

Electrical Machinery

MARKET & OPPORTUNITIES



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Introduction

The Engineering sector in India is the largest among industrial sectors and can be broadly categorised into the heavy engineering and light engineering sectors. The heavy engineering industry can be further classified into capital goods/machinery and equipment segments. The capital goods/machinery segment can be further classified into electrical machinery and non-electrical machinery.

The electrical machinery sector in India primarily caters to the power sector and is poised for growth in view of the Government's thrust on the power and construction industries.

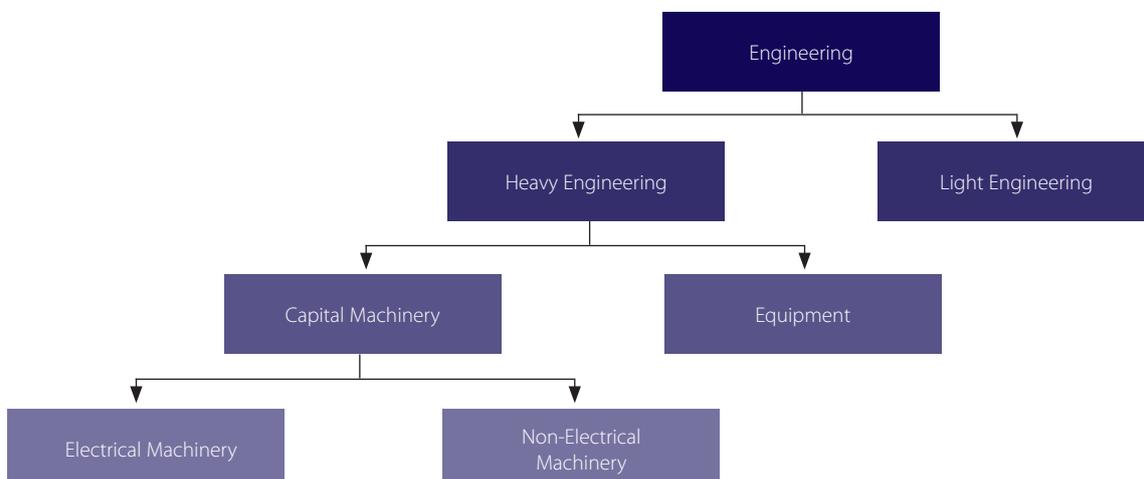
The Government of India (GOI) has embarked on an ambitious plan of 'Power for All By 2012'. This plan aims to achieve an installed generation capacity of 200,000 MW by 2012, which in turn translates to more than a 50 per cent increase over the current levels. In order to ensure that the generated power reaches all parts of the country, an expansion of the regional transmission network and inter regional capacity to transmit power will be essential.

All this presents an unparalleled growth opportunity for all industries associated with energy generation and transmission. The increasing thrust on power sector reforms is helping improve investor confidence in the sector and a parallel increase in the inflow of investments.

The Government is planning to add 150,000 MW of power generation capacity in the next 10 years. This will generate substantial demand for heavy electrical machinery. India's leading public sector electrical equipment manufacturing company, Bharat Heavy Electricals Limited, (BHEL) plans to augment its manufacturing capacity to 10,000 MW per annum by 2007, an increase of about 66 per cent from the 2006 levels of 6000 MW.

This report discusses the structure of the Indian electrical machinery industry, the size and growth across key segments and the associated growth drivers and attempts to identify the critical success factors for growth and opportunities/locations that can be attractive for investors.

Electrical Machinery Classification



Indian Electrical Machinery Industry

India produces the full range of electric power generation and transmission machinery. The electrical machinery industry consists of four key product categories, based on their use.

- Generation machinery - Key products in this category include generators, boilers and turbines
- Transmission machinery – This primarily includes different types of transformers and transmission towers
- Distribution machinery – Circuit breakers, switch gears and control gears are key products in this category
- Others – Electric motors, wires and cables

The small and medium size sectors have a significance presence in the electrical machinery industry, with an estimated share of around 35 per cent.

INCREASE IN POWER GENERATION CAPACITY SET TO DRIVE GROWTH

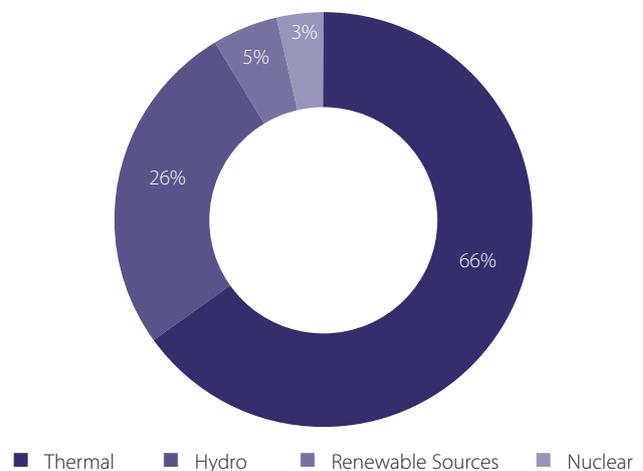
The growth of the electrical machinery industry is directly related to the development of power generation and distribution. Excluding the non-utilities, India's power generation capacity of 2,300 MW in 1950 has expanded to over 128,182 MW at present. This capacity is available through different sources of power, such as:

- Thermal power - 84149.84 MW
- Hydro-electric power- 33941.77 MW
- Renewable Energy Sources (RES) - 6190.86 MW
- Nuclear power - 3900 MW

In terms of number of units, power generation has grown at around a 5 per cent CAGR over the past seven years. (See bar graph)

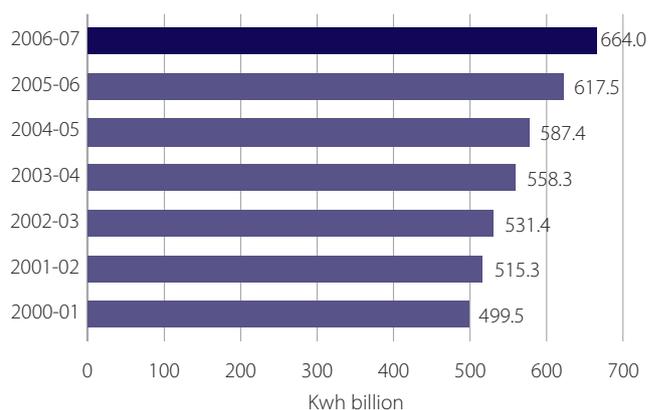
As stated earlier, the capacity is set to nearly double to about 200,000 MW over the next five years. The Electrical machinery industry has been gearing up to meet the

Installed Capacity of Power Generation (Various Sources)



Source: Ministry of Power

Electrical Power Generation



Source: Ministry of Power; KPMG Analysis

increase in demand owing to this increase in capacity. India has the capability to manufacture transmission and distribution machinery upto 400 Kilovolts (KV) AC and high Voltage DC (HVDC). Industry players are now engaged in upgrading transmission to the next higher voltage system of 765 KV and gearing up to supply transformers and related

equipment of this class. Indian manufacturers are catching up with developments in the global market with respect to product designs, manufacturing and testing facilities. Investments in R&D in the electrical machinery industry are amongst the largest in the corporate sector in India.

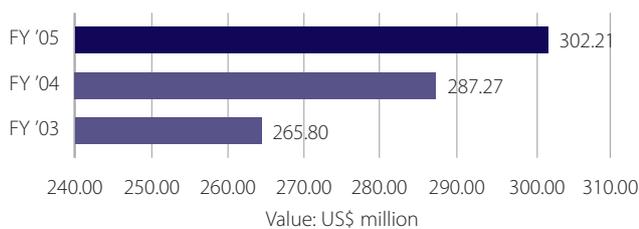
Hence, these are exciting and challenging times for India's electrical machinery industry. All the key product categories are poised for growth. In the following section, the different product categories are discussed in detail.

GENERATION MACHINERY

Turbines and Generators

The Indian electrical machinery industry manufactures a wide range of turbines such as steam and hydro turbines, with a total capacity of more than 7000 MW per annum. While BHEL is the largest player, there are significant number of smaller units in the private sector, manufacturing steam and hydro turbines for power generation and industrial use. Custom-built conventional hydro turbines of Kaplan, Francis and Pelton type, with matching generators, are also manufactured for local and export markets. The production of turbines and generator sets has grown at a CAGR of 7 per cent over 2003-05.

Production of Turbines & Generator Sets

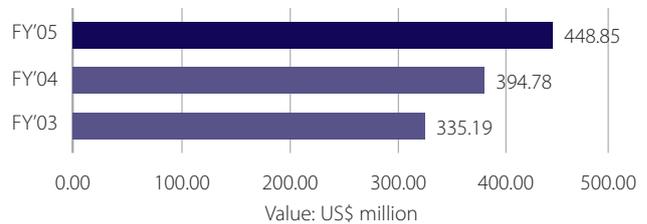


Source: Ministry of Heavy Industry, Annual Report

While the user industry is maturing, significant opportunities exist in this space for players with the technological know-how and investment capability. The imports and exports of turbines and generators during 2005-2006 were to the tune of US\$ 650 million and US\$ 140 million, respectively.

Boilers

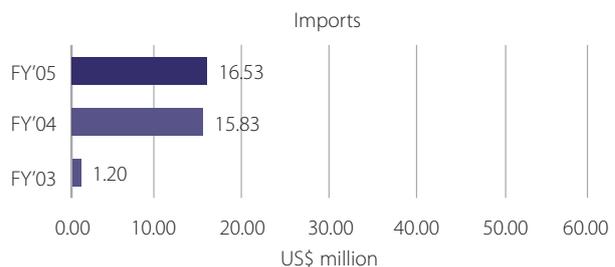
Production of Boilers



Source: Ministry of Heavy Industry, Annual Report FY'06

BHEL is the largest manufacturer of boilers in the country, with more than a 60 per cent share. It has the capacity to manufacture various types of boilers, ranging from utility and industrial boilers to boilers for super critical thermal power plants. The industry has the capacity to manufacture boilers with super critical parameters of size upto 1000 MW unit. Production of boilers in India has grown at nearly 16 per cent CAGR over 2003-05.

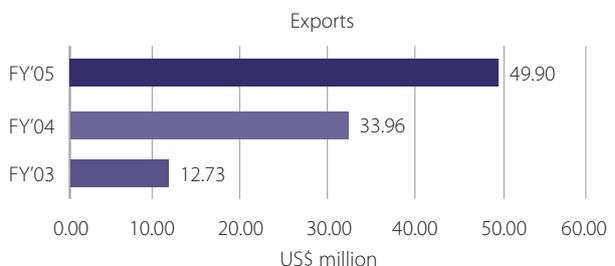
Trade in Boilers



Source: Ministry of Heavy Industries; Annual Report

Exports of boilers from India have been growing steadily. During 2003-05, exports grew at 98 per cent CAGR, from US\$ 12.7 million to US\$ 49.9 million. Imports came in much lower, at US\$ 16.5 million in 2005.

Trade in Boilers



Source: Ministry of Heavy Industries; Annual Report

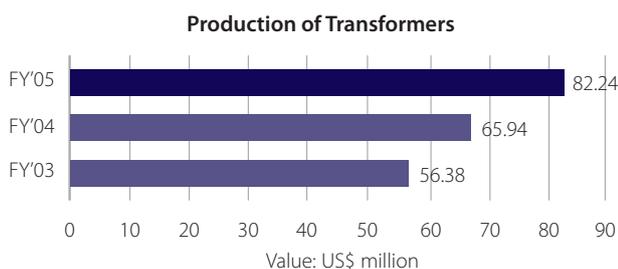
As the domestic industry has the capacity to meet the demand for boilers, this segment does not appear to be an attractive investment option. However, given the growth plans of the user segments in India, significant new avenues

for investment are opening up. With the right mix of technology, investment capabilities and global recognition, potential investors could find this segment very attractive.

TRANSMISSION MACHINERY

Transformers

The Indian electrical machinery industry has the capacity to manufacture the entire range of power and distribution transformers including the REC rating of 25, 53, and 100 KVA and also the extra high voltage range of 400 KV, 600 MVA. Special kinds of transformers required for furnaces, rectifiers, electric traction etc. and series and shunt reactors as well as HVDC transmission upto 500 kV are also being manufactured in the country. Apart from sales in the domestic market, transformers are also exported.



Source: Ministry of Heavy Industry, Annual Report, FY'06

Production of transformers in India grew at a 21 per cent CAGR, from US\$ 56.38 million in 2003 to US\$ 82.24 million in 2005. Exports and imports have grown at a CAGR of 32 & 26 per cent respectively over FY 03-05.

DISTRIBUTION MACHINERY

Switchgear and Controlgear

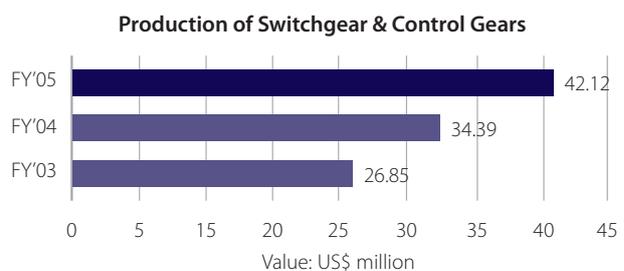
The Switchgear industry can be categorised into two main categories, Low Tension (LT) switchgears and High Tension (HT) switchgears. LT switchgears operate upto a maximum of 660 volts and are relatively less technology-driven. These are used in domestic and light industrial applications. The LT version has a 35 per cent share in the switchgear turnover. The leading players in the low tension category are Siemens, L&T and Datar Switchgears.

The high tension segment is more technology intensive. Higher price realisation, better margins and the presence

of multinationals with access to higher technology attract a premium in this segment. The major players in this segment are GEC Alstom, Crompton Greaves, BHEL and ABB.

Safety concerns have led to an increase in the demand for Earth Leakage Circuit Breakers (ELCB) and Miniature Circuit Breakers (MCBs), the two major varieties of switchgears used in the household segment. The growth in MCB sales volume has been between 30 and 40 per cent, primarily driven by replacement of old model switches.

India produces a range of circuit breakers from bulk oil, minimum oil, air blast, vacuum and SF₆, to standard specifications. The range of products produced cover the voltage range from 240KV to 800KV and includes switchgear, control gear, MCBs, air circuit breakers, switches, re-wireable fuses and HRC fuses with their respective fuse bases, holders and starters etc.



Source: Ministry of Heavy Industry, Annual Report, FY'06

The industry is competitive in design and engineering and the skill sets available in the country are relatively less expensive than comparable developing countries. The imports and exports of these equipment during 2005-2006 came in at around US\$ 383 million and US\$ 251 million, respectively.

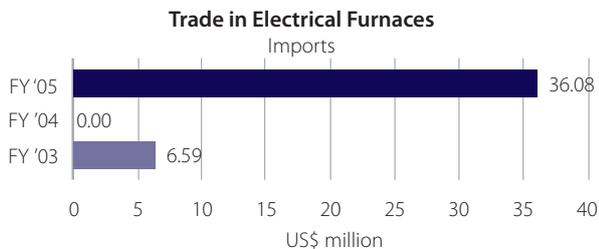
Production of switchgears has grown at a CAGR of around 25 per cent during 2003-05. Exports and imports have also increased in the FY'03-05 period. Exports have increased at a CAGR of 25 per cent, from US\$ 102.7 million in 2003 to US\$ 160 million in 2005. Imports have gone up from US\$ 182.3 million in FY'03 to US\$ 278.75 million in FY'05, at a CAGR of 23 per cent.

OTHERS

Electrical Furnaces

Electrical furnaces are used in metallurgical and engineering industries like forging and foundry, machine tools,

automobiles etc. While India produces a range of furnaces, significant volume of imports in this segment indicate gaps in domestic capacity and capability. Apart from meeting domestic demand, electric furnaces are also exported from India.



Source: Ministry of Heavy Industry, Annual Report

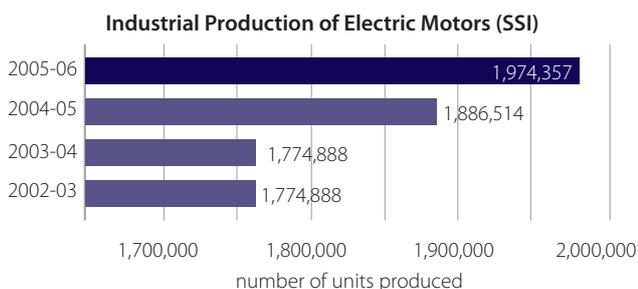


Source: Ministry of Heavy Industry, Annual Report

Exports and imports of electrical furnaces have increased in the FY'03-05 period. Exports have increased at a CAGR of 79 per cent, while imports have grown significantly from US\$ 6.59 million in FY'03 to US\$ 36.08 million in FY'05 (CAGR of 233 per cent). In 2005-06, imports and exports of electrical furnaces have further gone up to around US\$ 42 million and US\$ 25 million, respectively.

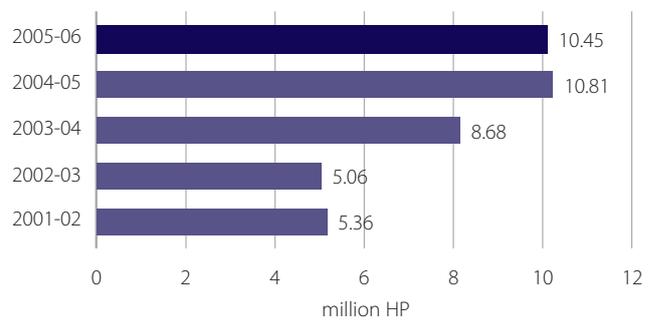
Electric Motors

Electric motors are widely used for a range of industrial applications. Growing at a CAGR of 3.6 per cent, production of electric motors in India has shown continuous growth over the period FY'03-06, from 1.77 million units to 1.97 million units.



Source: Indiatat

Electric Motors (IIP)

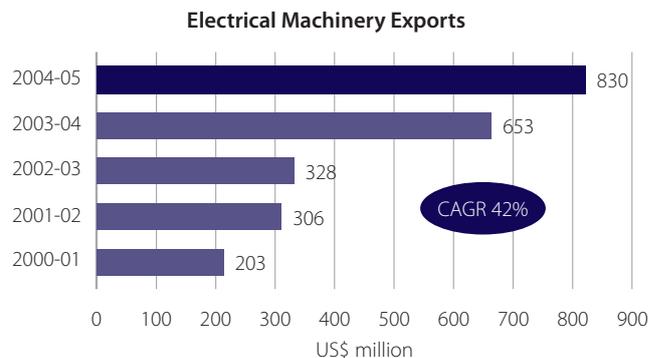


Source: Indiatat

In terms of power consumption (rating) of motors over the period FY'02-06, consumption has gone up from 5.36 million HP in FY'02 to 10.45 million HP in FY'06, growing at a CAGR of about 18 per cent.

EXPORTS OF ELECTRICAL MACHINERY

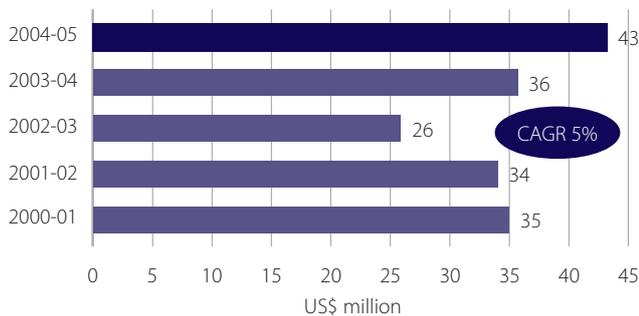
Exports of electrical machinery from India have registered continuous growth over the period FY'01-05. A key driver for exports has been increasing outsourcing of manufacturing goods from India, in addition to other factors like low labor costs and improvements in capability and technology of domestic players.



Source: Engineering Exports Promotion Council

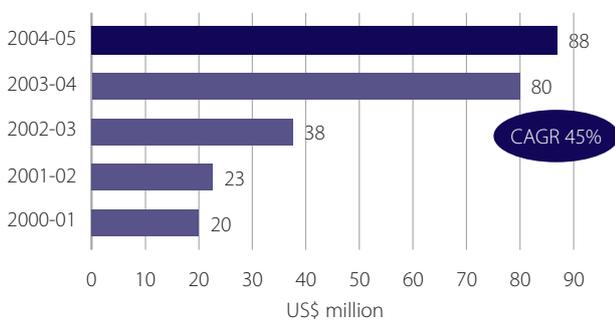
The following charts depict in detail the exports of electrical machinery from India. The overall exports have increased at a CAGR of about 42 per cent. Exports of transmission equipment had dipped till 2002-03, but have been since been growing at a 27 per cent CAGR. Exports of wires and cables have gone up over four times during 2000-05, at a CAGR of 45 per cent.

Transmission Equipment Exports



Source: Engineering Exports Promotion Council

Electric Wires/Cables Exports



Source: Engineering Exports Promotion Council

INDUSTRY TRENDS PRESENT POTENTIAL INVESTMENT OPPORTUNITIES

India's Advantages in the Sector

India has a number of advantages in the manufacturing sector that make it an attractive investment destination. Apart from a large and growing domestic market, it also has a well-developed supplier base, availability of skilled manpower at relatively lower costs, supportive regulatory environment and good support infrastructure. All these are positive drivers for potential investors to invest in the electrical machinery industry.

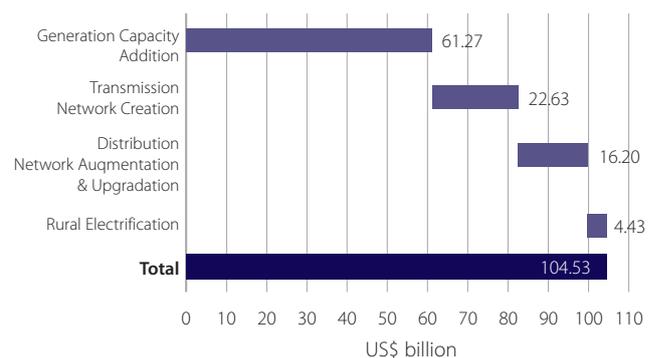
Specifically, the following factors are indicative of the attractiveness of the sector:

- Increasing importance of the industrial sector – The industrial sector in India is growing at over 10 per cent, as compared to the overall GDP growth of 8 per cent, indicating the increasing significance of this sector in the economy. As industry is one of the largest consumers of power, growth in industry is driving demand for power, which in turn drives demand for electrical machinery.
- Infrastructure development – The Government of India

has taken up infrastructure development as a priority area and large investments continue to be made in this area. Growth in housing and retail construction, which are major consumers of electricity also indicate a sustained demand in growth for power in the future.

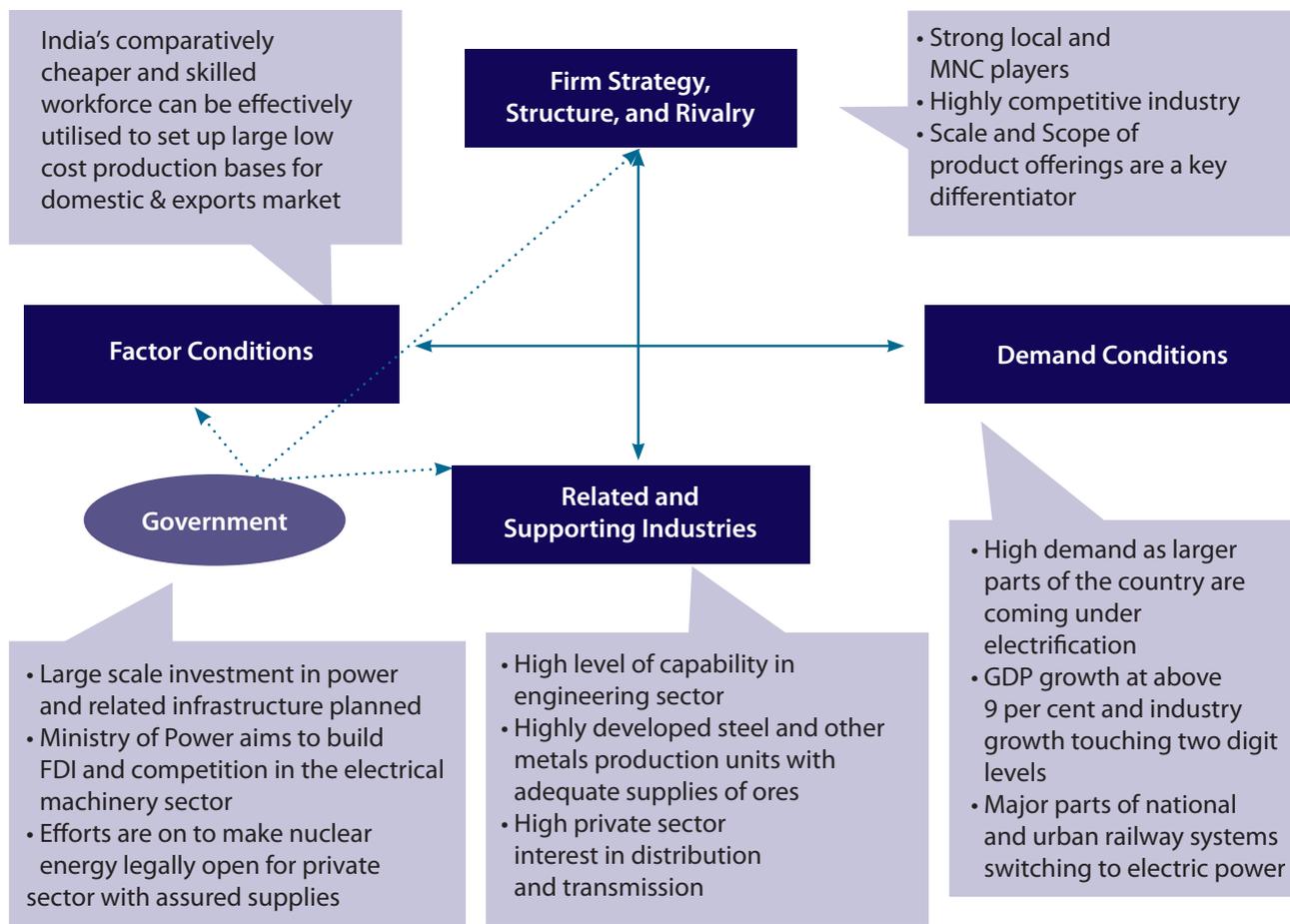
- Increased electrification – The Government is focusing on increasing the penetration of power supply in villages. Along with reach, the focus is also on improving the quality of power supplied. The Indian Railways is looking at increasing the share of electric locomotives and trains in an effort to reduce costs and pollution.
- Investments planned in expanding capacities in the power sector - The investments in the Indian electrical machinery industry by 2012 are expected to be about US\$ 105 billion. The bulk of the new investment is expected to be in increasing generation and transmission capacity, as depicted in the chart below.

Expected Investments



Source: Ministry of Power

India's Advantages in Electrical Machinery Industry



Source: KPMG Analysis

The figure above encapsulates India's advantages in the electrical machinery industry.

Industry Structure and Trends

The Electrical machinery industry in India is highly fragmented. Nearly 53 per cent companies in the industry have a turnover of US\$ 11 million or less.

Industry break-up as per firm size (turnover in US\$ million)	
Tiny (< 4)	23%
Small (4-10)	30%
Medium (10-100)	31%
Large (100-200)	8%
Very Large (>200)	8%

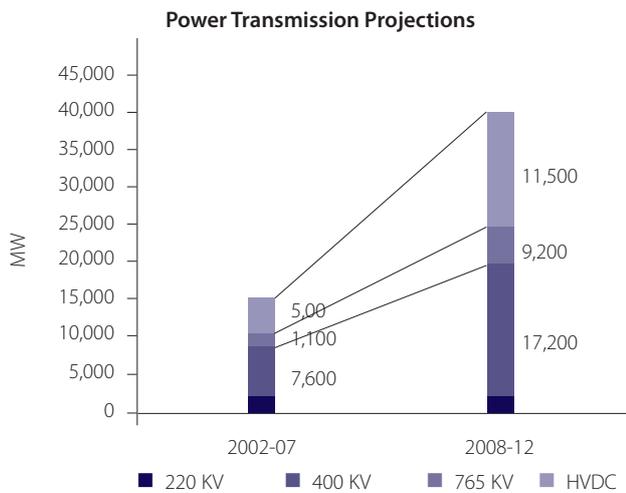
Given the growth rates projected for the industry and the improvement in technology levels, it is expected that the industry will undergo consolidation. Consolidation is

more likely in segments such as high voltage transformers, HT circuit breakers, high capacity motors, etc, than in low end, low voltage applications where technology is not a differentiator. This provides an opportunity for players with capabilities in HT application products to enter the market.

Moving Towards Higher Voltage Transmission

Transmission and distribution capacity has not kept pace with power generation capacity in India, leading to constraints in power evacuation from generating stations. Hence, investment in transmission and distribution capacity is a focus area for the sector.

Power transmission in India, which is currently carried out largely in the 220 KV and 400 KV range, is expected to move up to a higher range of 765 KV and HVDC over the next five years. To handle such high voltages, technology for equipment needs to be developed in India. This indicates an opportunity for manufacturers with capability in HV technology.



Source: Planning Commission, Ministry of Power, KPMG Analysis

CRITICAL SUCCESS FACTORS FOR MANUFACTURERS

Capability to Invest

A key success determinant in the electrical equipment space is the ability to scale up in accordance with the rate at which the market is expected to grow. Willingness to invest with a long-term view and building relationships with end-user segments will be key factor. Most of the end users are very large players and will prefer an assured supply with scale benefits from a consolidated supplier base.

Technology

The Indian electrical machinery industry is evolving from low-end, low voltage products to high voltage, technologically-advanced products. There are a number of user industries where requirements often need product customisation. Hence, capability to develop and deploy technology is a prime requirement.

It is estimated that manufacturers in India spend only about 0.5 per cent of their turnover on R&D, as compared to nearly 5 to 6 per cent in case of successful MNCs. This is a key gap that needs to be addressed by the domestic industry for it to grow in the face of increased competition.

Spectrum of Products

Given the fact that most industrial users of electrical machinery differentiate on scale, access to business relations with such a player will, at least in the future, entail build up of a spectrum of capabilities. The Indian market is growing steadily and rapidly and strong international players with newer technologies are establishing a presence here. The existing industry players will therefore need to enter into strategic alliances and tie-ups with technology suppliers to upgrade their capabilities. The technology for the manufacture of transformers, for instance, is largely European. Having the entire gamut of products and services, through appropriate alliances, will be required for companies to differentiate themselves.

Conclusion

The Electrical machinery sector in India is on a high growth path. The momentum is expected to continue, with the industrial sector witnessing sustained growth and the Government committed to achieving its goal of 'power for all by 2012' and committing significant funds towards this.

Increasing privatisation of the power sector, movement towards higher voltage transmission and increase in capacity across generation, transmission and distribution, all point to the transformation the industry is witnessing. The future looks both challenging and attractive for the industry.

Appendix

KEY PLAYERS

Bharat Heavy Electricals Limited. (BHEL)

BHEL, which was established more than 40 years ago, is the largest engineering and manufacturing enterprise in India in the energy-related/infrastructure sector. The company has been making profits since 1971-72 and paying dividends since 1976-77. BHEL manufactures over 180 products under 30 major product groups and caters to core sectors of the Indian economy. BHEL has 14 manufacturing divisions, four power sector regional centers, over 100 projects sites, 8 service centers, and 18 regional offices. It ranks among the top ten power machinery manufacturers globally. BHEL has contributed close to 65,000 MW of generating capacity, which is about 70 per cent of the total generating capacity installed in the country. BHEL is a forerunner in manufacturing machinery for power plants. Technology absorption through technical collaborations with world leaders has contributed to BHEL's achievements. These collaborations include Prommashenport of CIS; General Electric, Combustion Engineering, National Oil Well, all from the USA; Sulzer of Switzerland; Hitachi and Toa of Japan; Siemens of Germany; Asea Brown Boveri of Canada; Flakt of Sweden; Alsthom and Neypic Creusot-Loire of France; and Weir of the UK.

BHEL has a wide product range including boilers, generators and transformers. BHEL has also entered into technology collaborations for super critical power plants, which enables it to capture an incremental market share. BHEL's earnings are expected to grow at a CAGR of 31.9 per cent over the FY'06-09 period. BHEL has technology for 50-500 MW power plants.

BHEL has acquired certifications to Quality Management Systems (ISO 9001), Environmental Management Systems (ISO 14001) and Occupational Health & Safety Management

Systems (OHSAS 18001) and is also well on track towards Total Quality Management.

Crompton Greaves

Crompton Greaves (CG) has been synonymous with electricity in India for the past 70 years. The company has been a pioneer in the Management and Application of Electrical Energy since 1937. It is one of the key private sector enterprises in India, focused on high technology electrical products and services related to power generation, transmission and distribution as well as executing turnkey projects. The company has a customer-centric focus and is the single largest one-stop source for a wide variety of electrical equipment and products. Further, the company is emerging as a first choice global supplier for high quality electrical equipment.

The company has operations spanning 22 manufacturing divisions spread across Gujarat, Maharashtra, Goa, Madhya Pradesh and Karnataka. These are supported by a well-knit marketing and service network through 14 branches in various states under the supervision of four regional sales offices in Delhi, Kolkata, Mumbai and Chennai. The company has a large customer base, which includes State Electricity Boards, Government bodies and large companies in private and public sectors.

The company is expected to witness growth in the power machinery segment with demand from Accelerated Power Development Reform Program (APDRP) and the rural electrification programs. The company's revenues are expected to grow at a CAGR of 29 per cent over the FY'06-09 period. The company acquired Pauwels and Ganz to complete its product range in transformers, enabling it to address opportunities both in domestic and exports markets effectively.

EMCO

EMCO is one of the leading solution providers in the power sector in India. It is a globally competitive producer of a complete range of transformers. The company has been witnessing an increase in the demand for its transformers owing to growing investments in transmission and distribution. EMCO offers metering solutions to clients as well as project services for substations. The company is setting up a 135 MW thermal power plant at a cost of around US\$ 111 million. Expected to be commissioned in FY'10, power produced at this plant is likely to be sold to PTC India.

EMCO is one of the largest manufacturers of transformers in the country and is the market leader in single phase electronic energy meters. It has a project group that undertakes large electrical projects right from conception to commissioning. It also offers power automation solutions through its SCADA Group, which focuses on power automation and demand side management.

As technology continues to be EMCO's strength, it has evolved itself over the years from a product seller to a solution provider using Information Technology and the

Internet as its backbone. It now provides IT solutions to companies in distribution and automatic meter reading in the power distribution business.

With an experience of over 40 years, EMCO has four manufacturing plants, 10 offices and an employee strength of 1200 in the country and is ISO 9100:2000, ISO 14001 and OHSAS 18001 certified.

ABB

ABB is India's leading power systems producer and is expected to ride the power sector investment boom. ABB's strengths lie in its wide product range, global competence and ability to provide end-to-end solutions (from design to execution from its wide range of power systems and automotive technology products). ABB also gains its competitive edge from its ability to design, procure and implement automation drives for process industries. ABB plans to outsource products from its Indian operations, which would add to its revenue and earnings growth. The company's earnings are expected to grow at a CAGR of around 26 per cent on over FY'06-08.

Exchange Rate Used

Year	Exchange Rate (INR/US\$)
2000-01	45.75
2001-02	47.73
2002-03	48.42
2003-04	45.95
2004-05	44.87
2005-06	44.09
2006-07	45.11

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India Brand Equity Foundation

c/o Confederation of Indian Industry
249-F Sector 18, Udyog Vihar Phase IV
Gurgaon 122015, Haryana, INDIA

Tel: +91 124 401 4087, 4060 - 67

Fax: +91 124 401 3873, 401 4057

Email: j.bhuyan@ciionline.org

Web: www.ibef.org

Website in the Russian language: www.ibef.org/russia