



सत्यमेव जयते

GOVERNMENT OF INDIA  
TARIFF COMMISSION

**REPORT**  
**ON THE**  
**Continuance of Protection**  
**TO THE**  
**Power and Distribution Transform**  
**Industry**

**BOMBAY**  
**1963**

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**India, Tariff (—— Commission)**

Report on the Continuance of  
Protection to the Power and  
Distribution Transformers  
Industry—1963.



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## PERSONNEL OF THE COMMISSION

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**SECRETARY**

**SHRI PRAMOD SINGH**



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GOVERNMENT OF INDIA  
MINISTRY OF INTERNATIONAL TRADE

*New Delhi, the 23rd November, 1963.*

**RESOLUTION**

**Tariffs**

**No. 5(1)-Tar/63.**—The Tariff Commission has submitted its Report on the continuance of protection to the Power and Distribution Transformers Industry on the basis of an inquiry undertaken by it under Sections 11(e) and 13 of the Tariff Commission Act, 1951. Its recommendations are as follows:—

- (1) Protection to the transformer industry should be continued for a further period of two years ending 31st December, 1965 at the existing rate of duty and the scheme of protection should cover power and distribution transformers up to 50,000 KVA and 220 KV on the H.T. side and parts of such Transformers, not otherwise specified.
- (2) Government should implement the programme of doubling the capacity of Heavy Electricals Ltd., Bhopal and initiate plans for further expansion of its transformer capacity. They may also accord preference to the existing producers for further expansion of their capacity and should take steps well in advance to augment industry's capacity to avoid conditions of shortage.
- (3) Government should take immediate and effective steps to see that the transformer grade electric sheet steel planned for production at Rourkela from April, 1966 will be of the CRGO (Cold rolled grain oriented) variety. An assurance to this effect will further help changeover to this material by the producers.
- (4) The Government should make a survey of the insulator industry and if it is found that the existing capacity for bushings requires to be increased and/or diversified, it may be done at the earliest opportunity.
- (5) Higher priority should be given to the industry in the matter of allocation of steel.
- (6) The Central Water and Power Commission should disseminate necessary information, to the State Electricity Boards and other consumers regarding the advantages of the use of CRGO sheets and advise them to give preference to transformers with such sheets.

(ii)

- (7) The Central Water and Power Commission should intensify its efforts to achieve as complete a standardisation of distribution transformers as possible and to some extent also of the smaller power transformers not only in respect of preferred sizes but also for L.T. voltages, tapplings, impulse level, fittings, sizes, etc. State Governments, Electricity Boards and Electricity Undertakings, in turn, should spare no efforts to co-operate in this endeavour which is of material advantage alike to consumer and producer.
- (8) To obviate a situation where the industry might suffer from lack of timely supplies Government might permit more liberal imports of sheet steel and allow producers to carry a larger stock.
- (9) The producers of transformers should change over to the use of cold rolled grain oriented (CRGO) sheets in the shortest possible time. The supply of imported raw materials should be regulated so as to ensure a more effective use consistent with the adoption of CRGO sheets. Government may also consider laying down a phased programme for a changeover to CRGO sheets and for the reduction of the import of hot rolled sheets.
- (10) The producers of transformers in their own interest should extend their full co-operation in reducing the number of sizes and designs of bushings particularly of lower voltages and they should plan their procurement programme well in advance with the bushings manufacturers.
- (11) As transformers form an essential link in the power transmission and distribution system requiring utmost reliability under continuous service, producers should take due care during their manufacture and in packing so as to avoid even complaints of a minor nature.
- (12) Producers should offer lower prices for transformers of standard specifications as compared to those deviating from standards as an incentive towards achieving the object of standardisation.
- (13) As the high prices of transformers would, in turn, step up the cost of electricity, every attempt has to be made by producers of transformers and all concerned in its development to bring down the prices.

2. Government accept recommendation (1). The duty recommended by the Tariff Commission in respect of Power and Distribution Transformers is being brought into force with immediate effect by a Notification under Section 3A published separately in the Gazette of India to-day. The necessary legislation will also be undertaken in due course.

(iii)

3. Government have also taken note of recommendations (2) to (8) and steps will be taken to implement them as far as possible.

4. Attention of producers of transformers is drawn to recommendation (9) and Government have also taken note of it for necessary action to the extent possible.

5. Attention of producers of transformers is also drawn to recommendations (10) to (13).

## ORDER

ORDERED that the Resolution be published in the *Gazette of India* and a copy thereof communicated to all concerned.

(H. D. SHOURIE),

*Joint Secretary to the Government of India.*



GOVERNMENT OF INDIA  
MINISTRY OF INTERNATIONAL TRADE

New Delhi, the 23rd November, 1963.

**NOTIFICATION**

**Tariffs**

**No. 5(1)-Tar/63.**—In exercise of the powers conferred by sub-section (1) of section 3A of the Indian Tariff Act, 1934 (32 of 1934), the Central Government hereby directs that with immediate effect there shall be levied on the articles specified in column (1) of the Table hereto annexed, when imported into India, a duty of customs of such amount as is specified in the corresponding entry in column (2) thereof.

**THE TABLE**

Name of articles	Amount of duty of customs [in place of the duty specified in the First schedule to the Indian Tariff Act, 1934 (32 of 1934)]
1	2
Power and distribution transformers above 10,000 KVA and 132 KV on H. T. side but not exceeding 50,000 KVA and 220 KV on the H. T. side (primary voltage being over 250) excluding furnace, rectifier and flame-proof transformers and parts of such transformers, not otherwise specified.	10 per cent <i>ad valorem</i>

NOTE.—For the removal of doubts it is hereby clarified that the customs duty, if any, to which the said articles are liable under Section 2A of the Indian Tariff Act, 1934 (32 of 1934), and the surcharge leviable under sub-section (1) of section 23 of the Finance Act, 1963 (13 of 1963), shall be in addition to the duty leviable under this notification.

(H. D. SHOURIE),  
*Joint Secretary to the Government of India.*

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## REPORT ON THE CONTINUANCE OF PROTECTION TO THE POWER AND DISTRIBUTION TRANSFORMERS INDUSTRY

1. The power and distribution transformers industry has been the subject of three tariff inquiries in the past. The first inquiry was held in 1952 and on our recommendation, Government granted protection to this industry for three years ending 31st December, 1955, by enhancing the revenue duty of 5 per cent *ad valorem* to 10 per cent *ad valorem* (exclusive of surcharge which was 5 per cent of the duty) on power and distribution transformers up to a rating of 2,500 KVA and a voltage of 37.5 KV on the HT side. Furnace, rectifier and flame-proof transformers were excluded from the scope of protection. In consultation with us the period of protection was extended for another year till 31st December, 1956. We held the second inquiry in 1956 and recommended continuance of protection at the same rate of duty up to 31st December, 1960, but widened the scope of protection to include transformers up to 3,000 KVA and 37.5 KV on the HT side. These recommendations were accepted by Government. The last inquiry into this industry was undertaken by us in 1960 when we recommended continuance of protection at the same rate of duty up to 31st December, 1963, but again we extended the scope of protection to include transformers up to 10,000 KVA and 132 KV on the HT side and parts of such transformers, not otherwise specified, as some of the units in the industry were equipped to produce transformers of these higher ratings. Government accepted our recommendations and implemented them through the Indian Tariff (Amendment) Act, 1960.

2. As the protection granted to the industry is due to expire by the end of this year, we have undertaken the present inquiry under Section 11(e) read with Section 13 of the Tariff Commission Act, 1951 with a view to recommend any modifications, if necessary in the existing scheme of protection.

3.1. Questionnaires were issued to producers, importers and consumers of power and distribution transformers and their associations in January, 1963 and simultaneously by a press note those interested in the inquiry were invited to obtain copies of the relevant questionnaires and send their replies. The Department of Technical Development (hereinafter called DTD) was requested to furnish a detailed memorandum on the present position of the industry and its various problems. The Central Water and Power Commission was addressed to furnish information regarding additions to the generating capacity in the country during the Third Plan period, future requirements of transformers and its views on the quality and prices of indigenous transformers. The Collectors of Customs at the principal ports were addressed for data regarding c.i.f. prices and landed costs of imported power and distribution transformers. The Government of India Trade Representatives in the U.K., W. Germany, U.S.A. and Japan were

requested to furnish latest f.o.b. quotations of power and distribution transformers exported from those countries. The Directors of Industries of Maharashtra, Madras, West Bengal, Mysore and Kerala, the States where the units in the industry are located, were requested to furnish information on the various aspects of the industry in so far as the manufacturing units located in their respective States were concerned. Their views on the question of continuance of protection were also invited from the State Governments. The Indian Standards Institution was requested to apprise us regarding the progress made in the formulation of standard specifications. The Iron and Steel Controller was addressed to furnish information regarding the availability of iron and steel items required for the industry. Letters were also issued to suppliers of important raw materials to advise us regarding their availability, prices and quality. A memorandum on various aspects of the industry was invited from Indian Electrical Manufacturers' Association. A list of those to whom questionnaires and letters were issued and from whom replies were received is given in Appendix I. A statement showing the factories visited by us and officers of the Commission is given in Appendix II.

3.2. We selected three units, namely, Hackbridge-Hewittic and Easun Ltd., Madras, Kirloskar Electric Co. Ltd., Bangalore and Bharat Bijlee Ltd., Bombay, for cost investigation. The accounts of these units were examined by our Cost Accounts Officers.

3.3. A public inquiry into the industry was held on 28th May, 1963 in Bombay. A list of persons who attended this inquiry is given in Appendix III.

4. The recommendations made by us in our last Report (1960) on matters other than tariffs and the extent to which they have been implemented are briefly stated below:—

**Implementation of the Commission's ancillary recommendations made in its last Report (1960).**

*Recommendation No. 1 :*

"The present practice of assessing transformer oil imported with transformers to duty at the same rate as is applicable to transformer oil imported separately should be continued."

By their Resolution No. 11(1)-T.R./60 dated 9th December, 1960, Government of India accepted this recommendation and the above practice has been continued.

*Recommendation No. 2 :*

"In order to conserve foreign exchange each application for import of transformers up to 10,000 KVA and 132 KV on the HT side, either as a part of an integrated scheme or as individual item, should be thoroughly scrutinised before issuing import licences for the same."

Ministry of Commerce and Industry informed us in June, 1961 that pursuant to our recommendation and as a result of increase in the indigenous production of transformers, the quota for established importers from April-September, 1961 licensing period was reduced

from 15 per cent to nil. We understand that the provision for actual users' licences has been continued but a copy of our recommendation had also been forwarded for guidance to the licensing authorities concerned. The D.T.D. has informed us that cases for import of transformers even above 10,000 KVA are being invariably scrutinised before issuing import licences.

*Recommendation No. 3 :*

"Imports of power and distribution transformers should in future be classified by voltages on the HT side as (i) up to 37.5 KV, (ii) above 37.5 to 66 KV, (iii) above 66 to 132 KV and (iv) above 132 KV. Imports under each of these categories should be further sub-classified by ratings as follows: (i) up to 3,000 KVA, (ii) above 3,000 KVA to 5,000 KVA, (iii) above 5,000 KVA to 10,000 KVA and (iv) above 10,000 KVA. In addition to their number and value total KVA of such imports under each range should also be recorded separately".

Pursuant to Government's acceptance of this recommendation, the Director General, Commercial Intelligence and Statistics, Calcutta has started sending separate returns to us according to the above classifications since 1961. But in the Monthly Statistics of Foreign Trade of India published by him the earlier classification has been continued. We refer to this matter again in paragraph 12.2.3.

*Recommendation No. 4 :*

"The Government of Mysore should take immediate steps to organise the affairs of the Government Porcelain Factory, Bangalore and rationalise its production in such a manner as to enable the factory to diversify the range of its products, particularly porcelain bushings for higher voltages and to operate up to its full capacity."

The Government Porcelain Factory, Bangalore, has informed us that its production has been rationalised and diversification suggested by us has been attempted on the basis of anticipated demand. Further, plans for expansion and diversification at a cost of Rs. 33 lakhs are under implementation and necessary technical know-how from Japanese experts has been arranged. A second tunnel kiln is expected to be set up in 1964. As an indication of the progress made by this unit we have noted that its production of L.T. and H.T. bushings which was 5,140 Kg. and 9,230 Kg. respectively in 1960 has increased to 41,680 Kg. and 43,420 Kg. respectively in 1962 and bushings of up to 22 KV are included in the supplies made by the unit.

5.1. At the time of last inquiry in 1960 the scope of protection covered transformers up to 3,000 KVA and 37.5 KV on the H.T. side excluding furnace, rectifier and flame-proof transformers. On our recommendation, protection was extended to include power and distribution transformers up to 10,000 KVA and 132 KV on the HT side.

**5. Scope of inquiry.**

The main considerations on which we had extended the scope were that some of the producers in the private sector were already equipped and had technical collaboration to produce transformers up to this size and Heavy Electricals Ltd., Bhopal with its programme for manufacturing higher size power transformers was due to commence production in July, 1960.

5.2. In the course of the present inquiry the Indian Electrical Manufacturers' Association has pleaded for widening the scope of inquiry to include transformers of up to 20,000 KVA and 132 KV. Its request is based mainly on the manufacturing programme of the industry excluding Heavy Electricals Ltd., Bhopal. The latter has plans to manufacture transformers of up to 150,000 KVA and with the facilities at present installed in it works it can produce transformers of up to 50,000 KVA and 220 KV. It has already manufactured transformers of up to 12,500 KVA and orders for bigger transformers are in hand. Hackbridge-Hewitt & Easun Co. has claimed that it can produce transformers of up to 30,000 KVA and 132 KV. D.T.D. has informed us that quite a number of units are now taking up the manufacture of larger rating power transformers and these are indicated in paragraph 6.4. The matter was discussed at length at the public inquiry. It was the view of the representative of the D.T.D. that the scope of protection should be made applicable for the ensuing three years, and it would be advisable to widen it to cover transformers of up to 50,000 KVA or even 75,000 KVA, since Heavy Electricals Ltd., Bhopal is already equipped for it and has programmed to supply such transformers within this period. We were also informed that it has orders for 75,000 KVA transformers with 220 KV on the H.T. side. The representatives of the producers were also in favour of such an extension which would provide further stimulus to their plans for the manufacture of bigger transformers. Taking into consideration the facilities at present existing with Heavy Electricals Ltd., Bhopal, even without further capital expansion, we have decided to extend the scope of inquiry to include power and distribution transformers of up to 50,000 KVA and 220 KV on the H.T. side.

6.1. *Present position.*—At the last inquiry there were seventeen units engaged in the production of power and distribution transformers and their aggregate rated capacity on single shift was 1.47 million KVA. Further, Heavy Electricals Ltd., Bhopal, a Government of India undertaking, had a programme to manufacture transformers of higher ratings and was expected to commence production in July, 1960. Since then India Electric Works Ltd., Calcutta has discontinued manufacture of transformers. Hindustan Electric Co., Bombay which closed down its Howrah factory, but established a new one at Baroda with a capacity of 72,000 KVA, has entered into foreign collaboration with Brown Boveri & Co., Ltd., Baden, Switzerland and commenced production in early 1962. Another new unit, Andhra Pradesh Electrical Equipment Corporation, Vishakhapatnam was also established after the last inquiry with a licensed capacity of 150,000

**6. Present position of the industry and future expansion.**

KVA per annum on single shift and has been in operation since February, 1962. Electric Construction and Equipment Co. Ltd., Calcutta, one of the transformer manufacturers, owns this unit. Thus, besides Heavy Electricals Ltd., Bhopal, there are still 17 units effectively in operation. Heavy Electricals has entered into a technical agreement with Associated Electrical Industries of U.K. for a period of 15 years without any financial participation. Its licensed capacity of 3 million KVA on double shift basis is to be built up progressively. There is a proposal for doubling the output of the plant. Heavy Electricals plans to manufacture transformers totalling 1.4 million KVA during 1963-64, 1.9 million KVA in 1964-65 and 2.6 million KVA in 1965-66. With present crane facilities installed in its factory, it can handle transformers up to 50,000 KVA ratings. A statement showing particulars of each unit regarding technical collaboration, items of manufacture, maximum range of production, labour employed, etc., is given in Appendix IV.

6.2. The Government of West Bengal has reported that there are 15 small scale units in the State producing distribution transformers up to 1,500 KVA with a total annual capacity of 108,400 KVA. We have no further details about these units.

6.3. *Capacity.*—In connection with the present inquiry we have been furnished with the figures of installed capacity of each unit by the Department of Technical Development and by the producers themselves. Where they differed they were generally discussed at the public inquiry and the figures have been modified keeping in view the present procedure of indicating installed capacity without reference to shift and on the basis of past performance of the unit. Although in the case of Electric Construction & Equipment Co. Ltd., its representative stated at the public inquiry that the expansion has been implemented and capacity brought to 400,000 KVA, we have considered it advisable to adopt a lower figure of 250,000 KVA in view of the past performance. For Crompton Parkinson, National Electrical Industries, General Electric Co., Kirloskar Electric Co., Bharat Bijlee, Gandhi Electric Industries and Hackbridge-Hewitt & Easun Ltd., higher figures of capacity based mainly on actual performance have been adopted by us. For Gandhi Electric Industries and Transformer and Switchgear, the capacity after expansion has been taken. In case of Government Electric Factory, Bangalore and Indian Transformers, Alwaye, the additional licensed capacity does not appear to have been implemented so far. As regards Heavy Electricals whose licensed capacity will be achieved only after 1965-66, we have taken its present installed capacity as 1.4 million KVA on the basis of its production programme for 1963-64. A statement showing installed capacity of each unit as at the time of last inquiry and as accepted by us for this inquiry along with the expansion schemes at the time of last inquiry and the production of the units during 1962 is given later. It will be seen that the capacity of the industry has increased from 1.47 million KVA at the time of last inquiry in 1960 to 3.98 million KVA in early 1963 which includes the capacity of Heavy Electricals Ltd., Bhopal.

6.4. *Diversification.*—Further progress has been made by the industry since the last inquiry towards the manufacture of transformers of higher ratings and at higher voltages. In this connection Kirloskar Electric Co. has informed us that it is making arrangements to import machinery required for the manufacture of larger transformers up to 20,000 KVA and 132 KV. Crompton Parkinson Ltd., Bombay has stated that it has facilities to manufacture transformers up to 10,000/12,500 KVA and 132 KV and has a 50 tonne crane in its works. G.E.C. of India (P) Ltd., Calcutta has reported that its maximum capacity is 10,000 KVA and 33 KV. Hackbridge-Hewittic and Easun Ltd. has claimed its ability to manufacture transformers up to 30,000 KVA and 132 KV. Government Electric Factory, Bangalore is reported to have entered into technical collaboration to manufacture transformers up to 20,000 KVA and 132 KV. Transformer and Switchgear Ltd., Madras has informed us that its maximum capacity to produce transformers is 7,500 KVA and 33 KV. Electric Construction & Equipment Co. Ltd., Calcutta has stated that its scheme to manufacture transformers up to 15,000 KVA and 132 KV is under implementation and is likely to be effective by the end of 1963. We are further informed that some of the units are also manufacturing furnace transformers, rectifier transformers and welding transformers. The maximum capacity of transformers to be manufactured by Heavy Electricals is envisaged as 150,000 KVA and 220 KV.

6.5. *Future expansion.*—We are informed that Government of India set up a Committee in 1962 to assess the requirements of power transformers and to advise on the planning of capacity for their manufacture. Accordingly, Government granted licences for expansion to some of the existing units and to one new unit, namely, Kerala Heavy Electricals Project, Trivandrum. This company has an authorised capital of Rs. 220 lakhs and is negotiating foreign collaboration agreement with Hitachi Ltd., of Japan. The company has informed us that its annual capacity will be 600,000 KVA and will commence production by the end of 1964. Details about expansion schemes of existing units and the new unit are given on the next page. It will be seen that after these expansion schemes are implemented the total capacity will increase to 7.38 million KVA.

*Expansion schemes of existing and new units*

Sl. No.	Name of the unit	Additional capacity licensed/awaiting implementation		
		Distribution transformers	Power transformers	Total
1	2	3	4	5
		KVA	KVA	KVA
1	Bharat Bijlee Ltd., Bombay	120,000	..	120,000
2	Transformer & Switchgear Ltd., Madras.	..	49,200	49,200

1	2	3	4	5
3.	Government Electric Factory, Bangalore.	120,000	396,000	516,000
4.	Kirloskar Electric Co., Bangalore .	..	225,000	225,000
5.	Indian Transformers, Alwaye .	40,000	..	40,000
6.	Andhra Pradesh Electrical Equipment Corporation, Vishakhapatnam.	50,000	..	50,000*
7.	Electric Construction & Equipment Co. Ltd., Calcutta.	N.A.	N.A.	150,000**
8.	Beegee Corporation, Patiala .	50,000	..	50,000
9.	Kerala Heavy Electricals Project, Trivandrum.	N.A.	N.A.	600,000
10.	Heavy Electricals Ltd., Bhopal .	..	1,600,000	1,600,000†
	TOTAL	380,000	2,270,200	3,400,200

\*Andhra Pradesh Electrical Equipment Corpn., was granted a licence of 150,000 KVA of which it has established a capacity of 100,000 KVA. Hence the remaining capacity has been shown as additional capacity.

\*\*Electric Construction and Equipment Co. is licensed for a final capacity of 400,000 KVA of which 250,000 KVA has been adopted by us as installed. The remaining is shown as capacity yet to be implemented.

†Difference between the ultimate licensed capacity of 3 million KVA and the present installed capacity of 1.4 million KVA.

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*Statement showing annual installed capacity of the units at the time of the last inquiry and their present adopted installed capacity and production (1962)*

Sl. No.	Name of the unit	Annual capacity in 1960 (single-shift) (KVA)	Expansion granted at the time of the last inquiry (KVA)	Total capacity resulting after expansion (KVA)	Installed Capacity adopted for the present inquiry (KVA)	Production during 1962 (KVA)	Remarks
1	2	3	4	5	6	7	8
1.	Crompton Parkinson (Works) Pvt. Ltd., Bombay.	192,000	83,000	275,000	350,000	359,695	
2.	Associated Electl. Industries Mfg. Co. (P) Ltd., Calcutta.	65,000	..	65,000	90,000	90,328	
3.	National Electl. Industries Ltd., Bombay.	144,000	36,000	180,000	300,000	316,315	
4.	Government Electric Factory, Bangalore .	84,000	120,000	204,000	84,000	110,265	
5.	Bajaj Electricals Ltd., Bombay .	42,000	..	42,000	60,000	80,250	
6.	Radio & Electrica's Ltd., Madras .	102,000	..	102,000	102,000	31,350	
7.	Electric Construction & Equipment Co. Ltd., Calcutta.	104,000	296,000	400,000	250,000	236,210	The expansion licence of this unit was granted after the last inquiry.





7. A statement showing production of power and distribution transformers during 1960, 1961 and 1962 according to various ratings is given later along with their percentage of the total production. Details about production of

**Production.**

each unit are given in Appendix V. The Department of Technical Development has indicated that production during 1963 is expected to be of the order of 3 million KVA. It will be seen that total production of the industry has increased from 1.3 million KVA in 1960 to 2.3 million KVA in 1962, *i.e.*, an increase of 78 per cent and indicates a better utilisation of capacity. Further, the manufacture of transformers of higher ratings has also increased during the last two years, a trend which is expected to develop further in future.



*Statement showing rating-wise production of transformers during 1960,  
1961 and 1962*

	1960				1961				1962			
	No.	KVA	% in terms of KVA	No.	KVA	% in terms of KVA	No.	KVA	% in terms of KVA	No.	KVA	% in terms of KVA
Upto 25 KVA	2,279	44,930	3.5	2,598	50,106	2.8	4,736	102,193	4.4			
Above 25-75 KVA	2,824	163,959	12.7	3,878	213,409	11.9	3,605	180,140	7.9			
Above 75-250 KVA	2,439	323,949	25.1	3,633	469,405	26.1	4,336	584,970	25.5			
Above 250-500 KVA	542	223,022	17.3	721	293,870	16.4	861	375,173	16.3			
Above 500-700 KVA	128	86,341	6.7	201*	143,825*	8.0	216*	158,075*	6.9			
Above 700-1,000 KVA	107	106,000	8.2	116**	113,572**	6.3	214**	2,13,424**	9.3			
Above 1,000-2,000 KVA	121	194,315	15.0	98	135,607	7.6	132	215,750	9.4			
Above 2,000 KVA	41	148,500	11.5	89	376,100	20.9	107	466,150	20.3			
TOTAL	8,481	1,291,016	100	11,334	1,795,894	100	14,207	2,295,875	100			

\*These figures are for above 500—750 KVA range.

\*\*These figures are for above 750—1,000 KVA range.

8.1. At the time of the last inquiry for determining the requirements of transformers in terms of KVA we had been furnished a factor of 5.3 for multiplying generating capacity (in KW) to be added in any year. This factor covered the full requirements of power and distribution transformers and was the basis adopted by the Development Council for Heavy Electrical Industries in making its estimates. We had, however, modified this ratio to 5.0 by reducing the requirement of step-down transformers. Our estimates of demand are discussed in paragraph 8 of our Report (1960).

8.2.1. In connection with the present inquiry, Indian Electrical Manufacturers' Association has submitted its estimates based on the ratio: 5.0 adopted by us at the last inquiry as applied to the revised targets of additions to generating capacity and thus arriving at a demand of 5.25 million KVA in 1963-64 and 12.70 million KVA in 1965-66. Government Electric Factory, Kirloskar Electric Co. and Transformer and Switchgear have furnished estimates of demand, but either they are based on earlier targets of annual additions to generating capacity which now stand revised, or the basis has not been given.

8.2.2. The D.T.D. has furnished us the estimates of present and future demand of transformers as recommended by the *ad hoc* Committee appointed by Government in 1962 for assessing the demand for heavy electrical equipment and approved by the Development Council. These estimates of demand are:

Year	Step-up trans- formers	Step-down trans- formers	Distribution transformers	Total
	m. KVA	m. KVA	m. KVA	m. KVA
1961-62 . . .	1.62	4.06	4.85	10.53
1962-63 . . .	1.75	4.35	5.25	11.35
1963-64 . . .	1.90	4.70	5.65	12.25
1964-65 . . .	2.00	5.00	6.00	13.00
1965-66 . . .	2.00	5.00	6.00	13.00

The basis adopted for arriving at the above estimates is given below:

- (a) Step-up transformer capacity. . . .  $\frac{\text{Installed generating capacity}}{\text{Power factor (O.B.)}}$
- 1.25  $\times$  installed generating capacity.
- (b) Step-down transformer capacity . . . .  $2.5 \times$  step-up transformer capacity.
- 3.13  $\times$  installed generating capacity.

(c) Distribution transformer capacity . . .  $3 \times$  step-up transformer capacity.

$3.75 \times$  installed generating capacity.

Total transformer capacity required in KVA . . .  $8.13 \times$  installed generating capacity.

It will be seen that the estimates of demand for categories of transformers have been substantially stepped up in relation to the installed generating capacity by the *ad hoc* Committee.

8.3. The Central Water and Power Commission has furnished us with the figures of actual additions made to the generating capacity for the years 1959-60 to 1961-62 and the targets of further additions in the generating capacity planned for the remaining years of the Third Five Year Plan. These are given below:

		Additions of generating capacity in million KW.
1959-60 . . . . .		0.36
1960-61 . . . . .		0.706
1961-62 . . . . .		0.58
		} actual figures
1962-63 . . . . .		0.54
1963-64 . . . . .		1.03
1964-65 . . . . .		1.90
1965-66 . . . . .		3.39
		} estimated figures

The ratio of the apparent availability of transformers to the above figures of additions to the generating capacity during the three years 1960 to 1962 is, however, found by us to be less than 4. The factor 5 arrived at by us at the time of the last inquiry is already higher than this and the disparity between the actual ratio during the last three years and that recommended by the *ad hoc* Committee is very wide. At the public inquiry also the consensus of opinion was that the estimates of demand arrived at by the *ad hoc* Committee are on the high side. We have, therefore, for the purpose of arriving at our estimates of demand decided to retain the multiplying factor 5.0 and have arrived at an estimate of transformers of 5 million KVA in 1963-64. Depending on the additions to generating capacity, steeply rising as stated earlier, the demand for transformers will be 10 million KVA in 1964-65 and 17 million KVA in 1965-66:

8.4. In paragraph 6 we have indicated the existing capacity as about 4 million KVA and future capacity (on implementation of the present licensed capacity) as about 7 million KVA including the capacity of Heavy Electricals Ltd., Bhopal. The demand estimated above shows a steep rise from year to year and leaves a sizeable gap between demand and capacity. Severe shortages might, therefore, develop involving substantial foreign exchange to cover the gap by imports. As transformers constitute an essential link in the transmission and distribution of power before it can be put to use, it is necessary to

accord to their production the same priority as to the development of power; otherwise large investment on power plants may be rendered partly infructuous. We, therefore, recommend that Government should implement the programme of doubling the capacity of Heavy Electricals Ltd., Bhopal and initiate plans for further expansion of its transformer capacity. Further, since this is an industry where existing producers, given the requisite raw materials, can also augment their capacity and production with a very small expenditure of foreign exchange, we recommend that Government may accord preference to them for further expansion of their capacity. A careful watch over the situation would be necessary and steps to augment capacity should be taken well in advance to avoid conditions of shortage.

9.1. The principal raw materials and components required for the manufacture of transformers are given below:

**9. Raw materials.**

1. Electric sheet steel (silicon steel):
  - (a) hot rolled and (b) cold rolled grain oriented.
2. Insulated copper strips and wires (mainly paper insulated).
3. Porcelain bushings:
  - (a) high tension, and (b) low tension.
4. (a) cooling tubes: (i) circular, and (ii) elliptical, and (b) radiators.
5. Mild steel sheets and rolled sections.
6. Transformer oil.
7. (i) Paper based insulating material like presspan, leatheroid, etc., boards, tapes and bonded cork sheets, (ii) insulating varnishes.
8. Components and miscellaneous items:
  - (a) Thermometers (dial type or ordinary type); (b) Cable boxes; (c) Terminal components; (d) Off-load tap changing switches; (e) On-load tap changing switches; (f) Silica-gel-breathers; (g) Oil level gauges; (h) Relays; (i) Synthetic rubber gaskets; (j) Bolts, nuts, screws, washers; (k) Paints, etc.

The raw materials (items 1 to 7) constitute on an average about three-fourths of the total ex-works cost of a transformer and electric sheet steel and insulated copper account each for nearly 25 to 30 per cent of the cost of raw materials and components. The position regarding raw materials is reviewed below:

**9.2.1. Electric sheet steel:**

9.2.1.1. As at the time of the last inquiry, the industry's requirements of these sheets continue to be met entirely from imports. We have been informed by the Iron and Steel Controller that Rourkela Works of Hindustan Steel Ltd. has included, as a part of its 1.8 million tonnes expansion, a provision for the manufacture of 50,000 tonnes electric sheet steel half of which will be of transformer grade to be produced from April, 1966. It was not clear whether these would be cold rolled grain oriented sheets.

9.2.1.2. *Cold rolled grain oriented sheets.*—We have been advised that for production of these sheets, electric grade steel ingots (with about 3 to 3.5 per cent silicon) are first hot rolled in a continuous strip to a thickness of about 2 to 2.5 mm. After pickling, this is drastically reduced in two stages to the required thickness of about 0.35 mm., each reduction being followed by suitable continuous annealing and finally, by a box annealing at high temperature in hydrogen atmosphere. As a result of this processing the magnetic property of the sheet (along the direction of rolling) improves remarkably by increasing the permeability, raising of the saturation limit of the material and greatly decreasing the iron loss. This enables the material to be used at higher magnetic density thereby reducing the quantity required and at the same time reducing loss of electrical energy. The insulation used on these sheets being superior and smoother the stacking factor is better and reduces deterioration during storage. Thus the economy is not limited to electric sheet steel but a similar saving is effected in the requirement of copper, oil and the materials for fabrication of the tank. The size and weight of the transformer is greatly reduced which specially for larger ratings would mean a large saving in substation design. The lower power losses capitalised in terms of savings extending over the life of the transformer is another substantial advantage.

9.2.1.3. *Extent of saving.*—While changing over to the use of CRGO sheets either the specific losses can be kept at the same level as for conventional transformers and the active material reduced to the minimum, or the quantity of material maintained aiming at minimized losses or a compromise solution may be arrived at between the two desirable factors. At the public inquiry we had asked for an indication of saving for different ranges of transformers with use of CRGO sheets but no satisfactory estimate was obtained. In the case of one unit using CRGO sheets without annealing (after cutting of laminations) the overall saving in cost was indicated as roughly 5 per cent. We had requested some of the costed units to furnish comparative data for transformers with CRGO sheets and hot rolled sheets but no reliable information has been furnished. On the basis of studies made by Sankey Electrical Stampings, which is the main importer and supplier of such sheets and on the basis of a published technical study by an expert (Mr. Szafranski) the following savings are indicated simultaneously with 10 per cent reduction in losses.

Core steel (sheets)	15—25	Per cent.
Copper	10—25	„ „
Oil	8—15	„ „
M. S. sheets and sections	10—20	„ „

For providing a strictly comparable basis if same losses are allowed the saving in material is substantially more. Thus even allowing for the present high price of CRGO sheets which cannot continue, the net economies in the cost of other materials should more than offset the price disadvantage. Apart from the sheets, the substantial saving

in copper and oil both of which are entirely imported items would result in the saving of foreign exchange which is now a prime consideration.

9.2.1.4. It has been pointed out that factors like transport, handling and normal formation of joints adversely affect the advantage of CRGO sheets. On the basis of experiments carried out by the supplier of these sheets we understand that the deterioration in the quality of sheets in transport and handling can be reduced to a marginal level with due care in packing. For taking maximum advantage of the quality of sheets we are informed that it is essential to anneal the sheets after cutting of lamination in an inert atmosphere. Anticipating increase in the use of CRGO sheets and to help such a change over, Sankey has installed and commissioned in 1961 a suitable annealing furnace. We are, however, advised that stress relieving of the sheets even for a few minutes in a furnace with normal atmosphere, can almost fully restore this magnetic property. Some of the producers stated that with CRGO sheets it is essential to use mitre joints (joints at an angle of say,  $45^\circ$  or  $30^\circ$  against  $90^\circ$  in the conventional transformers). We were informed by the representative of the D.T.D. that for transformers of say, up to 1,000 KVA the practice abroad is to use conventional joints by sacrificing only a small part of the advantage. It was clear from the discussion at the public inquiry that substantial saving in material can result from the use of CRGO sheets and that the saving will be increased for higher rating transformers. It was stated by Kirloskar Electric and Hack-bridge-Hewittic and Easun that the transformers tendered by them for export to overseas customers were designed with CRGO sheets.

9.2.1.5. The producers discounted possibility of reduction in the cost of transformers from present levels due to the higher prices of CRGO laminations which at present are stated to be about 45 per cent more expensive than laminations from hot rolled sheets. On the other hand, the present unremunerative prices of CRGO sheets were attributed by Sankey to the small off-take of such sheets by the producers. Out of 10,517 tonnes of sheet steel imported by Sankey in 1961 and 1962, import of CRGO sheets was 557 tonnes. With such small quantity it could not negotiate for an advantageous price nor could it have the choice of ordering such sheets (supplied in coils) in different widths to minimise losses in cutting of laminations of different sizes. Even out of this quantity only 33 tonnes were sold in 1961 and 243 tonnes in 1962, leaving half the quantity as the balance to be carried over to 1963. The nitrogen atmosphere furnace installed by it was hardly run for a few days in a month resulting in higher fixed costs on this account. It has confirmed that with increased off-take of laminations from CRGO sheets it would be able to bring down the difference in price due to better utilisation of its annealing furnace and import of material in specific widths enabling it to effect reduction in wastage. Since CRGO sheet steel is supplied in coils as against hot rolled sheet steel in sheet form the waste from the former is lower. Sankey has also stated that in all advanced countries the tendency is to switch



over to the manufacture of CRGO sheets and its own associates in U.K. are shortly closing down their hot rolled sheet mills. It apprehends difficulties in future in procuring lower grades of hot rolled transformer grade sheets. The D.T.D. in its memorandum has urged that as most of the manufacturers abroad, even in respect of smaller distribution transformers, have almost completely changed over to the use of CRGO sheets, the indigenous industry, in view of the economies in the material cost of transformers, should also switch over to the use of CRGO sheets in its own interest. It has stated that since most of the manufacturers are having collaboration with manufacturers abroad, there should be no difficulty for them to get the designs for transformers with CRGO sheets. Annealing furnaces should not be a bottleneck as their indigenous production is growing. We have been informed by the representative of Heavy Electricals Ltd., Bhopal that its entire manufacturing programme of transformers from the current year 1963-64 onwards is based on the use of CRGO sheets.

9.2.1.6. At the public inquiry some of the producers pointed out that in spite of lower losses for transformers with CRGO sheets, their offers are not given preference by the consumers. We are, however, informed that the losses are capitalised and added to the cost of transformers at the time of the scrutiny of offers. If the implied suggestion of producers is that the consumers should pay higher prices for transformers with CRGO sheets as compared to the conventional transformers, we are unable to support such a contention. The consequential economies in the cost of other materials are expected to more than offset the present unfavourable prices of CRGO sheets, as discussed in paragraph 9.2.1.3., and this advantage has to be shared with the consumer who should benefit from the induction in our country of improved materials and designs which have already been in vogue in advanced countries for a long time. Any lowering of price from the present high levels is of special significance for exports in view of the disparity in the prices of indigenous transformers and those offered by overseas producers (as discussed in paragraph 14.2)

9.2.1.7. From the evidence placed before us we cannot help observing, as in the case of electric motors, that the long and expensive time lag between the established use of improved design and material in overseas countries and their acceptance in India is due to the inertia of indigenous producers who enjoy a sheltered market and higher price level for their products. After careful consideration of all aspects we are convinced that it is desirable for the industry to switch over to the use of CRGO sheets. We, therefore, recommend that the producers of transformers should change over to the use of CRGO sheets in the shortest possible time. In view of the consequential economies in copper and oil whose import carry a strain on the present foreign exchange resources, Government should regulate the supply of imported raw materials to the industry so as to ensure their more effective use consistent with the adoption of CRGO sheets. Government may also consider laying down a phased and early programme for a change-over to CRGO sheets and for the reduction of the import of hot rolled sheets. We also recommend that the Central

Water and Power Commission should disseminate necessary information to the State Electricity Boards and other consumers and advise them to give preference to transformers with CRGO sheets. Government should also take immediate and effective steps to see that the transformer grade electric sheet steel planned for production at Rourkela from April, 1966 will be of the CRGO variety. An assurance to this effect will further help change over to this material by the producers.

9.2.1.8. *Demand for sheets.*—The D.T.D. has placed the current demand for sheet steel at about 15,000 tonnes and expects it to increase to about 40,000 tonnes by 1965-66. On the basis of present availability of laminations and waste factor the requirement of sheet steel amounts to about 3,000 tonnes per million KVA of transformers and therefore on the basis of the targets of demand we estimate the requirement of electric sheet steel as 15,000 tonnes for 1963-64 and 51,000 tonnes in 1965-66. These estimates of requirements are based on the use of hot rolled sheets whereas the estimates with the use of CRGO sheets will be substantially lower. Since it would be preferable to aim at a slightly higher capacity for such a basic raw material, we have not considered it desirable to lower these estimates.

9.2.1.9. *Capacity for production of laminations.*—The bulk of the industry's requirements of laminations still continue to be met by Sankey Electrical Stampings Ltd. Since 1961 Devidayal Stainless Steel Industries has also commenced production. Some of the producers also are meeting either partly or wholly their requirements of transformer laminations. The present installed and licensed capacity of Sankey and Devidayal along with their production for 1960, 1961 and 1962 are given below:—

		(In tonnes)			
Name of the unit	Present installed capacity	Licensed capacity	Production		
			1960	1961	1962
(1) Sankey:					
(a) Bombay . . .	2,700	6,000	..	..	..
(b) Calcutta . . .	1,500	3,000	..	..	..
(c) Bangalore . . .	2,200	5,000	..	..	..
TOTAL . . .	6,400	14,000	2,653	3,745	4,329
(2) Devidayal Stainless . . .	1,440	2,000*	Nil	16	215
GRAND TOTAL . . .	7,840	16,000	2,653	3,761	4,544

\*Total capacity for laminations and motor stampings is stated as 6,000 tonnes. About one third will be for laminations and the rest for motor stampings.

Sankey has finalised plans to expand its capacity from 6,400 to 8,775 tonnes and expects to put up a plant at Bhopal to cater for the requirement of Heavy Electricals Ltd. It has stated that it would

endeavour to expand its capacity to 14,000 tonnes depending on the availability of foreign exchange. Devidayal Stainless has stated that it is shortly installing a punching press to step up its capacity by about 20 per cent. It also plans to instal a nitrogen atmosphere annealing furnace for CRGO sheets with a capacity of 1,200 tonnes per annum. Some of the requirements of laminations are met by the transformer producers themselves who import sheets and cut them into laminations by means of shear presses. From an examination of the present and future installed capacity for making of laminations it would appear that by 1965-66 the capacity would be far from adequate and necessary steps will have to be taken well in advance to augment it.

9.2.1.10. Sankey has also pointed out to us that it is now required to import sheet steel either under DLF or from Eastern European countries at higher prices and in the former case, long procedural delays are involved in licensing and imports. Devidayal has also complained of inadequate supplies. To obviate a situation where the industry might suffer from the lack of timely supplies Government might permit more liberal imports of sheets and allow producers, if they so desire, to carry a larger stock which may serve as a buffer and even out production.

9.2.1.11. The percentage of wasted material while cutting laminations has been reduced from 25 to 20 per cent in case of Sankey and it has stated that the advantage has been passed on to consumers. Its present prices, however, stand higher due to additional excise duty levied by the Government and the higher prices paid by it under DLF.

9.2.1.12. *Standardization of grades.*—Since the last inquiry in 1960 there has been a definite trend towards greater standardization of 86 and 80 grade sheets whose supply by Sankey, as percentage of total sales, has increased from 39 and 21 respectively in 1960 to 52 and 27 respectively in 1962. We have, however, recommended a change over to CRGO sheets and expect that with the use of these sheets producers will extend similar co-operation in standardising as few grades of CRGO sheets as possible.

9.2.2. *Insulated copper strips and wires.*—The transformer industry mostly uses paper covered wires and strips, manufacturers of the latter in turn making use of imported copper and paper. A capacity of 9,600 tonnes a year for producing electrolytic grade copper is under installation by Indian Copper Corporation which will make use of imported blister copper. The main producers of insulated copper strips and wires are Indian Cable Co., National Insulated Cable Co., Shakti Insulated Wires (P) Ltd., and Devidayal Cable Industries. The D.T.D. has informed us that the present demand is of the order of 3,000 tonnes of which 2,250 tonnes is the current indigenous production. It has estimated the demand by 1965-66 as about 9,000 tonnes and has stated that schemes are under way for the manufacture of paper covered wires and strips which will enable the bulk of the demand to be met from indigenous production. In view of our estimates of demand for transformers for 1965-66 being higher than those of the D.T.D. the

requirement of copper strips and wires would also have to be stepped up with corresponding increase in imports and expenditure on foreign exchange. In this context we would again like to impress on the producers of transformers the need to switch over to CRGO sheets which would substantially cut down imported copper requirements. We understand that at present there is no possibility of substituting copper by aluminium in this industry and in any case even if technically feasible economies are unlikely. Some complaints were expressed at the public inquiry regarding delays in the supply of wires and strips and shortage of particular sizes. We have, however, noted from the evidence that such cases were few and by and large the requirements of the manufacturers have been satisfactorily met.

9.2.3. *Porcelain Bushings*.—The requirement of L.T. (low tension) bushings and part of H.T. (high tension) bushings is now met fully from indigenous production. We understand some new units like Seshasayee are now in production and there is a proposal to put up a plant for hard-ware fittings of bushings. Some of the suppliers, chiefly the Government Porcelain Factory, Bangalore, have schemes to manufacture bushings up to 220 KV. The producers of transformers stated that they are not fully aware of the manufacturing plans of the insulator industry and since the capacity and production of bushings are indicated in tonnes they are unable to equate them to their requirements which are in numbers. We consider that the producers could help to solve this difficulty by providing information about the weight of different bushings used and needed by them. Government Porcelain Factory, Bangalore has referred to the Planning Commission's estimate of 200 Kgs. of bushings per 1,000 KVA comprising on an average 5 units stating that the weight of bushings will be higher for higher voltage rating of transformers, the number will, however, diminish. It has been ascertained from manufacturers that the ratio adopted will be a fair indication of the weight of bushings required. From the production data available with us we find that the average KVA of transformers produced was 154 KVA in 1960, 158 KVA in 1961 and 162 KVA in 1962 and the trend of increase in the average KVA is likely to continue. The representatives of the producers at the public inquiry favoured a detailed survey of the industry producing bushings. We agree with this and suggest that Government should investigate this matter and in case the existing capacity needs to be augmented and/or diversified it may be done at the earliest opportunity. It was also brought to our notice that the bushings manufacturers encounter difficulty in planning their production in the absence of a knowledge of long-term requirements of the transformer industry and due to its insistence on a large number of sizes and designs of bushings for the same voltage ratings. We impressed on the representatives of the producers at the public inquiry to plan their orders on the bushing manufacturers in advance to ensure timely supplies. Although I.S.I. has now laid down the performance tests for bushings (IS:2099-1962) sizes and designs have not been standardized by it. Nevertheless the producers agreed that there is ample scope for cutting down the number of sizes and designs of bushings to a much smaller

number and that it would result in greater interchangeability and lowering the cost of bushings, reducing inventories both with the producers of bushings as well as of transformers. As a measure to increase production and reduce cost of bushings we recommend that the producers of transformers in their own interest should extend their full co-operation in reducing the number of sizes and designs of bushings particularly of lower voltages and they should plan their procurement programme well in advance with the bushings manufacturers.

9.2.4. *Cooling tubes and radiators.*—The requirement of tubes both circular and elliptical is being met by indigenous producers namely, Indian Tube Co., Tube Products of India, Premier Automobiles and Godrej. Transformer producers have complained of shortage of tubes which in turn has been explained by the tube manufacturers as due to shortage of requisite raw material required by them. Tube Products has complained that even indigenous skelp is not made available in adequate quantity for feeding the cold rolling mill it has set up for overcoming its raw material shortage for tube production. As regards pressed steel radiators which according to Indian Electrical Manufacturers' Association are more economical for larger transformers say 2,000 KVA and above, some of them are manufactured indigenously and the rest imported. The D.T.D. has informed us that one licence for the manufacture of this item in the country in collaboration with a foreign firm has been given and the industry's requirement is expected to be met mostly from indigenous production.

9.2.5. *Mild steel sheets and rolled sections.*—The D.T.D. has indicated to us that the current demand for m.s. sheets required by the industry stands at about 6,000 tonnes and is expected to rise to about 15,000 tonnes by 1965-66. While the supply position of m.s. sections and angles is said to be satisfactory, shortage of flat products has been reported. In the context of the overall shortage of the latter in the country we expect that Government would take remedial measures, but in the meantime considering the importance of this industry we suggest higher priority should be given to it in the allocation of steel. Further, it has been brought to our notice that sheets of certain sizes for tank making such as of 8' width are not available. In view of the non-availability and high cost of rolling, if attempted in the country, the representative of D.T.D. has suggested to the producers to see if they can make use of 6' wide sheets but in case it was not possible he was willing to recommend the import of 8' wide sheets.

9.2.6. *Transformer oil etc.*—The current demand of transformer oil has been placed by the D.T.D. at about 1.25 million gallons which is expected to increase to 3 million gallons by 1965-66. This oil is entirely imported and no serious shortage has been brought to our notice. With regard to insulating materials which are at present imported we are informed that a licence has been issued to manufacture paper based insulating materials used by the industry. When implemented it would meet the requirement of the industry during the next 2 to 3 years. Other insulating materials such as bakelized paper,

impregnating compounds, varnishes, etc. are manufactured in the country. A scheme is under implementation for the manufacture of suitable laminated wood in collaboration with a U.K. firm. Off-load tap changing switches are produced by the manufacturers of transformers themselves while the on-load tap changing switches are imported. Shortage of electrodes for fabrication of tanks was reported but we have been advised by the representative of the D.T.D. that arrangements have been made to overcome it.

10.1. At the time of the last inquiry the consensus of opinion among consumers was that the quality of the domestic product was generally good and comparable with the imported one. During this inquiry most of the

**10. Quality.** consumers and Government departments have expressed general satisfaction with the quality of indigenous transformers and have stated that they compare favourably with imported transformers. The Central Water and Power Commission however has stated that certain Electricity Boards have commented adversely about the quality of transformers, pointing out defects of poor workmanship and unsatisfactory performance. Other complaints of minor mechanical nature continue to occur but they are reported to have been rectified whenever brought to the notice of the producers. From the discussions at the public inquiry it appears that complaints regarding the performance of the transformers had been relatively few and they were rectified by the producers to the satisfaction of consumers.

10.2. The producers have stated that they are well equipped for carrying out necessary tests for transformers manufactured by them excepting for high voltage and impulse tests the facilities for which are reported to exist at the Indian Institute of Science, Bangalore. As transformers form an essential link in the power transmission and distribution system requiring utmost reliability under continuous service no compromise is possible with regard to their quality and we would impress on the producers the importance of due care during their manufacture and in packing them for despatch so as to avoid even complaints of a minor nature.

10.3. In addition to IS:1180 of 1958 covering distribution transformers up to 100 KVA, the ISI has brought out in 1962, IS:2026 covering power transformers rated 1 KVA and above for single phase and 25 KVA and above for 3 phase operations. The Central Water and Power Commission has stated that these two standards are based on the present manufacturing technique and design of transformers and take into account the ambient conditions prevailing in the country. It feels that transformers designed according to IS:2026 should adequately meet the requirements of the whole country. Certain other specifications having an indirect bearing on the standardisation of transformers have also been published. These are IS: 585 of 1962 standardising voltages and frequency for AC transmission and distribution system, IS:2099-1962 for high voltage porcelain bushings, IS:2188-1962 for methods of test for paper for electrical purposes, etc.

10.4. In our last Report (1960) we had discussed in detail the complaints brought to our notice that the consumers did not adhere to the specifications laid down but prescribed their own specifications for each individual requirement. These deviations, many of them unnecessary, pertained to voltage ratio, impedance, temperature rise, ratings, fittings, tapplings, etc. and necessitated considerable amount of fresh designing and draughting and maintenance of a larger variety of stocks of raw materials and components. This resulted in lower productivity and higher costs. Although a few consumers such as Director General of Supplies and Disposals and Railway Design and Standardization Organisation had adopted I.S. specifications, we were not satisfied with the progress in the acceptance of standardized transformers by electricity boards, etc. and we had suggested that whenever a tender invitation deviated from the I.S. specifications the producers should bring it to the notice of the Central Water and Power Commission, the D.T.D. and the Indian Standards Institution who should take positive steps to prevail upon the authorities concerned to order their requirements of transformers according to the standards prescribed by the I.S.I. The Central Water and Power Commission has reported that it has been impressing on the various electricity undertakings/boards to select preferred sizes and it has also issued a circular to the project authorities indicating the standard sizes which HEL would be manufacturing. In our opinion these hortative measures fall short of requirements. Although hardly any complaints have been brought to the notice of the Central Water and Power Commission or the D.T.D., perhaps due to the delicate nature of the relations between the institutional consumers and the transformer manufacturers, most of the latter have again complained about the lack of standardisation and its adverse effects on productivity and cost of production. The D. T. D. has referred to the poor response from departments/industry as consumers in adopting standardisation initially for at least distribution transformers, which would result in considerable economies in their designing and production and ultimately benefit them also. It has been indicated to us that if repeat orders in large numbers of identical transformers were made feasible and properly planned it could substantially reduce the conversion costs. The D.T.D. has cited the case of British Electricity Board having completely standardised its requirements of transformers from 5 KVA to 1,000 KVA which enabled the U.K. transformer manufacturers to standardise the designs, components and other raw materials resulting in earlier delivery and interchangeability. The matter was discussed at the public inquiry and there was complete unanimity as regards the advantages and the desirability of consumers' standardizing their requirements for at least the distribution transformers. We, therefore, recommend that the Central Water and Power Commission should intensify its efforts to achieve as complete a standardisation of distribution transformers as possible and to some extent also of the smaller power transformers not only in respect of preferred sizes but also for L.T. voltages, tapplings, impulse, level, fittings, sizes, etc. State Governments, Electricity Boards and Electricity undertakings in turn should spare no efforts to co-operate in this endeavour which is of material advantage alike to consumer and producer. We also

recommend that the producers should offer lower prices for transformers of standard specifications as compared to those deviating from standards as an incentive towards achieving this objective.

10.5. I.S.I. has informed us that neither any Certification Marking Licence has been granted against the two specifications covering transformers nor has it received any application for the same. While the producers as stated above have complained of the deviations from IS specifications made by the consumers, the Indian Electrical Manufacturers' Association has pointed out that the State Electricity Boards and other consumers have started insisting on buying transformers bearing the ISI certification mark. It has stated that certification marks are not essential for capital goods like transformers which are manufactured by producers possessing fully equipped testing laboratories and are purchased by qualified engineers who have the resources and personnel to inspect and make sure of the quality. We do not agree with this contention as we are advised that not all the units or consumers are equipped to carry out all essential tests specified by ISI. Insistence on ISI certification marks for such items as distribution transformers will be conducive to attainment of the degree of standardization considered desirable by the producers themselves.

11. Power and distribution transformers up to 10,000 KVA and 132 KV on the H.T. side are assessed to duty under item No. 72(39) of the First Schedule to the Indian Tariff Act, 1934 the relevant extract from which is reproduced below:—

S.No.	Name of article	Nature of duty	Standard rate duty	Preferential rate of duty if the article is the produce or manufacture of			Duration of protective rates of duty,
				The U.K.	A British Col-ony	Burma	
72(39)	Power and Distribution transformers upto 10,000 KVA and 132 KV on the H. T. side (primary voltage being over 250) excluding furnace, rectifier and flame-proof transformers and parts of such transformers, not otherwise specified.	Protective	10 per cent <i>ad valorem</i> .	..	..	..	December 31, 1963.

NOTE.—Under the Finance Act, 1963 a general surcharge of 10 per cent has been added on all import duties.



12.1. *Import control policy.*—For the purpose of import control, power and distribution transformers are classified under Serial No. 42(a) and (d) of Part II of the Import Trade Control Schedule. The licensing policy for the different licensing periods from April-September, 1960 onwards is given below:—

Import control policy  
and imports

*April-September, 1960.*—No licences were issued for import of transformers up to 1,500 KVA and 22 KV on the H.T. side. As regards transformer of higher ratings a quota of 15 per cent of half of the best year's imports was granted on annual basis. Actual users' applications were also considered by the Chief Controller of Imports but these were not valid for import of transformers up to 3,000 KVA/37.5 KV. Applications from established importers for import of spare parts of this item excluding prohibited parts against their imports of complete machinery falling under the serial number were considered and licences were granted on a quota basis of  $2\frac{1}{2}$  per cent of half of the best year's imports in the basic period.

*October 1960—March 1961.*—The same policy as in the previous period was continued in respect of transformers up to 1,500 KVA and 22 KV on the H.T. side. For transformers of higher ratings, no licences were issued as those issued during the previous period were on an annual basis. Actual users' applications were considered by the Chief Controller of Imports.

*April-September, 1961.*—No licences were granted to established importers for import of transformers of any rating. However, actual users' applications were considered by the Chief Controller of Imports for import of transformers of ratings higher than 1,500 KVA and 22 KV on the H.T. side. As regards spare parts of transformers of ratings higher than 1,500 KVA and 22 KV the policy for established importers was the same as in April-September, 1960 licensing period.

*October, 1961—March, 1962 and April, 1962—March, 1963.*—The same policy was continued as in the previous period. However, Government of India decided on 8th June, 1962 to effect a cut of 50 per cent on entitlement for import quota of established importers during the above period in view of the serious balance of payment position except in case of licences granted to established importers under aid from U.S.A. A cut was also applied in licensing requirements of actual users from free resources. The extent of cut was decided in each case on merit subject to availability of foreign exchange.

*April, 1963—March, 1964.*—The same policy continued as in April-September, 1961 licensing period. However, provision for spare parts was abolished during this period.

## 12.2. Imports :

12.2.1. The Department of Commercial Intelligence and Statistics, Calcutta has furnished us with data for imports according to the

classification recommended in our last Report and these are given in Appendix VI. A summary is given below:—

	Nos.	KVA (’000)	Value Rs./lakhs
1961 . . . . .	55	297	38·20
1962 . . . . .	151	390	49·78

12.2.2. According to the published records of the Monthly Statistics of Foreign Trade of India, imports of transformers were as under:—

	Nos.	Value Rs./lakhs
1960 . . . . .	12,563	247·08
1961 . . . . .	5,568	401·76
1962 . . . . .	2,462	147·51

A detailed break-up of these figures according to voltages and ratings is given in Appendix VII. During 1962 imports mainly came from West Germany, Japan, U.K. and Italy.

12.2.3. The two sets of figures of imports diverge widely as regards number as well as value. From clarification received from the Director General of Commercial Intelligence and Statistics, it is noted that the published figures of imports include instrument transformers also (other than those for radio receivers) in addition to power and distribution transformers. Reconciliation of the two sets of figures would be thus impossible. In paragraph 4 we have referred to our earlier recommendation that the classification of import of transformers should be by groups of rating indicated and which has not been implemented in the Monthly Statistics of Foreign Trade of India. Publication of import data according to the classification recommended by us is therefore very desirable and should be carried out as early as possible. It will also be more helpful to the producers of transformers and to their raw material suppliers in planning their production. We, therefore, suggest that the classification recommended by us in our Report (1960) should be made applicable to the Monthly Statistics of Foreign Trade of India.

13.1. The industry exported 18 transformers valued at Rs. 4,113 in 1961 and 16 transformers valued at Rs. 14,533 in 1962. The transformers exported were of lower voltages and ratings. It has to travel a long way to build up the export potential.

#### Exports

13.2. Regarding the possibility of increasing exports in the near future, the Indian Electrical Manufacturers Association has informed us that the manufacturers are exploring it but the high cost of production mainly on account of high prices of raw materials which constitute

about three-fourths of the total cost is responsible for the lack of progress. It has further stated that tenders are often invited for a complete project including transformers and that transformers alone cannot be offered for sale unless tenders for complete projects are submitted by a consortium. We are sure there should be scope of offering transformers alone, and as some producers are also manufacturing switch gear etc. these could be included in their offers. Kirloskar Electric Co. Ltd., Bangalore has observed that some East European countries are offering their products at prices which are even below the cost of raw materials purchased by the Indian manufacturers and often the producer in Europe has a price advantage of 25-30 per cent in the cost of raw materials. In so far as the cost of raw materials of the indigenous producers is pushed up by the import and excise duties they are allowed the drawback of such duties on exports. Certain import entitlements are also allowed as incentive. We have already discussed in paragraph 9.2.1.3. the main reasons for the higher cost structure of indigenous transformers. We would like to reiterate that unless the industry which has established itself and benefited by good technical collaboration shows its willingness to adopt quickly technological improvements followed by overseas producers of advanced countries, it would be difficult to think in terms of sizeable exports in near future. We have drawn the attention of the producers to this aspect not only in case of transformers but also in case of electric motors. It behoves the protected industries to compete with the overseas producers on parity of improved design and material utilised and cutting down their cost of production.

14.1. *Selling system*.—Being a capital goods item, whose principal consumers are State Electricity Boards and Corporations, transformers are produced only on receipt of orders and made to suit the needs of these customers. Sales are made generally against tenders invited by the Electricity Boards, the D.G.S. & D., etc.

**Selling system and selling prices**

Manufacturers sell either directly or through selling agents or distributors and in view of good companies there are no complaints regarding the selling system adopted by the producers. We notice, however, that there is some dissatisfaction regarding delays in the delivery of transformers. Producers say that this is sometimes due to considerable delay in the placing of orders with them after submission of tenders, to the congestion of orders in large numbers towards the end of financial year which dislocates planned production and to their further difficulties on account of non-availability of raw materials and components. We are of the view that there is considerable scope for better planning on the part of Electricity Boards and other consumers whose requirements can be foreseen far in advance and orders planned accordingly. Further, if consumers agree to purchase standardized transformers as stated in paragraph 10.4, the problems of procurement of raw materials, components and designs will be rendered easier for the producers enabling them to effect earlier deliveries. The need for early augmentation of capacity has also been underlined by us (see paragraph 8.4).

14.2. *Selling prices.*—As transformers are not standardized products, there is no fixed price list and the price of a transformer of any KVA rating would vary according to designs, voltage ratio, losses, fittings, etc. As the main consumers call for open tenders, there is an element of competition. Consumers have generally considered as reasonable prices of indigenous transformers of smaller ratings. We have however received complaints that the prices charged by domestic producers particularly for the bigger size transformers are unreasonably high as compared to overseas prices. A comparison of tendered prices of indigenous and overseas transformers furnished to us showed that the gap between them was very wide and in some cases the prices of indigenous transformers were more than twice the prices quoted by overseas producers. The reasons advanced by the producers for such disparity are their high prices of raw materials, the heavy incidence of import duties thereon and high production costs in the absence of standardisation. It was also mentioned at the public inquiry that since orders for raw materials have to be placed after receipt of orders and since it is only recently that indigenous manufacturers are venturing into the field of bigger transformers, there is an attempt to cover risks due to future rise in the cost of raw materials. A significant point has also been made by some manufacturers that though in respect of import orders both escalation is allowed and deposit payments are made therefor to the suppliers, indigenous manufacturers have to make a deposit and wait long for payment. All these indirectly add to their costs. Sankey has stated that many transformer manufacturers are under-capitalised and delay payments to them despite a cash discount offered. It is true that the higher cost of raw materials for which the industry is dependent on imports (if routed through DLF channel they are stated to be even more expensive), contributes substantially towards higher cost of indigenous transformers. The average incidence of various duties, namely, customs duty, surcharge and countervailing duties (applicable from 1st March, 1963) may at present work out to 25 per cent on the c.i.f. costs of different items of raw materials and thus their incidence on the cost of transformer may be roughly about 20 per cent, which is a large charge for an industrial plant for which normally the import duty is low. But the wide disparity in the prices of indigenous and imported transformers can be attributed only partly to the higher cost of raw materials. In the case of bigger transformers such as 10,000 KVA where the difference in prices was greatest as there is scope of standardization, better technique and possible economies, the main responsibility for higher prices has to be placed on the producers themselves. We have already discussed at length in paragraph 9.2.1.3. the possible economies with the use of CRGO sheets and the lack of initiative on the part of producers to switch over to their use although in most cases their own collaborators have been using this improved material for some years. Discerning producers should also explore the possibilities of economies in processing costs to offset disadvantage in price of raw material. As the high prices of transformers would in turn step up the cost of electricity, every attempt has to be made by the producers of transformers and all concerned in its development to bring down the prices.

15.1. As stated in paragraph 3.2 three units, viz., Kirloskar Electric Co. Ltd., Bangalore, Hackbridge-Hewittic and Eusan Ltd., Madras and Bharat Bijlee Ltd., Bombay were selected for the purpose of determining the costs of production of indigenous power and distribution transformers. All three units have foreign collaboration and the output of two at least is comparable. Our Cost Accounts Officers have examined the costs of production of transformers manufactured by these three units, for the latest available period in all cases covering first half of 1962. The items for which costing has been done represent 87 per cent, 75 per cent and 85 per cent respectively of their total production in KVA during the costed period. The reports of our Cost Accounts Officers are forwarded separately as confidential enclosures to this Report.

Estimates of cost of  
production and fair ex-  
works prices

15.2. On the basis of actual costs of production during the period investigated, we have estimated the future costs of production for the three units for different ratings of transformers and discussed relevant points with the representatives of the costed units. Our estimates of future costs and future fair ex-works prices are given later for products of each of the units without disclosing their identity.

15.3. In preparing the estimates of fair ex-works costs and fair ex-works prices, we have taken into consideration the increased volume of production envisaged by the units during next three years. The pattern of production has been assumed to be generally the same as in the actual period for which costs have been investigated. As regards raw materials, latest available rates were adopted, including the effect of additional levies in the Finance Act, 1963, wherever information was available. Consumption factors have been taken on the basis of standard specifications, adopted for the actual period. Out of three units selected, Kirloskar Electric and Bharat Bijlee have manufactured other items in addition to transformers. As such with regard to conversion charges in these units, elements of costs which called for apportionment between manufacture of transformers and other manufacturing activities, have been duly apportioned taking into consideration the estimated production of transformers as well as other activities. Labour and establishment costs have been estimated after taking into account the increase in labour charges both to cover annual increments, dearness allowance, provident fund contributions, gratuities, etc. as well as increase needed for larger output. Incidents of repairs and maintenance have been similarly allowed. Depreciation has been calculated at normal income-tax rates after taking into consideration additions to assets, wherever necessary, to maintain the estimated level of production. Provision has been made for Emergency Risk Insurance. The working capital element in capital employed has been computed at an amount equivalent to 4 months' cost of production, excluding depreciation. Return has been allowed at 12 per cent on capital employed which we have been now allowing to the industries recently.

*Estimates of fair ex-works prices of transformers manufactured by different units*

25 KVA		50 KVA		75 KVA		100 KVA			
11 KV		11 KV		11 KV		11 KV			
1	Unit C	Unit A		Unit B		Unit A		Unit B	
		Unit C		Unit B		Unit A		Unit B	
2	3	4	5	6	7	8			
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.			
Net Material Cost	. . .	1,442.33	2,583.36	2,123.47	2,602.19	3,268.83	3,252.53	3,772.05	
Conversion Charges	. . .	505.16	907.48	603.85	581.29	724.07	1,106.57	815.06	
Packing . . . . .	. . .	28.69	67.19	49.66	125.00	125.00	80.63	125.00	
Works Cost	. . .	1,976.18	3,558.03	2,776.98	3,308.48	4,117.90	4,439.73	4,712.11	
Return on capital employed	. . .	122.81	200.67	160.78	216.71	272.46	250.40	311.98	
Fair ex-works price	. . .	2,098.99	3,758.70	2,937.76	3,525.19	4,390.36	4,690.13	5,024.09	

## Estimates of fair ex-works prices of transformers manufactured by different units—contd.

	200 KVA	250 KVA	500 KVA	750 KVA	750 KVA	750 KVA
	11 KV	11 KV	11 KV	11 KV	11 KV	3·3, KV.
	Unit A	Unit C	Unit A	Unit C	Unit A	Unit C
1	9	10	11	12	13	15
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Net Material Cost . . . . .	5,663·59	6,139·61	10,385·12	10,880·19	15,234·88	13,444·49
Conversion Charges . . . . .	2,176·10	1,416·61	3,866·05	2,739·67	4,509·62	3,170·13
Packing . . . . .	105·89	204·97	162·06	236·78	218·76	260·69
Works Cost . . . . .	7,945·58	7,761·19	14,413·23	13,856·64	19,963·26	16,875·31
Return on Capital employed . . . . .	448·13	419·10	812·91	771·16	1,125·93	920·21
Fair ex-works price . . . . .	8,393·71	8,180·29	15,226·14	14,627·80	21,089·19	17,795·52

*Estimates of fair ex-works prices of transformers manufactured by different units—contd.*

		1000 KVA			1000 KVA			1250 KVA			1500 KVA		
		11 KV			33 KV			6·6 KV			11 KV		
		Unit A	Unit C	Unit B	Unit A	Unit B	Unit C	Unit A	Unit C	Unit C	Unit C	Unit C	Unit C
1		16	17	18	19	20	21						
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.						
Net Material Cost	. . . . .	18,936·76	17,074·59	23,336·56	21,182·65	20,131·02	21,425·28						
Conversion Charges	. . . . .	5,227·27	3,597·64	5,133·08	6,433·42	3,807·24	4,167·29						
Packing	. . . . .	269·29	304·23	368·75	269·29	331·04	331·04						
Works Cost	. . . . .	24,433·32	20,976·46	28,838·39	27,885·36	24,269·30	25,923·61						
Return on capital employed.	. . . . .	1,378·04	1,104·95	1,936·02	1,572·73	1,238·16	1,333·74						
Fair ex-works price	. . . . .	25,811·36	22,081·41	30,774·41	29,458·09	25,507·46	27,257·35						



*Estimates of fair ex-works prices of transformers manufactured by different units—contd.*

	1	2500 KVA		3000 KVA		5000 KVA		5000 KVA		7500 KVA	
		33 KV		11 KV		33 KV		10·5 KV		6·6 KV	
		Unit A	Unit B	Unit A	Unit B	Unit A	Unit B	Unit A	Unit B	Unit A	Unit B
		22	23	24	25	26					
		Rs.	Rs.	Rs.	Rs.	Rs.					
Net Material Cost . . . . .	.	50,918·86	44,748·40	74,666·27	82,555·51	117,206·72					
Conversion Charges . . . . .	.	11,914·35	10,028·62	29,027·52	17,376·75	26,559·72					
Packing . . . . .	.	307·45	543·95	353·41	598·46	836·10					
Works Cost . . . . .	.	63,140·66	55,320·97	104,047·20	100,530·72	144,602·54					
Return on capital employed . . . . .	.	3,561·13	3,739·75	5,868·26	6,724·73	9,719·93					
Fair ex-works price . . . . .	.	66,701·79	59,060·72	109,915·46	107,255·45	154,322·47					

16.1. We called for information from the Collectors of Customs and some of the importers regarding c.i.f. prices and landed costs of power and distribution transformers recently imported. Due to restriction on imports of transformers of protected sizes relevant information could not be obtained. We, therefore, requested importers and manufacturers with foreign collaboration to send us f.o.b./c.i.f. quotations of transformers manufactured by their principals abroad.

**Comparison of the estimated fair ex-works prices of indigenous transformers with the landed costs without duty of imported transformers**

Only one party, namely, Hawker Siddeley Brush (India) Ltd. furnished us the requisite information which we have adopted for purposes of comparison with our estimated fair ex-works prices of like indigenous transformers. It will be seen that this is all for transformers of medium and higher range, no data being available for smaller size transformers which are not imported.

16.2. The statement on next page gives the comparison of landed costs without duty of transformers if imported with the fair ex-works prices of the costed indigenous products.



*Statement showing the comparison of landed costs without duty of transformers (if imported) with fair ex-works prices of indigenous transformers*

	200 KVA		250 KVA		500 KVA		750 KVA	
	11 KV		11 KV		11 KV		11 KV	
	Unit A	Unit C	Unit A	Unit C	Average	Unit A	Unit B	Average
1	2	3	4	5	6	7	8	9
(i) Ex-works price	Rs. 8,393.71	Rs. 8,180.29	Rs. 15,226.14	Rs. 14,627.80	Rs. 14,926.97	Rs. 21,089.19	Rs. 22,051.88	Rs. 21,570.53
(ii) C. i. f. price	7,880.00	8,946.00	13,720.00	13,720.00	13,720.00	18,533.00	18,533.00	18,533.00
(iii) Clearing charges (1%)	78.80	89.46	137.20	137.20	137.20	185.33	185.33	185.33
(iv) Landed cost without duty.	7,958.80	9,035.46	13,857.20	13,857.20	13,857.20	18,718.33	18,718.33	18,718.33
(v) Difference between Ex-works price and landed cost without duty.	434.91	(—) 855.17	1,368.94	770.60	1,069.77	2,370.86	3,333.55	2,852.20
(vi) Difference as a percentage of c. i. f. price.	5.52	(—) 9.56	9.98	5.62	7.80	12.79	17.99	15.39

*Statement showing the comparison of landed costs without duty of transformers (if imported) with fair ex-works prices of indigenous transformers—contd.*

	1000 KVA					
	11 KV			33 KV		
	Unit A	Unit C	Unit B	Average	Unit A	Unit C
1	10	11	12	13	14	15
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
(i) Ex-works price . . . . .	25,811.36	22,081.41	30,774.41	26,222.39	29,458.09	25,507.46
(ii) C. i. f. price . . . . .	23,000.00	23,000.00	23,000.00	23,000.00	32,013.00	28,120.00
(iii) Clearing Charges (1%) . . . . .	230.00	230.00	230.00	230.00	320.13	281.20
(iv) Landed cost without duty . . . . .	23,230.00	23,230.00	23,230.00	23,230.00	32,333.13	28,401.20
(v) Difference between ex-works price and landed cost without duty . . . . .	2,581.36	(-) 1,148.59	7,544.41	2,992.39	(-) 2,875.04	(-) 2,893.74
(vi) Difference as a percentage of c.i.f. price.	11.22	(-) 4.99	32.80	13.01	(-) 8.98	(-) 10.29

*Statement showing the comparison of landed costs without duty of transformers (if imported)  
with fair ex-works prices of indigenous transformers—contd.*

	1500 KVA		2500 KVA		3000 KVA		5000 KVA		5000 KVA	
	11 KV		33 KV		11 KV		33 KV		10.5 KV	
	Unit C		Unit A		Unit B		Unit A		Unit B	
1	16		17		18		19		20	
	Rs.		Rs.		Rs.		Rs.		Rs.	
(i) Ex-works price	.	.	.	.	27,257.35	66,701.79	59,060.72	109,915.45	107,255.45	
(ii) C. i. f. price	.	.	.	.	32,933.00	56,440.00	59,587.00	96,066.00	86,146.00	
(iii) Clearing Charges (1%)	.	.	.	.	329.33	564.40	595.87	960.66	861.46	
(iv) Landed cost without duty	.	.	.	.	33,262.33	57,004.40	60,182.87	97,026.66	87,007.46	
(v) Difference between ex-works price and landed cost without duty.	(—)	6,004.98	(—)	9,697.39	(—)	1,122.15	12,888.80	20,247.99		
(vi) Difference as a percentage of c.i.f. price	.	.	(—)	18.23	.	17.18	(—)	1.88	13.42	23.50

17. The above comparison of our estimated fair ex-works prices of indigenous transformers with the landed costs without duty of corresponding imported transformers indicate that

**Continuance of protection**

(i) in the case of distribution transformers up to 1,000 KVA the position of the domestic industry varies from a disadvantage of 15.4 per cent for a 750 KVA transformer to an advantage of 9.56 per cent for a 250 KVA transformer, (ii) in the case of transformers of 1,250 KVA and 1,500 KVA the industry is at an advantage of 10.3 per cent and 18.2 per cent respectively, (iii) in the case of transformers of higher ratings the disadvantage suffered by the industry ranges from 13.4 per cent to 23.5 per cent except in the case of a 3,000 KVA transformer where the industry has a nominal advantage of 1.9 per cent. Thus the overall position remains more or less the same as at the time of the last inquiry when the industry had an advantage in some cases and disadvantage in others, the maximum advantage and disadvantage then being 26.53 per cent and 21.44 per cent respectively. The industry is continuing its attempt to take up the manufacture of transformers of still higher ratings and to enable it to consolidate its position we have already recommended that the scope of protection should be widened to include transformers up to 50,000 KVA and 220 KV on the H.T. side. In paragraph 14.2 we have mentioned that the domestic prices of transformers particularly for bigger size are unreasonably high as compared to overseas prices and part of this disparity in price is for reasons beyond the control of the producers themselves. The industry is dependent on imported raw materials for the bulk of its requirement whose costs have been rising and this dependence on imported raw materials and the rising trend of their prices is likely to continue for some years. Thus even after the industry switches over to the use of CRGO sheets as recommended by us and effects all economies in cost it is unlikely to be able to withstand competition of overseas producers who have stabilised their manufacturing practices on the basis of use of better and cheaper raw materials. With few exceptions the producers, consumers, importers and Government departments including the Department of Technical Development have expressed the view that protection to the industry should be continued. The industry has pleaded that although it has developed sufficiently and is capable of meeting the country's requirements despite various difficulties, it has yet to reach maturity. Protection is therefore desirable firstly to encourage the indigenous producers to stabilise the manufacture of transformers of higher ratings and secondly to ensure that the industry adopts the use of improved materials and design practices and passes on the advantage of lower prices resulting from such progressive measures to its consumers who have borne the burden of protection for a decade. The need for protection also exists in order to develop indigenous sources of raw materials to suit the requirement of the industry. We do not favour, however, a long period of protection as it is likely to delay the effective implementation by the units of our recommendation for the use of improved materials, designs and techniques. Further, power and distribution transformers constitute an essential link in making electricity available for use to industrial, agricultural and domestic consumers and

as the cost of electricity has to be kept at a minimum, we do not consider it necessary to recommend any change in the existing low rate of duty applicable to power and distribution transformers. In view of the above considerations we recommend that protection to the transformer industry should be continued for a further period of two years ending 31st December, 1965 at the existing rate of duty and the scheme of protection should cover power and distribution transformers up to 50,000 KVA and 220 KV on the H.T. side and parts of such transformers not otherwise specified.

18. If the recommendations in paragraph 17 are accepted, item No. 72(39) of the First Schedule to the Indian Tariff Act, 1934 should be amended as indicated below:—

Item No.	Name of the article	Nature of duty	Standard rate of duty	Duration of protective duty
72(39)	Power and Distribution transformers upto 50,000 KVA and 220 KV on the H. T. side (primary voltage being over 250) excluding furnace, rectifier and flame-proof transformers and parts of such transformers, not otherwise specified.	Protective	10 per cent <i>ad valorem</i> .	December 31st, 1965.

19. Our conclusions and recommendations are summarised as under:—

(i) The present annual capacity of the industry including Heavy Electricals Ltd., Bhopal is 3,978,800 KVA. With the completion of expansion schemes by the existing units and the establishment of a new unit, the total capacity of the industry will increase to 7,379,000 KVA.

[Paragraph 6.3 and 6.5]

(ii) The production of transformers was 8,481 in numbers totalling 1,291,016 KVA in 1960, 11,334 in numbers totalling 1,795,894 KVA in 1961 and 14,207 in numbers totalling 2,295,875 KVA in 1962.

[Paragraph 7]

(iii) The demand for transformers is estimated at 5 million KVA in 1963-64. Depending on the additions to the generating capacity according to the revised targets the demand for transformers will go up to 10 million KVA in 1964-65 and 17 million KVA in 1965-66.

[Paragraph 8.3]

(iv) Government should implement the programme of doubling the capacity of Heavy Electricals Ltd., Bhopal and initiate plans for further expansion of its transformer capacity. They may also accord

preference to the existing producers for further expansion of their capacity and should take steps well in advance to augment industry's capacity to avoid conditions of shortage.

[Paragraph 8.4]

(v) The producers of transformers should change over to the use of cold rolled grain oriented CRGO sheets in the shortest possible time. The supply of imported raw materials should be regulated so as to ensure a more effective use consistent with the adoption of CRGO sheets. Government may also consider laying down a phased programme for a changeover to CRGO sheets and for the reduction of the import of hot rolled sheets.

[Paragraph 9.2.1.7]

(vi) The Central Water and Power Commission should disseminate necessary information to the State Electricity Boards and other consumers regarding the advantages of the use of CRGO sheets and advise them to give preference to transformers with such sheets.

[Paragraph 9.2.1.7]

(vii) Government should take immediate and effective steps to see that the transformer grade electric sheet steel planned for production at Rourkela from April, 1966 will be of the CRGO variety. An assurance to this effect will further help changeover to this material by the producers.

[Paragraph 9.2.1.7]

(viii) To obviate a situation where the industry might suffer from lack of timely supplies Government might permit more liberal imports of sheet steel and allow producers to carry a larger stock.

[Paragraph 9.2.1.10]

(ix) The Government should make a survey of the insulator industry and if it is found that the existing capacity for bushings requires to be increased and/or diversified, it may be done at the earliest opportunity.

[Paragraph 9.2.3]

(x) The producers of transformers in their own interest should extend their full co-operation in reducing the number of sizes and designs of bushings particularly of lower voltages and they should plan their procurement programme well in advance with the bushings manufacturers.

[Paragraph 9.2.3]

(xi) Higher priority should be given to the industry in the matter of allocation of steel.

[Paragraph 9.2.5]



(xii) As transformers form an essential link in the power transmission and distribution system requiring utmost reliability under continuous service, producers should take due care during their manufacture and in packing so as to avoid even complaints of a minor nature.

[Paragraph 10.2]

(xiii) The Central Water and Power Commission should intensify its efforts to achieve as complete a standardisation of distribution transformers as possible and to some extent also of the smaller power transformers not only in respect of preferred sizes but also for L.T. voltages, tapplings, impulse level, fittings, sizes, etc. State Governments, Electricity Boards and Electricity Undertakings, in turn, should spare no efforts to co-operate in this endeavour which is of material advantage alike to consumer and producer.

[Paragraph 10.4]

(xiv) Producers should offer lower prices for transformers of standard specifications as compared to those deviating from standards as an incentive towards achieving the object of standardisation.

[Paragraph 10.4]

(xv) The classification of imports data for transformers recommended in the Commission's 1960 Report should be made applicable to the Monthly Statistics of Foreign Trade of India.

[Paragraph 12.2.3]

(xvi) As the high prices of transformers would, in turn, step up the cost of electricity, every attempt has to be made by producers of transformers and all concerned in its development to bring down the prices.

[Paragraph 14.2]

(xvii) Protection to the transformer industry should be continued for a further period of two years ending 31st December, 1965 at the existing rate of duty and the scheme of protection should cover power and distribution transformers up to 50,000 KVA and 220 KV on the H.T. side and parts of such transformers not otherwise specified.

[Paragraph 17]

(xviii) If the recommendation for continuance and expansion of the scope of protection is accepted, necessary changes in the First Schedule to the Indian Tariff Act, 1934 should be made as indicated in paragraph 18.

[Paragraph 18]

20. We wish to convey our thanks to the manufacturers, importers, consumers and the Associations who furnished us with detailed information in connection with this inquiry and to their representatives who gave evidence before us at the public inquiry.

K. R. P. AIYANGAR,  
*Chairman.*

J. N. SEN GUPTA,  
*Member.*

R. BALAKRISHNA,  
*Member.*

PRAMOD SINGH,  
*Secretary.*

BOMBAY :  
*Dated the 12th August, 1963.*



## APPENDIX I

(Vide Paragraph 3.1)

*List of those to whom questionnaires and letters were issued and from whom replies were received*

\* Indicates those who furnished information in reply.

† Indicates those who had no information to furnish in reply.

### *I. Producers :*

1. National Electrical Industries Ltd., The Industrial Estate, Bombay-12.
- \*2. Crompton Parkinson (Works) Pvt. Ltd., Haines Road, Bombay-18.
- \*3. Bharat Bijlee Ltd., Udyog Nagar. Near King Cricle Rly. Station, Bombay-22.
- \*4. Bajaj Electricals Ltd., 45-47, Veer Nariman Road, Bombay-1.
- \*5. Gandhi Electric Industries Pvt. Ltd., 94, Medows Street, Fort, Bombay-1.
- \*6. Associated Electrical Industries Mfg., 1, Taratalla Road, Garden Reach, Calcutta-24.
- \*7. The General Electric Co. of India Manufacturing Pvt. Ltd., Magnet House, Chittaranjan Avenue, Calcutta-1.
- \*8. Electric Construction & Equipment Co., 9, Kaliprasanna Singhee Road, Calcutta-2.
- \*9. The India Electric Works Ltd., Diamond Harbour Road, Behala, Calcutta-34.
- \*10. Hackbridge-Hewittic & Easun Pvt. Ltd., 5-7, Second Line Beach, Madras-1.
- \*11. Transformer & Switchgear Ltd., No. 34, Second Main Road, Gandhi Nagar, Adyar, Madras-20.
- \*12. Radio and Electricals Ltd., Post Box No. 730, 38, Mount Road, Madras-6.
- \*13. Kirloskar Electric Co. Ltd., Post Box No. 1017, Bangalore-3.
- \*14. Government Electric Factory, Post Box No. 579, Mysore Road, Bangalore-2.
15. Indian Transformers Ltd., P. O. Box No. 21, Alwaye, Kerala.
- \*16. Pradip Lamp Works, P. O. Begumpur, Patna.
- \*17. The Hindustan Electric Co. Ltd., Thackersey House, Graham Road, Ballard Estate, Bombay-1.
- \*18. Andhra Pradesh Electrical Equipment Corporation, Prop: Electric Construction & Equipment Co. Ltd., 9, Kaliprasanna Singhee Road, Calcutta-2.
- \*19. Heavy Electricals Ltd., Govindpura, Post Box No. 46, Bhopal.
- \*20. Kerala Heavy Electrical Project, Punnen Road, Trivandrum-1.

### *II. Producers' Associations :*

- \*1. Indian Electrical Mfrs. Association, India Exchange (7th Floor), Calcutta-1.
- †2. Transformers Mfrs. Association, C/o. Bajaj Electricals Ltd., 45-47, Veer Nariman Road, Bombay-1.

### III. Importers :

1. International General Electric Co. (India) Ltd., Thackersey House, Graham Road, Ballard Estate, Bombay-1.
- \*2. General Electric Co. (India) Ltd., Magnet House, Chittaranjan Avenue, Calcutta-1.
- \*3. The English Electric Co. Ltd., Post Box No. 752, Bombay.
4. Easun Engineering Co. Ltd., 2nd Line Beach, Madras.
- †5. Parry & Co. Ltd., Mount Road, Madras.
6. Associated Electrical Industries (India), Crown House, Mission Row Calcutta.
- †7. Siemens Engineering & Manufacturing Co. of India Ltd., 81, Veer Nariman Road, Bombay-1.
- \*8. Voltas Ltd., Strand House, Ballard Estate, Bombay-1.
- †9. Westinghouse Trading Co. (Asia) Ltd., 16, Queen's Road, Bombay-1.
- \*10. Dodsall Pvt. Ltd., Mafatlal House, Backbay Reclamation, Bombay-1.
- †11. Mitsubishi Shoji Kaisha Ltd., Kasturi Building, Jamshedji Tata Road, Bombay-1.

### IV. Consumers :

1. The Federation of Electricity Undertaking of India, Killick House, Home Street, Fort, Bombay-1.
- \*2. The Calcutta Electric Supply Corporation Ltd., Victoria House, Chowringhee Square, Calcutta.
3. Electricity Supply Undertakings, Managing Agents, Martin Burn Ltd., 12, Mission Row, Calcutta.
- \*4. The Association of Electricity Supply Companies, Uttar Pradesh, C/o., Martin Burn Ltd., 12, Mission Row, Calcutta.
5. The Association of Electricity Undertakings, Bengal, Victoria House, Calcutta.
6. The South Madras Electric Supply Corp. Ltd., Tiruchirappalli, South India.
- \*7. Madhya Pradesh Electricity Board, Rampur, Jabalpur.
8. Mysore State Electricity Board, Office of the Chief Engineer, Electricity, Post Box No. 15, Bangalore-1.
9. Kerala State Electricity Board, Post Box No. 65, Trivandrum.
- \*10. Chief Engineer, Electricity, Government of Orissa, Orissa State Electricity Board, Bhubaneswar.
11. The Chief Engineer, Bombay State Electricity Board, Mercantile Bank Building, Mahatma Gandhi Road, Bombay-1.
- \*12. Kanpur Electricity Supply Administration, (U.P. State Electricity Board), 'Kesa House', 14/71, Civil Lines, Kanpur, (U.P.).
- \*13. Damodar Valley Corporation, Anderson House, Alipore, Calcutta-27.
- \*14. The Tata Hydro-Electric Power Supply Co. Ltd., Bombay House, Bruce Street, Bombay-1.
- \*15. B. E. S. T. Undertaking, Best House, Post Box No. 192, Bombay-1.
16. The Superintending Engineer, Technical (Electrical), Madras State Electricity Board, 157, Mount Road, Madras-2.
17. The Chief Engineer, Andhra Pradesh State Electricity Board, Khairabad, Hyderabad (Andhra Pradesh).
18. The Superintending Engineer, Hydrel Ganga Circle, Rorkee.

- \*19. The Chief Engineer, Punjab State Electricity Board, Project Section, Patiala.
- \*20. Killick Industries Ltd., Managing Agents for Central, Administration Department, 5, Graham Road, (4th Floor), Ballard Estate, Bombay.
- \*21. Octavius Steel and Co., P. B. No. 39, Calcutta.
- †22. Andrew Yule & Co. Ltd., 8, Clive Row, Calcutta-1.
- \*23. Assam State Electricity Board, Shillong.

#### *V. Raw Material Suppliers:*

- \*1. Devidayal Stainless Steel Industries Pvt. Ltd., Darukhana, Reay Road, Bombay-10.
- \*2. Sankey Electrical Stampings Pvt. Ltd., Wakefield House, Sprott Road, Ballard Estate, Bombay-1.
- \*3. Government Porcelain Factory, Post Box. No. 4, Bangalore.
- \*4. Bengal Potteries Ltd., 45, Tangra Road, Calcutta.
- \*5. Bengal Porcelain Co. Ltd., 1/2, Motisil Street, Calcutta-13.
- \*6. Hindustan Potteries, 12, Shib Kriston Daw Lane, Calcutta-7.
- \*7. Premier Automobiles Ltd., Agra Road, Kurla, Bombay-70.
- \*8. Tube Products of India, Avadi, Near Madras.
- \*9. National Insulated Cable Co. of India Ltd., Nicco House, 2, Hare Street, Calcutta.
- \*10. Indian Cable Co. Ltd., 9, Hare Street, Calcutta.
- \*11. Devidayal Cable Industries Pvt. Ltd., Darukhana, Bombay-10.
- \*12. Shakti Insulated Wires Pvt. Ltd., Bansilal Motilal Mansion, 22, Apollo Street, Bombay-1.
- †13. Tata Iron & Steel Co. Ltd., Bombay House, Bruce Street, Bombay.
- \*14. The Indian Tube Co. (1953) Ltd., 41, Chowringhee Road, Calcutta-16.

#### *VI. Central Government Departments:*

- \*1. The Senior Industrial Adviser, Department of Technical Development, Ministry of Economic & Defence Co-ordination, Udyog Bhavan, Maulana Azad Road, New Delhi.
- \*2. Member (Utilization), Central Water & Power Commission, Ministry of Irrigation & Power (Power Wing), New Delhi.
- \*3. The Director, Indian Standards Institution, Manak Bhavan, 9, Mathura Road, New Delhi.
- \*4. The Iron and Steel Controller, 33, Netaji Subhas Road, Calcutta-1.
- \*5. The Collector of Customs, Bombay.
- \*6. The Collector of Customs, Madras.
- †7. The Collector of Customs, Calcutta.
- †8. The Collector of Customs, Cochin.
- \*9. Director General of Commercial Intelligence & Statistics, 1, Council House Street, Calcutta-1.
- 10. Development Commissioner, Small Scale Industries, Udyog Bhavan, New Delhi.
- \*11. The Minister (Economic), High Commission of India in U. K., India House, Aldwych, London.
- 12. Commercial Counsellor, Embassy of India, 262, Koblenz Strasse, Bonn.

13. First Secretary (Commercial), Embassy of India in Japan, Empire House, (Naigai Building), Marunouchi, Chiyoda, Ku, Tokyo.
- \*14. First Secretary (Commercial) to the Embassy of India, 2107, Massachusetts Avenue, Washington-8. D. C.

*VII. State Government Departments:*

- \*1. The Director of Industries, Government of Mysore, Bangalore.
2. The Director of Industries, Government of Kerala, Trivandrum.
- \*3. The Director of Industries, Government of Maharashtra, Bombay.
- \*4. The Director of Industries, Government of West Bengal, Calcutta.
- \*5. The Director of Industries, Government of Madras, Madras.

*VIII. Chief Secretaries of States:*

- †1. The Chief Secretary to the Government of Andhra Pradesh, Hyderabad.
- \*2. The Chief Secretary to the Government of Assam, Shillong.
3. The Chief Secretary to the Government of Bihar Patna.
- \*4. The Chief Secretary to the Government of West Bengal, Calcutta.
5. The Chief Secretary to the Government of Gujarat, Ahmedabad.
6. The Chief Secretary to the Government of Jammu and Kashmir, Srinagar.
7. The Chief Secretary to the Government of Kerala, Trivandrum.
- †8. The Chief Secretary to the Government of Madhya Pradesh, Bhopal.
- \*9. The Chief Secretary to the Government of Madras, Madras.
- \*10. The Chief Secretary to the Government of Maharashtra, Bombay.
- \*11. The Chief Secretary to the Government of Mysore, Bangalore.
- \*12. The Chief Secretary to the Government of Orissa, Bhubaneswar.
- \*13. The Chief Secretary to the Government of Punjab, Chandigarh.
14. The Chief Secretary to the Government of Rajasthan, Jaipur.
15. The Chief Secretary to the Government of Uttar Pradesh, Lucknow.
- †16. The Chief Commissioner, Delhi Administration, Delhi.
- †17. The Chief Commissioner, Himachal Pradesh, Simla.

## APPENDIX II

(Vide Paragraph 3.1)

*Statement showing the factories visited by the Commission and other Officers*

Sl. No.	Name of the factory	By whom visited	Date of visit
1	2	3	4
1.	Kirloskar Electric Co. Ltd., Bangalore	1. Shri K. R. P. Aiyangar, Chairman 2. Dr. R. Balakrishna, Member. 3. Shri Hari Bhushan, Technical Director (Engg. & Metallurgy). 4. Shri A. K. Ganguli, Assistant Accounts Officer.	18/19th February, 1963. 22nd February, 1963. 4th October, 1962. Between 31st March, 1963 and 13th April, 1963.
2.	Government Porcelain Factory, Bangalore.	1. Shri K. R. P. Aiyangar, Chairman 2. Dr. R. Balakrishna, Member 3. Shri Hari Bhushan, T. D. (E. & M.)	18/19th February, 1963. 3rd May, 1963. 3rd October, 1962.
3.	Sankey Electrical Stampings Ltd., Bangalore.	1. Shri Hari Bhushan, T. D. (E. & M.)	1st October, 1962.
4.	Hackbridge-Hewitt & Easun (Pvt.) Ltd., Madras.	1. Shri K. R. P. Aiyangar, Chairman 2. Shri Hari Bhushan, T. D. (E. & M.) 3. Shri S. R. Mallya, Assistant Cost Accounts Officer.	15/16th February, 1963. 15th November, 1962. Between 31st December, 1962 and 16th January, 1963.
5.	General Electric Co. of India (Mfg.) Pvt. Ltd., Calcutta.	Shri Hari Bhushan, T. D. (E. & M.)	21st January, 1963.

1	2	3	4
6.	Associated Electrical Industries Mfg. Co. Pvt. Ltd., Calcutta.	1. Shri K. R. P. Aiyangar, Chairman 2. Shri J. N. Sen Gupta, Member 3. Shri Hari Bhushan, T. D. (E. & M.)	6th June, 1963. 7th February, 1963. 21st January, 1963.
7.	Electric Construction & Equipment Co. Ltd., Calcutta.	1. Shri J. N. Sen Gupta, Member 2. Shri Hari Bhushan, T. D. (E. & M.)	5th February, 1963. 22nd January, 1963.
8.	Transformer & Switchgear Ltd., Madras.	3. Shri K. R. P. Aiyangar, Chairman	20th February, 1963.
9.	Government Electric Factory, Bangalore	1. Shri K. R. P. Aiyangar, Chairman 2. Dr. R. Balakrishna, Member.	18/19th February, 1963. 5th May, 1963.
10.	Devidayal Stainless Steel Pvt. Ltd. Bombay.	1. Shri K. R. P. Aiyangar, Chairman 2. Dr. R. Balakrishna, Member	15th May, 1963.
11.	Sankey Electrical Stampings Ltd., Bombay.	3. Shri Pramod Singh, Secretary	
12.	Crompton Parkinson (Works) Ltd., Bhandup.		
13.	Alpha Electrical Engineering Co., Bombay.	1. Shri K. R. P. Aiyangar, Chairman 2. Dr. R. Balakrishna, Member	16th May, 1963.
14.	Bharat Bijlee Ltd., Bombay	3. Shri Pramod Singh, Secretary	
15.	Crompton Parkinson (Works) Ltd., Worli.		
16.	Bharat Bijlee Ltd., Bombay	Shri S. N. Raghvan, A.C.A.O.	From 5th April, 1963, onwards.



**APPENDIX III**  
(Vide Paragraph 3.3)

*List of persons who attended the Commission's public inquiry on  
28th May, 1963*

Name of the Representative		Name of firm/body represented
1		2
<i>I. Producers :</i>		
1. Shri R. L. Kirloskar . . . . .	}	Kirloskar Electric Co. Ltd., Post Box. No. 1017, Bangalore-3.
2. „ P. R. Mundewadi . . . . .		
3. „ M. K. Ajwani . . . . .		Heavy Electricals (India) Ltd., Post Box No. 46, Bhopal.
4. „ D. G. Goverdhana . . . . .		Associated Electrical Mfg. Co. Private Ltd., 1, Taratalla Road, Garden Reach, Calcutta-24.
5. „ C. D. Gandhi . . . . .		Gandhi Electric Industries Pvt. Ltd., 2nd Floor, Ahoora Mahal, 93, Marine Drive, Bombay-2.
6. „ J. S. Zaveri . . . . .		Bharat Bijlee Ltd., Udyog Nagar, Near King's Circle Rly. Station, P. B. 6772, Bombay-22.
7. „ H. Eswaran . . . . .		Hackbridge-Hewittic and Easun Ltd., Post Box No. 50, 5-7, Second Line Beach, Madras-1.
8. „ S. Szafranski . . . . .		General Electric Co. of India Pvt. Ltd., 58, Taratalla Road, Garden Reach, Calcutta.
9. „ E. M. D' Mello . . . . .	}	National Electrical Industries Ltd., Industrial Estate, Lal- baug, Bombay-12.
10. „ M. G. Gursahaney . . . . .		
11. „ M. Nazir Ahmed . . . . .	}	Government Electric Factory, Post Box No. 579, Mysore Road, Bangalore.
12. „ V. Srinivasa Rao . . . . .		
13. „ V. V. Dhume . . . . .	}	Crompton Parkinson (Works) Ltd., Haines Road, Worli, Bombay-18.
14. „ M. R. Deo . . . . .		
15. „ P. K. Oza . . . . .		
16. „ V. D. Desai . . . . .		
17. „ M. P. Helops . . . . .		

1	2
18. Shri B. R. Rajanna . . . . .	Hindustan Electric Co. Ltd., Thakersey House, Graham Road, Ballard Estate, Bom- bay-1.
19. „ M. L. Gauba . . . . .	Bajaj Electricals Ltd., 15-17, Victoria Road, Mazgaon, Bombay-10. Indian Electrical Mfrs' Associa- tion, India Exchange (7th Floor), Calcutta-1.
20. „ P. R. Deshpande . . . . .	Indian Electrical Manufacturers'
21. „ M. C. Dhar . . . . .	Association, India Exchange, (7th Floor), Calcutta-1.
22. „ L. P. Shah . . . . .	Electric Construction & Equip- ment Co. Ltd., 9, Kaliprasan- na Singhee Road, Calcutta-2. and
23. „ M. L. Lakhotia . . . . .	Indian Electrical Mfrs' Associa- tion, India Exchange (7th Floor), Calcutta-1.
<i>II. Raw Materials Suppliers :</i>	
24. Shri V. S. Despande . . . . .	Sankey Electrical Stampings
25. „ N. R. Banerjee . . . . .	Ltd., Wakefield House, Sprott
26. „ F. R. Ladyman . . . . .	Road, Ballard Estate, P. Box
27. „ V. R. Alagwadi . . . . .	121-A, Bombay-1.
28. „ Omprakash Aggarwal . . . . .	Devidayal Stainless Steel In-
29. „ S. C. Shah . . . . .	dustries Pvt. Ltd., Post Box
30. „ K. Aggarwal . . . . .	No. 6224, Darukhana, Rey Road, Bombay-10.
31. „ A. Sambamoorthy . . . . .	Government Porcelain Factory, Post Box No. 4, Science Ins- titute, P. O., Bangalore-12.
32. „ S. K. Shah . . . . .	Premier Automobiles Ltd., Agra Road, Kurla, Bombay-70.
33. „ C. V. Panshikar . . . . .	Indian Cable Co. Ltd., 9, Hare Street, P. O. Box 514, Cal- cutta-1.
34. „ K. N. R. Nair . . . . .	Tube Products of India, Avadi Near Madras.
35. „ M. C. Thakore . . . . .	Shakti Insulated Wires Pvt.
36. „ H. M. Shah . . . . .	Ltd., Bansilal Motilal Man- sion, 22, Apollo Street, Bombay-1.

1

2

*III. Consumers :*

- |     |                     |   |   |   |   |   |
|-----|---------------------|---|---|---|---|---|
| 37. | Shri H. S. Kulkarni | . | . | . | . | } Federation of Electricity Under-<br>taking of India, Killick House,<br>Home Street, Bombay-1. |
| 38. | „ M. P. Kirpalani   | . | . | . | . |   |
| 39. | „ L. W. Brazel      | . | . | . | . | Calcutta Electric Supply Cor-<br>poration Ltd., Victoria House,<br>Calcutta-1.                  |
| 40. | „ V. S. Shevade     | . | . | . | . | Maharashtra State Electricity<br>Board, Mercantile Bank Build-<br>ing, Bombay-1.                |
| 41. | „ K. Matthan        | . | . | . | . | Bombay Electric Supply &<br>Transport Undertaking, Best<br>House, P. B. No. 192, Bom-<br>bay-1. |

*IV. Importers :*

- |     |   |   |   |   |   |  |
|-----|---|---|---|---|---|--|
| 42. | Shri P. K. Mehta  | . | . | . | . | } English Electric Co. of India,<br>Ltd., Vulcan Insurance Build-<br>ing, 202-B, Veer Nariman<br>Road, Post Box No. 752,<br>Bombay-1.            |
| 43. | „ K. H. P. Sharma   | . | . | . | . |  |
| 44. | „ K. P. Dharap  | . | . | . | . | Voltas Ltd., Electrical Division,<br>Graham Road, Ballard Estate,<br>P. B. 900, Bombay-1.  |
| 45. | „ S. Sekhri   | . | . | . | . | Easun Engg. Co. Ltd., 2nd Line<br>Beach, Madras.   |
| 46. | Dr. B. D. Kalelkar, Senior Industrial Advi-<br>ser (Engg).  | . | . | . | . | } Department of Technical Devel-<br>opment, Ministry of Economic<br>and Defence Co-ordination,<br>Udyog Bhavan, Maulana<br>Azad Road, New Delhi. |
| 47. | Shri K. N. Ramaswamy, Development Offi-<br>cer (Electrical) | . | . | . | . |  |
| 48. | Shri T. V. Thadani, Deputy Director                         | . | . | . | . | Central Water and Power Com-<br>mission, (Power Wing),<br>Bikaner House, New Delhi.  |

*V. Government Departments :*

1	2
49. Lt. Col. O. G. Eapen, Deputy Iron and Steel Controller.	Ministry of Steel & Heavy Industries, (Department of Iron & Steel), Iron and Steel Control, 33, Netaji Subhas Road, Calcutta-1.
50. Shri S. P. Sachdev, Extra Assistant Director (Marks).	Indian Standards Institution, Manak Bhavan, 9, Mathura Road, New Delhi.
51. „ B. K. Kale, Appraiser	Collector of Customs, New Customs House, Bombay-1.
52. „ D. S. Godbole, Deputy Director of Industries.	Directorate of Industries, Government of Maharashtra, Sachivalaya Annexe, Bombay-32.



सत्यमेव जयते

# APPENDIX IV

(Vide Paragraph 6.1)

Statement showing particulars about units manufacturing transformers

Sl. No.	Name of unit	Name of foreign co-laborators if any	Articles other than Power and Distribution Transformers manufactured	Maximum capacity and voltage ratings of transformers that can be produced	Average No. of workers employed during				Remarks
					1960	1961	1962		
1	2	3	4	5	6	7	8	9	
1.	Crompton (Works) Pvt. Ltd., Bombay.	Crompton Parkinson Ltd., London.	Motor control gear, Switchgear, Electric Motors, fans, etc.	10,000/12500 KVA ON/OB and 132 KV.	411	518	547		
2.	Associated Industries Mfg. Co. (P) Ltd., Calcutta.	A member of A. E. I. Ltd., London, group of companies.	Motors, starters, isolators and connectors, M.C. switches, Lighting equipment, electrical furnaces, traction equipment and oil circuit breakers.	5,000 KVA-37.5 KV .	N.A.	N.A.	N.A.		
3.	Government Electric Factory, Bangalore.	A.E.G. of West Germany.	Transmission line towers, Bakelite parts, dummy levels and survey instruments.	1,000 KVA-33 KV	333	333	333		
4.	Bajaj Electricals Ltd., Bombay.	Nil.	Fluorescent lighting fittings & Ballasts, Electrical measuring & Scientific instruments.	5,000 KVA-22 KV	182	198	204		

1	2	3	4	5	6	7	8	9
5.	Electric Construction and Equipment Co. Ltd., Calcutta.	Tokyo Shibaura Electric Co. Ltd., Tokyo-Japan.	Air break switches, Triple pole and neutral iron clad switch fuse units, Motors and copper drawing & covering.	15,000 KVA-132 KV.	275	275	275	
6.	The G. E. C. of India (P) Ltd., Calcutta.	General Electric Co. Ltd., England.	Fans, motors, house service meters, radio receivers and switch & control gear.	10,000 KVA-33KV	109	196	253	
7.	Kirloskar Electric Co., Bangalore.	Brush Electrical Engg. Co. Ltd., U. K.	Electric equipment such as electric motors, alternators, etc.	5,000 KVA-33 KV 2,000 KVA-66 KV.	169	183	187	
8.	Hindustan Electric Co., (Baroda Works)	Brown Boveri & Co. Ltd., Baden, Switzerland.	Nil.	1,000 KVA-33 KV	27	35	40	
9.	Bharat Bijlee Ltd., Bombay.	Siemens Engg. & Mfg. Co. of India Ltd., Bombay who have got the patent and manufacturing rights from Siemens Schuekertwerke, AG., West Germany.	All types of A. C. 3 phase Induction Motors.	2,000 KVA-11KV 1,500 KVA-22KV 500 KVA-33KV.	107	129	146	
10.	Hackbridge-Hewittic and Eason Ltd., Madras.	Hackbridge and Hewittic Electric Co. Ltd., U.K.	Nil.	*30000 KVA-132 KV.	162	203	230*	Maximum size that can be handled in the vacuum pot.

11. Transformer & Switchgear Ltd., Madras.	M/s. Dominittwerke, Hoppeake, Kr. Brilon, West Germany.	Nil.	7500 KVA-33 KV	85	79	93
12. Pradip Lamp Works, Patna.	Nil.	Electric lamps, fluorescent tubes and other discharge lamps.	500 KVA-33 KV	39	15	29
13. Radio and Electricals Ltd., Madras.	Merlin & Gerin France.	Nil.	1500 KVA-33 KV	94	94	100
14. Andhra Pradesh, Electrical Equipment Corporation, Visakhapatnam.	Nil.	Licence granted for the manufacture of switchgears including circuit breakers and air break switches.	500 KVA-33 KV	90	90	90
15. Heavy Electricals (India) Ltd., Bhopal.	A technical consultancy agreement with the A. E. I., U. K.	N.A.	*150,000 KVA-220 KV	N.A.	N.A.	*Maximum capacity envisaged for Rs. 25 crore output project.
<i>New Unit</i>						
Kerala Heavy Electricals Project, Trivandrum.	Hitachi Ltd., Japan (Agreement is not yet approved by the Government).	..	1000 to 50,000 KVA-33-132 KV/11 KV (Range of manufacture).	..	..	The Company is under formation.

# APPENDIX

(Vide Para

## (i) Statement showing production of transformers

Sl. No.	Name of the firm	Up to 25 KVA		Above 25-75 KVA		Above 75-250 KVA	
		Nos.	KVA	Nos.	KVA	Nos.	KVA
1	2	3	4	5	6	7	8
1	Crompton Parkinson (Works) Ltd., Bombay.	231	2,894	359	18,325	392	57,755
2	National Electrical Industries, Bombay .	30	470	107	5,430	77	12,700
3	Bharat Bijlee Ltd., Bombay. . .	301	4,985	111	5,384	137	22,275
4	Gandhi Electrical Industries, Bombay .-	1	25	22	1,425	126	15,449
5	Bajaj Electricals Ltd., Bombay. .	25	650	8	400	251	37,800
6	Associated Electrical Industries, Calcutta. .	..	..	145	10,900	47	9,300
7	Electric Const. & Equip. Co., Calcutta.	514	11,915	603	38,500	655	72,050
8	General Electric Co., Naini . .	267	5,084	31	1,550	98	15,850
9	Government Electric Factory, Bangalore	545	11,900	263	14,680	324	34,045
10	Hindustan Elec. Co., Howrah . .	83	2,057	12	600	11	1,300
11	Hackbridge Hewittic & Easun Ltd., Madras.	..	..	412	25,295	42	4,175
12	India Elec. Works, Calcutta . . .	..	..	6	450	..	..
13	Indian Transformers, Alwaye . . .	25	250	..	..	9	1,650
14	Kirloskar Elec. Co., Bangalore . .	143	3,490	337	21,445	147	25,550
15	Radio & Elec. Ltd., Madras . . .	30	685	223	12,500	82	9,950
16	Transformer & Switchgear, Madras .	83	525	179	7,075	41	4,100
TOTAL		2,279	44,930	2,824	1,63,959	2,439	3,23,949
		%	(3.5)		(12.7)		(25.1)



# V

graph 7)

of individual manufacturers during 1960

Above 250-500 KVA		Above 500-700 KVA		Above 700-1000 KVA		Above 1000-2000 KVA		Above 2000 KVA		Total	
Nos.	KVA	Nos.	KVA	Nos.	KVA	Nos.	KVA	Nos.	KVA	Nos.	KVA
9	10	11	12	13	14	15	16	17	18	19	20
96	42,400	26	17,919	39	38,650	29	46,750	5	16,000	1,177	2,40,693
78	36,250	14	10,150	15	14,750	42	67,550	9	54,500	372	2,01,800
16	6,700	8	6,000	..	..	6	7,500	..	..	579	52,844
16	7,400	1	750	..	..	1	1,250	..	..	167	26,299
18	5,500	..	..	..	..	..	..	..	..	303	44,350
28	11,750	5	3,300	6	5,800	2	2,300	..	..	234	43,350
87	30,512	1	750	3	3,000	4	5,750	..	..	1,867	1,62,477
66	24,250	10	7,150	7	7,000	7	10,500	..	..	486	71,384
35	16,400	7	5,250	2	2,000	2	3,000	..	..	1,183	87,275
..	..	1	750	1	1,000	1	2,000	1	3,000	11	10,707
32	12,800	30	16,300	15	14,800	4	6,500	15	34,000	550	1,13,870
..	..	..	..	..	..	..	..	..	..	6	450
..	..	..	..	..	..	..	..	..	..	34	1,900
44	17,160	25	18,022	14	14,000	16	29,650	5	13,000	731	1,42,317
25	11,400	..	..	..	..	..	..	..	..	360	34,535
1	500	..	..	5	5,000	7	11,565	6	28,000	322	56,765
542	2,23,022	128	86,341	107	1,06,000	121	1,94,315	41	1,48,500	8,481	12,91,016
(17.3)		(6.7)		(8.2)		(15.0)		(11.5)		(100)	

## (ii) Statement showing production of transformers

Sl. No.	Name of the firm	Upto 25 KVA		Above 25-75 KVA		Above 75-250 KVA	
		Nos.	KVA	Nos.	KVA	Nos.	KVA
1	2	3	4	5	6	7	8
1	Crompton Parkinson (Works) Ltd., Bombay.	565	8,720	212	9,350	395	63,530
2	National Electrical Industries, Bombay	12	300	346	17,050	55	11,775
3	Bharat Bijlee Ltd., Bombay	343	8,315	365	18,275	42	65,000
4	Gandhi Elec. Inds., Bombay	34	475	39	2,275	120	15,200
5	Bajaj Elects. Ltd., Bombay	..	..	72	3,775	337	47,550
6	Associated Electl. Industries, Calcutta	..	..	57	4,024	39	8,300
7	Electric Const. & Equipment Co., Calcutta	674	15,530	1,298	74,715	573	47,525
8	Radio & Elecls. Ltd., Madras	4	100	149	7,800	35	7,300
9	Hackbridge-Hewittic & Easun Ltd., Madras.	..	..	328	19,375	255	31,700
10	Govt. Electric Factory, Bangalore	499	8,091	177	9,435	428	49,450
11	Kirloskar Elec. Co., Bangalore.	45	850	353	22,135	761	95,600
12	Transformer & Switchgear Ltd., Madras	31	50	54	3,800	196	19,650
13	Indian Transformers, Alwaye	..	..	46	2,300	1	150
14	Hindustan Elec. Co., Howrah	68	1,625	61	3,050	195	28,425
15	General Elec. Co. Calcutta	323	6,050	321	16,050	196	36,750
16	India Elect. Works, Calcutta	..	..	..	..	..	..
TOTAL		2,598	50,106	3,878	2,13,409	3,633	4,69,405
		%		(2.8)		(11.9)	
						(26.1)	

*of individual manufacturers during 1961*

Above 250-500 KVA		Above 500-750 KVA		Above 750-1000 KVA		Above 1000-2000 KVA		Above 2000 KVA		Total	
Nos.	KVA	Nos.	KVA	Nos.	KVA	Nos.	KVA	Nos.	KVA	Nos.	KVA
9	10	11	12	13	14	15	16	17	18	19	20
162	64,620	63	42,450	35	34,150	20	25,200	10	25,250	1,462	2,73,270
26	12,700	8	6,750	15	15,000	11	16,725	29	1,44,100	502	2,24,400
15	6,800	3	2,250	2	2,000	20	24,750	..	..	790	68,890
26	10,700	6	4,400	3	3,000	..	..	..	..	228	36,050
51	18,400	..	..	..	..	..	..	..	..	460	69,725
19	7,750	9	5,550	7	6,800	3	4,000	9	25,250	143	61,674
173	61,800	26	19,375	..	..	1	1,500	1	5,000	2,751	2,25,445
26	12,550	6	4,000	..	..	..	..	..	..	220	31,750
28	11,850	26	19,500	11	11,000	18	20,520	20	1,12,500	686	2,26,445
50	24,100	21	15,750	14	13,000	..	..	..	..	1,189	1,19,826
29	13,500	12	9,150	10	10,000	6	8,750	8	23,000	1,224	1,82,985
1	500	..	..	2	2,000	4	6,000	12	41,000	300	73,000
..	..	..	..	..	..	..	..	..	..	47	2,450
24	11,200	2	1,200	7	7,000	5	9,500	..	..	362	62,000
91	37,400	19	13,450	10	9,622	10	18,662	..	..	970	1,37,984
..	..	..	..	..	..	..	..	..	..	Nil	Nil
721	2,93,870	201	1,43,825	116	1,13,572	98	1,35,607	89	3,76,100	11,334	17,95,894
(16.4)		(8.0)		(6.3)		(7.6)		(20.9)		(100)	

## (iii) Statement showing production of transformers

Sl. No.	Name of the firm	Upto 25 KVA		Above 25-75 KVA		Above 75-250 KVA	
		Nos.	KVA	Nos.	KVA	Nos.	KVA
1	2	3	4	5	6	7	8
1	Kirloskar Elec. Co., Bangalore . . .	4	81	104	5,425	966	1,25,450
2	Bajaj Electl. Ltd., Bombay . . .	..	..	95	4,775	314	48,975
3	National Electl. Industries, Bombay . .	111	2,775	123	5,845	205	38,100
4	Hackbridge-Hewitt & Easun Ltd., Madras.	155	3,950	601	36,800	391	43,050
5	Electric Const. & Equipment Co., Calcutta	1,503	37,610	326	16,350	736	80,350
6	Associated Electl. Industries, Calcutta .	2	30	16	848	32	6,650
7	Govt. Elec. Factory, Bangalore . . .	744	14,760	194	9,695	384	58,010
8	Crompton Parkinson (Works) Ltd., Bombay.	742	13,552	102	4,578	474	67,715
9	Bharat Bijlee Ltd., Bombay . . .	577	13,175	432	20,625	105	19,750
10	General Electric Co., Calcutta . . .	627	10,110	534	21,155	224	36,550
11	Transformer & Switchgear Ltd., Madras . .	..	..	352	18,900	32	3,400
12	Andhra Pradesh Electricals Equipments Corpn., Visakhapatnam.	202	5,175	275	14,250	100	10,800
13	Radio & Elecls. Ltd., Madras . . .	..	..	128	6,250	142	15,850
14	Indian Transformers, Alwaye . . .	37	925	164	8,200	3	300
15	Gandhi Electl. Industries, Bombay . . .	1	25	21	1,014	153	22,470
16	Hindustan Elec. Co., Baroda . . .	1	25	33	2,230	75	8,350
17	Pradip Lamp Works, Patna . . .	..	..	105	3,200	..	..
TOTAL		4,736	1,02,193	3,605	1,80,140	4,336	5,84,970
		%	(4.4)		(7.9)		(25.5)

*of individual manufacturers during 1962*

Above 250-500 KVA		Above 500-750 KVA		Above 750-1000 KVA		Above 1000-2000 KVA		Above 2000-KVA		Total	
Nos.	KVA	Nos.	KVA	Nos.	KVA	Nos.	KVA	Nos.	KVA	Nos.	KVA
9	10	11	12	13	14	15	16	17	18	19	20
101	45,050	17	12,300	16	16,000	19	26,450	3	15,000	1,230	2,45,756
64	26,500	..	..	..	..	..	..	..	..	473	80,250
94	42,550	31	22,495	36	38,550	42	68,000	18	98,000	660	3,16,315
15	5,450	25	18,410	22	17,800	6	14,200	38	1,89,450	1,253	3,29,110
94	40,800	39	28,850	19	19,500	2	2,750	5	10,000	2,724	2,36,210
49	24,150	11	8,100	21	19,800	8	13,550	6	17,200	145	90,328
46	21,700	1	600	4	4,000	1	1,500	..	..	1,404	1,10,265
137	60,200	42	30,300	37	37,800	37	58,050	22	87,500	1,593	3,59,695
38	16,800	2	1,560	28	29,200	4	5,850	..	..	1,186	1,06,960
165	65,423	17	12,450	17	16,774	11	22,400	..	..	1,595	1,84,862
1	500	..	..	11	11,000	..	..	15	49,000	411	82,800
..	..	..	..	..	..	..	..	..	..	577	29,425
17	8,500	1	750	..	..	..	..	..	..	288	31,350
..	..	..	..	..	..	..	..	..	..	204	9,425
31	13,650	28	20,760	2	2,000	2	3,000	..	..	238	62,919
9	3,900	2	1,500	1	1,000	..	1,000	..	..	121	17,005
..	..	..	..	..	..	..	..	..	..	105	3,200
861	3,75,173	216	1,58,075	214	2,13,424	132	2,15,750	107	4,66,150	14,207	22,95,875
(16.3)		(6.9)		(9.3)		(9.4)		(20.3)		(100)	

# APPENDIX VI

(Vide Paragraph 12.2.1)

Statement showing imports of transformers during 1961 and 1962 according to the classification recommended by the Commission in its 1960 Report

Transformers	1961			1962		
	No.	KVA	Value (Rs.)	No.	KVA	Value (Rs.)
<b>Upto 37.5 KV</b>						
(i) Upto 3000 KVA	22	7,569	1,28,021	21	3,736	1,22,511
(ii) Above 3000 KVA to 5000 KVA	2	5,000	1,30,219	..	..	..
(iii) Above 5000 KVA to 10,000 KVA	4	37,500	11,74,008	2	17,500	2,60,008
(iv) Above 10,000 KVA	..	..	..	1	12,000	1,82,725
	28	50,069	14,32,248	24	33,236	5,65,244
<b>Above 37.5 KV to 66 KV</b>						
(i) Upto 3000 KVA	..	..	..	..	..	..
(ii) Above 3000 KVA to 5000 KVA	..	..	..	..	..	..
(iii) Above 5000 KVA to 10,000 KVA	..	..	..	9	17,500	87,308
(iv) Above 10,000 KVA	..	..	..	1	60,000	4,14,728
	..	..	..	10	77,500	5,02,036
<b>Above 66 KV to 132 KV</b>						
(i) Upto 3000 KVA	10	2,000	11,855	3	15,350	3,35,308
(ii) Above 3000 KVA to 5000 KVA	7	35,000	9,78,338	..	..	..
(iii) Above 5000 KVA to 10,000 KVA	7	30,000	8,90,150	103	53,500	22,29,341
(iv) Above 10,000 KVA	3	1,80,000	5,07,403	11	2,10,000	12,47,625
	27	2,47,000	23,87,746	117	2,78,850	38,12,274
<b>Above 132 KV</b>						
(i) Upto 3000 KVA	..	..	..	..	..	..
(ii) Above 3000 to 5000 KVA	..	..	..	..	..	..
(iii) Above 5000 to 10,000 KVA	..	..	..	..	..	..
(iv) Above 10,000 KVA	..	..	..	N.A.	N.A.	98,819
	..	..	..	..	..	98,819
<b>TOTAL</b>	55	2,97,069	38,19,994	151	3,89,586	49,78,373

## APPENDIX VII

(Vide Paragraph 12.2.2)

*Statement showing Imports of Transformers during 1960, 1961 & 1962—  
as recorded in the Monthly Statistics of Foreign Trade of India.*

Transformers	1960		1961		1962	
	No.	(Value) Rs.	No.	(Value) Rs.	No.	(Value) Rs.
<b>1. Up to 3·3 KV</b>						
Up to 25 KVA . . .	161	87,687	150	1,55,749	139	1,28,544
26 to 75 KVA . . .	8	27,413	8	61,177	13	31,613
76 to 250 KVA . . .	8	6,574	148	20,32,265	21	76,636
251 to 500 KVA . . .	..	..	..	..	2	38,468
501 to 1000 KVA . . .	1	2,73,855	..	..	2	76,873
1001 to 1500 KVA . . .	10	12,495	..	..	..	..
1501 to 2500 KVA . . .	1	1,56,003	3	2,02,475	..	..
Above 2500 KVA . . .	..	..	1	4,29,089	1	2,69,414
<b>TOTAL</b> . . .	<b>189</b>	<b>5,64,027</b>	<b>310</b>	<b>28,80,755</b>	<b>178</b>	<b>6,21,548</b>
<b>2. 3·4 to 6·6 KV</b>						
Upto 25 KVA . . .	..	..	48	27,363	8	11,644
26 to 75 KVA . . .	6	1,09,994	..	..	2	3,460
76 to 250 KVA . . .	1	6,473	1	13,368	..	..
251 to 500 KVA . . .	27	7,005	..	..	..	..
501 to 1000 KVA . . .	..	..	7	4,52,520	..	..
1001 to 1500 KVA . . .	..	..	..	..	..	..
1501 to 2500 KVA . . .	..	..	..	..	..	..
Above 2500 KVA . . .	1	91,707	..	..	10	12,19,574
<b>TOTAL</b> . . .	<b>35</b>	<b>2,15,179</b>	<b>56</b>	<b>4,93,251</b>	<b>20</b>	<b>12,34,678</b>

Transformers	1960		1961		1962	
	No.	(Value) Rs.	No.	(Value) Rs.	No.	(Value) Rs.
<b>3. 6·7 to 11 KV</b>						
Upto 25 KVA . .	54	4,916	62	49,478	295	2,47,429
26 to 75 KVA . .	5	1,332	..	..	..	..
76 to 250 KVA . .	..	..	9	65,790	7	31,307
251 to 500 KVA . .	1	50,000	2	67,138	..	..
501 to 1000 KVA . .	..	..	6	3,37,447	..	..
1001 to 1500 KVA . .	6	8,99,597	..	..	..	..
1501 to 2500 KVA . .	5	8,93,516	..	..	..	..
Above 2500 KVA . .	18	32,97,894	1	1,60,556	3	6,34,818
<b>TOTAL</b> . .	<b>89</b>	<b>51,47,255</b>	<b>80</b>	<b>6,80,409</b>	<b>305</b>	<b>9,13,554</b>
<b>4. 22 KV</b>						
Upto 25 KVA . .	1	2,758	33	44,512	..	..
26 to 75 KVA . .	3	2,098	1	10,323	..	..
76 to 250 KVA . .	..	..	9	1,07,788	..	..
251 to 500 KVA . .	1	11,048	..	..	..	..
501 to 1000 KVA . .	..	..	..	..	..	..
1001 to 1500 KVA . .	..	..	..	..	..	..
1501 to 2500 KVA . .	..	..	..	..	..	..
Above 2500 KVA . .	4	93,374	6	11,53,808	3	6,73,347
<b>TOTAL</b> . .	<b>9</b>	<b>1,09,278</b>	<b>49</b>	<b>13,16,431</b>	<b>3</b>	<b>6,73,347</b>
<b>5. 33 KV to 37·5 KV</b>						
Upto 25 KVA . .	2	2,241	8	17,129	..	..
26 to 75 KVA . .	18	19,602	60	65,700	..	..
76 to 250 KVA . .	3	44,265	..	..	2	7,673
251 to 500 KVA . .	3	5,01,266	6	36,115	..	..
501 to 1000 KVA . .	12	65,320	1	33,336	6	2,33,416
1001 to 1500 KVA . .	1	40,000	..	..	..	..
1501 to 2500 KVA . .	6	2,23,415	..	..	22	6,19,979
Above 2500 KVA . .	26	35,10,013	7	17,25,936	2	3,04,023
<b>TOTAL</b> . .	<b>71</b>	<b>44,06,122</b>	<b>82</b>	<b>18,78,216</b>	<b>32</b>	<b>11,65,091</b>



Transformers	1960		1961		1962	
	No.	(Value) Rs.	No.	(Value) Rs.	No.	(Value) Rs.
<b>6. Above 37·5 KVA</b>						
Upto 25 KVA . . . . .	..	..	..	..	9	3,039
26 to 75 KVA . . . . .	9	6,028	..	..	..	..
76 to 250 KVA . . . . .	78	3,75,259	1	2,739	1	2,796
251 to 500 KVA . . . . .	31	1,99,710	25	7,89,744	1	15,144
501 to 1000 KVA . . . . .	6	36,959	7	71,381	..	..
1001 to 1500 KVA . . . . .	3	81,131	6	70,501	..	..
1501 to 2500 KVA . . . . .	55	2,30,768	15	3,84,077	..	..
Above 2500 KVA . . . . .	57	73,66,609	79	1,77,17,414	15	38,67,699
<b>TOTAL</b> . . . . .	<b>239</b>	<b>82,96,464</b>	<b>133</b>	<b>1,90,35,856</b>	<b>26</b>	<b>38,88,678</b>
<b>7. Transformers— Lighting smaller than 1KVA . . . . .</b>						
	793	1,05,543	228	29,109	392	21,644
<b>8. Transformers— N.E.S. . . . .</b>						
	11,138	58,63,765	4,630	1,38,61,982	1,506	62,32,272
<b>TOTAL OF 1 TO 6</b> . . . . .	<b>632</b>	<b>1,87,38,325</b>	<b>710</b>	<b>2,62,84,918</b>	<b>564</b>	<b>84,96,896</b>
<b>GRAND TOTAL OF 1 TO 8</b> . . . . .	<b>12,563</b>	<b>2,47,07,633</b>	<b>5,568</b>	<b>4,01,76,009</b>	<b>2,462</b>	<b>1,47,50,812</b>