

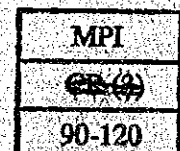
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**A STUDY ON  
INDUSTRIAL SUB-SECTOR  
DEVELOPMENT  
IN THE REPUBLIC OF INDONESIA**

**Part IV  
Electrical Machinery Industry  
FIRST YEAR FINAL REPORT**

**AUGUST 1990**

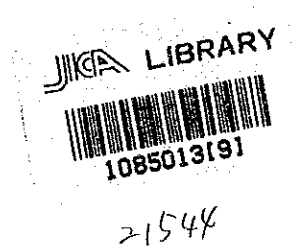
**JAPAN INTERNATIONAL COOPERATION AGENCY**





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<b>4. Electrical Machinery Industry</b>	
<b>4.1 Survey Methodology</b> .....	IV-1
<b>4.2 World Supply and Demand Trends</b> .....	IV-1
(1) Introduction .....	IV-1
(2) World Imports According to OECD Statistics .....	IV-2
(3) U.S. Market.....	IV-7
(4) West German Market .....	IV-14
(5) Japanese Market.....	IV-20
(6) Competing Nations.....	IV-29
<b>4.3 Indonesian Industry Today</b> .....	IV-35
(1) APPI Organization and Activities .....	IV-35
(2) Corporate Strategies.....	IV-37
(3) Production Trends.....	IV-44
(4) Imports .....	IV-49
(5) Local Production and Imports of Raw Materials and Components.....	IV-50
(6) Exports .....	IV-60
(7) Industrial Development Policy.....	IV-68
(8) Export and Investment Policy.....	IV-68
(9) Finance/Banking Policy for Development of the Electrical Machinery Sub-sector.....	IV-68
<b>4.4 Foreign Investment in the Electrical Machinery Sub-sector</b> .....	IV-69
(1) The Advance of Foreign Capital .....	IV-69
(2) The investment environment in Indonesia as seen from the strategies of European, American and Japanese firms.....	IV-70
<b>4.5 Present Situation Of Technology and Management</b> .....	IV-71
(1) Technology.....	IV-71
1) Production Process .....	IV-71
2) Technology Level.....	IV-78
3) Raw Materials and Parts .....	IV-85
4) Research & Development (R&D).....	IV-93
(2) Management.....	IV-96
1) Human Development .....	IV-96
2) Information .....	IV-103
3) Cost Analysis.....	IV-105
4) Attitudes of Management.....	IV-112
(3) Supporting Industries and Facilities.....	IV-115
1) Supporting Industries .....	IV-115
2) Supporting Facilities.....	IV-118
<b>4.6. Proposal for Comprehensive Promotion Programs for the Electrical Machinery Industry</b> .....	IV-126
<b>4.7 Information for Promotion of Investments and Technical Tieups in Electrical Machinery Industry</b> .....	IV-146
(1) List of Japanese Companies Interested in Investment.....	IV-146
(2) List of Indonesian Companies Interested in Joint Ventures or Technical Tieups .....	IV-147
(3) Information on Companies in Above Lists.....	IV-148

## Chapter 4. Electrical Machinery Industry

Fig. 4-2-1:	Trends in Imports and Exports of Motors/Generators in U.S.....	IV-9
Fig. 4-2-2:	Trends in Imports and Exports of Transformers in U.S.....	IV-9
Fig. 4-2-3:	Distribution Route of Electrical Machinery in the United States.....	IV-13
Fig. 4-5-1:	Production Process of Motors.....	IV-72
Fig. 4-5-2:	Production Process of Transformers.....	IV-72
Fig. 4-5-3:	Industrial Standards in Indonesia.....	IV-75
Fig. 4-5-4:	Manufacturing Process of Electric Machinery.....	IV-78
Fig. 4-5-5:	Composition of Employees by Level of Education.....	IV-99
Fig. 4-5-6:	Comparison of Production Cost between Indonesia and Japan.....	IV-107
Fig. 4-5-7:	Main Items of Concern by Managers.....	IV-114
Fig. 4-5-8:	Education System in Indonesia.....	IV-122
Fig. 4-6-1:	Comprehensive Promotion Programs for the Electrical Machinery Industry.....	IV-144
Fig. 4-6-2:	Schedule for Promotion Programs for Machinery (Tentative).....	IV-145
Table 4-2-1a:	Imports from OECD Countries By Type (1987).....	IV-3
Table 4-2-1b:	Imports from ASEAN Countries By Type (1987).....	IV-3
Table 4-2-2a:	Exports of Key Countries by Type (1987).....	IV-4
Table 4-2-2b:	Exports of ASEAN Countries by Type (1987).....	IV-4
Table 4-2-3:	Matrix of Main Exporting and Importing Countries by Type of Electrical Machinery (1987).....	IV-5
Table 4-2-4:	Domestic U.S. Shipments of Electrical Machinery.....	IV-7
Table 4-2-5:	Trends in Imports of Small Motors of U.S. by Country.....	IV-10
Table 4-2-6:	Projections of Capital Expenditures of U.S. Power Industry.....	IV-11
Table 4-2-7:	Projections of Installation of Distribution Transformers of Under 46 KVA in U.S. from 1989 to 1994.....	IV-11
Table 4-2-8:	Projections on U.S. Demand of Motors and Generators.....	IV-12
Table 4-2-9:	Trends in Domestic Production of Electrical Machinery in West Germany.....	IV-14
Table 4-2-10:	Production of Motors, Generators, and Transformers of West Germany.....	IV-15
Table 4-2-11:	Imports of Electrical Machinery (1988).....	IV-17
Table 4-2-12:	Apparent Demand of Electrical Machinery in West Germany.....	IV-19
Table 4-2-13:	Trends in Production of Electrical Machinery in Japan.....	IV-21
Table 4-2-14:	Trends in Exports of Electrical Machinery of Japan by Type.....	IV-24
Table 4-2-15:	Trends in Imports of Electrical Machinery of Japan.....	IV-25
Table 4-2-16:	List of Top Products Imported from Main Countries.....	IV-26
Table 4-2-17:	High Growth Imported Products in Japan by Country of Origin (January to June 1989).....	IV-27
Table 4-2-18:	Trends in Supply and Demand of Heavy Electrical Machinery in South Korea.....	IV-30
Table 4-2-19:	Production, Exports, and Imports of Electrical Machinery in 1988.....	IV-31
Table 4-2-20:	Trends in Exports to and Imports from Japan of Heavy Electrical Machinery by Year.....	IV-32
Table 4-2-21:	Trends in Production of Electrical Machinery in Singapore.....	IV-33
Table 4-2-22:	Value of Imports in 1988 by Main Country/Region.....	IV-33
Table 4-2-23:	Example of Cost Analysis of Singapore.....	IV-34
Table 4-2-24:	Supporting Industries of Singapore.....	IV-34
Table 4-3-1:	Number of Companies in Electrical Machinery Industry of Indonesia and Number of Companies Surveyed.....	IV-39
Table 4-3-2:	Breakdown of Companies Surveyed by Capital <sup>40</sup> (No. of Companies).....	IV-40

Table 4-3-3:	Number of Companies by Number of Employees.....	IV-41
Table 4-3-4:	Number of Companies by Class of Company.....	IV-41
Table 4-3-5:	Location of Companies (Number of Companies).....	IV-42
Table 4-3-6:	Number of Companies by Year of Establishment and Investing Countries.....	IV-43
Table 4-3-7:	Domestic Production of Electrical Machinery .....	IV-44
Table 4-3-8:	Production of Electrical Machinery in Indonesia and Fifth Five-Year Plan.....	IV-44
Table 4-3-9:	Production Capacities of Products by Company.....	IV-45
Table 4-3-10:	Imports of Electrical Machinery by Indonesia (1988) .....	IV-49
Table 4-3-11:	State of Imports of Materials and Parts (1988).....	IV-50
Table 4-3-12:	Comparison Between Imported and Domestically Produced Transformer Materials and Finished Products.....	IV-52
Table 4-3-13:	Current State of Domestic Production of Materials, Parts, and Metal Working .....	IV-54
Table 4-3-14:	State of Procurement of Materials and Parts by Generator Manufacturers .....	IV-55
Table 4-3-15:	Procurement of Materials and Parts by Electrical Machinery Manufacturers .....	IV-56
Table 4-3-16:	Procurement of Materials and Parts by Transformer Manufacturers .....	IV-57
Table 4-3-17:	Trends in Demand by Company .....	IV-58
Table 4-3-18:	Sales Activities .....	IV-61
Table 4-3-19:	Weighted Average Rate of Sales Destinations (%).....	IV-62
Table 4-3-20:	Existence of Sales Divisions.....	IV-62
Table 4-3-21:	Exports of Indonesia by Product (1988).....	IV-63
Table 4-3-22:	State of Export Activities.....	IV-65
Table 4-3-23:	Reasons for Not Engaging in Export Activities (Number of Companies).....	IV-65
Table 4-3-24:	Means of Export Promotion Activities (Number of Companies).....	IV-65
Table 4-3-25:	Sources of Acquisition of Overseas Information.....	IV-66
Table 4-3-26:	Necessary Overseas Market Information.....	IV-66
Table 4-3-27:	State of Utilization of Export Promotion Measures.....	IV-67
Table 4-3-28:	Export Promotion Measures Being Used .....	IV-67
Table 4-4-1:	List of Applications for Investment Related to Electrical Machinery in 1988.....	IV-69
Table 4-5-1:	Principal Production Facilities.....	IV-74
Table 4-5-2:	Industrial Standards .....	IV-77
Table 4-5-3:	Present Situation of Technical Agreements (Number of Firms).....	IV-80
Table 4-5-4:	Quality Control.....	IV-82
Table 4-5-5:	Ratio of Defective Products.....	IV-82
Table 4-5-6:	Quality Inspection.....	IV-84
Table 4-5-7:	Composition of Source of Procurement.....	IV-85
Table 4-5-8:	Country of Origin of Imported Materials and Components.....	IV-87
Table 4-5-9:	Procurement of Major Parts by Number of Firm (Generators).....	IV-90
Table 4-5-10:	Procurement of Major Parts by Number of Firms (Motors).....	IV-91
Table 4-5-11:	Procurement of Major Parts by Number of Firms (Transformers) ..	IV-92
Table 4-5-12:	Research and Development (R&D) Activities .....	IV-94
Table 4-5-13:	Number of Persons Working for R&D Department .....	IV-94
Table 4-5-14:	Use of Outside R&D Institutions (number of firms) .....	IV-95
Table 4-5-15:	Number of Employees by Level of Position and Seniority .....	IV-97
Table 4-5-16:	Number of Employees by Level of Position and Seniority(%).....	IV-97
Table 4-5-17:	Breakdown of Factory Workers by Level of Education.....	IV-98
Table 4-5-18:	Degrees Received in Foreign Countries.....	IV-98

Table 4-5-19:	Kind of Training by Number of Firms.....	IV-101
Table 4-5-20:	Expected Governmental Support by Number of Firms .....	IV-101
Table 4-5-21:	Source of Product Development Information.....	IV-103
Table 4-5-22:	Concerns for Technical Tie-Up (Nbr. of Firms).....	IV-104
Table 4-5-23:	Breakdown of Manufacturing Costs.....	IV-108
Table 4-5-24:	Comparison of Production Cost of Electric Machinery between Indonesia and Japan.....	IV-109
Table 4-5-25:	Average Wage of Employees (thousand Rupiah).....	IV-111
Table 4-5-26:	Cost Saving Activities by Number of Firm.....	IV-112
Table 4-5-27:	Evaluation of Local Sub-contractors.....	IV-117
Table 4-5-28:	Support to Sub Contractors .....	IV-117
Table 4-5-29:	Kind of Technical Support.....	IV-117
Table 4-5-30:	Organization of LMK-PLN.....	IV-121
ANX-1.	Matters of Interest in Management.....	IV-155
ANX-2:	Labor Management .....	IV-157
ANX-3:	Labor Management .....	IV-158
ANX-4:	Labor Management .....	IV-159
ANX-5:	Labor Management .....	IV-160
ANX-6:	Labor Management .....	IV-161
ANX-7.	Overseas Market Information.....	IV-162



## **Chapter IV Electrical Machinery Industry**



## **Chapter 4. Electrical Machinery Industry**

### **4.1 Survey Methodology**

#### **(1) Local Survey**

Through an arrangement with the Directorate General for Machinery, Basic Metal and Electronic Industry, a total of 33 surveys were conducted covering such areas as the electrical machinery industry, related parts industries, universities, polytechnics, and research institutes. These were supplemented with a questionnaire survey in which responses were received from 16 companies.

Companies located in Jakarta and the surrounding area, Bogor, Bandung, and Surabaya were visited by a four-member team consisting of two economists, one technical expert from Japan, and the section chief of Electric Machinery, Division of the Ministry of Industry. They were surveyed concerning questions of government policy, management, and technology.

#### **(2) Japanese Survey**

11 member firms of the Japan Electrical Manufacturers' Association engaged in the production of electrical machinery (including generators, electric motors, and transformers) were asked to respond to a questionnaire covering such items as overseas dealings (including Indonesia), manufacturing costs, parts production, and subcontracting. Responses were obtained from seven out of the eleven firms.

#### **(3) Third-Country Surveys**

Surveys covering production, trade, technology, and the outlook for the future were undertaken for the U.S., West Germany, Korea, and Singapore, the latter two of which represent Indonesia's Asian competitors. The surveys were entrusted to specialists in the various nations, and the results were utilized in drawing up the present report.

### **4.2 World Supply and Demand Trends**

#### **(1) Introduction**

Overall, the world market for generators, electric motors, and transformers is on an upward trend. Apparent demand in the U.S. (production + imports - exports) exceeded \$10 billion in 1988, with the Japanese and West German markets estimated at \$7 billion and \$3 billion, respectively, for the same year. Thus, these three nations alone represent demand of more than \$20 billion.

Apparent demand in the U.S. for electric motors and generators was \$7.9 billion in 1989, a figure which is expected to grow 2-3% annually over the next five years due to increased demand from the construction and air conditioner sectors, resulting in demand of \$8.94 billion by 1994. In addition, domestic shipments of transformers totaled \$3.3 billion in 1987.

Against this backdrop, the market share of imports is increasing. In 1988 imports captured 23% of the market for electric motors and generators and 16% of the transformer market. Suppliers included Japan, Korea, Taiwan, Hong Kong, Singapore, West Germany, Canada, and Mexico. Imports garnered the largest shares in three areas -- small electric motors (less than 1 hp), generators (less than 400 KVA), and small distribution transformers (less than 500 KVA) -- with U.S. manufacturers in these sectors seen to be losing their competitiveness and gradually giving in to imports.

The West German market experienced a slight contraction during the 1986-1988 period, reflecting a sudden increase in exports despite growth in both domestic production and imports. Corporate restructuring in preparation for the EC market integration of 1992 and increased investment for R&D are expected to further intensify competition in this market.

## **(2) World Imports According to OECD Statistics**

Tables 4-2-1a and 4-2-2a show the latest OECD statistics (1987) for worldwide imports and exports of electrical machinery. Table 4-2-1b and 4-2-2b take up the ASEAN nations in particular for comparison. Table 4-2-3 shows the top five importers among the industrialized nations and among Asian countries/regions.

Based on these Tables, worldwide imports of electrical machinery (including DC machinery, AC motors, AC generators, and transformers) totaled approximately \$6 billion in 1987 (this figure is limited to exports from OECD nations), with AC motors accounting for \$2 billion, transformers for \$1.8 billion, DC machinery for \$1.6 billion, and AC generators for about \$600 million. Leading markets included the U.S. and European nations such as West Germany, France, the U.K., and Italy, followed by Asian nations such as Singapore and Korea. Japanese imports amounted to only \$27 million. However, Japanese government measures to promote imports are expected to bring about a gradual increase in this figure in the future.

Table 4-2-2 shows leading exporters based on 1987 OECD figures. As can be seen from the Table, West Germany was the leading exporter, at more than \$1 billion, followed by Japan, the U.S., France, Italy, Switzerland, Taiwan, the U.K., Mexico, and Sweden, in that order. This group was followed by the Netherlands, Korea, Hong Kong, Belgium/Luxembourg, and Denmark.

The main destinations of West German exports were EC nations and the U.S. Japan exported to Australia in addition to the U.S. and Europe, while major destinations for U.S. exports included Japan and Canada.

Taiwan, Mexico, Korea, and Hong Kong are among the NIEs struggling to catch up with European nations, the U.S., and Japan. Taiwan exported mainly DC machinery and transformers to Japan and the U.S., while Mexico supplied AC motors to the U.S.; Korea, transformers to Japan; and Hong Kong, DC machinery to Europe and the U.S.

As shown in Table 4-2-2, Indonesian exports in 1987 totaled \$1.802 million based on OECD figures, the great majority of this figure (\$1.747 million, or 96.6%) consisting of transformer sales. Sweden was the leading purchaser. At look at the position of Indonesia in the ASEAN nations, shown by Table 4-2-1b and Table 4-2-2b shows that Indonesia was second in imports in the region and fourth in exports. By type of imports, Indonesia was top in transformers and AC generators. In particular, it accounted for 76 percent of the value of imports of the ASEAN nations of AC generators. In exports, aside from transformers, Indonesia was merely exporting samples.

**Table 4-2-1a: Imports from OECD Countries By Type (1987)**

(Unit: US\$1000)

Importing country/region	DC machinery	AC motors	AC generators	Transformers	Total
[1] U.S.	220,447	119,081	94,205	102,628	536,361
[2] F.R.G	124,957	248,702	17,517	117,851	509,027
[3] France	137,864	140,646	13,294	86,101	377,905
[4] U.K.	107,954	121,188	13,792	80,581	323,515
[5] Italy	87,481	122,910	10,456	44,094	264,941
[6] Netherlands	48,643	118,597	14,888	55,904	238,032
[7] Belgium					
Luxembourg	49,139	103,186	8,742	61,143	222,210
[8] Canada	88,858	82,337	8,702	33,179	213,076
[9] Singapore	138,545	18,403	3,816	41,483	202,247
[10] R.Korea	106,882	39,369	16,528	34,306	197,085
[11] Taiwan	22,484	23,907	3,679	50,289	196,259
[12] China	16,605	22,458	9,875	80,655	129,593
[13] Iran	3,439	17,595	29,494	60,879	111,407
[14] India	22,678	13,560	24,713	34,949	95,900
[15] Australia	18,034	35,582	20,094	21,501	95,211
[16] Indonesia	2,236	7,660	39,098	42,868	91,862
Japan	6,287	9,698	2,398	8,645	27,028
World Total	1,589,155	1,979,149	555,111	1,785,960	5,909,375

**Table 4-2-1b: Imports from ASEAN Countries By Type (1987)**

(Unit: US\$1000)

Exporting country/region	DC machinery	AC motors	AC generators	Transformers	Total
[1] Singapore	138,545	18,403	3,816	41,483	202,247
[2] Indonesia	2,236	7,660	39,098	42,868	91,862
[3] Malaysia	2,092	6,788	4,806	16,666	30,352
[4] Thailand	4,156	6,594	3,008	9,582	23,240
[5] Philippines	1,187	2,551	130	4,724	8,592
Asean Total	148,216	41,996	50,858	115,323	356,393

Note: Prepared from export statistics of OECD countries arranged by export destinations  
Source: OECD foreign trade statistics

**Table 4-2-2a: Exports of Key Countries by Type (1987)**

(Unit: US\$1000)

Exporting country/region	DC machinery	AC motors	AC generators	Transformers	Total
[1] F.R.G.	300,710	528,411	45,811	181,533	1,052,465
[2] Japan	197,411	207,501	58,926	98,092	561,930
[3] U.S.	186,043	188,108	34,845	123,009	532,005
[4] France	108,907	181,689	27,826	48,980	367,402
[5] Italy	38,285	193,610	18,599	43,784	294,278
[6] Switzerland	88,265	132,870	22,409	46,196	289,740
[7] Taiwan	118,089	37,411	2,682	98,025	256,207
[8] U.K.	65,659	87,730	40,879	45,450	239,718
[9] Mexico	27,352	139,896	869	49,961	218,078
[10] Sweden	41,158	105,494	10,313	43,780	200,745
[11] Netherlands	39,063	44,411	20,598	57,334	161,406
[12] R.Korea	16,611	31,784	1,053	86,550	135,998
[13] Hong Kong	66,725	29,090	1,693	25,560	123,068
[14] Belgium					
Luxemboug	41,305	26,695	2,947	50,899	121,846
[15] Denmark	39,352	51,440	2,250	18,541	111,285
Indonesia	31	21	3	1,747	1,802
W. Total	1,520,466	2,373,259	318,073	1,310,391	5,522,189

**Table 4-2-2b Exports of ASEAN Countries by Type (1987)**

(Unit: US\$1000)

Exporting country/region	DC machinery	AC motors	AC generators	Transformers	Total
[1] Singapore	15,393	27,402	424	13,446	56,665
[2] Thailand	10,619	639	-	-	11,258
[3] Malaysia	1,116	157	183	519	1,975
[4] Indonesia	31	21	3	1,747	1,802
[5] Philippines	93	479	-	-	572
Asean Total	27,252	28,698	610	15,712	72,272

Note: Prepared from import statistics of OECD countries arranged by countries of origin

Source: Same as previous table.

**Table 4-2-3: Matrix of Main Exporting and Importing Countries by Type of Electrical Machinery (1987)**

(Unit: US\$1000)

DC machines			Importing countries (top five)							
Exporting countries (Advanced countries)										
FRG	France	78,367	USA	43,548	UK	37,107	Italy	31,592	Netherlands	13,164
Japan	USA	108,595	UK	21,107	FRG	16,173	Australia	6,968	Italy	6,448
USA	Canada	57,678	FRG	31,178	UK	23,248	Japan	22,711	Netherlands	12,495
France	FRG	29,176	USA	24,889	Italy	16,273	UK	8,606	Belguim	5,577
Italy	FRG	10,804	France	9,918	UK	5,918	USA	1,273	Belgium	785

(Asia)

Taiwan	Japan	80,648	USA	17,007	FRG	5,078	Netherlands	3,792	UK	1,796
R. Korea	Japan	15,543	USA	592	UK	191	FRG	156	Canada	67
Hong Kong	USA	23,778	FRG	20,704	Japan	7,780	France	4,264	UK	3,386
Singapore	USA	5,636	Japan	5,527	FRG	897	Netherlands	555	UK	472
Indonesia	UK	26	FRG	4						

AC motors, including general use (AC and DC) motors

Exporting countries (Advanced countries)			Importing countries (top five)							
FRG	Italy	86,885	Netherlands	73,017	France	59,505	USA	52,572	UK	42,385
Japan	USA	126,317	UK	18,364	Australia	16,891	FRG	9,837	France	9,633
USA	Canada	72,268	FRG	29,832	UK	18,310	France	11,800	Japan	10,871
France	FRG	61,662	Italy	35,931	Belgium	14,452	Netherlands	12,398	UK	11,062
Italy	France	57,279	FRG	56,326	UK	16,938	Netherlands	8,389	USA	6,707

(Asia)

Taiwan	USA	18,776	Japan	5,757	Australia	4,198	UK	2,235	France	2,102
R. Korea	USA	26,824	Japan	2,403	Canada	752	Netherlands	33	FRG	26
Hong Kong	USA	12,896	FRG	4,582	UK	2,577	Italy	1,758	Japan	1,598
Singapore	USA	18,328	Japan	6,336	FRG	943	Netherlands	545	UK	318
Indonesia	Italy	17	UK	1						

AC generators  
Exporting countries  
(Advanced countries)

Importing countries (top five)

F.R.G.	France	11,677	Netherlands	4,277	Italy	3,937	Denmark	3,258	Belgium	1,728
Japan	Netherlands	48,687	France	4,681	UK	1,260	FRG	689	Denmark	127
USA	Netherlands	10,381	Canada	6,222	Japan	3,558	France	3,726	Netherlands	2,044
France	UK	6,971	FRG	3,213	Belgium	3,034	Canada	2,778	Netherlands	2,250
Italy	France	5,554	UK	2,090	FRG	1,623	Belgium	781	Australia	712

(Asia)

Taiwan	France	2,524	UK	63	Belgium	22	Japan	21	FRG	12
R. Korea	France	692	Japan	358	Denmark	3				
Hong Kong	France	1,369	Italy	283	UK	32	Belgium	1	Australia	1
Singapore	France	249	UK	100	Japan	67	Netherlands	5	Australia	1
Indonesia	UK	3								

Transformers  
Exporting countries  
(Advanced countries)

Importing countries (top five)

F.R.G.	France	25,626	Netherlands	24,328	Belgium	16,225	Italy	13,308	UK	12,628
Japan	USA	32,673	UK	20,888	FRG	15,821	France	6,813	Australia	5,833
U.S.A.	Canada	37,200	FRG	13,938	UK	13,421	Japan	11,873	Italy	6,258
France	FRG	11,651	Belgium	10,228	Italy	6,602	USA	3,436	UK	2,111
Italy	France	12,559	FRG	9,585	Netherlands	3,518	UK	3,003	USA	2,213

(Asia)

Taiwan	USA	52,903	Japan	30,669	FRG	3,069	Netherlands	2,137	Canada	1,470
R. Korea	Japan	66,777	USA	13,760	France	2,225	Canada	617	Italy	511
Hong Kong	USA	12,568	UK	2,252	Japan	2,092	FRG	1,814	Australia	1,569
Singapore	UK	4,851	USA	3,514	FRG	1,748	Japan	1,173	Netherlands	748
Indonesia	Japan	7	UK	1	France	1				

Note: Statistics of Belgium include figures for Luxembourg.  
Source: Same as Table 4-2-1.



### (3) U.S. Market

#### 1) Local Industries

There are more than 600 manufacturers of electric motors, generators, and transformers in the U.S., but the four leading producers -- G.E., Westinghouse, Emerson, and Honeywell -- are responsible for about 36% of all electric motor and generator shipments and more than half of all shipments of transformers.

The U.S. industry is presently faced with the dual problems of excess production capacity and intensified competition from imports, and during the past ten years shipments have fallen off and earnings ratios declined. From 1972 to 1988, actual local shipments grew at an annual rate of less than 1%.

Consequently, U.S. manufacturers are (1) withdrawing from low-profit sectors; (2) restructuring to boost competitiveness on the world market; and (3) approaching capital and technical tie-ups with foreign partners. Direct investment by U.S. manufacturers has appeared in the form of the relocation of production operations to Mexico, Canada, Brazil, and Singapore, and joint venture investments have been made in Korea, Taiwan, Japan, Thailand, India, and Indonesia. In addition, the outright purchase of foreign companies, partial stock acquisition in U.S. companies, technical tie-ups, and the procurement of imported components are all becoming commonplace. Although the outlook for local shipments of electric motors and generators is not a bright one, the future is looking up for small electric motors.

The transformer sector is likely to remain a buyers' market through 1993, as yearly growth of approximately minus 2% is expected, but the market is expected to start growing again from around 1994-95.

**Table 4-2-4: Domestic U.S. Shipments of Electrical Machinery**

(Unit: US\$ million)

	Motors/Generators	Transformers
1986	6,198.6	3,398
1987	6,806.2	3,270
1988	7,450.8	-

Source: U.S. Commerce Department

#### 2) Imports

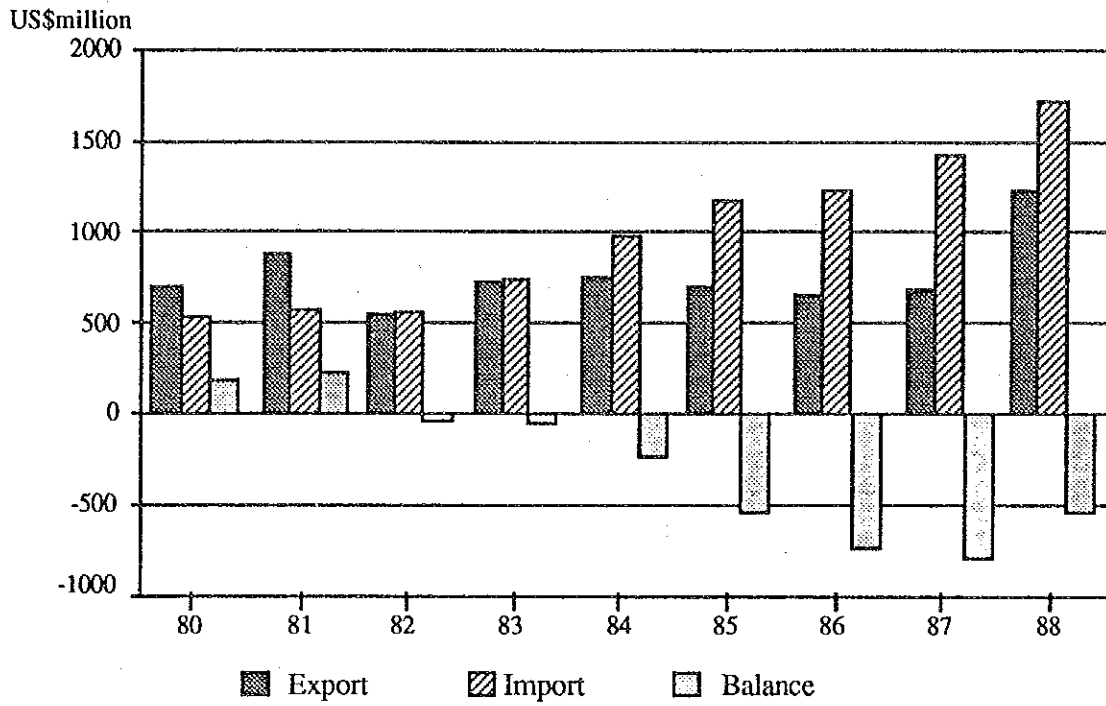
U.S. imports of electrical machinery showed steady annual growth of 17-18% during the years from 1972 to 1988. Imports of transformers exceeded exports for the first time in 1979, with the same occurring for electric motors and generators in 1982. Starting in 1985, the trade imbalance in the electric motor and generator and transformer sectors began to expand rapidly (see Tables 4-2-1 and 4-2-2). Imports of electric motors and generators amounted to \$1.8 billion in 1988 (23% of apparent demand), while transformer imports totaled approximately \$600 million for the same year (16.8%).

According to American industry experts, the outlook for imports over the next five years will depend on overall economic prosperity (including the construction industry), capital investment by end users, and cost reduction efforts by U.S. manufacturers, but imports of electric motors and generators are expected to increase their share of total demand to about 30% by 1995.

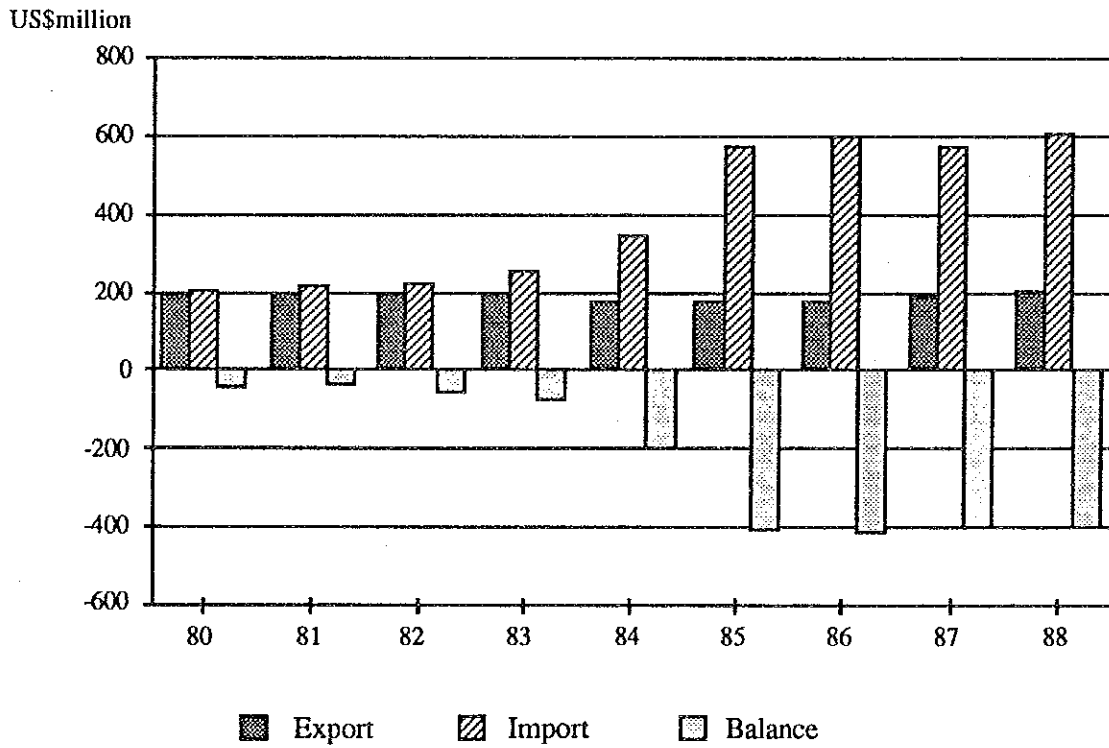
Transformer imports have continued strong despite the overall stagnation in demand, and during the next five years are expected to account for 16-20% of total demand.

Imports from Indonesia are not included in U.S. import statistics and can be considered negligible. At present, however, the U.S. electrical machinery industry is being threatened by imports and is rapidly losing its market share. Future survival will require the relocation of production bases to countries offering inexpensive labor and the switch to inexpensive imported components. Leading manufacturers have already established production facilities in Mexico, Canada, Brazil, and Singapore. With the coming improvements in Indonesia's technical levels, it is possible that U.S. manufacturers will turn to Indonesia for (1) import of components, (2) technical cooperation, and (3) investment in the form of joint ventures.

**Fig. 4-2-1: Trends in Imports and Exports of Motors/Generators in U.S.**



**Fig. 4-2-2: Trends in Imports and Exports of Transformers in U.S.**



**Table 4-2-5: Trends in Imports of Small Motors of U.S. by Country**

(Unit: US\$1000)

	1984	1985	1986	1987	1988
Japan	117,958	102,947	116,315	145,284	180,765
Mexico	97,865	112,572	120,452	138,206	152,914
Hong Kong	26,926	29,306	24,143	32,810	54,143
F.R.G.	25,069	22,506	33,740	37,794	48,177
R. Korea	8,848	12,215	4,202	20,332	38,148
Taiwan	11,734	16,671	19,338	19,894	27,516
Singapore	30,663	21,930	17,811	17,269	19,118
Canada	25,511	19,385	23,266	21,493	19,062
Switzerland	5,798	5,298	6,411	7,256	9,286
Others	18,472	30,588	38,419	44,179	54,220
Total	368,844	373,418	404,097	484,520	603,349

Source: Statistics of U.S. Commerce Department

**Table 4-2-6: Projections of Capital Expenditures of U.S. Power Industry**

(Unit: US\$ million)

Year	Generation	Transmission	Distribution	Other	Total
1988	13,505	3,200	9,895	1,768	28,368
1989	12,574	3,500	9,910	1,924	25,894
1990	10,372	3,500	9,200	1,786	24,858
1991	9,180	3,140	9,770	1,671	22,090
1992	5,700	2,706	10,750	1,245	19,155
1993	6,700	3,300	9,450	1,264	19,450
1994	9,765	3,700	9,730	1,508	23,195
1995	13,380	4,200	9,820	1,781	27,400
1996	18,470	4,500	9,895	2,136	32,865
1997	25,425	4,650	9,950	2,600	40,025
1998	29,760	4,825	9,960	2,895	44,545
1999	31,340	5,000	9,985	3,011	46,325
2000	30,140	4,700	10,100	2,925	44,940

Source: Electrical World, October 1989

**Table 4-2-7: Projections of Installation of Distribution Transformers of Under 46 KVA in U.S. from 1989 to 1994**

(Unit: MVA)

	1989	1990	1991	1992-94
Total	36,556	36,382	37,211	99,752

**Table 4-2-8: Projections on U.S. Demand of Motors and Generators**

(Unit: US\$ million)

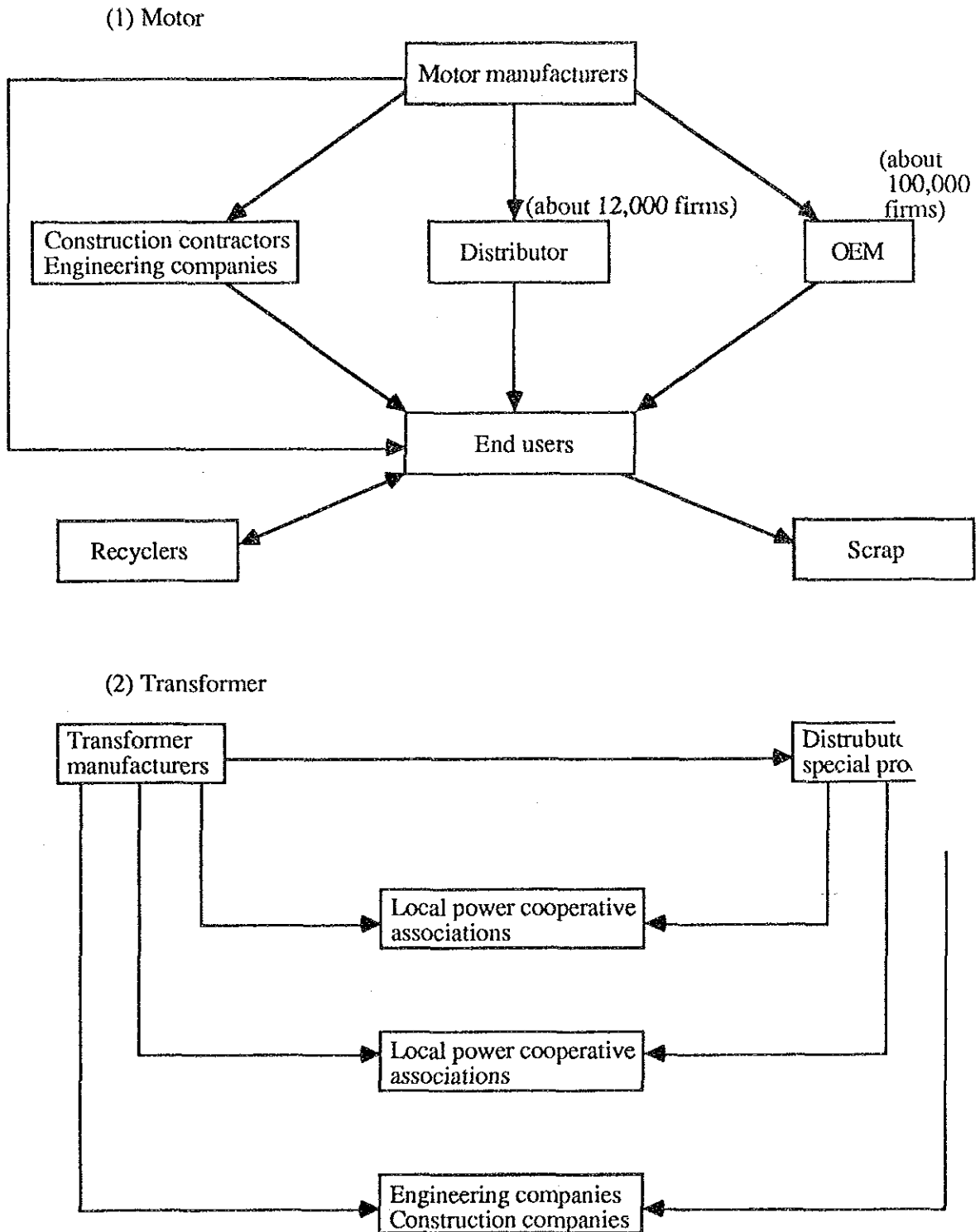
1989	7,898.2
1990	8,095.7
1991	8,298.1
1992	8,505.5
1993	8,718.2
1994	8,936.1

Source: Projections of U.S. industry

### 3) Distribution Channels

U.S. Distribution channels for electric motors and transformers are shown below.

Fig. 4-2-3: Distribution Route of Electrical Machinery in the United States



#### 4) Manufacturing Costs

U.S. manufacturing costs for electric motors and transformers are as follows:

Raw materials	30-40%
Labor	15-20%
Energy	1-2%
Other costs	30-50%

Raw material costs have risen rapidly during recent years, with especially steep price hikes for magnet wire, non-ferrous metals, and carbon steel.

The average hourly wage of a worker has also risen 2.1-fold, from \$4.78 in 1975 to \$10.04 in 1987.

#### (4) West German Market

##### 1) Local Production

In West Germany, production of electric motors and generators in 1988 accounted for just 4.4% of total domestic production of electrical machinery. The same figure for transformers was 1.4%, the two sectors accounting for a mere 5.8% of total production in the industry.

Table 4-2-9 shows 1986-88 production of electric motors, generators, and transformers in West Germany, with the total for 1988 exceeding 8.3 billion marks. Table 4-2-10 provides a breakdown of production volume and value.

**Table 4-2-9: Trends in Domestic Production of Electrical Machinery in West Germany**

(Unit: million marks)

	1986		1987		1988	
	Production	Change from prior year (%)	Production	Change from prior year (%)	Production	Change from prior year (%)
Generators and motors	6,248.1	+4.2	6,182.6	-1.0	6,378.5	+3.2
Transformers	2,026.9	+3.1	1,873.8	-7.6	1,965.3	+4.9
Total	8,275.0	+3.9	8,056.4	-2.6	8,343.8	+3.6

Source: Statistics of West German Electrical and Electronic Manufacturers' Association (ZVEI)



**Table 4-2-10: Production of Motors, Generators, and Transformers of West Germany**

(Unit: 1000 pieces for volume and million marks for value)

	1986	1987	1988	1986	1987	1988
<b>DC machines</b>						
0.75-7.5KW	218	201	197	246	210	202
7.5-75KW	35	28	31	170	151	157
75-750KW	5	5	5	87	96	91
750KW and over	0.1	0.2	0.09	38	59	31
<b>Single-phase AC motors</b>						
0.05-0.375KW	9,152	9,231	10,245	418.7	428.0	463.9
0.375KW and over	1,565.3	1,540.7	1,668.5	135.2	126.1	130.3
<b>Multi-phase AC motors</b>						
0.05-0.375KW	815.1	812.7	921.7	218.3	219.4	238.9
0.375-7.5KW	2,697.9	2,675.9	2,954.3	1,092.1	1,100.5	1,226.5
7.5-75KW	202.0	193.4	224.5	368.5	339.0	372.5
75KW and over (1KW and under)	13.1	11.4	12.8	176.9	150.7	169.9
75-750KW	2.0	1.5	1.6	79.7	64.6	61.5
750KW and over	0.8	0.9	0.8	160.1	181.8	131.9
<b>AC generators</b>						
7.5-75KVA	3.3	5.3	10.2	14.4	17.5	19.3
75-750KVA	1.9	2.6	3.0	34.5	29.1	37.3
750-3000KVA	0.5	0.4	0.4	52.0	32.1	36.5
3000KVA and over	0.2	0.1	0.1	182.9	280.9	210.4

	1986	1987	1988	1986	1987	1988
<b>Oil immersed transformers</b>						
650KVA and under	12.9	8.6	7.8	129.3	87.5	77.3
650-1600KVA	1.9	0.9	0.8	45.1	24.2	20.4
1600-10000KVA	0.4	0.5	0.4	41.2	52.3	42.4
10000KVA and over	0.4	0.3	0.3	414.6	373.5	356.1
<b>Dry type transformers</b>						
0.01-1KVA	14,200.0	16,800.0	20,300.0	264.8	268.0	309.0
1-16KVA	3,100.0	2,100.0	2,200.0	140.8	124.1	138.8
16KVA	12.7	12.4	13.8	150.7	142.2	131.2

Source: Prepared from statistics of Federal Statistics Bureau and ZVEI.

## 2) Import/Export Trends

Overall, West German manufacturers export about 30% of all domestic production (amounting to roughly 2.5 billion marks in 1988), with more than 70% of all shipments destined for other European nations such as the Netherlands, Italy, and Belgium. 46% of generator exports, on the other hand, is sent to developing nations in Asia and Africa.

Imports totaled 1.1 billion marks in 1988, which translates into roughly 40% of apparent demand. As shown in Table 4-2-11, major suppliers include European neighbors such as France, Italy, and the Netherlands along with EFTA countries, the U.S., and Japan. Imports from European countries accounted more than 80% of the total, however, with further gains continuing against the U.S. and Japanese shares. Imports from West German subsidiaries in Spain and Austria are also on the rise. Imports from the Asian NIEs reached the 12-million-mark level in 1988, but this figure represents only 1.1% of total imports, and with the considerable fluctuations seen each year in this market such a figure hardly constitutes a significant presence.

**Table 4-2-11: Imports of Electrical Machinery in West Germany (1988)**

(Unit: million marks)

Country of origin	Generators	Motors	Transformers
Europe	62,659	614,332	227,578
EC	42,525	361,955	128,965
(France)	9,587	121,831	47,191
(Italy)	8,896	111,934	22,377
(Netherlands)	7,645	15,293	17,910
(U.K.)	6,130	19,009	10,319
EFTA	18,462	207,587	81,726
Non-European countries	20,399	83,389	82,463
U.S.A.	9,233	49,404	25,803
Japan	8,850	17,747	29,577
Developing countries	1,145	15,471	21,454
Total	83,064	697,746	310,058

Source: ZVEI trade statistics

## 3) Industry Trends and the Demand Forecast

Apparent demand for electric motors and generators dropped at an annual rate of 2.4% over the last three years. As shown in Table 4-2-12, 1988 demand was less than 4 billion marks, down from 1986-87.

In line with this overall trend, demand for transformers dropped an average of 1.9% each year during 1986-1988, falling to slightly more than 1 billion marks in 1988. This was due mainly to small increases in electrical power consumption and surplus supply capacity in the electric power industry.

Local demand for electric motors is basically dependent on investment trends in the machinery, iron and steel, and electrical industries. Continued investment for the automation of the production process means a bright outlook for speed-controlled motors during the next few years. In the export sector as well, the prospects are good for electric motors for special application in system technology-related areas together with related

expertise, both of which are in high demand. It is believed, however, that manufacturers of variable-speed-control electric motors will have difficulty settling on a format.

In the field of electrical power technology, Siemens predicts annual growth of 11% through 1992. This figure takes into account the 15% annual growth expected in sales of controllable three-phase current power units, which currently account for 3 billion marks in annual sales, and outpaces the average rate of growth for the world electrical machinery market by two- to three-fold. According to Siemens, the company currently maintains a 10% share of the world market. By 1992-93 the firm is expected to have invested 400 million marks in R&D for phase current technology, and digitally-controlled variable-speed phase current power units will probably be in the spotlight of attention. As a result, demand in sectors such as machine tools, railways, and air pipes for blast furnaces is expected to double by 1992.

On the other hand, the situation for the transformer industry is not nearly so rosy. The current surplus in production capacity and the trend towards energy conservation make doubtful any improvement through the 1990s. Since 1988, the number of European manufacturers of transformers has dwindled to only five as the result of plant closures and corporate buyouts, and in West Germany there have been only two firms since 1985 -- ABB (located in Mannheim) and Trafo-Union (located in Nurnberg), a Siemens group company -- due to cutbacks in production facilities and mergers.

The future of the European transformer industry will be determined by these five remaining manufacturers. Both Siemens and ABB are now considering further cost reduction measures and reexamining current production capacities as part of their efforts towards restructuring. Increased local production of transformers overseas is likely to further intensify competition in the export market. Siemens, however, does expect a turnaround in demand for moulded resin transformers and large-size special power transformers.

**Table 4-2-12: Apparent Demand of Electrical Machinery in West Germany**

(Unit: million marks)

Demand by type of machinery	1986	1987	1988	Annual change from 1986 to 1988 (%)
<b>Motors and generators</b>				
Domestic production	6,248.1	6,182.6	6,278.5	+1.0
Export	3,565.1	3,525.9	4,061.8	+6.7
Domestic sales	2,683.0	2,656.7	2,316.7	-7.1
Imports	1,473.4	1,494.2	1,645.8	+5.7
Apparent demand	4,156.4	4,150.9	3,962.5	-2.4
<b>Transformers</b>				
Domestic production	2,026.9	1,873.8	1,965.3	-1.5
Export	1,340.0	1,210.6	1,293.9	-1.7
Domestic sales	686.9	663.2	671.4	-1.1
Imports	387.6	396.5	363.0	-3.2
Apparent demand	1,074.5	1,059.7	1,034.4	-1.9

Note: The trade statistics were tailored to the production statistics, so there is no match with the import statistics of Table 4-2-11.

Source: Calculated from statistics of ZVEI

## **(5) Japanese Market**

### **1) Local Production**

Japan's heavy electrical machinery industry consists of manufacturers of (1) boilers, turbines, and other related parts for power generation, (2) generators, induction motors, and other rotating electrical machinery, and (3) transformers, rectifiers, capacitors, and other stationary electrical equipment. Since the end of World War II the industry has experienced steady development boosted by the increased need for electrical power accompanying the heavy and chemical industrialization undertaken by the nation during its period of high economic growth. With the 1973 oil crisis as a turning point, however, the Japanese industrial structure began the shift from an energy-intensive to a knowledge-intensive one centered around processing and assembly, and the heavy electrical machinery industry suffered as a result. Although a temporary reversal of this trend was achieved in 1984 as the result of increased exports and renewed capital investment, production has shown little growth since 1985. Production of electrical machinery in 1987 totaled ¥1,078.7 billion, with heavy electrical machinery accounting for 31.4% of this total. A breakdown by type of equipment is as follows: electric motors, ¥712.6 billion (66.1%); transformers, ¥235.1 billion (21.8%); generators, ¥89.6 billion (8.3%); and DC machinery, ¥41.5 billion (3.8%).

With the exceptions of small electric motors and standard transformers, production of all types of equipment has fallen since 1985 in reflection of the drop in exports.

**Table 4-2-13: Trends in Production of Electrical Machinery in Japan**

(Unit: 100 million yen for value, 1000 pieces for volume)

	1975	1978	1981	1984	1985	1986	1987	1988
<b>DC machines</b>								
Value	323	393	542	639	662	518	415	421
Volume	56	229	163	359	551	291	267	-
<b>Generators</b>								
<b>DC generators</b>								
Value	558	1,352	1,460	1,515	1,046	898	895	1,069
Volume	271	906	1,058	1,088	1,176	769	728	-
<b>Motors</b>								
Value	2,250	3,265	3,873	6,067	6,607	6,778	7,126	6,834
<b>AC motors</b>								
Value	1,723	2,326	2,600	2,904	2,933	2,574	2,498	2,604
Volume	17,516	27,628	27,255	35,933	35,756	31,633	35,418	-
<b>Standard single-phase induction motors</b>								
Value	41	59	52	57	41	36		
Volume	477	712	654	823	501	418		
<b>Custom made single-phase induction motors of over 70W</b>								
Value	294	483	499	689	673	602	641	
Volume	9,525	16,283	17,039	23,409	24,219	21,953		-
<b>Standard three-phase induction motors</b>								
Value	220	313	299	365	368	309		
Volume	1,325	1,948	1,715	1,965	1,857	1,605		
<b>Standard three-phase induction motors of under 11 KW</b>								
Value	175	257	244	292	289	245		
Volume	1,284	1,898	1,667	1,905	1,796	1,552		

Standard three-phase induction motors of over 11 KW

Value	45	56	55	74	78	64
Volume	41	50	48	60	61	54

Custom made three-phase induction motors of over 70W

Value	984	1,232	1,460	1,454	1,545	1,331	1,307
Volume	2,125	3,698	3,613	5,323	5,647	4,989	-

Synchronous motors of over 70W

Value	38	39	36	36	59	87
Volume	7	5	3	10	26	56

Commutator motors of over 70W

Value	14	21	18	30	27	20
Volume	175	218	169	465	422	218

Variable-speed control electric motors of over 70W

Value	18	32	54	69	64	47
Volume	12	28	63	87	81	57

Electric sewing machine motors

Value	69	80	84	76	69	52
Volume	3,587	4,418	3,633	3,389	2,670	2,047

Clutch motors

Value	42	66	97	128	86	91
Volume	281	315	365	456	328	287

Small motors of under 70W

Value	527	939	1,273	3,162	3,134	4,203	4,078	4,230
Volume	-	-	-	-	-	-	630,236	-



Transformers

Value	1,374	2,366	2,328	2,217	2,237	2,469	2,351	2,214
Volume	2,494	4,618	5,184	6,187	6,218	-	-	-

Standard

Value	240	517	455	400	422	547	564	550
Volume	313	545	437	374	383	468	468	-

Custom made

Value	846	1,409	1,398	1,247	1,280	1,402	1,275	1,186
Volume	40	63	66	98	97	107	106	-

Others

Value	-	-	-	-	534	521	511	
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Source: Figures from "Long Term Demand Projections by Product", published by Tsusan Shiryo Chosakai and materials of Japan Electrical Manufacturers Association

## 2) Export/Import Trends

Table 4-2-14 shows recent trends in Japanese exports of electrical machinery. As can be seen from the Table, 1987 exports were valued at approximately ¥250 billion, accounting for 23.2% of domestic production, with the main buyers including Asian nations such as Korea, Singapore, Indonesia, and China together with Europe and the U.S. Asian nations accounted for 44.9% of all exports in 1987, compared with 20.0% for North America. The strength of the yen has brought about a downturn in exports, which once were responsible for more than 30% of Japanese production.

Japanese exports of electrical machinery to Indonesia in 1987 totaled ¥9.5 billion, the breakdown being as follows: generators, ¥6,321 million; transformers, ¥2,297 million; and electric motors, ¥863 million.

**Table 4-2-14: Trends in Exports of Electrical Machinery of Japan by Type**

(Unit: 100 million yen)

	1975	1978	1981	1984	1985	1986	1987
DC machines	29	69	163	135	163	-	-
Generators	372	899	1,423	1,492	1,280	834	685
DC generators	4	10	18	13	22	21	8
AC generators	209	465	597	588	348	264	265
Other generators	159	423	807	890	910	549	412
Motors	356	625	933	1,210	1,177	1,150	1,173
DC motors	25	59	146	122	141	144	134
AC motors	215	379	494	414	368	317	259
Small motors	116	186	292	671	667	688	779
Transformers	151	520	735	652	585	654	648
Of which, over 1000 KW	-	413	568	515	443	-	-

Source: Figures from "Long Term Demand Projections by Product", published by Tsusan Shiryo Chosakai and materials of Japan Electrical Manufacturers Association

**Table 4-2-15: Trends in Imports of Electrical Machinery of Japan***(Unit: 100 million yen)*

	1985	1986	1987	1988
<b>Generators</b>	51	37	19	59.5
DC generators	2	2	3.7	25.6
AC generators	28	17	8	31.6
Other generators	21	17	7	2.3
<b>Motors</b>	301	249	275	333
AC motors	33	34	18	-
DC generators	66	47	62	54.7
Other generators	200	167	194	278
<b>Transformers</b>	203	160	176	228.7

Source: Japan Electrical Manufacturers Association, "Heavy Electrical Machinery", 1987 edition and 1988 edition

Japanese imports of electrical machinery are tabulated in Table 4-2-15. Imports of generators dropped during the period 1985-1987, but rebounded to ¥5.95 billion in 1988, representing an increase of 313% over the previous year. A similar trend was indicated in the electric motor and transformer sectors, with increases of 121% and 130%, respectively, recorded for 1988. DC generator imports in particular grew 691.9%, followed by imports of AC generators, which grew 395%. The growth in electric motor imports was due primarily to increased imports of small electric motors, while imports of AC motors actually fell by 12%.

The main suppliers of generators were North America, at ¥4,168 million, followed by West Germany, at ¥456 million. Regional totals were ¥859 million for Europe (including West Germany) and ¥669 million for Southeast Asia. In the electric motor sector, North America again topped the list with exports of ¥1,269 million, followed by West Germany, with exports of ¥766 million. Europe was the largest regional exporter, with ¥2,313 million in products. Imports from Southeast Asia totaled ¥2,100 million.

Imports of transformers from Southeast Asia were noteworthy, at ¥19,875 million.

Product categories experiencing rapid increases in imports from Southeast Asia are shown in Tables 4-2-16 and 4-2-17.

**Table 4-2-16: Imports of Electrical Machinery from Southeast Asia (January to June 1989)**

(Unit: US\$1,000)			
	Value	Share (%)	Growth (%)
<b>Generators and motors</b>			
Taiwan	56,597	26.6	8.0
Hong Kong	21,450	10.1	123.4
Singapore	17,535	8.2	93.1
Thailand	9,477	4.5	90.5
<b>Transformers</b>			
Hong Kong	8,545	8.8	166.1
Malaysia	5,305	5.4	579.0

Source: "Trends in Japan's Imports of Manufactured Goods (January to June 1989), JETRO, September 1990

**Table 4-2-17: High Growth Imported Products in Japan by Country of Origin (January to June 1989)**  
(Products imported in amounts of over US\$1 million and with growth rates of over 40%)

	Volume	Value (US\$1000)	Growth over corresponding period of prior year (%)	
			Volume	Value
<b>U.S.A.</b>				
AC generators	378	5,178	-52.0	219.7
AC motors	112,000	9,357	115.4	42.4
DC generators and motors	642,000	15,621	42.4	47.2
DC motors with outputs of under 10W)	41,000	7,042	37.0	58.6
<b>F.R.G.</b>				
AC motors	40,000	5,000	60.0	45.5
<b>France</b>				
AC motors	163,000	3,378	158.7	45.9
<b>South Korea</b>				
DC generators and motors	9,304,000	13,672	44.4	53.5
<b>Hong Kong</b>				
DC generators and motors	43,827,000	18,861	113.7	152.8
DC motors(40,607,000 with outputs of under 10W)	13,950	116.8	217.0	
Transformers (except oil immersed)	66,363,000	8,545	145.7	166.1
Transformers (under 1 KVA)	66,360,000	8,537	146.9	169.6
<b>Singapore</b>				
DC generators and motors	12,532,000	14,127	291.4	204.9
DC motors (with outputs of under 10W)	12,431,000	13,223	289.0	187.6
Transformers (except oil immersed)	738,000	1,212	-20.7	81.3
Transformers (under 1 KVA)	738,000	1,212	-20.7	82.3

### Thailand

DC generators and motors	2,864,000	9,053	210.6	88.1
DC motors (without outputs of under 10W)	2,864,000	9,053	214.4	89.4

### Malaysia

Transformers (except oil immersed)	28,399,000	5,305	500.0	579.0
Transformers (under 1 KVA)	28,399,000	5,305	500.0	579.0

### China

DC generators and motors	20,652,000	11,400	389.2	218.0
DC motors (with outputs of under 10W)	60,602,000	11,393	388.0	217.8
Transformers (except oil immersed)	63,194,000	8,384	71.7	96.4
Transformers (under 1 KVA)	63,194,000	8,384	71.7	96.5

Source: Same as previous table.

### 3) Forecasted Trends for the Heavy Electrical Machinery Industry

In the post-1988 upswing, increased capital investment by manufacturers is affecting a wide variety of industries, and the current prosperity is expected to continue. In 1988, the increase in capital investment touched such diverse sectors as electrical machinery, a processing and assembly-oriented industry, chemicals, a materials-oriented industry, together with other manufacturing industries such as foodstuffs, printing, and publishing. Industry as a whole experienced a balanced upturn in capital investment. In 1989 the investment trend leaned towards electrical machinery and was centered around the processing-oriented industries, but a gradual increase in investment continues for industry as a whole, and with the current boom, fueled by internal demand, capital investment can be seen to be steadily growing over a broad area.

In the field of rotating electrical machinery, growth in small electric motors is expected to result from increasing office and factory automation and the spread of robots. In line with the worldwide trend towards technological innovation, recent capital investment is shifting towards areas like electronics and systems software, and further growth is expected in demand for stationary electrical equipment such as controlling equipment, universal inverters, and personal computers.

No growth is expected in the markets for other generators and transformers. Since these products form an integral part of the hardware of the heavy electrical machinery industry, however, the development of new semiconductor-related technologies in response to the innovations in electronics and systems software has become necessary. In the future, the heavy electrical machinery industry will have to work actively towards the development and manufacture of heavy electrical machinery incorporating semiconductor technologies.

Private companies had virtually their best year ever in 1990, with investment in facilities and research and development greater than for any other industry. In the future, huge amounts of investment will be required of the electrical machinery industry for the development of next-generation computers. An increasing shift from heavy electrical equipment to integrated electronics equipment is being seen among Japan's leading manufacturers of heavy electrical machinery. At one such manufacturer, for example, power generation plants, transformers, universal electric motors and other varieties of heavy electrical machinery sold mainly to electric power companies accounted for more than half of all sales until the mid-1980s. This figure dropped to 38% in 1987 and 36% in 1988, however, and a further decline to about 30% was expected for 1989. This is the result of single-digit annual growth for heavy electrical machinery during the past several years. On the other hand, semiconductors and other electronics devices together with factory automation and information processing-related equipment are experiencing significant growth. Manufacturers are not relegating themselves to the inevitable decline of the heavy equipment sector; rather, they are working towards the development of new growth products in this sector, which forms the backbone of the industry. Fuel cells, which constitute the next generation of power-generating devices, are one of the products receiving a great deal of attention. Fuel cells are highly efficient and free from environmental contaminants such as sulphur oxides (SOx) since they use natural gas for fuel. One Japanese giant company has undertaken a joint development and sales project with the U.S. firm International Fuel Cells, the world leader in this field.

## **(6) Competing Nations**

### **1) Korean Production and Consumption, Trade**

Korea's competitors include the U.S., West Germany, Japan, the U.K., and France, and the nation is naturally at a disadvantage in terms of material and parts procurement and technology. In terms of prices, Korea is quite competitive in the field of small, universal machinery, but in the area of large, special-order equipment numerous difficulties in procuring materials and parts from abroad make it difficult for the nation to compete with its industrialized rivals. In 1988, emphasis was being placed on internal demand, and the industry was characterized as an import substituting industry.

Since 1980 Korea's electrical machinery industry has achieved a rate of growth far outpacing the average rate of growth for all manufacturing industries in the areas of production value, number of corporations, and number of employees. According to a statistical survey report on the mining and manufacturing industries conducted by the Korean Economic Planning Agency production value increased from 48.3 billion won in 1980 to 232.2 billion won in 1987, an increase of 381%. During the same period, the number of companies increased 127%, from 376 to 853, and the number of employees grew 100%, from 26,000 to 52,000. In terms of production value, however, the electrical machinery industry represents only 2% of production by all manufacturing industries in the nation.

Demand for heavy electrical machinery grew at the high annual pace of 15.8% from 1985 to 1988, with 1988 production valued at \$1,458 million, an increase of 8.9% over the previous year. Imports, at \$950 million, accounted for 43.9% of domestic demand. Exports totaled \$245 million, accounting for 16.8% of domestic production. This extremely high reliance on imports should be curbed by promoting local industries.

In its plan for localization of machinery parts production, the government prepared development plans for 86 items in 1986-88. Development work on 21 of these has already been completed, and with the exception of two being put on hold local production of the remaining 63 is now being undertaken. Measures being used by the government include surveys to determine the gap with industrialized nations, financial assistance,

certification systems for quality and performance, the introduction of advanced technologies, the promotion of R&D work, and the attraction of foreign capital.

**Table 4-2-18: Trends in Supply and Demand of Heavy Electrical Machinery in South Korea**

(Unit: US\$ million)

		1985	1986	1987	1988	Average annual growth (%)
Total demand	Exports	122	137	179	245	26.1
	Domestic demand	1,427	1,819	2,275	2,163	14.8
Total		1,549	1,956	2,454	2,408	15.8
Total supply	Production	888	965	1,337	1,458	17.9
	Imports	661	991	1,117	950	12.8
Self-sufficiency (%) (production - exports)/domestic demand x 100		53.6	46.3	50.9	56.1	
Export ratio (%) (exports/production) x 100		13.7	12.6	13.4	16.8	
Export ratio (%) (imports/domestic demand) x 100		46.3	54.5	49.1	43.9	

Source: South Korean Tariff Agency, "Trade Statistics Yearly", and South Korean Electrical Industry Cooperative Association

The rotating electrical machinery sector experienced growth in production of generators (10.1%) and electric motors (25%) in 1988 as the result of government assistance and facility automation, both of which resulted in increased production capacity. In the stationary electrical equipment sector, increased replacement demand and the automation of electrical power systems and industrial facilities resulted in an 8.9% increase in production of transformers.



**Table 4-2-19: Production, Exports, and Imports of Electrical Machinery in 1988**

(Unit: US\$1000)

	Production	Average annual growth	Exports		Imports	
Generators	66,495	6.8	6,592	35.5	123,419	19.3
Motors	241,465	24.3	29,843	12.1	141,546	45.8
Transformers	160,179	5.1	56,819	15.4	14,423	7.8
Electrical machinery total	468,139	-	93,254	-	279,388	-
Share of total electrical machinery in heavy electrical machinery	32.1	-	38.0	-	29.4	-
Heavy electrical machinery total	1,458,007	-	245,150	-	950,113	-

Source: South Korean Electrical Industry Cooperative Association

1988 exports of generators, electric motors, and transformers totaled \$93.254 million, representing 38% of total exports of heavy electrical machinery. Areas recording significant increases over the previous year included electric motors (62%) and transformers (45%). This upward trend is expected to continue in 1989 as the result of the strong yen and improvements in technical levels and quality by the Korean industry.

Export destinations are concentrated in Southeast Asia and the U.S. Korea supplies countries in the former region mainly with generators and transformers while exporting electric motors to the U.S. The increase in exports to Japan has also been noteworthy, with annual growth of 62.6% during the 1985-1988 period. Imports from Japan during the same period grew at the slightly slower pace of 34.9%. Recently, imports of electric motors and generators from European countries have been increasing.

**Table 4-2-20: Trends in Exports to and Imports from Japan of Heavy Electrical Machinery by Year**

(Unit: US\$ million)

	1985	1986	1987	1988	Average annual growth (%)
Export total	122	137	179	245	26.1
Exports to Japan	10	12	19	43	62.6
Share of exports to Japan in all exports (%)	8.1	8.7	10.6	17.6	-
Import total	661	991	1,117	950	12.8
Imports from Japan	204	420	442	501	34.9
Share of imports from Japan in all imports	30.9	42.4	39.6	52.8	-

Source: South Korean Electrical Industry Cooperative Association

## 2) Singaporean Production and Consumption, Trade

In Singapore electric motors and dry transformers form the backbone electrical machinery production. Electric motors accounted for 78% of total production during 1986-1988. Transformers maintained a 22% share during the same period, with generators responsible for a mere 0.32% of total production.

Table 4-2-22 shows electrical machinery trade statistics for major importing nations.

Singapore is characterized by a high re-export ratio. Based on 1988 figures, re-exports were responsible for 34.1% of total exports of battery-driven electric motors, 41.7% for electric motors of less than 1 kw, 24.9% for electric motors of 1 kw or more, 95.2% for DC generators of less than 10 kw, 100% for DC generators of 10 kw or more, 79.1% for AC generators of less than 10 kw, 86.2% for AC generators of 10 kw or more, 59.6% for oil immersed transformers, and 42.5% for other types of transformers. The exports of generators, which are not produced in Singapore, are actually re-exports. Transformers account for 41% of all exports and 25% of all imports, indicating the greater demand for re-exports in comparison to the local products.

**Table 4-2-21: Trends in Production of Electrical Machinery in Singapore**  
(Unit: 1000 Singapore dollars, pieces)

	1986		1987		1988	
	Value	Volume	Value	Volume	Value	Volume
DC motors	66,500	25,100,000	150,000	56,600,000	263,000	99,200,000
AC motors	113,682	16,200,000	138,100	20,600,000	155,900	21,800,000
DC generators	149	400	432	6,000	924	2,500
AC generators	346	210	1,718	1,400	-	-
Oil immersed transformers	18	290	2	32	2	48,000
Other transformers	50,900	60,000,000	82,000	72,000,000	112,000	89,000,000

Source: Survey of the Electric Machinery Industry in Singapore

**Table 4-2-22: Value of Imports in 1988 by Main Country/Region**  
(Unit: 1000 Singapore dollars)

Battery driven motors	Japan	331,644	Thailand	80,246	Hong Kong	41,557
DC generators						
Under 10 KW	Japan	2,094	U.S.A.	1,177	Australia	849
Over 10 KW	France	3,742	Japan	2,989	U.S.A.	1,488
Other motors						
Under 1 KW	Malaysia	41,545	Japan	24,056	Taiwan	5,662
Over 1 KW	Japan	18,708	U.S.A.	17,352	Taiwan	9,306
AC generators						
Under 10 KW	Japan	5,595	China	1,480	U.S.A.	1,377
Over 10 KW	U. K.	6,627	U.S.A.	5,621	Japan	4,538
Oil immersed transformers	Malaysia	444	F.R.G.	81	Japan	59
Other transformers	Malaysia	153,470	Japan	96,868	Taiwan	36,367

Source: Same as before.

**Table 4-2-23: Example of Cost Analysis of Singapore**

Production item	Average manufacturing cost	Cost of electrical machinery	Share of same	Cost of materials	Labor cost
Automatic washing machines	380S\$	Drum motors (AC) 52S\$	13.6%	65%	32%
		Transformers 5S\$	1.3%		
1.5 hp air conditioners	520S\$	AC fan motors 68S\$	13.0%	75%	23%
Halogen lamp lighting equipment	220S\$	Transformers 190S\$	83.3%	90%	8%

Source: S\$ means Singapore dollars.

**Table 4-2-24: Supporting Industries of Singapore**

Production items	No. of manufacturers	Total no. of employees	Production capacity
Bolts and nuts	7	about 800	60,000 metric tons a year
Rotors and rotor shafts	0 specialized manufacture 20 sub-contractors or multi-product manufacturers	about 450	100 million units a year
Ball bearings	2 (mini bearing, SKF)	1,650	50 million units a year
Enamel wire	6	about 500	2,5000 metric tons a year
Casting	11	2,000	16,000 metric tons a year

### 4.3 Indonesian Industry Today

#### (1) APPI Organization and Activities

APPI, or the Association of Electrical Industries of Indonesia (Gajah Mada Tower Lantai 23, Jl, Gajah Mada No. 19-26, Jakarta 101-30; Tel: 366070 Ext. 2301, 2302; Telex: 45483 LOMAS IA; Facsimile: (6221) 3803919), is one of the electrical machinery industry associations in Indonesia. APPI stands for Asosiasi Produsen Peralatan Listrik Indonesia.

##### 1) Capsule History

In May 1976 the Association of Indonesia Electrical Panel Producers was established by 16 firms in the electrical panel sector. Electrical panels are used in wiring systems, control systems for electric motors, and as components in generators and transformers. Suggestions from the Ministry of Industry led to a unanimous decision by the group at a July 1977 meeting to change its name to the Association of Electrical Industries of Indonesia.

After this change in name, APPI became an official association for Indonesian manufacturers of electrical machinery. The current list of 63 member firms (as of May 1989) includes manufacturers of generators, generating sets, welding machines, electric motors, transformers, kwh meters, mini circuit breakers, insulators, transmission equipment, and various parts.

##### 2) Organization

The APPI Board of Directors for 1988-1990 is as follows:

Chairman	Subingar Sukartin, Director and President, PT. Siemens Indonesia
First Vice-Chairman	R. Sidharta, Director, PT. Merlin Gerin Indonesia
Second Vice-Chairman	Ir. Syahriar Syarif MBA, Director and President, PT. Arya Sada Daya ElektriKA
Third Vice-Chairman	Drs. Sutrisno, Director, PT. Adiasa Sakti
Fourth Vice-Chairman	Ir. Rudy Loprang, Sales Manager, PT. UNINDO
Auditor	Mohammad Yusef, Director and President, PT. Trafindo Perkasa
Standardization and Quality Control Department Chairman	Ir. Karel Pijpaert, Technical Consultant, PT. Merlin Gerin Indonesia
Generator and Electric Motor Department Chairman	Slamet Tjokrowerdojo, General Affairs Manager, PT. Alsthomindo
Transformer	Suwardi Tanu,

Department Chairman	Director, PT. Asata Utama
Switchboard Department Chairman	Sudiro, Electrical Division Manager, PT.Mega Eltra
KWH Meter and Miniature Circuit Board Department Chairman	Ir. Johnny Santosa, Sales Manager, PT.Sigma Bina Elekrika
Armature Lamp Department Chairman	Wirasmo Hesmoepранoto, Director, PT.Industira
Small Transformer and Ballast Department Chairman	Tolip Tanaga, Vice-President, PT.Nikkatsu Electrical Works
Construction Materials Department Chairman	R.B. Handoko, Director and President,PT. Silda Utama Fransindo
Electronic Components Department Chairman	Ir. Tedjo Suwarno, Assistant Manager, PT. Guna Elektro
Managing Director	Abdullah Baadilla
Consultants	Ir. Amir Husein Abdillah, Vice-President, PT. Newage Engineers Indonesia
	Widiarko, Director, PT. Mega Eltra
	Ir. Darius Fachruddin, Director and President, PT. Industira
<u>Eastern Java APPI</u> Chairman	Ir. Kusumahadi Ali, PT. Boma Bisma Indra
Vice-Chairman	Arthur Pelupessy B.Sc, MBA, PT. Bambang Djaja
Auditor	Hendratmo Tjahyadi, PT. Guna Elektro
General Manager	Ir. Loekito Koestantono, PT. Merlin Gerin Indonesia
Consultant	Ir. Harsono Koesoemo, PT. Merlin Gerin Indonesia
Location	Jl. Taman Ade Tirma Suryani Nasution No. 33, Blok H Lantai 3, Surabaya

The 63 member firms include five state-owned companies, 13 foreign affiliates, and 13 local (Indonesian) capital firms. Items produced by the 63 companies include electric motors, generators, transformers, ampere-meters, battery chargers, cable accessories, circuit breakers, contactors, central air-conditioning units, switches, sockets, plugs, fuse boxes, frequency meters, insulators, inverters, kwh meters, lighting fixtures, diesel motors, switchboards, control panels, fluorescent light ballast, voltage indicators, voltmeters, water level controllers, and welding machines.

As a whole, APPI member firms have invested a total of 425 billion rupiahs in the past and currently employ more than 13,400 workers.

### **3) Activities**

APPI is engaged in three major types of activities -- (1) providing information to user companies, (2) making suggestions to appropriate government bodies, and (3) attracting foreign capital.

(1) APPI is constantly working to promote members firms and their products through APPI catalogs and other publications, exhibitions, and symposiums.

(2) APPI is under the guidance of the Directorate General for Machinery, Basic Metal and Electronic Industry and various other directorate generals of the Ministry of Industry. In addition to improving quality through the application of industrial standards and thoroughgoing quality control measures, APPI works to cut back production costs through improved efficiency and productivity while at the same time offering suggestions to the Ministry of Industry concerning import regulations and customs duties. In this way, it helps to build a dynamic and healthy business environment. The organization also participates in the preparation of industrial standards together with the Directorate General for Electric Power and New Energy and the National Standardization Council (DSN).

(3) As a member of the Indonesia Electrical Association, APPI has established cooperative relationships with PLN and other major buyers, and as a member of the Indonesia Chamber of Commerce and Industry (KADIN) has made significant contributions to business activities in the electrical machinery industry. Furthermore, it is an active participant in the Association of Electricity Supply Industries of East Asia and the Western Pacific (AESIEAP) and is working to promote the attraction of foreign capital.

### **(2) Corporate Strategies**

#### **1) Number of Companies**

21 APPI member firms are engaged in the manufacture of generators, electric motors, and transformers. A list of these companies is provided below.

#### **Generators (8 companies)**

- PT. Pindad
- PT. Alsothomindo
- PT. Denyo Indonesia
- PT. Newage Engineers Indonesia
- CV. Echo
- CV. Guntur
- PT. Adi Perkasa Buana
- PT. Nur Cakera Mulia

#### **Electric motors (3 companies)**

PT. Indo Bangna Prima  
PT. Adi Perkasa Buana  
PT. Teco Multiguna Elektro

Transformers (11 companies)  
[Power transformers] (2 companies)  
PT. Unilec Indonesia (UNINDO)  
PT. Trafindo Perkasa

[Distribution transformers] (7 companies)  
PT. Panelindo Pura Jaya Tehnika  
PT. Unilec Indonesia (UNINDO)  
PT. Asata Utama Electrical Industries Ltd.  
PT. Trafindo Perkasa  
PT. Morawa Electric Transbuana  
PT. Rawa Buaya  
PT. Bambang Djaja

[Current transformers] (2 companies)  
PT. AEG Bina  
PT. Sari S.E.G.

[Auto transformers] (3 companies)  
PT. Sinar Elektronika SEB  
PT. Asata Utama Electrical Industries Ltd.  
PT. Morawa Electric Transbuana

[Small transformers] (1 company)  
PT. Nikkatsu Electric Works

Taking into account PT. Adi Perkasa Buana, which is engaged in production of both generators and electric motors, and the several firms which are engaged in the manufacture of different types of transformers, a total of 21 APPI member firms are involved in production of electrical machinery. There are also seven companies which do not belong to APPI but which produce electrical machinery. These firms are listed below.

Generators (3 companies)  
PT. Avankaick Indonesia (AVK)  
PT. Ahli Teknik Indonesia  
PT. Wira Mustika Indah

Electric motors (3 companies)  
PT. Emi  
PT. Wira Mustika Indah  
PT. Asea Sakti Utama = PT. Asea Brown Boveri Sakti (ABB)

Transformers  
[Distribution transformers]  
PT. First Pura Jaya Tehnika

[Other types]  
CV. Erka

Altogether, including both APPI members and non-members, there are 11 manufacturers of generators, 6 of electric motors, and 13 of transformers. Excluding



overlapped companies, this amounts to a total of 28 companies. The following Table provides a brief summary.

**Table 4-3-1: Number of Companies in Electrical Machinery Industry of Indonesia and Number of Companies Surveyed**

Production item	APPI members		Nonmembers		Total	
	No. of companies	No. surveyed	No. of companies	No. surveyed	No. of companies	No. surveyed
Generators	8	6	3	1	11	7
Motors	3	2	3	1	6	3
Transformers	11	7	2	1	13	8
No. of companies (except overlapping ones)	21	15	7	3	28	18

Note: Figures for companies surveyed exclude parts manufacturers etc.

## 2) Corporate Strategies

Corporate strategies at the 16 firms which responded to the questionnaire will be described below.

### [1] Corporate Scale

Table 4-3-2 shows a breakdown by capitalization of the 16 firms visited in the present survey together with Morawa Electric Transbuana and Adi Perkasa Buana, two leading manufacturers of transformers and generators. The Indonesian Ministry of Industry divides manufacturers into two categories -- small enterprises and medium- and large-scale enterprises -- on the basis of capitalization and assets. Small businesses are those operations (1) having less than 70 million rupiahs of investment in production facilities and equipment, (2) having less than 62,500 rupiahs in paid-in capital for each employee, and (3) capitalized locally. Firms which cannot fulfill each of these three conditions are considered to be medium- and large-scale companies. Based on this definition, all of the companies studied in the present survey fell into the latter category.

**Table 4-3-2: Breakdown of Companies Surveyed by Capital (No. of Companies)**

Capital (million rupiah)	Local capital	Foreign capital affiliated			Total
		Western	Japan	Others	
~ 70	0	0	0	0	0
70 ~ 100	1	0	0	0	1
100 ~ 500	2	1	1	0	4
500 ~ 1,000	4	0	0	0	4
1,000 ~ 5,000	3	2	0	0	5
5,000 ~ 10,000	0	0	0	1	1
10,000 ~ 50,000	1	2	0	0	3
50,000 ~	0	0	0	0	0
Total	11	5	1	1	18

Source: Questionnaire survey

### [2] Number of employees

Table 4-3-3 shows corporate scale in terms of the number of employees. Even the smallest of the 16 companies surveyed had more than 30 employees, and there were none of the "small-scale enterprises" defined by the Central Bureau of Statistics as having 5-19 employees. The same organization defines medium-scale enterprises as those having 20-99 employees and large-scale enterprises as those having at least 100. Consequently, nine of the companies surveyed, or about 56% of the total, were medium-scale enterprises, with the remaining seven falling into the large-scale enterprise classification. In summary, the companies studied in the current survey were medium- and large-scale companies when viewed by either capitalization and assets or by number of employees.

In the industrial classifications of the Central Bureau of Statistics, the electrical machinery industry is Number 38 among the major headings ("Manufacturer of fabricated metal products, machinery and equipment"). The percentages of large- and medium-scale corporations, small businesses, and handicraftsmen among those firms given the industrial classification number 38 according to a 1986 census are as shown in Table 4-3-4. Thus the companies studied in the current survey were among the 3.1% of medium- and large-scale firms.

**Table 4-3-3: Number of Companies by Number of Employees**

Number of employees	Generators	Motors	Transformers	Total
1 ~ 29	0	0	0	0
30 ~ 49	0	0	1	1
50 ~ 69	4	1	0	5
70 ~ 99	2	0	1	3
100 ~ 199	0	1	0	1
200 ~ 299	0	0	3	3
300 ~ 399	0	0	2	2
400 ~ 499	0	1	0	1
500 ~	0	0	0	0

Source: Questionnaire survey

**Table 4-3-4: Number of Companies by Class of Company**

	Large and medium size	Small size	Cottage	Total
<b>Nation as a whole</b>				
Number of business establishments	1,272	5,018	34,403	40,693
Share	3.1%	12.3%	84.5%	100.0%
<b>Companies surveyed</b>				
Number of business establishments	16	0	0	0
Share	100%	0%	0%	100.0%

Source: Statistik Indonesia, 1988

Note: Figures are rounded off and therefore do not necessary match with totals.

[c] Location

Table 4-3-5 provides a breakdown of the locations of the 16 surveyed firms together with Morawa Electric Transbuana and Adi Perkasa Buana. 14 of the 18 companies, or slightly less than 80%, were located in Jakarta or the surrounding Jabotabek district (including Jakarta, Bogor, Tangerang, and Bekasi). Three companies were located in Surabaya and one in Medan. These figures are indicative of the excessive concentration of corporations in Jakarta and surrounding areas.

This situation can also be understood from the fact that roughly 85% of the employees at large- and medium-scale companies and 85% of the added value at these firms are produced on Java and the fact that most large- and medium-scale enterprises on Java are concentrated in the Jabotabek district. At the end of May 1989 APPI had 63 members, and 46 of these, or 73% of the total, had factories in Jabotabek.

This district is home to Tanjung Priok, the country's largest port, and Sukarno Hatta, its primary international airport, providing gateways to the seas and skies. Jakarta, which forms the greatest source of demand for finished products, is also located here. The industrial infrastructure of this district is far more advanced than in other areas, resulting in a concentration of capital, both local and foreign. This trend is true for manufacturers of generators, electric motors, and transformers, and no exceptions can be found to this rule.

**Table 4-3-5: Location of Companies (Number of Companies)**

	Jabotabek	Surabaya	Medan	Others
Generators	5	1	0	0
Motors	4	0	0	0
Transformers	5	2	1	0
Others	14	3	1	0
(APPI member companies) (46)		(6)	(2)	(9)

Source: Questionnaire survey

[d] Capital Structure

Table 4-3-6 provides a breakdown of capital structure at the 16 companies responding to the questionnaire according to the main investor. Nine of the companies were local-capital firms, while the remaining seven boasted foreign firms as their major investors. One of the local-capital companies was 100% government-owned. Of the foreign-affiliate joint ventures, two were West German, one each British, Swedish, Taiwanese, and Japanese, and one a tri-party venture between a local firm, the government, and France. The foreign capital ratios and years of establishment for the companies are listed below, but all of the firms were relatively new. As a result, foreign corporations still held a majority of the capital at three of the seven foreign-capital operations.

Company	Production item	Foreign partner	Foreign equity (%)	Year of establishment
	Generators	Japan	49	1976
	Generators	U.K.	77	1982
	Generators	F.R.G.	70	1984
	Motors	Sweden	40	1987
	Motors	Taiwan	20	1981
	Transformers	France	44	1972
	Transformers	F.R.G.	51	1970

**Table 4-3-6: Number of Companies by Year of Establishment and Investing Countries**

Year of establishment	Local capital	Foreign capital affiliated			Total
		Western	Japan	Others	
~1969	0	0	0	0	0
1970~1974	1	2	0	0	3
1975~1979	1	0	1	0	2
1980~1984	7	2	0	1	10
1985~1989	0	1	0	0	1
<b>Total</b>	<b>9</b>	<b>5</b>	<b>1</b>	<b>1</b>	<b>16</b>

Source: Questionnaire survey

### (3) Production Trends

1) Indonesian production volume for electrical machinery is shown in Table 4-3-7, while Table 4-3-8 indicates production plans laid out in the 5th Five-Year Plan (1989-93).

Based on Indonesia's plans for the localization of production, the import of finished generators with output ranging from 0.5 KVA to 750 KVA is prohibited, and a 30% duty is levied on those units with output of 750 KVA to 6,000 KVA. Import prohibitions are also in effect for electric motors from 1 to 100 hp and for transformers up to 6,000 KVA.

According to studies made by APPI, 7-12.5 KVA DC generators and 2-6,000 KVA AC generators have been designated as areas for the promotion of localization.

The DC generators produced in Indonesia are limited to small devices used mainly in welding or lighting on construction sites and the like. Units used to supply power to industrial equipment performing frequent speed control are not produced at present. In the field of AC generators, three-phase synchronous units are most common and are generally used for household lighting, etc.

**Table 4-3-7: Domestic Production of Electrical Machinery**

(Unit: Pcs)

Product	1983~ 1984	1984~ 1985	1985~ 1986	1986~ 1987	1987~ 1988	1988~ 1989*	Average annual growth(%)
Generators (general)	33,771	32,450	20,833	19,425	15,000	6,570	-27.9
Electric welder generators	1,800	1,840	485	1,702	2,500	2,610	7.7
Motors	5,530	36,000	5,667	21,307	16,500	24,780	35.0
Power transformers	7	75	83	57	90	65	56.2
Distribution transformers	5,667	5,839	12,124	7,977	9,500	15,850	22.8

Source: Economic Report of the President

Note: Asterisks indicate provisional figures.

**Table 4-3-8: Production of Electrical Machinery in Indonesia and Fifth Five-Year Plan**

(Unit: US\$1000)

	1988 results	Plan					Annual growth %
		1989	1990	1991	1992	1993	
Generators	120	130	140	160	175	190	9.7
Motors	830	1,000	1,200	1,900	2,800	3,700	35.7
Transformers and parts	3,600	4,000	4,300	4,800	5,300	5,800	10.0

Source: Materials of Indonesian Ministry of Industry

Table 4-3-9: Production Capacities of Products by Company

Name of company	Production capacity	Annual range of production	No. of units produced a year	Mode of production
<b>Generator</b>				
PT.Pindad	0.5MW-6MW	(3ph)AC- 0.5MVA-8MVA 2KVA-3,000KVA	40-50	License with Siemens of West Germany
PT.Denyo Indonesia	2KVA-375KVA	10KVA-1,875KVA	15,000	License with Denyo of Japan
PT.Newage Engineers	2KVA-150KVA	2KVA-150KVA	1,200	License with Newage of U.K.
CV.Echo	2KVA-1,150KVA	2KVA-300KVA	13,000	Assembly for Ohaisu of Japan
CV.Gunur	25KVA-3,000KVA	5KVA-15KVA	5,225	Scheduled to handle assembly after establishment of JV
PT.AVK Manufacturer	5KVA-15KVA	25KVA-1,000KVA	480	License with AVK of West Germany
PT.Cahaya Adi Alam Sales	2KVA-150KVA	5KVA-15KVA	2,500	Assembly for Nishuhatsu of Japan
PT.Cahaya Waja Lugas Group			5,000	
PT.Nur Cakera Mulla				
<b>Motor</b>				
PT.Indo Bangsa Prima	1/3HP-180HP 15HP-150HP	0.75-10HP	50,000	
PT.Adi Perkasa Buana	1HP-15HP	0.22-15KW (0.29HP-29HP)	10,000-20,000	
PT.Teco Multiguna Elek.	1/4HP-150HP		92,000	
PT.Asea Brown Boverl /Sakti	0.5HP-75HP (0.37KW-55KW)		18,000	License production for ABB
<b>Transformer</b> (Power Transformer)				
PT.Unindo	2,000KVA-60,000KVA	2,000-60,000KVA	40	License with Alsthorn of France
PT.Trafindo Perkasa (Distribution Transformer)	2MVA-50MVA		25	Trafindo brand
PT.Unindo	15KVA-2,500KVA	15-2,500KVA	15,000	License with Alsthorn of France
PT.Pancindo P>J>Tehnika	1KVA-630KVA	Only production license		
PT.Asata Utama Elec. Ind.	200W-8,300KVA	200W-6,300KVA	12,000	Starlite brand
PT.Trafindo Perkasa	(1ph)10-50KVA	50-1,600KVA	1,300	Transformatoren of West Germany
PT.Morawa Electric Transbuana	(3ph)25-2,000KVA			Assembly for Union AG
PT.Bambang Djaja	15KVA-5MVA	15KVA-5MVA	11,000	License with Tanung of Taiwan

Name of company	Production capacity	Annual range of production	No. of units produced a year	Mode of production
(Current Transformer) PT.AEG Bina	~4,000/5A	12KVA-36KV, 1KV-24KV 100KVA-2,000KVA	35,000	License with AEG Telefunken of West Germany
PT.Sinar Elektronika SEB (Auto Transformer)	100KVA-2,000KVA	100KVA-2,000KVA		License with West Germany
PT.Sinar Elektronika SEB	(3ph)3-630KVA	3KVA-630KVA 500KVA		License with West Germany
PT.Asata Utama Elec. Inc. PT.Morawa Electric Transbuana	100KVA-6,000KVA	Step up/step down		
PT Nikkatsu Electric (Potential Transformer)	30-1,000VA	30-1,000VA	Transformer 192,000	Located in Medan Sinar brand
PT Sinar Elektronika SEB CV Erka	3KV-100KV 1-200KVA	3-100KV	300	License with West Germany

Source: APPI (Indonesian Electrical Industry Association) directory 1989



Corporate production is concentrated most heavily in the 10-20 KVA range for generators. This is followed by the 2-7.5 KVA and 25-150 KVA ranges, indicative of the fact that most of the generators produced in Indonesia are used in power generating stations for buildings or isolated islands, as auxiliary and emergency power sources for factories, and as power sources for construction sites. For the time being, therefore, demand for generators will have to be supplemented in some way, and the industry should consider the possibility of exports to neighboring ASEAN countries as well as nations in Southwest Asia and Africa.

2) Two of the four manufacturers of electric motors have yet to begin actual production activities. Production at the remaining two is centered around AC standard single-phase induction motors and standard three-phase induction motors. Although production of variable-speed motors is also held to be possible, the range of possible machines is from 25 hp (187.5 W) to 180 hp (135 W), with both firms engaged in production of units falling in these ranges. There is no production of 150-180 hp universal units, custom-made single-phase induction motors, or custom-made three-phase induction motors.

Universal electric motors being manufactured are used in industry, agriculture, and a wide variety of other sectors, with applications including industrial equipment such as machine tools, pumps, and blowers. Once production of high-capacity standard motors and custom-made three-phase induction motors begins, application to household sewing machines, washing machines, fans, refrigerators and other consumer electrical appliances as well as automobiles, cranes, and elevators will become possible. The introduction of production technology is urgently needed in order to diversify product lines and improve performance.

3) Distribution transformers are produced in a wide range of capacities, from 200 W to 60 MVA, while power transformers are produced in the 2,000 KVA - 60 MVA and 1 - 200 KVA ranges. There is no production of power transformers in the 200-2,000 KVA range. In the case of current transformers, there is no production of 37-99 KV units. In the field of large-capacity transformers, production is concentrated in the 50-500 KV range, while for small transformers production falls into the 1-6,000 KVA range.

#### 4) Joint Ventures and Technical Tie-Ups

Many companies are engaged in production under license from foreign corporations, including Pindad, the state-run manufacturer of generators (which has a tie-up with Siemens of West Germany), and Newage, which has an agreement with the British firm Stamford. Companies with assembly agreements include Alsthomindo (Alsthom, France), Denyo (Denyo, Japan), Echo (Ohatsu, Japan), and Nur Cakera (Nishihatsu, Japan). All of the six companies surveyed were engaged in production under license from foreign corporations.

The three largest manufacturers of electric motors are Asea Sakti Utama, Indo Bangna Prima, and Teco Multiguna. Asea Sakti, the industry leader, has established a joint venture, Asea Brown Boveri, with ABB, which in turn is a Swedish/West German joint venture, for the production of electric motors. Company A, currently Indonesia's only mass producer of universal electric motors, is an Indonesian company but is now negotiating a joint venture with a Japanese firm; most of production at Company B, a technical tie-up with a Taiwanese firm, is also under license.

In the transformer sector as well, licensed production for foreign corporations is the rule, with Indonesian manufacturers like Asata Utama and Morawa being the exceptions. State-owned Unindo (PT. Unilec Indonesia) is a joint venture with Alsthom of France, Trafindo is engaged in assembly and production for Transformatoren Union AG of West Germany, Bambang Djaja is engaged in production under license with the

technical assistance of Taiwanese firm Tatung, AEG Bina is engaged in assembly and production under license from the West German firm AEG Telefunken, and Sari SEG is engaged in licensed production for S.E.G.

Concerning investment plans for Indonesian capital, state-owned Company C is in the midst of a 10-year investment program (1983-1993) totaling \$3.5 million. It is uncertain, however, how much of this will be spent for generators.

Company D of PMDN has plans for joint investment of \$1.5 million for power transformers with a certain foreign corporation, and negotiations are currently under way.

In the case of state-owned Company E, the relocation of its generator factory is the main target for investment. The generator division at this firm is also planning a joint venture with a foreign corporation in 1990.

Company F of PMDN has new investment plans for the production of transformers, but details concerning this project could not be obtained during the present survey.

Company G, a parts manufacturer, plans to spend 2 million rupiahs for the purchase of facilities from West Germany and Switzerland. The money will be borrowed from banks.

Company H of PMDN is currently said to be negotiating a joint venture or technical tie-up with a Japanese firm for the manufacture of transformers. The firm is also considering the introduction of computers in its production line.

#### (4) Imports

According to 1988 import statistics for Indonesia, the following products are being imported: CKD DC and AC electric motors, DC and AC motors and transformers, and finished DC and AC motors.

**Table 4-3-10: Imports of Electrical Machinery by Indonesia (1988)**

(Unit: US\$)

CCCN		Subtotal	Share in total (%)	
8501111 DC motors and generators CKD	79,090		0.05	
8501119 Other DC motors and generators	69,988,740	70,067,830	42.89	42.94
8501121 AC and DC motors CKD	4,594,501		2.81	
8501129 AC and DC motor final products	11,108,674	15,703,175	6.81	9.62
8501131 AC generators CKD	6,105,935		3.74	
8501139 Other AC generators	40,173,246	46,279,181	24.62	28.36
8501510 Transformers using insulating fluids	13,511,168		8.28	
8501590 Other transformers	17,630,375	31,141,543	10.80	19.08
<b>Total</b>		<b>163,191,729</b>	<b>100.00</b>	

Source: Indonesia Foreign Trade Statistics-Import 1988 Vol. I

The DC devices which account for the largest percentage of imports are used as power sources in rolling mills, winding machines, cranes, the chemical industry, the light metals industry, and paper-winder, and they are not produced locally. AC generators are used in power generation, factories, emergency loads, power generators in buildings and isolated islands, and regular, auxiliary, and emergency power sources for factories, but these too are not manufactured within Indonesia. Imported transformers are limited to large units. In the field of universal AC and DC electric motors, where localization of production has had some success, imports were the lowest of any sector but still totaled \$15.7 million in 1988.

## (5) Local Production and Imports of Raw Materials and Components

1) In order to evaluate local production and imports of raw materials and components related to generators, electric motors, and transformers, they were broken down into the following three categories. The first consists of those items for which there is no local production and for which imports are relied upon exclusively. A typical example is silicon steel sheets; in 1988 Indonesia imported \$9 million worth of silicon steel sheets with thickness of less than 3 mm for use in transformer cores.

**Table 4-3-11: State of Imports of Materials and Parts (1988)**

Materials and Parts	Exporter	Weight (kg)	Value (US\$)	Share in total (%)
Copper ore and crude copper	Singapore	150,000	6,831	-
	Sub-total	150,000	6,831	
Enamel resins	Singapore	978,428	1,490,170	13.1
	Japan	338,199	989,183	
	FRG	136,555	582,425	
	Sub-total	1,713,426	3,538,734	
Epoxy resins (3901719)	Netherlands	230,889	554,135	11.5
	Japan	148,633	757,939	
	Singapore	58,937	456,948	
	FRG	108,007	334,513	
	Canada	113,230	315,043	
	Sub-total	879,886	3,088,279	
Silicon steel sheets of less than 3 mm thickness for transformer cores	Japan	5,282,085	5,074,429	33.5
	Singapore	2,342,369	2,042,792	
	Hong Kong	616,750	312,296	
	USA	398,111	534,526	
	FRG	442,181	516,901	
	Sub-total	9,617,837	9,036,145	
Transformer capacitors	Japan	258,741	2,380,317	29.3
	Taiwan	445,694	1,992,701	
	Singapore	135,149	1,500,020	
	Hong Kong	210,643	696,170	
	Sub-total	1,214,218	7,900,470	
DC machine carbon brushes	Japan	27,236	100,604	-
	FRG	6,616	101,580	
	Taiwan	14,048	29,594	
	USA	480	27,849	
	R.Korea	9,230	10,705	
	Sub-total	61,421	318,422	
Transformer bushings	Japan	428,791	1,823,646	11.3
	France	67,833	431,865	
	Italy	69,107	272,950	
	Sub-total	683,746	3,053,547	
Total of above			26,942,428	100%

Source: Indonesia Foreign Trade Statistics-Imports 1988 Vol. I

Japan was the leading supplier of silicon steel sheets for use in transformers, providing 56% of all shipments by value. Singapore followed with a 22.6% share, these two nations alone accounting for 78.6% of all imports. In the area of transformer bushings and accessories, Japan supplied 59.7% (\$3.05 million) of all imports, with other suppliers including Italy and France. As can be seen from Table 4-3-11, although all of the raw copper and resins listed were not necessarily used in electrical machinery, silicon steel sheets for use in transformers accounted for 34% of total imports of \$26,942,428, while capacitors for use in transformers accounted for another 29% and bushings and epoxy resin for 11% each. Thus those parts and materials clearly labeled as being destined for use in transformers amounted to 73.5% of total imports, which translates into a figure of about \$20 million.

The metal magnets used in the cores of electrical machinery such as generators, electric motors, and transformers have a small coercive force, and soft magnetic materials which can be easily magnetized, such as silicon steel sheets (Fe-Si), permalloy (Fe-Ni), perminbar, ferrite, and pure iron, are often used. Hardened steel, with a coercive force falling midway between that of soft and hard magnetic materials, is used for the rotors of hysteresis motors. Thus silicon steel sheets is the main metal magnetic material used in the cores of electrical machinery, and it would be no overstatement to say that both the copper wiring and insulators of electrical machinery are made from silicon steel sheets.

As will be described below, localization of copper wire and insulator production is gradually proceeding, but it remains to be seen when local production of silicon steel sheets and other soft magnetic materials will begin.

**Table 4-3-12: Comparison Between Imported and Domestically Produced Transformer Materials and Finished Products**

Imports of silicon steel sheets of less than 3 mm thickness for transformer cores	9,036,145 US\$ CIF
Imports of finished transformers	31,141,543 US\$ CIF
Domestic production of transformers	12,121,294 US\$
Imports of DC machines and DC and AC motors	85,771,005 US\$ CIF
Domestic production of DC machines and DC and AC motors	280,447 US\$
Imports of AC generators	46,279,181 US\$CIF
Domestic production of AC generators	Figures unknown

Source: Figures for domestic production of transformers and DC machines and DC/AC motors are obtained by totaling the figures for the related items in "Industrial Statistics - Survey of Manufacturing Industries, Large and Medium, Volume I and II, 1987" and converting the results into U.S. dollars. Figures for imports come from Table 4-3-10 and 4-3-11.

According to Table 4-3-12, imports of silicon steel sheets with thickness of 3 mm or less for use in transformer cores account for as much as 74.5 percent of the total domestic transformer output valued at US\$12,121,294. The ratio of silicon steel sheets to the total shipment value of transformers rises further when various expenses are added to import value. Under such circumstances, it is rather difficult to strengthen the international competitiveness of the products. It may be said that efforts to reduce material costs through domestic production and other means are urgently needed.

Insulating material for transformers, special insulating paper for generators and electric motors and high-tension insulating material are also imported because the domestic products are not of good quality. Imports of one typical product, enamel varnish, amount to \$3,540,000 annually and are sourced from Singapore, Japan and West Germany. One firm says that domestically-produced insulating material "does not satisfy internationally-recognized standards such as DIN." Imports of another typical product, epoxy resin, are valued at \$40,320,000 and come from the Netherlands and Japan. Carbon black is imported from Australia, South Korea and Taiwan at a rate of \$30,090,000 per year.

Imports of profile copper wire, which generator makers use for low-voltage/high current, amount to \$197,000.

2) Next come items which are produced in the country but also depend on imports. First comes copper, an important raw material. Total demand for copper amounts to 3,674 tons, 2,806 tons of which is locally produced and 868 tons or 23.6 percent of which is imported. Copper is produced in Irian Jaya and copper ore exports amount to about 300,000 tons, 88 percent of which is shipped to Japan. A shortage of smelting facilities has led to dependence on imports of refined copper.

As for parts, some enameled copper wire is imported. According to industrial statistics for 1987, the ratio of dependence on imports stands at 6.1 percent in volume and 6.84 percent in value. Since production of heavy copper wire is progressing smoothly at Sucaco and that of fine copper wire under way at Ewindo, full domestic production of these items will be realized shortly if the special coating technology for insulation is mastered.

There are problems with quality and standardization in the production of nuts and bolts. According to the industrial statistics for 1987, the market share of imported nuts and bolts related to electrical machinery manufacturing is as small as 0.17 percent. Most of the domestic products are manufactured in-house or purchased from local markets. Two electric motor makers, however, say they are "depending on imported special nuts and bolts because we have misgivings about domestic products." For example, they say local markets have only inch-scale special-specification products and cm-scale products cannot be obtained. Hard bolts are also difficult to purchase at local markets, they add.

3) Items whose domestic production has made enough progress to remove the need for imports include copper rods, round copper wire cables, insulating paper, transformer boxes and ampere motors.

Procurement of raw materials and parts by the firms visited during this survey indicates a division into those items for which the industry as a whole generally depends on imports and those which are produced in the country as shown in the following table.

**Table 4-3-13: Current State of Domestic Production of Materials, Parts, and Metal Working**

Products or processing being produced or handled domestically, even partially	Manufacturer	Yearly production
Casting Iron/Ductile Cast Iron for Generator Bracket	A company	3,000 ton
Forging, Casting, Precision Machining	B company	
Brass Terminal Holder & Plate Diecasting, Moulding, Punching, Foundry	C company	
Shafts, Frame, Bracket for Motor Frame for Generator & Transformer	D company	
Aluminium Ingot for Frames	E company	
SIH-TMS Copper Wire Rod in thickness 8mm	F company	3,000 ton
Copper & Copper Alloy	G company	12,000 ton
Enameled Copper Wires	H company	1,000 ton
Enameled Copper Wires	I company	1,800 ton
Enameled Copper Wires	J company	
Carbon Brushes	K company	40,000 pcs
Bushing Isolater & Connector	L company	
Terminal Connection	M company	

Products mostly imported

Metal Bearing, Ball for Bearing, Bearing Cover & Flange
Plastic for Terminal Connection
Spring Washer, Special Hard-metal Bolt & Nut
Bushing, Clamp, Brass-holder
Silicon Steel Sheet, Silicon Steel Bars, Rotor Core, Stator Core
Epoxy Resin, Cast Resin, Polyester, Adhesive, Forming Polyethylene, Vinyl Chloride
Insulation Paper, Insulation Oil
Double Coating Enamel Wire, Profile Copper Wire
Ferro-silicon

Source: Questionnaire survey



#### 4) Problems

Three out of the six major generator makers surveyed do in-house parts manufacturing. Company A has forging, casting and precision machining sections and manufactures most of the parts it needs in-house. Company B has a cutting section and orders other machining works from outside. Company D manufactures control panels and cases in-house. So far as can be ascertained by the operations of these three firms, if a firm has forging, casting and welding facilities and machine tools, it apparently makes as many parts as possible. The local content ratios of seven generator makers vary widely from the lowest 10 percent to the highest 75 percent, averaging 38.6 percent. The ratio of imports averages 50.7 percent, or higher than that of local purchases, with the dependence of individual firms ranging from 25 percent to 70 percent. As for the source countries of imports, half of the firms depend solely on one country while the other half rely on various nations.

**Table 4-3-14: State of Procurement of Materials and Parts by Generator Manufacturers**

	In-house manufacture	Local procurement	Imports	Source of imports
A company	30%	10%	60%	Only Siemens of West Germany
B company	35%	30%	35%	Only Japan
C company		55%	45%	From U.K., Malaysia, Romania, Sweden, and other countries
D company	10%	20%	70%	From Japan, Taiwan, South Korea, Yugoslavia, etc.
E company		75%	25%	Mainly from Japan
F company		40%	60%	Dealt with in accordance with orders from customers
G company		40%	60%	From West Germany

Source: Same as previous table

The electric motor industry is slightly different from the generator industry. The larger the capacity of electric motors they produce, the lower the local content of the products. As shown in Table 4-3-15, company A purchases all raw materials and parts locally for electric motors of 0.75 -- 10 HP but imports all of those required for 15 --150 HP motors. Company B also purchases all raw materials and parts locally for 0.29 -- 4.9 HP motors but imports all of those for 5 -- 20 HP products. Because company C has not actually begun producing, its figures are presented only for reference. Although they have contracts for production under license, companies A and B show that all raw materials and parts can be purchased locally for small capacity electric motors.

**Table 4-3-15: Procurement of Materials and Parts by Electrical Machinery Manufacturers**

	In-house manufacturer	Local procurement	Imports	Contents of imports
A company				
0.75 ~ 10HP		100%		
15 ~ 150HP			100%	From Taiwan and China
B company				
0.29 ~ 4.9HP		100%		
5 ~ 20HP			100%	From Taiwan
C company				
1st Stage		30%	70%	
2nd Stage		50%	50%	
3rd Stage		100%	0	

Source: Same as previous table

The ratio of local purchases by seven transformer makers averages 47.9 percent. Their ratio of imports averages 43.6 percent which is lower than that of local purchases and contrary to the case of generator makers. The range of ratios of imports is wider at 5 - - 80 percent than that of local purchases which stands at 20 -- 80 percent. It may be said that generators, being rotating devices, require more technologically advanced parts than transformers, which are stationary equipment, and as a result, dependence on imports for the former is higher than that for the latter.

**Table 4-3-16: Procurement of Materials and Parts by Transformer Manufacturers**

	In-house manufacturer	Local procurement	Import	Source of import
A company	Some	60%	40%	Japan
B company	Some	20%	80%	
C company	25%	70%	5%	Singapore etc.
D company	Some	50%	50%	Japan, Italy, etc.
E company	5%	45%	50%	
F company	Some	80%	20%	Japan
G company	Some	30%	70%	
H company	30%	40%	30%	

Source: Same as previous table

As stated above, the local content of generators stands at 38.6 percent, electric motors at 43 percent and transformers at 47.9 percent, averaging 43.2 percent for the three items combined. While all of the manufacturers purchase raw materials and parts freely at the local market whenever they need them, cases of regular purchasing from fixed sources are noticeable in terms of imports. A specialized parts manufacturer complains that "the electrical machinery makers have a strong tendency of not purchasing raw materials from domestic parts manufacturers."

A breakdown by public and private demand of Indonesian domestic demand for the products of the various enterprises surveyed is shown in the following table.

**Table 4-3-17: Trends in Demand by Company**

Company name	JV partner	Government sector demand	Private sector demand	
A company	State-run	90% PLN	10%	Aircraft manufacture ITTN, hotels, rural
B company	Japan	50% 50%, PLN, telegraph, telephone, satellite communication related	100%	Shrimp culturing, welding
C company	U.K.		50%	Rural electrification project
D company	Japan		100%	
E company	Indonesia	30%	70%	30% in industry and 40% in culturing
F company	Japan	0	100%	Building and other construction fields and small sized factories
G company	FRG	60% BBI	40%	
H company	Indonesia		100%	No fixed customers
I company	Taiwan	20%	80%	
J company	Sweden/FRG			Under construction
K company	France	80%	20%	
L company	FRG	40% PLN, ITTN	60%	Almost all production on order
M company	Indonesia	90% PLN	10%	
N company	Taiwan	50% PLN	50%	Almost all production on order
O company	FRG	100% JICA, Pertamina PLN		
P company	Japan		100%	National Gobel etc.
Q company	Indonesia	50% Pertamina, Petrokimia Gresik	50%	
R company	FRG	50% PLN	50%	Building demand

Source: Interview survey

As far as the table above shows, demand from government agencies is concentrated on firms other than joint ventures with Japan, while joint ventures with Japan are specialized in private demand. On the whole, the products are not used in the same way as automakers or electric appliance manufacturers use their parts. Since manufacturers need orders which are continuous and stable to some degree to acquire technological abilities, it is desirable that local purchases of generators, electric motors and transformers to be used for automobiles and electric appliances be expanded in addition to the current transactions.

For the expansion of local purchases, it is first necessary to show customers the excellent quality and performance of domestically-produced electrical machinery. Higher appraisals by the domestic market will lead to exports of the products. A means of appraisal generally used in other nations is presentation to customers of manufacturers' specifications of quality and performance. But whether the products are manufactured in accordance with the specifications will not be known until they are actually used. As far as such uneasiness remains, customers will not purchase local products. It is also because of the remaining uneasiness that "users have a strong tendency of not purchasing electrical machinery from domestic makers."

As will be stated below, electrical machinery makers are remarkably ill-equipped in terms of electrical test facilities. Coupled with the disunity of unit systems, the deficiency in testing and inspection results in domestic customers' distrust of domestically-produced products and forms a major stumbling block for exports. The customers distrust will be greatly reduced if official organs are equipped with good testing facilities and issue "marks of their approval of products as excellent articles."

Basic standards for approval as excellent articles will be the accuracy of specifications on the performance of electrical machinery. Electric motors, for instance, will be checked based on their rated output, time rating, revolving velocity, efficiency, power factor, starting characteristics, braking, speed control precision, maintainability and price.

We suggest that, after inspection, B4T reports to the Ministry of Industry, which in turn makes approvals and issues the "Marks of Approval" to the manufacturers.

## (6) Exports

### 1) Selling Activities

The domestic market for electrical machinery has grown smoothly in line with increased power generation (supply), rising power consumption and the increasing rate of electrification in rural areas. The domestic demand for transformers is interrelated with the volume of domestic power generation because they are used mainly for power distribution. The domestic demand for electric motors is interrelated with GDP since they are used for plant equipment, electric appliances and agricultural machinery (pumps, shrimp/prawn/lobster farming, rice-cleaning machines, etc.). Domestic demand for generators is interrelated with both the volume of domestic power generation and GDP because they are used for power generation by PLN, independent power plants at factories and hotels, electric welders, etc.

While GDP grew at an annual rate of 4 percent in real terms during the period of the fourth five-year plan (April 1984--March 1989), power supply during the period achieved growth of as high as over 12 percent. In response to the smooth growth of the macroeconomy, domestic production of electrical machinery in the period showed large increases with the exception of general-purpose generators, imports of which rose sharply. The pace of increase varied widely year by year, however.

Most domestic products are channeled to satisfy domestic demand, leaving only a small volume for export. According to the results of the questionnaires, only one generator maker and two transformer manufacturers have exported their products. Their ratio of exports to total products has stayed at a mere 2 -- 5 percent, however, as Fig. 4-3-18 shows. Sales of generators, electric motors, transformers and electric machinery overall by buyer are shown in Table 4-3-19. Since it is very difficult under the current circumstances to identify the sales of individual firms accurately, weighted average sales were obtained on the assumption that the number of employees of individual firms is proportional to their sales.

The table revealed that great differences existed among the buyers of each product. Although it is risky to draw a conclusion on electric motors from only one sample firm, it may be said roughly that domestic private demand accounts for most sales of the products. PLN and other government organs each account for about 15 percent of generator sales, together accounting for less than one-third of total sales. The remaining sales are accounted for by domestic private firms. Exports accounted for a mere 0.4 percent of generator sales. In contrast, the percentage of total transformer sales accounted for by PLN and other government organs is as large as 60 percent. In particular, PLN accounts for nearly 50 percent of the total sales. PLN may be said to support the industry. The ratio of exports to total transformer sales stands at 2.1 percent, the highest among the three electric machinery items. In this sense, transformers may be said to be the most competitive of the three products on the international market.

Sales sections have been set up by 11 out of the 14 enterprises which replied to the questionnaires. Only one firm had more than 10 people in its sales section, though the number varied widely among individual firms. The small size of sales section staffs stems from the fact that most of the manufacturers are selling their products through sales subsidiaries or agents, making it unnecessary to have large-scale sales systems. The results of the questionnaires are shown in Table 4-3-20.

**Table 4-3-18: Sales Activities**

Product	Company	No. of persons in sales division	Shares of customers (%)			Exports
			Power Agency	Government organizations	Private (domestic)	
Generators	A	1	0	0	100	0
	B	4	20	20	58	2
	C	30	20	30	50	0
	D	2	20	10	70	0
Motors	E	7	0	0	100	0
Transformers	F	9	80	0	15	5
	G	1	50	50	0	0
	H	0	0	30	70	0
	I	5	70	2	28	0
	J	0	0	10	90	0
	K	N.A.	0	10	90	0
	L	N.A.	50	0	45	5

Source: Questionnaire survey

**Table 4-3-19: Weighted Average Rate of Sales Destinations (%)**

Product	Power Agency	Government organizations	Private (domestic)	Exports	Total
Generators	14.1	15.2	70.3	0.4	100%
Motors	0	0	100.0	0	100%
Transformers	48.7	11.0	38.1	2.1	100%
Electrical machinery	34.3	9.3	55.0	1.5	100%

Source: Table 4-6-34

Note: Figures are rounded off, so the totals do not necessary come to 100%.

**Table 4-3-20: Existence of Sales Divisions**

Product	Sales divisions		No response
	Have	Don't have	
Generators	5	0	1
Motors	1	1	1
Transformers	5	2	0
Total	11	3	2

Source: Questionnaire survey



## 2) Export Promotion Activities

### a) System and contents of activities

Practically none of the firms are active in exports. The highest ratio of exports by an individual firm is a mere 5 percent of total sales. This ratio was attained by two transformer manufacturers. One of the two, a joint venture with a French enterprise, exported two 50KVA units, eighteen 100KVA units and forty-two 315 KVA units to Singapore in 1987 and in 1988 exported two 62.5KVA units and a 320KVA unit, also to Singapore. The other, a local enterprise set up under the Domestic Investment Law but engaged in a technological tie-up with West German and American firms, started exporting in 1988 and has already supplied two 300 KVA units to Malaysia and five 630 KVA units to Singapore.

**Table 4-3-21: Exports of Indonesia by Product (1988)**

CCCN code	Product	SITC code	Destination	Volume (kg)	FOB value(US\$)
8501119	Other DC motors and generators	7161190	Singapore	3,400	5,981
			Bangladesh	3,000	8,000
			Sub-total	6,400	13,981
8501129	Assembled AC and DC motors	7162190	Australia	62,642	128,425
			Japan	7,560	47,419
			Sub-total	70,202	175,844
8501490	Other motor parts	7169900	Singapore	60,570	176,250
			Sub-total	60,670	176,250
8501510	Oil immersed transformers	7711100	Singapore	3,020	8,460
			Sub-total	3,020	8,460
8501590	Other transformers	7711800	Japan	388,493	925,057
			Hong Kong	8,250	20,250
			Taiwan	3,620	9,900
			Singapore	1,067	5,218
			Netherlands	200	6,120
			Sub-total	401,630	966,545
Total					1,341,080

Source: Indonesia Foreign Trade Statistics - Exports 1988 Vol. I

The results of the questionnaires on export activities are shown in Tables 4-3-22 -- 24. As the tables show, only four firms are engaged in export activities. Only three have set up export sections and none of them have made exports a major part of their business. Although a shortage of information on overseas markets is cited as the biggest reason for the inactivity, complicated procedures and the low profitability of exports have also discouraged many enterprises. A few firms addressed the problem positively by preparing corporate profiles in English. But without their own overseas bases, they often depend on parent firms, partner enterprises in technological tie-ups and trading firms abroad to open up overseas sales channels. Several firms made visits to their overseas customers, held exhibitions of their products and visited international fairs.

## b) Overseas market information

As shown in Table 4-3-25, information on export markets is obtained through NAFED, trading firms inside and outside of the country, overseas partners in technological tie-ups, sales agents and buyers abroad. But no information sources received high marks. Regarding NAFED, a central organ for sales promotion activities, two firms were dissatisfied while only one was satisfied. Basically, however, the electric machinery industry in the country is still in its infancy with few firms having the technological ability and capacity to export, despite being very interested in overseas market information.

Table 4-3-26 shows the results of the questionnaires on what kinds of overseas market information is wanted by managers of electrical machinery-related firms. The respondents were asked to choose six items of interest and list them in a descending order of interest. In making the table, the item chosen first was given six marks, the second five, the third four and so forth. An item whose position was not clear was given 3.5 marks. Thus, the table shows the weighted aggregate marks for individual items.

The table shows that information on consumers preferences and transaction practices is positioned the lowest. This kind of information, being qualitative and difficult to indicate in figures, must be supplied on a timely basis. On the other hand, demand outlooks and import estimates ranked first and second respectively. These are the most basic macroeconomic figures. Such quantitative figures can usually be obtained relatively easily in the advanced nations while information on consumers preferences and transaction practices is comparatively difficult to obtain and what can be gathered is highly valued. These facts revealed that 1) export activities have just begun in the country and few people recognize what information is really necessary, and 2) there are no organs which supply basic macroeconomic information on overseas markets.

## c) Utilization of export promotion measures

The results of the questionnaires on the subject are shown in Tables 4-3-27 -- 28. Twelve firms had not utilized export promotion measures or did not reply to the questionnaire and four firms had utilized the measures. A shortage of information and knowledge is cited as the main reason for the failure to utilize the export promotion measures. According to interviews conducted during a visit to the country, the reasons are roughly i) they did not know what promotion measures were in existence, and ii) they did not know where they could obtain information about the matter. Moreover, complaints were heard about overly frequent policy changes, though these were not directly related to the export promotion measures, and contradictions between policies established by different government agencies.

Among the export promotion measures, tariff exemption on raw material imports was utilized by six firms, export financing by five and import tariff rebates by two. Several firms pointed out, however, that procedures for tariff exemption on raw material imports and import tariff rebates were too complicated. One firm which exports a small amount said it did not utilize the promotion measures because of their complexity. Simplification of procedures is required to promote small-scale exports. As for export financing, a system of advancing funds before shipment at a rate of 14.0 percent for primary products and 14.5 percent for other products existed at the time of our survey. The rates, however, are raised in stages and the system itself is scheduled to be abolished in April 1990. It has been heard that the government has no plans to replace the current system with a new export financing system. It will become necessary, however, to consider a new favorable treatment policy for finance in order to promote exports by small and medium-scale enterprises.

**Table 4-3-22: State of Export Activities**

Product	Export activities (no. of companies)		Existence of export division (no. of companies)		No response
	Yes	No	Have	Don't have	
Generators	1	3	1	3	2
Motors	0	2	0	2	1
Transformers	3	3	2	4	1
Total	4	8	3	9	4

Source: Questionnaire survey

**Table 4-3-23: Reasons for Not Engaging in Export Activities (Number of Companies)**

Product	Reasons for not engaging in export activities (no. of companies)			
	Insufficient production capacity	Low profit	Complicated proccdures	Insufficient overseas information
Generators	0	0	1	2
Motors	1	0	0	1
Transformers	0	2	0	1
Total	1	2	1	4

Source: Questionnaire survey

**Table 4-3-24: Means of Export Promotion Activities (Number of Companies)**

Product	Means of export promotion activities (no. of companies)						
	Overseas offices	Overseas sales agents	Importers	Visits to overseas customers	Participation in overseas trade fairs	Attendance in overseas trade fairs	Advertisement in overseas magazines
Generators	0	1	0	1	0	2	0
Motors	0	0	0	0	0	0	0
Transformers	0	0	2	2	1	2	0
Total	0	1	2	3	1	4	0

Source: Questionnaire survey

**Table 4-3-25: Sources of Acquisition of Overseas Information**

Sources of information	Evaluation of sources of information (no. of companies)		
	Sufficient	Usual	Insufficient
NAFED	1	0	2
Domestic trading companies	1	3	0
Overseas partners in technical tieups		1	3 1
Overseas sales agents	1	2	2
Overseas buyers	1	4	1
Others	1	0	1

Source: Questionnaire survey

**Table 4-3-26: Necessary Overseas Market Information**

Order	No. of companies interested	Weighted total points	Item
1	8	41.5	Demand projections
2	6	26.5	Import projections
3	6	26	Sales channels
4	5	19	Import regulations
5	5	10	Consumer preferences
6	4	9	Business practices

Source: ANX-7

**Table 4-3-27: State of Utilization of Export Promotion Measures**

Product	Utilization of promotion measures		No response	Reasons for non-use (no. of companies)				
	Yes	No		Insufficient information	Complicated pcedures	Long time for procedures	Doubts over effect	Others
Generators	2	2	2	2	0	0	0	0
Motors	0	1	2	1	0	0	0	0
Transformers	2	0	5	0	0	0	0	0
Total	4	3	9	3	0	0	0	0

Source: Questionnaire survey

**Table 4-3-28: Export Promotion Measures Being Used**

Product	Export promotion measures being used (no. of companies)				
	Exemption of import tarrifs on materials	Drawback of import tariffs	Export financing	Others	No response
Generators	2	1	1	1	2
Motors	1	0	1	0	2
Transformers	3	1	3	0	4
Total	6	2	5	1	8

Source: Questionnaire survey

## **(7) Industrial Development Policy**

While this industrial sub-sector is currently an import substitution industry, it is expected that it will gradually grow and become an export industry. In order to increase the competitiveness and efficiency of this industry, restructuring, including optimum utilization of production capacity, reduction of production costs, enhancement of technology and improvement of the business environment, is necessary. The products which are dealt with in this report are crucial for expansion of the electric generation and transmission network and therefore the development of electric generating machinery (generators, turbines, boilers), transmitting machinery, transformer substations (transformers, high voltage panels, etc.), power distribution apparatus (medium voltage panels, distribution transformers, switch gears), electrical machinery for industrial use (generators, motors, welding machinery), and other machinery (KWH meter, MCB, cables) are given priority.

## **(8) Export and Investment Policy**

Electrical machinery was one industrial sub-sector subject to deletion programs which have been in effect since 1983. From 1990, the sub-sector is now switched to one of the industries targeted for export promotion under the current economic development plan (Repelita V).

Although details of promotion programs have yet to be announced, the government has set export targets of 9.7 percent annual growth in volume for electric motors, and 10.0 percent annual growth for transformers, during the period of Repelita V (1989-1993).

Foreign investment in the electrical machinery sub-sector is not included among "reserved fields" on the "negative list" under the latest foreign investment law of Indonesia. Rather, foreign investment is welcome by the Government.

## **(9) Finance/Banking Policy for Development of the Electrical Machinery Sub-sector**

Indonesia's monetary policy is based on the philosophy that optimal distribution of capital is achieved through a free market and competition.

Therefore, only a few sub-sectors such as food and sugar procurement have special loan schemes and the electrical machinery sector does not have any special loan schemes.

However, the electrical machinery firms can raise funds based on their creditworthiness without restriction. They can also raise funds on foreign capital markets.

For small enterprises with total assets of not more than 600 million RP., there once were special credit schemes, but the policy package of January 29, 1990 abolished these and replaced them with a guideline for banks that stated banks should provide more than 20 percent of their credit to small-scale enterprises. Through this policy change, the amount of credit available to small-scale enterprises will remain the same, but the interest will be determined according to market rates and creditworthiness.

#### 4.4 Foreign Investment in the Electrical Machinery Sub-sector

##### (1) The Advance of Foreign Capital

As stated earlier, foreign capital participates in seven electrical machinery manufacturing firms in Indonesia, specifically in three generator makers, two electric motor makers and two transformer makers. Among them, Denyo is a joint venture with Japan, Newage with the United Kingdom, AVK and AEG Bina with West Germany, ABB with Sweden and West Germany, Unindo with France and Tecu with Taiwan.

In terms of the future investment plans of these firms and other foreign capital enterprises, A company, which is producing 25KVA-1,000KVA generators at a monthly rate of 40 units, is planning to manufacture electric motors as well in the future. B company, which will continue producing its own brand of electric motors for the time being, is considering OEM production of other foreign brands in the future.

C company has just completed a new plant and begun installing production equipment under its new investment plan. Applications for investment presented to BKPM between 1967 and 1988 show that five firms were in the process of applying for investment as of 1988.

**Table 4-4-1: List of Applications for Investment Related to Electrical Machinery in 1988**

Name of company	Investment (US\$)	Job created	Production items	Production volume
	13,649,000	200	Power Transformer	40 unit
	500,000	86	Current Transformer & Potential Transformer	2,200 pcs
	21,271,767	546	Electric Component Parts	380,000 set
	1,300,000	143	Electric Moter 8-55w	1,800,000 set
	1,000,000	753	Enamelled Wire	1,800 ton

Source: BKPM

**(2) The investment environment in Indonesia as seen from the strategies of European, American and Japanese firms.**

**1) American Firms**

Because of a gradual increase in imports into the U.S. market and a rise in manufacturing costs, many U.S. firms are restructuring or shifting their business to other types of industry. As part of such efforts, they import components and parts from low-labor-cost countries instead of producing in the U.S. and move their production bases abroad, particularly to developing nations, through direct foreign investment. Indonesia is drawing attention as such a base because of its geographical location and low labor costs.

**2) West German Firms**

With the integration of the EC markets set for 1992 and keener competition expected as a result, West German firms as well are in the midst of a swirl of rapid mergers and restructuring. Investment by West German makers is mainly directed toward Greece, Portugal and Spain. Outside Europe, the investment is thought to be going to the United States, Venezuela, India, Iran and Kenya.

**3) Japanese Firms**

In general, Japanese firms' investment in ASEAN nations is expanding to Indonesia and the Philippines in addition to Singapore, Thailand and Malaysia.

Japanese investments to Indonesia by industry groups primarily concentrate on chemicals, textiles and their products, transportation machinery, home appliances and electronics, metal products and so on. Investment by electrical machinery manufacturers is still on an early stage. In the future, Japanese investment is expected to increase on such merits as [1] inexpensive labor cost, [2] political stability, [3] Government's export-oriented industrialization programs. Public relations activities by Indonesian side toward potential Japanese investors will be necessary.

Japanese investors, potential and others, point out such problems as: [a] limitations of equity shares in joint ventures, [b] under-development of supporting industries, [c] shortage of middle-class managers, [d] shortage of engineers and mechanics, [e] difficulties in local financing and high interest rates, [f] poor conditions of infrastructures. The Indonesia has to make efforts to improve such images borne by Japanese companies.