of NACE covers the manufacture of electrical appliances generally destined for domestic use. It includes the following articles:

- ❖ microwave ovens;
- ❖ cookers (free-standing and built-in);
- ❖ dishwashers;
- ❖ home laundry products (including washing machines);
- ❖ spin-dryers and tumble dryers;
- ❖ refrigeration products (refrigerators and freezers);
- ❖ personal care products (hair-dryers etc.);
- ❖ small kitchen appliances;
- ❖ vacuum cleaners;
- ❖ irons;
- ❖ heating products.

### Current situation

Domestic appliances forms one of the main sub-sectors of the electrical engineering industry. Within the EC, domestic appliances production represents about 10% of total production in the electrical engineering sector. This relative size varies depending on the Member State: while it represents less than 7% in Germany, it reaches almost 15% in Italy. Unlike the

sectors of electrical equipment and telecommunications, which are driven by investment, domestic appliances depend on consumer demand and building activity.

The Community production volume for principal white goods in 1987 was 57% higher than United States production and 150% higher than that of Japan.

Germany, France, Italy and the United Kingdom together account for about 83% of total EC production. German manufacturers tend to be more heavily export-orientated and account for about 30% of exports outside the Community. The Community domestic appliances industry finally overcame the downward trend in production which had affected it for so long at the beginning of the 1980s. In 1989, as in 1988, growth in the production index was 7.5%, a sign of the revival of activity in the sector following an increase in demand and the measures undertaken towards rationalisation. In some countries, this rationalisation resulted in falls in production, of which the largest were witnessed in France and the United Kingdom, countries where the rationalisation of industry has been particularly sweeping.

**Table 1**  
Main indicators, 1980-90 (1)  
Domestic electrical appliances

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990 (2)
Apparent consumption (2)	10 830	11 760	12 730	13 157	14 448	14 348	16 656	18 100	20 222	21 872	22 352
Net exports	908	760	767	792	688	704	761	570	464	715	1 138
Production (2)	11 738	12 520	13 497	13 949	15 136	15 052	17 417	18 670	20 686	22 587	23 490
Employment (thousands) (2)	268	264	250	240	233	222	237	234	232	233	220

(1) Taking into account changes in EC membership.

(2) Netherlands estimated.

(3) Estimated

Source: Eurostat (Inde)

The domestic electrical appliances market is characterised by fierce price competition both at national and international level.

This is shown by the price indexes of domestic appliances, which have risen by an average of 1.8% during recent years.

This rate is well below average inflation in manufacturing sectors (3 to 4% annually over the same period).

The surplus dumped onto the market, resulting in downward pressure being exerted on profits, triggered a rationalization of production potential during the 1980s. To some extent, this rationalisation is still going on. However, certain factors are already showing that the industry has regained its profitability, with some major groups, such as Bosch-Siemens and AEG, recording good results.

## Production

The production value of domestic appliances in the EC reached ECU 22.5 thousand million ECU in 1989, which represented an increase in value of 9.2% compared to 1988. Apparent consumption rose by 8.2%, which implies that export penetration into the EC has fallen after two years of strong increases.

The rise in living standards and growth in mass purchasing power brought with them a change in consumer demand and, as a result, certain changes were made to production trends. Between 1980 and 1987, growth in production was fairly low for large domestic appliances (+ 6%), but high for small domestic appliances and electric heating product sub-sectors (+ 13% each).

In 1988, however, large domestic ap-

pliances rose by 13% and small domestic appliances by 2%, whilst heating products fell by 8%. In the category of large domestic appliances, particularly strong growth has been recorded since 1980 in microwave ovens and dishwashers, products for which the market is a long way from saturation.

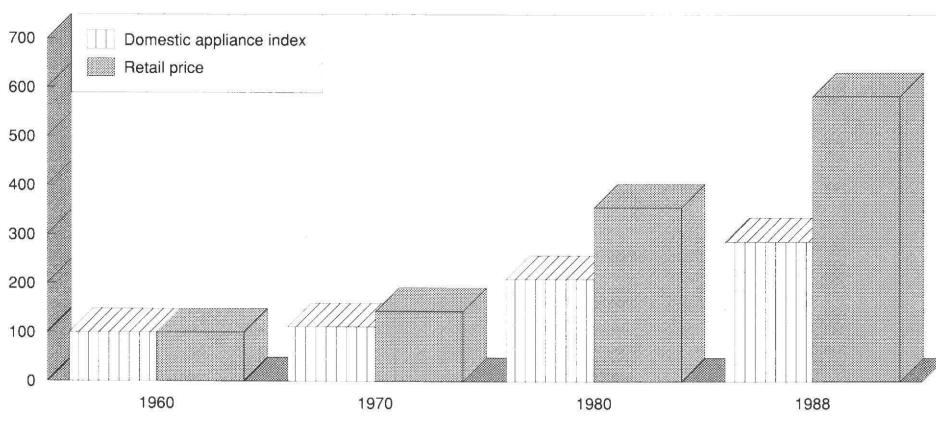
In 1980, refrigerators represented 37.5% of the market in large white goods. In 1988, this percentage was down to 32.7%. Dishwashers and microwave ovens are forming an increasingly stronger market share, even if they still account for a small fraction of the total. In the whole of the EC in 1988, microwave ovens represented 6.6% of total white goods production, against 2% in 1985.

In the United States, the same figure stood at 16.6%, while in Japan it reached the very high level of 35%. The latter figure reflects the race by Japanese industry in technical progress, and, as a result, towards articles which offer greater added value. At the present time, producers from the Far East dominate the microwave oven market in the EC. In 1988, however, as in 1987, Community production of microwave ovens grew strongly, with a rise of 81%.

## Consumption

The beginning of the 1980s was a difficult period for the domestic appliances industry. Consumption only grew slowly, parallel to

**Figure 1**  
Comparative evolution of retail price and of the price of domestic appliances  
(1960 = 100)



Source: CEDED

**Table 2**  
Domestic electrical appliances  
Production by appliance

(million units)	1980	(%)	1985	(%)	1987	(%)	1988	(%)
<b>Major appliances</b>								
Refrigeration products	13.7	37.5	12.4	35.4	13.3	34.5	14.3	32.7
Home laundry products	10.8	29.6	10.5	30.0	12.4	32.0	13.8	31.6
Cookers	10.0	27.4	9.2	26.3	8.6	22.2	9.2	21.1
Dishwashers	2.0	5.5	2.2	6.3	2.8	7.2	3.5	8.0
Microwave ovens	0.0	0.0	0.7	2.0	1.6	4.1	2.9	6.6
<b>Total</b>	<b>36.5</b>	<b>100.0</b>	<b>35.0</b>	<b>100.0</b>	<b>38.7</b>	<b>100.0</b>	<b>43.7</b>	<b>100.0</b>
<b>Small appliances</b>								
Small kitchen appliances	60.0	54.1	70.4	56.7	67.7	53.7	67.5	52.5
Personal care products	28.3	25.5	29.3	23.6	32.4	25.7	31.5	24.5
Irons	13.2	11.9	13.8	11.1	14.7	11.7	18.0	14.0
Vacuum cleaners	9.4	8.5	10.6	8.6	11.2	8.9	11.6	9.0
<b>Total</b>	<b>110.9</b>	<b>100.0</b>	<b>124.1</b>	<b>100.0</b>	<b>126.0</b>	<b>100.0</b>	<b>128.6</b>	<b>100.0</b>
<b>Heating products</b>								
Space heaters	13.0	63.4	15.4	67.5	16.2	69.8	13.9	65.6
Water heaters	7.5	36.6	7.4	32.5	7.0	30.2	7.3	34.4
<b>Total</b>	<b>20.5</b>	<b>100.0</b>	<b>22.8</b>	<b>100.0</b>	<b>23.2</b>	<b>100.0</b>	<b>21.2</b>	<b>100.0</b>
<b>Grand total</b>	<b>167.9</b>	<b>100.0</b>	<b>181.9</b>	<b>100.0</b>	<b>187.9</b>	<b>100.0</b>	<b>193.5</b>	<b>100.0</b>

Source: CECED

generally low growth in consumer spending in the Member States.

Over the last two or three years, a certain recovery in demand has been witnessed, especially in the northern Member States of the Community. However, with international competition increasingly lively, the value of imports to the EC more than tripled between 1980 and 1989.

An important factor in consumer trends during the 1980s lay in the degree of market saturation, since the market essentially became a replacement one for some products. In 1988, 97% of households owned a refrigerator, 88% a washing machine and 82% a vacuum cleaner.

Only the markets for dishwashers, freezers and microwave ovens had yet to reach their saturation levels. Home penetration levels are shown in Table 3.

These consumer trends are being reinforced by stagnant demographic growth in the most industrially advanced Member States, and by slow growth in the others. This phenomenon is, however, compen-

sated for in part by the strong increase in the number of households due to socio-economic factors. The Member States in which consumer demand has been best sustained are Germany, Italy and the United Kingdom.

### External trade

In 1989, the value of exports outside the EC reached 2.8 thousand million ECU that is to say around 12% of the total value of production. In 1989, exports rose strongly with growth at 19%; from 1980 to 1989, they increased in value by 83%.

The growth in exports slowed down from 1980 to 1987, because of increased competition from south-east Asia and eastern European countries in markets outside the

Community. This trend had been strengthened by movements in exchange rates affecting the competitiveness of some EC countries. Despite its weakening trade balance in domestic appliances, the EC remains a major competitor in foreign markets on account of its advantages in terms of product quality and its technological lead when it comes to product design. This is especially true as far as trade with other developed countries is concerned. Imports, however, have risen much more quickly than exports (by 237% in value between 1980 and 1989). Given the fact that imports do not involve the same goods as exports and that exports tend to be concentrated on high

**Table 3**  
Domestic electrical appliances  
Growth of home penetration

(%)	1970	1980	1985	1987	1988
Refrigerators	77	93	96	96	97
Freezers	8	30	37	43	43
Washing machines	63	79	86	88	88
Dishwashers	3	14	20	22	22
Vacuum cleaners	60	75	79	82	82

Source: CECED

**Table 4**  
Domestic electrical appliances - Production, value added and investment (1980-1989)

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990 (*)
Production in current prices											
EC (1)	11 738	12 520	13 497	13 949	15 136	15 052	17 417	18 670	20 686	22 587	23 490
Index	78	83	90	93	101	100	116	124	137	150	156.0
USA (2)	8 254	11 333	12 844	14 717	17 226	18 252	15 033	13 115	13 399	14 663	N/A
Index	45	62	70	81	94	100	82	72	73	80	N/A
Japan (2)	7 998	10 042	11 083	14 587	17 270	18 205	17 921	16 300	18 723	18 294	N/A
Index	43.9	55.2	60.9	80.1	94.9	100	98.4	89.5	103.4	100.5	N/A
EC (1)											
Production in constant prices											
Index	16 448	15 351	15 314	15 071	15 669	15 150	15 990	17 127	18 497	19 541	20 364
Index	108	103	105	101	105	100	105	109	120	129	134
Productivity											
Index	22	22	22	24	24	24	24	28	29	30	N/A
Index	91	89	91	97	98	100	100	117	118	124	N/A
Value added in current value											
Index	4 676	5 084	5 264	5 642	5 755	5 775	6 210	6 658	7 360	8 038	N/A
Index	81.0	88.0	91.2	97.7	99.7	100.0	107.5	115.3	127.4	139.2	N/A
Investment in current value(3)											
Index	459	441	506	505	544	605	646	726	N/A	N/A	N/A
Index	75.9	72.9	83.6	83.5	89.9	100.0	106.8	120.0	N/A	N/A	N/A

(1) Netherlands estimated, Belgium: 1980 estimated.

(2) Census of Manufactures and Eurostat estimates.

(3) Germany, Italy, France and United Kingdom only.

(4) Estimated

Source: Eurostat (Inde, Comext)

price and quality merchandise, the gap in real levels of growth ought to be much higher. The export/import ratio, which had fallen continuously since 1980, moving from 2.5 in 1980 to 1.2 in 1988, recovered in 1989, however, with a figure of 1.3. It is too early to say whether this will mean a reversal of the trend in the long term.

### Employment

Due to surplus capacity during the 1980s, rationalisation and restructuring led to a drop in employment. Although this fall had begun in the 1970s, it gained pace rapidly over the period 1980-87, at the end of which the number of persons involved in the manufacture of domestic appliances had dropped by 26% according to CECED (13% according to Eurostat), compared to the 1980 employment level. This figure has since stabilised at around 210 000 persons (Eurostat reports 233 000).

In some Member States, employment has gone up, although to a lesser extent. Productivity has increased strongly over the last few years, and the importance attached in the industry to productivity gains

is obvious. Employment levels have fallen to a greater extent in France and the United Kingdom, by 22 and 34% respectively. Moreover, these trends continue to be identifiable. In comparison, employment in German industry fell by only around 9% between 1980 and 1986.

### Structural changes

The concentration of the industry manufacturing domestic appliances has always been relatively strong compared to other industries. Mass production methods and economies of scale represent particularly important aspects of the manufacture of these products.

During the last two decades, the industry's concentration has increased and the number of manufacturers fallen; this trend was reinforced by the process of rationalisation undertaken during the 1980s. In 1980, the EC counted 540 domestic appliance manufacturers. By 1988, this number had been reduced to 430. However, the majority of rationalisation measures in this sector were taken at the beginning of the 1980s, and the downward trend in the number of

manufacturers is diminishing.

Production is dominated by major multinational firms, chiefly for reasons of economies of scale. Today, four companies dominate the EC market: Electrolux (Sweden), Whirlpool Philips (Italy), Bosch-Siemens (F.R.G.) and Merloni (Italy).

Among the major EC producers, mergers and acquisitions have multiplied in the last few years: the takeover of Bauknecht (F.R.G.) by Philips in 1986, the takeover of the operations of Zanussi (Italy) in Italy and Spain by Electrolux in 1987, the merger of the Italian firms Ariston and Indesit in 1988, the takeover of the Germans Rowenta by the French firm SEB and of the British Swan by the French firm Moulinex. At the same time, the Italians Candy took control of the French Rosieres, while Merloni took over Scholtes (France). There were also takeovers at international level, with the takeover of White Westinghouse in the United States by Electrolux and the acquisition of Philips' Major Appliance Operation by the American company Whirlpool. The merger of General Electric (the largest

**Table 5**  
Domestic electrical appliances - EC Trade in current value <sup>(1)</sup> (1980-1990)

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990 <sup>(2)</sup>
Exports extra-EC	1 523.0	1 567.5	1 592.6	1 729.0	1 911.9	2 074.1	2 105.1	2 149.9	2 331.3	2 788.3	3 015.8
Index <sup>(3)</sup>	73.9	75.6	76.8	83.4	92.2	100.0	98.7	100.8	109.3	130.7	145.0
Imports extra-EC	614.6	807.2	826.0	937.3	1 223.9	1 370.3	1 343.6	1 579.6	1 867.1	2 072.8	1 878.8
Index <sup>(3)</sup>	45.2	58.9	60.3	68.4	89.3	100.0	96.4	113.3	134.0	148.7	137.0
X/M	2.5	1.9	1.9	1.8	1.6	1.5	1.6	1.4	1.2	1.3	1.6
Trade intra-EC	2 287.8	2 461.0	2 741.8	2 940.6	3 147.0	3 511.5	4 254.9	4 685.8	5 148.6	5 824.1	N/A
Index <sup>(3)</sup>	65.2	70.1	78.1	83.7	89.6	100.0	115.6	127.3	139.8	158.2	N/A
Share of total(%)	60.0	61.1	63.3	63.0	62.2	62.9	66.9	68.5	67.5	66.4	N/A

<sup>(1)</sup> 1980 EC9 1981-85 EC10

<sup>(2)</sup> Taking account of changes in EC membership.

<sup>(3)</sup> Estimated

Source : Eurostat (Comext)

American producer) and GEC-Hotpoint (United Kingdom), as well as the buying of Hoover by the Americans Maytag, means that the four largest American producers now have production capacities in Europe. Absent until now from the European continent, the American producers are all aware of the very high costs of access to the European market: the necessity to integrate European "norms"; market fragmentation, the multiplicity of brands and regional habits in the field of white goods. The price to pay is relatively high, which explains perhaps the disappointment of some American groups in the face of the low profitability of their new European operations.

Mergers and takeovers are a means for companies to increase their market share while achieving fairly limited overall growth (contrary to what happens in more lucrative markets, such as mass electronics). However, the mergers and acquisitions are also caused by the necessity to reduce production costs further by means of economies of scale.

The prospect of the Single Market in 1992 will no doubt accentuate this process of concentration within the Community still further. Domestic appliances production exists in all the Community Member

States. With transport costs representing an important factor in overall costs, the proximity of markets is a key element in decisions to set up business. Moreover, considerations linked to the cost of transportation have kept Japanese and American producers outside the EC market, save for the case of microwave ovens for which the proportion of transport costs in relation to price is fairly low. Recently, however, Japanese producers have developed plans to purchase or establish production plants in the EC.

Even if the differences in terms of design and aesthetics between EC and Japanese consumers represent a major obstacle to Japanese sales in Europe, some Japanese firms in 1989 nevertheless began testing the possibility of commercialising their products in the EC, and more especially on the United Kingdom market. Should this trial be successful, similar penetration into the remaining Community markets may be expected; Japanese companies might soon take up 5% to 10% of the Community domestic appliances market. However, the reality is that a major part of these "made in Japan" items will in fact have been manufactured in Europe. In this, Japanese manufacturers are following the strategy of American domestic appliance

producers.

## Outlook

The removal of CFC gases from refrigerators and the need for a significant reduction in energy consumption by all products are leading to important demands on investment which could produce further rationalisation in the industry.

In addition, in eastern Europe, private firms, especially major groups such as Electrolux, Merloni and Bosch-Siemens, are beginning to establish active contacts with local producers. In the past, low price imports from eastern Europe involving especially refrigerators, vacuum cleaners and some small appliances were viewed as harmful to EC producers, who were not in a position to export their products, mainly for currency reasons. Through the development of market economies in these countries, new opportunities will be appearing for Community producers. However, the state of the economy in each country will be the decisive factor. A sustained growth in consumption of the order of 3 to 4% has been forecast for 1990. More rapid growth is expected for some products, such as microwave ovens and dishwashers. As for levels of growth in Community production, these should slow down after the outstanding years of 1988-89 and steady

at around a zero growth level. For the next five years, European industry will continue to operate in an environment marked by growing industrial concentration and very lively competition both nationally and internationally.

**CECED: European Committee of Manufacture of Electric Domestic Equipment** Address: Leicester House, 8 Leicester Street, London WC2H 7BN, United Kingdom; tel.: (44 71) 437 06 78; fax: (44 71) 494 10 94.

Updated by: DRI Europe

Code 347 of the NACE covers the manufacture of lamps (NACE 347.1) and electric lighting equipment (NACE 347.2). The years 1987, 1988 and 1989 were ones of strong growth for the European electric lighting industry, and Community production at constant prices registered increases of 8.2% in 1987, 7.2% in 1988 and 8.8% in 1989. Total EC production came to near 7.8 thousand million ECU in 1989, while the European industry employed a total of around 100,000 people. 1989 was marked by exceptional growth in trade between Member States and countries outside the EC. The existence of different norms and standards for electrical appliances within the EC did, however, hamper the development of trade between the Member States.

### Current situation

**Consumption** Demand for lamps can be broken down into replacement demand and new demand. Demand for replacement lamps is relatively stable. The construction of new buildings and the renovation of older ones create new demand both for lamps and the electric lighting equipment necessary for these lamps to be fitted. This second type of demand is cyclical and is linked to development in the building trade.

The growth in sales of lamps is due primarily

to new products, halogen lamps, high energy efficiency lamps, which meet the demand of consumers to make better use of energy, discharge lamps, and compact fluorescent lamps. Low-voltage halogen lamps have thus registered growth. Initially sold for industrial or commercial use, they are today also used for lighting in the home. 1989 was relatively positive for electric lighting appliances, with demand stimulated by the sound economic footing of the EC building industry.



**Production** Community production experienced a net fall at the beginning of the 1980s, chiefly on account of the very low level of activity in the building sector in most EC countries. From 1980 to 1983, production at constant prices therefore fell by 10% in EC 10. From 1984, growth recovered to an average rate of 6.5% per year until 1986, before accelerating from 1987 to 1989 with an average growth rate for production at constant prices of 8.1% per year. In 1989, EC production reached 7,796 million ECU. The main producers were the Federal Republic of Germany (with estimated production of 2,631 million ECU or 33.7% of total production), the United Kingdom (18% of the total),

France (17.9%), Italy (9.6%) and Spain (7.4%). The Netherlands, for which no figures are available, is also a major producer. Since 1980, France and Italy have seen their share of Community production grow, with France recording the biggest increase. Spain's share, which declined steeply at the beginning of the 1980s, has recovered slightly since 1987. The shares for the F.R.G. and the United Kingdom have remained relatively stable during the period.

### Structure of the sector

The Community market for electric lamps and electric lighting equipment is essentially dominated by EC firms. Like a great many other sectors, the electric lighting in-

dustry has entered a phase of intensive concentration which is driving the largest producers into making acquisitions:

General Electric (United States), for example, acquired 50% of the shares in Tungsram (Hungary) in 1989.

Within the perspective of the 1992 Single Market, a number of companies are feeling the need to reach the critical size necessary for survival; in January 1990, GEC (United Kingdom), feeling that it may not reach its critical threshold, opted instead to withdraw its investment in electric lighting by selling off 51% of the shares which it held in the joint company,

**Table 1**  
Electric lighting  
Main Indicators, 1980-90<sup>(1)</sup>

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990 <sup>(2)</sup>
Apparent consumption <sup>(2)</sup>	3 048	2 904	3 052	3 218	3 754	4 280	5 227	5 833	6 525	7 377	7 423
Net exports	309	391	421	485	525	610	543	452	406	419	430
Production <sup>(2)</sup>	3 357	3 294	3 473	3 703	4 279	4 890	5 770	6 285	6 930	7 796	7 853
Employment (thousands) <sup>(2)</sup>	88	84	76	74	77	81	92	95	95	98	96

<sup>(1)</sup> Taking account of changes in EC membership; 1980 EC9, 1981-85 EC10, 1986-89 EC12.

<sup>(2)</sup> Netherlands estimated

<sup>(3)</sup> Estimated

Source: Eurostat (Inde, Comext)

**Table 2**  
Electric lighting  
Production, value added and investment

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990 <sup>(1)</sup>
Production in current prices											
EC <sup>(1)</sup>	3 357.1	3 294.4	3 472.6	3 702.9	4 278.8	4 889.8	5 769.7	6 285.2	6 930.2	7 795.5	7 853
Index	68.7	67.4	71.0	75.7	87.5	100.0	118.0	128.5	141.7	159.4	160.6
USA <sup>(2)</sup>	4 070.5	5 330.5	6 251.2	7 539.0	9 624.2	10 867.9	8 742.6	7 755.0	7 815.9	8 724.7	N/A
Index	37.5	49.0	57.5	69.4	88.6	100.0	80.4	71.4	71.9	80.3	N/A
Japan <sup>(2)</sup>	2 185.0	2 716.0	2 908.0	3 377.0	3 863.0	4 072.0	3 957.0	3 817.0	4 519.0	4 832.0	N/A
Index	53.7	66.7	71.4	82.9	94.9	100.0	97.2	93.7	111.0	118.7	N/A
EC <sup>(1)</sup>											
Production in constant prices	5 288.8	4 884.8	4 756.2	4 734.2	5 008.9	5 405.5	5 721.1	6 189.5	6 637.7	7 221.3	N/A
Index	97.8	90.4	88.0	87.6	92.7	100.0	105.8	114.5	122.8	133.6	N/A
Productivity	27.1	26.0	27.7	28.6	28.5	27.8	25.3	26.9	28.6	30.1	N/A
Index	97.5	93.5	99.6	102.9	102.5	100.0	91.0	96.8	102.9	108.3	N/A
Value added in current value	4 494.0	4 829.0	5 005.0	5 347.0	5 442.0	5 443.0	5 850.0	6 279.0	6 974.0	7 620.0	N/A
Index	82.6	88.7	92.0	98.2	100.0	100.0	107.5	115.4	128.1	140.0	N/A
Investment in current value <sup>(3)</sup>	131.0	138.0	117.0	109.0	149.0	202.0	235.0	241.0	N/A	N/A	N/A
Index	64.9	68.3	57.9	54.0	73.8	100.0	116.3	119.3	N/A	N/A	N/A

<sup>(1)</sup> Netherlands estimated.

<sup>(2)</sup> Census of Manufactures and Eurostat estimates.

<sup>(3)</sup> Germany, Italy, France and United Kingdom only.

<sup>(4)</sup> Estimated

Source: Eurostat (Inde, Comext)

GEC/Osram, to its partner, Siemens.

**Electric lamps** Within the EC, the Netherlands produces the most electric lamps, with France and the Federal Republic of Germany following some way behind.

Philips, the Dutch multinational electrical construction firm, plays a vital role in maintaining the position of the Netherlands as Europe's number one.

The sector's biggest companies are as follows:

- ❖ Philips (The Netherlands);
- ❖ Osram, a division of Siemens (F.R.G.);
- ❖ GTE/Sylvania (United States);
- ❖ Thorn EMI (United Kingdom);
- ❖ Tungsram (Hungary);
- ❖ General Electric (United States).

**Electric lighting equipment** The market for electric lighting equipment is considerably more fragmented than the market for electric

lamps. In this splintered market, even the main producers only have a relatively low market share;

- ❖ Thorn Lighting (United Kingdom);
- ❖ Philips (Netherlands);
- ❖ Siemens (F.R.G.);
- ❖ Zumtobel (Austria);
- ❖ GTE/Sylvania (United States);
- ❖ Trilux (F.R.G.);
- ❖ AEG (F.R.G.).

### Employment

The number of people employed by this sector fell rapidly at the beginning of the 1980s; chiefly following restructuring and the elimination of obsolete or superfluous production capacities which existed in the EC. Total employment in the EC went from about 109,000 people in 1980 to 90,000 in 1983, that is to say a fall of 17%. Since 1985, employment growth has

recovered slightly, reaching the figure of 98,000 people in 1989.

Certain countries have been more affected than others by the reductions in the workforce in the 1980s; the industry in Spain saw its workforce fall from 16,605 in 1980 to 7,092 in 1986, that is to say a drop of almost 60%, while, for its part, France recorded a fall of only 10% in its workforce during the same period. It is noticeable that, by 1989, the biggest producers - France, F.R.G. and the United Kingdom - had recovered, or even surpassed their 1980 employment levels. In 1989, as in 1980, the German industry remained the largest employer with more than 34,000 people, followed by the United Kingdom (25,000) and France (13,000). These three countries represented 75% of the workforce employed by the electric light-

**Table 3**  
Electric lighting  
Production by country

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987 <sup>(1)</sup>	1988 <sup>(1)</sup>	1989 <sup>(1)</sup>
BR Deutschland	1 346.4	1 297.9	1 375.0	1 522.8	1 628.5	1 795.2	2 004.4	2 129.9	2 371.5	2 631.0
Hellas <sup>(2)</sup>	9.2	10.7	11.8	11.3	8.5	9.7	9.5	7.7	7.3	8.4
España <sup>(2)</sup>	535.7	559.8	565.8	490.1	487.6	508.7	369.3	437.5	516.1	579.7
France	466.9	486.4	549.0	548.6	593.1	822.2	940.0	994.0	1 143.9	1 394.3
Italia	325.8	331.5	290.5	263.3	476.0	501.9	543.6	687.6	636.4	745.1
Portugal	53.7	71.5	71.6	75.8	72.8	64.0	68.1	64.6	74.9	80.7
United Kingdom	787.5	727.7	801.4	830.4	902.9	1 006.7	985.7	1 119.3	1 301.9	1 400.6
Total	3 525.2	3 485.5	3 665.1	3 742.3	4 169.4	4 708.4	4 920.6	5 440.6	6 052.0	6 839.8

(<sup>1</sup>) Estimated  
(<sup>2</sup>) 1986-89 estimated  
(<sup>3</sup>) 1987-89 estimated  
Source: Eurostat (Inde)

**Table 4**  
Electric Lighting  
Employment by country, 1980-89

	1980	1981	1982	1983	1984	1985	1986	1987	1988 <sup>(1)</sup>	1989 <sup>(1)</sup>
BR Deutschland	35 108	32 909	30 856	30 046	29 876	31 335	32 133	32 326	32 751	34 363
Hellas <sup>(2)</sup>	488	432	327	304	205	198	201	202	205	215
España <sup>(2)</sup>	16 605	15 530	13 918	12 020	9 501	9 349	7 092	7 140	7 249	7 606
France	12 408	11 775	11 605	11 122	11 357	13 084	13 321	13 039	13 147	13 416
Italia	9 565	9 417	6 900	5 170	7 511	7 053	6 673	7 206	7 205	7 560
Portugal <sup>(2)</sup>	4 132	4 226	4 269	4 156	3 868	3 172	2 998	2 757	2 799	2 937
United Kingdom	25 613	24 306	21 748	21 818	22 040	22 615	22 741	25 741	25 675	25 285
Total	103 919	98 595	89 623	84 636	84 358	86 806	85 159	88 411	89 031	91 382

(<sup>1</sup>) Estimated  
(<sup>2</sup>) 1986-89 estimated  
(<sup>3</sup>) 1987-88 estimated  
Source: Eurostat (Inde)

**Table 5**  
Electric lighting - EC Trade in current value

(million ECU)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990 (*)
Exports extra-EC Index (%)	658.3 57.9	759.8 66.7	814.6 71.6	902.7 79.3	1 008.5 88.6	1 138.3 100.0	1 091.4 91.0	1 062.7 88.6	1 127.3 94.0	1 269.5 105.8	1 288.5 113.0
Imports extra-EC Index (%)	349.5 67.1	369.3 69.9	394.0 74.6	417.9 79.1	483.3 91.5	528.1 100.0	548.2 98.6	610.4 109.8	721.7 129.8	850.6 153.0	858.5 162.0
X/M	1.9	2.1	2.1	2.2	2.1	2.2	2.0	1.7	1.6	1.5	1.5
Trade intra-EC Index (%)	1 032.1 66.3	1 038.6 66.7	1 137.4 73.0	1 185.1 76.1	1 231.0 79.0	1 558.0 100.0	1 980.9 124.0	2 103.8 131.7	1 780.7 111.5	2 081.6 130.3	N/A N/A
Share of total (%)	0.6	0.6	0.6	0.6	0.5	0.6	0.6	0.7	0.5	0.5	N/A

(\*) Taking account of changes in EC membership.  
Source: Eurostat (Comext)

ing industry in the EC.

### Trends in trade

1989 was an exceptional year for extra EC trade. Exports progressed by 12% in value, while imports saw a growth rate of 18%, as in 1988. Exports outside the EC rose in value by 83% during the period 1980-1989, reaching 1,270 million ECU in 1989. At the same time, however, imports increased by 128% in the course of the same period, bringing them to a level of 851 million ECU in 1989.

Throughout the 1980s, as far as electric lighting was concerned, the EC held a trade surplus with the rest of the world. After increasing at the beginning of the 1980s, this surplus has declined bit by bit since 1985. In 1989, the extra EC trade surplus came to 419 million ECU, down 23% compared to 1986. The export/import ratio with outside the EC dropped steadily; it fell from 2.2 in 1985 to 1.5 in 1989.

All this is an indication that the Community is progressively losing its competitive advantage in the world electric lighting market. In an attempt to maintain its position, industry in the Community has tried to intensify investment in products with higher added value such as energy-saving electric lamps and specially-designed equipment for the interior decoration of homes and offices.

As many other branches of industry, the electrical lighting sector has not been sheltered from the competition of Asian manufacturers. Although relatively high transport costs (when compared to product value) have prevented non-Community manufacturers from penetrating the EC market for ordinary light bulbs, there has been considerable growth in halogen lamp imports from Japan, China and other Eastern countries. During 1990, this led the European Commission to impose provisional anti-dumping taxes as high as 85.4% on halogen lamp imports from Japan.

Separate consideration should be given to producers from countries in Eastern Europe and Northern Europe. They are less affected by transport costs, and their potential competition more dangerous. In the high-price designer lamp market, producers from Nordic countries thus made important breakthroughs during the 1980s. Trade between Member States grew at the same rate as extra-EC trade during the 1980s. The value of trade between Member States rose by 97% during the period 1980-89. In 1989, growth in trade between Member States was 17%.

### Outlook

In 1990, the growth of the last few years should be repeated. In the highly competitive market for electric lamps,

innovation remains the driving force behind growth. New products - halogen lamps, discharge lamps, compact fluorescent lamps, high energy efficiency lamps - will continue to stimulate demand. R & D will be paramount in success; nowadays it is orientated towards new products and electric lighting regulating devices - micro-electronics have become more and more important in the operation of modern light sources. Further research is aimed at improving light emitting efficiency and colour rendering, and at reducing still further the size of electric lamps. The lighting appliances market is set to record slower growth in 1990. In anticipation of the creation of the Single Market in 1992, the Commission of the European Communities has undertaken to harmonise the norms applicable to electrical equipment. This would have a very favourable impact on trade between Member States and on the Community's electric lighting industry.

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