INDIAN ELECTRICAL EQUIPMENT INDUSTRY

MISSION PLAN 2012-2022

सत्यमेव जयते

Ministry of Heavy Industries & Public Enterprises
Government of India

Vision 2022 for

Indian Electrical Equipment Industry

To make India the country of choice for the production of electrical equipment and reach an output of US$ 100 billion by balancing exports and imports

From the Desk of the Hon'ble Minister of Heavy Industries & Public Enterprises

The rising aspirations of India and its people can be met only if our economy continues to grow at a fast and sustained pace. For this to happen, it is vital that India's power sector continues to progress and rapidly grow. The Indian electrical equipment industry must, therefore, increase its preparedness and enhance its competitiveness to meet the current and future demands of our power sector and also other sectors of the economy.

The next 10 years will be crucial for the Indian electrical equipment industry as it gears up to meet the rapidly rising domestic demand and also establish its presence as an important player in the global electrical equipment arena. I am happy to see that all the stakeholders are focussed on converting this opportunity into reality.

We need a plan to steer, coordinate and synergise the efforts of all stakeholders, in an effective manner, to accelerate and sustain the growth of the domestic electrical equipment industry. I am glad that the Ministry, in consultation with the industry, power utilities, planners, regulatory authorities and concerned Central and State Authorities, has prepared this comprehensive document - *Indian Electrical Equipment Industry Mission Plan 2012 – 2022.*

I am confident that the combined efforts of the government and industry will ensure the success of this Mission Plan. I compliment the contribution of all those who have been instrumental in giving shape to this Mission Plan.

(Praful Patel)

New Delhi
April 2013

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FOREWORD

India is targeting a gross domestic product (GDP) growth rate of 8-9% in the coming years. To enable this growth, the country's economy needs the support of its power sector, which is witnessing heavy investments that will enable it to cater to India's increasing power demand. The capacity addition target in the 12th Plan (2012–2017) is expected to be 88.5 gigawatts (GW) and 93 GW in the 13th Plan (2017–2022). Though coal will likely remain the major fuel source in the future, the introduction of new and efficient technologies for power generation is being aggressively pursued, with greater stress on renewable energy sources such as wind, solar and nuclear. Within the thermal segment, installation of large supercritical units is being encouraged with the view to enable rapid capacity addition, enhance efficiency and reduce coal consumption, water requirement and greenhouse gas emissions. Globally, further advances in technology have resulted in developing advanced ultra-supercritical technologies.

India's electrical equipment industry is expected to p lay a critical role in improving its power infrastructure. Undoubtedly, the health of the Indian electrical equipment industry is of prime importance. The industry faces challenges both domestically and internationally. Low capacity utilisations, especially in the transmission & distribution (T&D) segment, and the growing threat of low cost imports are some of the key challenges.

The Department of Heavy Industry (DHI) recognises the power sector's strategic nature and the resulting importance of the electrical equipment industry. To address the various challenges, interventions need to be identified and implemented in a mission mode. Thus, DHI has developed this Mission Plan to support the domestic electrical equipment industry's future development and enhance its global competitiveness.

The Department expresses its appreciation of the work and support provided by the Indian Electrical & Electronics Manufacturers' Association (IEEMA) in helping us in preparing the Mission Plan. The Department also acknowledges the valuable contributions made by all the stakeholders, including manufacturers, power utilities, financing agencies, industry experts and the various Ministries and Departments of the Government of India. The government is convinced that the aspirations unfolded in the Mission Plan will be achieved and the Indian electrical equipment industry will be able to meet the competition globally and evolve into a world-class industry. The Mission Plan is envisioned as a blueprint for the industry's future and will require close collaboration between the government and the industry for its implementation.

New Delhi
April 2013

(Sutanu Behuria)
Secretary to Government of India
Department of Heavy Industry

PREFACE

An efficient power supply system is a key requirement for a nation's economic growth and the quality of life of its citizens. Assured availability of quality power at a reasonable cost is not only a catalyst in the socio-economic development of the country, but also enhances the global competitiveness of the industrial sector leading to enhanced employment generation and per capita income.

The Indian power industry embarked on a new journey in 1991 with de-licensing, and subsequently enactment of the Electricity Act, 2003, increasing the private sector's participation in power generation, transmission and distribution sectors, leading to the rapid development of robust and healthy domestic electrical equipment (EE) industry, supporting the complete value chain in power generation, transmission and distribution. As of 2011-12, the Indian EE industry has grown close to ₹ 1.20 lakh crore (US$ 25 billion). It contributes 1.4% to the nation's GDP and 10.0% to the manufacturing GDP.

The growth of the Indian power sector will entail exponential demand for electrical equipment. The government is likely to add around 88.5 GW and 93 GW, respectively, under its 12th and 13th Five Year Plans. Expected investment in the 12th Five Year Plan period in the generation and T&D segment would be ₹ 6.39 lakh crore in generation, ₹ 1.80 lakh crore in transmission and ₹ 3.06 lakh crore in distribution. Based on investment estimates and capacity addition targets, domestic demand for generation equipment (BTG) could be in the range of US$ 25-30 billion by 2022; for the T&D equipment industry, it may be US$ 70–75 billion. The EE industry is projected to provide direct employment to 1.5 million people and indirect employment to 2 million by 2022.

Based on the sector's growth projections in the previous Plans, India's EE industry has been investing in capacity enhancements. But increasing challenges from the supply and demand side and international competition have begun to impact the industry's health.

The current scenario necessitates the development of a well-defined, robust plan to support the long-term growth of this industry and tackle obstacles. The government, through the DHI, decided to develop a 10-year Mission Plan (2012-22) for the Indian EE industry. Indian Electrical Equipment Industry Mission Plan 2012–2022 was the outcome of in-depth dialogue with different stakeholders including EE manufacturers, users (power generation and T&D companies), the investor community and various departments of Government of India.

The process has led to the creation of the following Vision for the Indian EE Industry:

"To make India the country of choice for production of electrical equipment and reach an output of US$ 100 billion by balancing exports and imports"

The Department formulated five working groups and detailed discussions took place with various stakeholders to understand current issues and arrive at recommendations. The key areas discussed in the working groups were as follows:

- **Working Group 1 – Upgrade Technology to meet Future Requirements**
  - Technology up gradation in generation equipment industry
  - Technology up gradation in transmission and distribution equipment industry
  - Enhance research & development (R&D) expenditure by domestic companies
  - Upgrade testing facilities and improve power distribution systems

- **Working Group 2 — Enhancement of Industry Competitiveness**
  - Improve quality of products
  - Secure supplies of critical raw material / key inputs
  - Provide level playing field to the domestic industry
  - Review impediments to optimal working capital management
  - Improve labour productivity
- **Working Group 3 — Conversion of Latent Demand into Actual Demand**
  - Improve signing of power purchase agreement (PPA) and financial closure
  - Review lack of infrastructure
  - Ensure land acquisition and other clearances
  - Construction power supply for projects
  - Provide fuel linkages
- **Working Group 4 — Skills Development**
  - Estimate skilled manpower required in different skill trades
  - Review the working of vocational training institutions
  - Review the working of private engineering colleges and polytechnics
  - Industry institute interaction
  - Review curriculum for engineering and diploma courses
- **Working Group 5 — Export of Electrical Equipment**
  - Identify target markets and increase exports to emerging markets
  - Estimate transaction cost of exports
  - Identify infrastructure constraints
  - Review trade agreements
  - Improve funds availability and long term buyers' credit
  - Support from Government and Indian Missions abroad
  - Identify technical barriers to exports
  - Review and enhance export incentives
  - Industry initiatives

The time-bound implementation of the Indian Electrical Equipment Industry Mission Plan 2012–2022 will ensure that the Indian electrical equipment industry takes centre-stage and becomes a preferred choice for production of electrical equipment globally.

The Department expresses its appreciation of the support provided by the Indian Electrical & Electronics Manufacturers' Association (IEEMA) in development of this document. The Ministry also acknowledges the valuable contributions made by all the stakeholders, including manufacturers, power utilities, investor community, industry experts and the various Ministries and Departments of the Government of India.

New Delhi
April 2013

(Ambuj Sharma)
Joint Secretary to Government of India
Department of Heavy Industry

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

Assured availability of quality power at competitive rate is a sine qua non for industrial and economic development. For an efficient and developed power sector in a country of India's size, a strong domestic electrical equipment manufacturing base is essential.

Considering that the government plans to increase power generation capacity from 200 GW in 2012 to about 400 GW by 2022 with commensurate T&D capacity enhancement, Indian EE manufacturers not only have to meet demand of such huge capacity addition, but also that of metros, airports, railways, other infrastructure projects and increase in domestic consumer demand too. Per capita electricity consumption in India in 2011-12 was 879 kilowatt hour (kWh), less than one-fourth the global average.

Presently, the domestic electrical equipment industry size exceeds ₹ 1.20 lakh crore (US$ 25 billion) with the share of generation equipment (boilers, turbines, generators - BTG) being about one-fourth and that of T&D being three-fourth of the total. The domestic EE industry contributed 1.4% to the nation's GDP in 2011-12 and 10.0% to the manufacturing GDP. The industry provides direct employment to about 0.5 million persons and indirectly to about 1 million persons. The entire value chain would account for a total employment of over 5 million persons.

The domestic industry is now by and large geared up to meet the current and future demand of the power and other sectors of the economy.

The industry's share of exports is about 1.5% of the country's total exports, whereas its share of imports is about 3.2% of the total imports. The country's trade deficit in EE is widening every year, which is a matter of serious concern.

The capacity utilisation of the T&D equipment industry is broadly only 70%, which is a matter of concern for the industry. At present, the total manufacturing capacity of BTG equipment in the country is about 25,000 megawatt (MW) per annum and is expected to increase to 40,000 MW per annum by 2014-15, once more joint ventures commence production. As a result, even the generation equipment sector will soon be sitting on huge surplus capacity.

Imports have captured about 43% of the market for electrical equipment in India, whereas there is significant domestic overcapacity.

Considering the domestic EE industry's importance for the power sector, GDP growth and also employment, it is extremely important to ensure that the targeted growth of the entire electrical equipment industry is aligned with the 12th and 13th Five Year Plans.

Vision 2022 for the Indian electrical equipment industry is to make India the country of choice for the production of electrical equipment and reach an output of US$ 100 billion by balancing exports and imports. The Indian Electrical Equipment Industry Mission Plan 2012-2022 has been evolved through an elaborate exercise involving all stakeholders. Five critical areas that need to be addressed by the industry, with support from the government, are industry competitiveness, technology up gradation, skills development, exports and conversion of latent demand.

A. Industry Competitiveness

While the performance of the domestic electrical industry has been strong over the last decade, it is important to maintain sustained high rate of growth if it has to meet the demand arising out of the targeted generation capacity addition, meet the growth of other sectors of economy and also become globally competitive and increase exports. Therefore, it is important to provide a level playing field in the country to domestic EE manufacturers vis-à-vis foreign manufacturers, who are enjoying support from their respective governments with respect to subsidies on raw material, incentives for export, low cost of funds, better infrastructure, etc.

Indian industry can be supported by levying a higher import duty on electrical equipment, allowing import of cold rolled grain oriented (CRGO) electrical steel at zero customs duty, replacing the L1 criteria of procurement by power utilities in India with two part bidding, augmenting domestic testing facilities to cover the type testing of all equipment, mandating type testing of imported small equipment in Indian labs, supporting SMEs in technology up gradation and testing, standardisation of product ratings and specifications, keeping a provision for type testing of small equipment picked up from site, etc.

The government also needs to support the industry by providing funds at globally competitive rates of interest and help industry to establish clusters of electrical and component manufacturers and provide them funds for technology up gradation. Foreign suppliers of heavy equipment may also be insisted upon to set up phased manufacturing facilities in India.

B. Technology Up gradation

The generating and switchgear equipment being manufactured in India can compete with the best in the world. However, Indian industry as a whole does not

give the required importance to R&D and spends less than 1% of their sales on R&D. Large companies in other countries spend 5 to 6% of sales on R&D. 90% of T&D equipment manufacturers in India are in the small and medium enterprises (SME) sector, and are generally unable to upgrade technology and improve their products.

R&D in the BTG and T&D sectors takes place at the individual company level in public sector enterprises (PSEs) and in some private companies, but there is no coordinated and collaborative effort by industries and utilities. Therefore, desired results are generally not forthcoming and the country's dependence on the import of technology is very high.

Bharat Heavy Electricals Ltd. (BHEL) has developed a demonstration model based on Integrated Gasification Combined Cycle (IGCC) and advanced ultra-supercritical technology. BHEL should be supported by the government to build high capacity commercial units in a time-bound manner. This technology, which is not available in the world for Indian coal, should also be made available to other manufacturers. For any R&D project, the user organisation or main beneficiary should be supported by the government for leading the research in a planned and committed manner.

In the transmission sector, the Power Grid Corporation of India Ltd. (PGCIL) has developed an experimental 1,200 kilovolt (kV) station at Bina (Madhya Pradesh) with the involvement of domestic electrical equipment manufacturers, EPC (Engineering, Procurement & Construction) contractors, and a foreign expert. This is an excellent model of public-private partnership (PPP) for fast development of new technology / systems and should be replicated in other areas. To increase the capacity of existing transmission lines, stress should be laid on areas such as high surge impedance loading lines and development of high temperature low sag carbon core conductors. As experimental models, using superconductors, of transformers, motors, cables, etc. have already been developed in the world, focussed attention should be given to research on superconductivity, under the leadership of organisations like PGCIL.

C. Skills Development

The electrical equipment industry plays a very important role not only in GDP growth but also in providing employment in the country. It is estimated that this industry requires almost 80,000 to 90,000 skilled workers every year. A large number of skilled workers coming out of technical institutes do not possess the required skills and are not employable. The industry has to spend time and money on their training. In the case of engineers and supervisors, the situation is quite alarming. The quality of knowledge possessed by graduates and diploma-holders coming out of most private institutes is very poor. This is one of the major reasons for the low productivity of manpower in India as compared to other economies.

It has been observed that most existing technical training institutes run by the government and private sector do not have proper training facilities, their curriculum is not updated, the system of providing proper practical training to the students is nearly non-existent and does not meet the needs of the industry either. Forming a Sector Skill Council (SSC) for the electrical equipment industry with support from the National Skill Development Corporation (NSDC) has been proposed to improve the quality of training being provided in the existing institutes. The SSC will consolidate data regarding the number of skilled workers required in different regions of the country. It will have regional offices that will interact with the industry to provide training to the workers and also train the trainers / teachers, propose changes in curriculum, etc. It will also arrange for accreditation of the institutes and certification of the students. In accordance to their requirement and with the help of NSDC, the IPPs and PSEs may take over and upgrade training facilities of the local institutes wherever they set up power and other infrastructure projects.

To meet the growing demand of information and communications technology (ICT) sector in the 1980s, the Government of India gave a mandate to the All India Council for Technical Education (AICTE) to encourage private and voluntary organisations to set up technical and management institutes in India. As a result of these initiatives, the number of engineering colleges increased from less than 450 in 2002 to around 3,500 in 2012. Intake of students has increased from 0.84 million in 2008 to more than 1.76 million in 2012. In the process, the norms got diluted and quality of education suffered. Most of the graduates coming out of private engineering colleges do not possess the basic knowledge of their respective discipline.

Every year, industry experts visit these private colleges for campus interviews. Their feedback can be utilized by AICTE to review the accreditation of these colleges and initiate action for improving the standard of education. The industry may be involved in the periodic review of the curriculum, summer training of students and for guest lectures of the industry experts.

D. Exports

Export of electrical equipment in 2011-12 was US$ 4.6 billion, which is about 1.5% of total exports from India, and imports were US$ 15.7 billion, which is about 3.2% of total imports. During the last five years, exports

of electrical equipment have increased at a CAGR of 9.7% whereas imports have increased at a CAGR of 27.2%. Clearly, there is an urgent need for reducing the increasing trade deficit.

Some countries provide very effective support to their domestic manufacturers of electrical equipment, which results in them being more competitive vis-à-vis Indian manufacturers in the global market. Indian industry is also unable to compete because of the industry's lack of focus on quality of the products, delivery commitments, high cost of shipment, lack of infrastructure, non-recognition of test certificates of CPRI by some countries, high cost of production, high cost of finance, lack of interaction of the industry with Indian missions and trade commissions abroad, etc.

A study of the emerging markets in Africa, Latin America and Central Asian countries may be conducted to identify the countries and the equipment that have good scope for exports from India. The Foreign Trade Policy should provide specific incentives for export of electrical equipment.

The Export-Import Bank of India (EXIM Bank) may provide more project specific lines of credit to other countries with an emphasis on acceptance of equipment / material only from India for such projects. The government may provide loans to underdeveloped countries for power plants, transmission and distribution projects or barter for oil and gas and other minerals. In order to reduce the shipping cost and the time taken for clearance of documents and actual shipment of consignments, all the recommendations of the Task Force on Transaction Cost, set up by the Department of Commerce, may be implemented at the earliest.

The Central Power Research Institute (CPRI) may initiate action to see that its certification is accepted in all foreign countries. The participation of foreign buyers in specialised trade fairs of electrical equipment in India should be encouraged. Likewise, Indian manufacturers of electrical equipment should be encouraged to take part in specialised trade fairs abroad. A larger number of business delegations of Indian electrical equipment manufacturers should be organised to target foreign markets.

E. Conversion of Latent Demand

Delays in timely commissioning of power projects directly impact the capacity utilisation of the BTG industry and its growth. This also leads to delays in completion of downstream transmission projects that are linked to the evacuation of power from the power projects and thus impacts the growth of transmission equipment industry. Because of high aggregate technical & commercial (AT&C) losses, power distribution utilities are unable to take up improvement projects and the demand for distribution equipment is not growing significantly.

Problems faced in land acquisition, signing of PPAs, forest and environment clearances, construction power supply, approach roads to project sites, right of way, high cost of finance, fuel linkages, etc. are the major causes of delays in the timely completion of projects.

For development of new colonies, industrial estates, construction of roads, etc. by the states, State Governments acquire land, construct approach roads, arrange power supply, and arrange forest and environment clearances, even though the actual construction / development is carried out by private contractors. On similar lines, once a power project is identified for the central sector or for independent power producers (IPPs), the Central Electricity Authority (CEA) can provide data and the concerned State Government can acquire land, construct roads, and arrange construction power supply and other clearances. Developers can reimburse the cost to the concerned State Government with interest and overhead costs on award of the power plants. This will avoid uncertainty and help developers start the projects faster. Banks will gain confidence and funding will become easier. Early commissioning will help the states immensely. Similarly, states can acquire land for 400 kV and above substations required for meeting the ever increasing demand of cities and evacuation of power.

For reducing AT&C losses of power distribution companies (DISCOMs), it is suggested that urban areas with high AT&C losses should be handed over to private sector on the input-based franchisee model with the provision for investment by the franchisee for system improvement. The franchisee can be asked to set up decentralised distribution-cum-generation (DDG) projects in identified rural areas. A suitable model for compensating the franchisee for high cost of DDG power can be developed keeping the actual cost of rural supply from the grid into consideration. This will generate demand for distribution equipment and DDG and will help DISCOMs in signing PPAs since their AT&C losses will come down. Peak load demand on the grid will also reduce.

The Way Forward

To carry forward the recommendations arising out of the Mission Plan, a proper review mechanism through the Development Council / Inter-Ministerial Group / Sub-Groups comprising representatives of the Department of Heavy Industry (DHI) and other concerned Ministries / Departments, IEEMA, industry and other stakeholders may be constituted for monitoring the implementation of the recommendations and for periodic follow-up of its status.

1.0 Global Power & Electrical Equipment Industry

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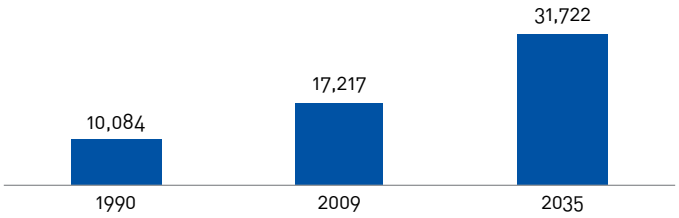
Figure 1.1: World Electricity Consumption in Terawatt Hours (TWh)



Source: The International Energy Agency's World Energy Outlook 2011 report (1 TWh = 1,000 GWh)

1.1 Global Electricity Market

The demand for electricity worldwide is projected to grow at an annual rate of 2.4% for the period 2009–2035, driven by economic and population growth. Over 80% of the growth between 2009 and 2035 is expected to be in non-OECD countries.

1.2 New Capacity and Investment in Power Infrastructure

1.2.1 The world's installed power generation capacity is projected to rise from 4,957 GW in 2009 to about 9100 GW in 2035. The total gross capacity addition is expected to amount to 4,100 GW over the period, with 48% of this addition planned for installation by 2020[1].

1.2.2 The cumulative investment during 2009–2035 is expected to amount to US$ 16.9 trillion, with US$ 9.8 trillion needed in generation and US$ 7.1 trillion in T&D.[2]

1.2.3 The share of coal in total electricity generation is expected to decrease from 41% in 2009 to 33% in 2035[3]. Non-hydro renewable energy sources – biomass, wind, solar, geothermal, wave and tidal energy – are expected to continue gaining share of the market, accounting for almost 15% of generation in 2035, up from 2% in 2009. The share of nuclear power (14% in 2009) is not expected to increase by 2035[4]W.

1.3 Global Electrical Equipment Industry

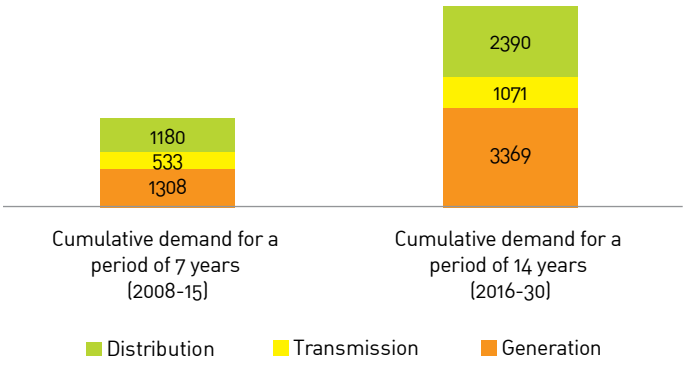
1.3.1 The global EE industry consists of the following two segments:

a. The global heavy electrical equipment market, including boilers, turbines, generators, wind turbines, solar power systems, etc.,

b. The global T&D equipment market, including electric power cables, transformers, electrical switchgear, transmission line towers, conductors, control equipment, meters, etc.

1.3.2 The global EE market is expected to increase from a cumulative size of more than US$ 3 trillion (2008-15) to US$ 6.8 trillion (2016-30). This translates into around 2% CAGR over the long term.

Figure 1.2: Global Electrical Equipment Cumulative Demand (US$ billion)



Source: The International Energy Agency's World Energy Outlook 2009 report

1.3.3 Asia-Pacific and Europe together account for more than 70% of the global market, with the Asia-Pacific region's share being 45%. This region is expected to see the strongest demand in future due to the region's strong expected economic growth rates.

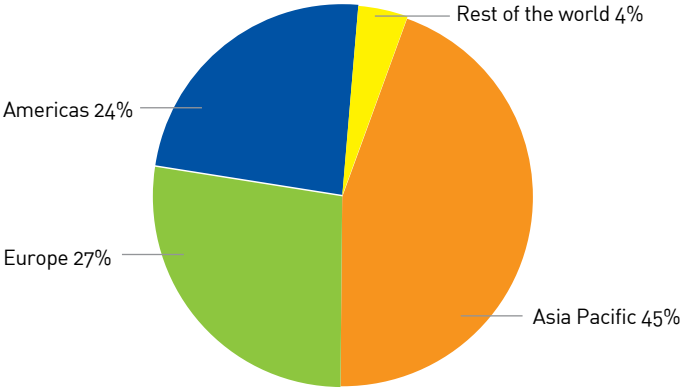
1 International Energy Agency's World Energy Outlook 2011 report

2 International Energy Agency's World Energy Outlook 2011 report

3 International Energy Agency's World Energy Outlook 2011 report

4 International Energy Agency's World Energy Outlook 2011 report

Figure 1.3: Global Electrical Equipment Market Share by Region (2010)



Source: Datamonitor

1.3.4 In spite of less-than-impressive growth rates in recent years in the electrical equipment market, there is substantial scope for expansion in certain areas, such as the emerging markets in the Asia-Pacific and Africa region. Robust economic growth in emerging countries such as China and India, combined with rapid urbanization and strong growth in investment in these countries, is expected to boost the demand for electrical equipment in these countries in the future.

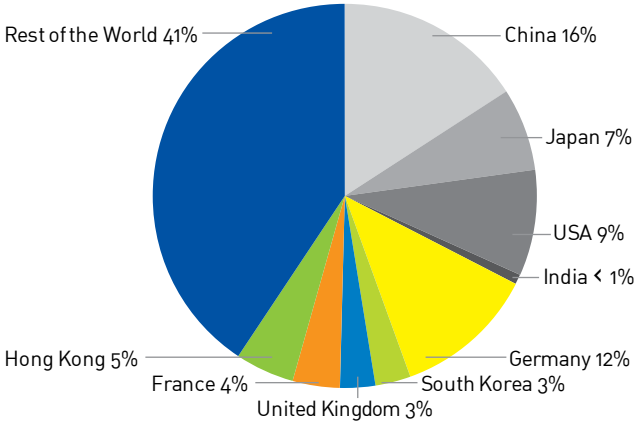
1.3.5 In developed countries, and also in several developing countries, rising ecological concerns and investment in alternative sources of power generation should benefit equipment segments such as wind turbines, solar power systems, etc.

1.4 Global Trade in Electrical Equipment

1.4.1 Global trade in EE products accounts for 3% of the overall trade. While global trade has grown at 18% since 2010, trade in EE has grown by 9% over the same period; thus despite an increase in EE trade, its share in the global trade has not increased.

1.4.2 Global trade in EE reached US$ 540 billion in 2011, with China being the leading exporter with over 16% share. India accounts for less than 1% of the total share of exports.

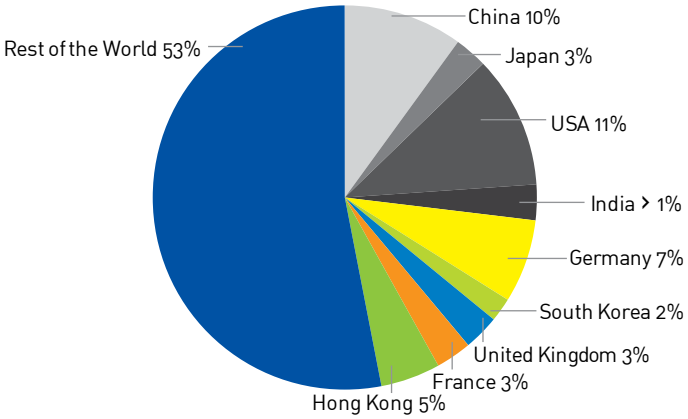
Figure 1.4: Global Electrical Equipment Export Share by Region (2011)



Source: ITC

1.4.3 The US and China are the largest import markets in the world for EE. India imports more than 2% of total EE trade of the world. India has a trade deficit in EE trade, with imports higher than exports, consistently for the last many years.

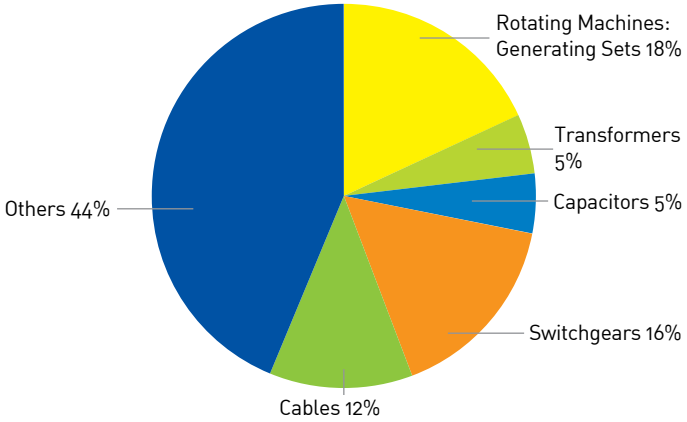
Figure 1.5: Global Electrical Equipment Import Share by Region (2011)



Source: ITC

1.4.4 Switchgears and rotating machines together cover around 34% of the trade market. China is the leading exporter in rotating machines as well as transformers with more than 16% share, while India has less than 2% share in global trade of these products. The US is the largest importer of rotating machines as well as transformers.

Figure 1.6: Product-wise Breakup of Traded EE (2011)



Source: ITC

1.4.5 China dominates trade in most of these product segments. Segments such as rotating machines, transformers are dominated by China with a double digit share in global trade. Countries like Japan, the US and Germany dominate trade in a few segments like lamps, cables, switchgears, insulators, capacitors, etc.

1.5 Equipment and Manufacturing Technology

1.5.1 The average gross efficiency (excluding combined heat and power) of coal-fired power plants is projected to increase slightly from 35% in 2007 to 40% in 2030[5]. New power plants being planned are based on advanced technologies. Supercritical technology is expected to be widely used in the medium term, with advanced ultra-supercritical technology and integrated gasification combined-cycle plants becoming more widespread after 2020.

1.5.2 Equipment and equipment manufacturing technology is witnessing significant modernisation while new technology is also being adopted in the manufacturing processes. Technological advancements, like smart grids, and policies on emission reduction will influence the future direction taken by the power sector and electrical equipment industry in various countries.

1.5.3 Developed economies are witnessing a trend of slowing growth in electricity demand. Emerging economies such as China and India are expected to continue augmenting their existing power capacities and infrastructure, to meet their ever increasing demand for power. While thermal sources of power generation will continue to account for a major share of the global capacity addition, there is a visible shift towards renewable sources of energy in developed nations. Technological advancement in both power generation and T&D equipment remains a key focus area in global markets and is expected to drive the next phase of growth in the sector.

5 World Energy Outlook 2009

2.0 Indian Power and Electrical Equipment Industry

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2.1 Indian Power Sector

Power is a necessary fuel for a growing economy. The Indian economy is on a rising path targeting GDP growth rate of 8-9%. To achieve this growth, it is imperative that proper power infrastructure is in place.

India has the fifth-largest generation capacity in the world with an installed capacity of over 211 GW, as on 31st January, 2013[6] and is also the sixth-largest electricity consumer, accounting for 3.4% of total global consumption. India's per capita consumption of electricity was 879 kWh in 2011-12[7].

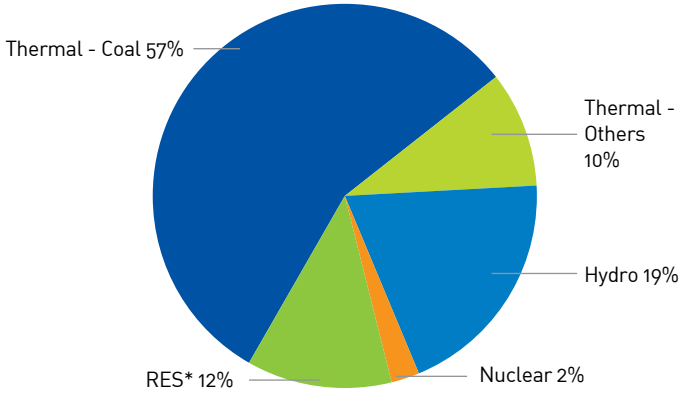
The industrial sector, due to increasing capacity additions, has the highest demand for electricity across all sectors and is expected to remain high. The domestic and commercial sectors are likely to experience a steady increase in demand for electricity, but the share of agriculture is expected to see a decline in the coming years.

2.1.1 Generation

2.1.1.1 Thermal energy accounts for the major share of generation in India. Share of wind and other renewable forms of energy currently stands at around 12% of the total installed capacity. Government plans to increase the share of power generated from renewable sources in the coming Plans. India currently stands as the 5th largest and 3rd largest producer in the world of hydro and wind energy respectively.

2.1.1.2 With envisioned capacity additions, India is expected to reach an installed capacity of 400 GW by 2022. This increase will be in line with the country's GDP growth plans of 8–9% per year.

Figure 2.1: Installed Total Capacity (as on 31st January 2013)



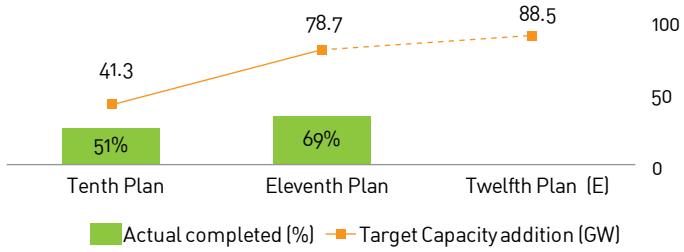
*RES – Renewable Energy Sources

Source: CEA

Total 211 GW

Capacity addition in the 11th Plan has been 69% of the original target, which is encouraging. This is expected to increase further in the 12th Plan.

Figure 2.2: Plan-wise Capacity Additions Envisaged and Percentage Achieved



Source: CEA

2.1.1.3 The Indian power sector is facing some key challenges, which restrict it from growing to its full potential and meet the Five Year Plan targets. Some of these challenges include

a. Timely delivery of equipment: Lack of manufacturing capacity for BTG equipment has, in the past, impacted equipment delivery timelines, in turn affecting project execution timelines.

b. Fuel linkages: 66% of India's power capacity is thermal-based, making fuel linkage (coal, gas, etc.) very critical and challenging. Requirement of coal for coal-based power plants in the year

6 Ministry of Power

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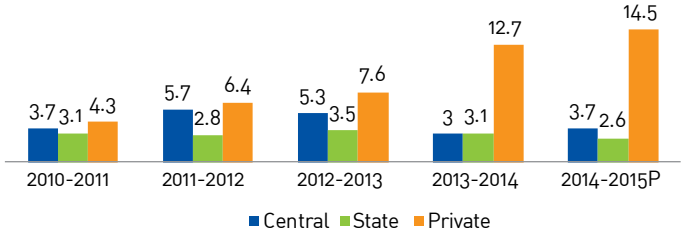
2017 and 2022 is expected to be 900 million MT and 1,180 million MT per annum[8] respectively. Currently, close to 140 million MT out of 460 million MT of coal is imported annually. Domestic supply share of coal is expected to dwindle further with more than 150 mining projects of Coal India Ltd. awaiting clearances, amidst various hurdles.

c. Land acquisition: Legal and environmental complications, making availability of land for setting up power plants a major challenge.

d. Availability and cost of power project funding: Indian players will need to scout globally for inexpensive sources of funds, as rising inflation is resulting in the rising cost of funds in India.

2.1.1.4 To meet the targeted power capacity additions, the Indian government is encouraging private participation in power projects. During 2010-11 to 2014-15, private players are expected to add nearly 45 GW of power, resulting in a 55% share of private players. Additions by central and state agencies is expected to be 21.4 GW and 15.2 GW respectively during the same period.

Figure 2.3: Expected Capacity Additions (GW)



Source: Crisil Research

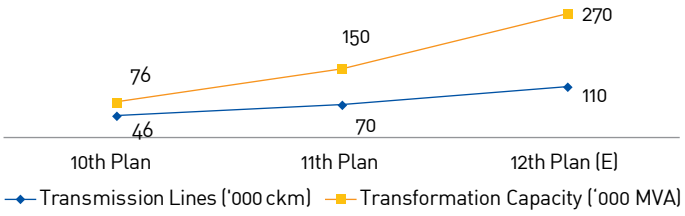
2.1.1.5 India is also aiming at moving towards cleaner energy sources as it tries to reduce its energy demand-supply gap. It initiated a US$ 19 billion plan in July 2009 to produce 20 GW of solar power by 2022 under the Jawaharlal Nehru National Solar Mission.

2.1.2 Transmission & Distribution

2.1.2.1 Investment in new technology and modernization, like 1,200 kV transmission lines, +/-800 kVDC transmission, planning of smart grid projects and establishment of the national grid by the Power Grid Corporation of India are major steps towards efficient utilization of energy by evacuating electricity from power surplus regions to meet demand in power deficit regions.

2.1.2.2 The transmission segment plays a key role in transmitting power to various distribution entities across India. The inter-regional capacity at the end of the 11th Plan was 28 GW. During the 12th Plan, total transmission substation capacity addition is expected to be 270,000 MVA, while 110,340 circuit kilometres (ckm) of transmission lines are expected to be added. With this, the inter-regional transmission line carrying capacity at the end of the 12th Plan is expected to increase to 66 GW.

Figure 2.4: Transmission Additions



Source: CEA

2.1.2.3 The Ministry of Power has implemented the following initiatives to improve the overall performance of the transmission sector:

a. Private sector participation in transmission: A number of projects are being implemented by private companies under build, own and operate route.

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b. Development of National Power Grid: The National Grid is expected to facilitate the optimal utilization of electricity and also make scheduled/ unscheduled exchange of power between such regions possible.

2.1.2.4 Distribution of electricity in India is largely operated by states, with only 5–7% being distributed by private players. One of the major problems in this segment is high Aggregate Technical & Commercial (AT&C) losses, which continue to be around 26% against the global average of 10–15% in 2010–11[9].

2.1.2.5 The following are some of the key initiatives that the Indian government has taken to improve distribution:

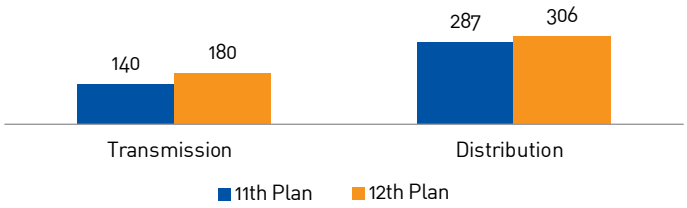
a. Restructured Accelerated Power Development & Reforms Programme (R-APDRP): This programme focuses on actual, demonstrable performance in terms of sustained loss reduction. It aims to establish reliable and automated systems for sustained collection of accurate base line data. It also adopts IT in areas of energy accounting before implementing distribution-strengthening projects, consumer attitude surveys, etc.

b. Franchise Model: Distribution companies have been recommended to give urban areas with high losses to private parties on input based franchisee. In this model, the purchase of power is primarily at a pre-determined rate, i.e., the input rate from the licensee, thus significantly removing the uncertainty linked to high power procurement costs.

c. Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY): This scheme aims at providing access to all rural households and villages. In addition, it intends to provide electricity connection to Below Poverty Line (BPL) families, free of charge. As on 28 February, 2013, a total of ₹ 28,827 crore (US$ 5.8 billion) have been released under this scheme.

2.1.2.6 The lack of adequate T&D infrastructure and the need to modernise the existing infrastructure calls for significant funding in this sub-sector. Financial institutions such as the Power Finance Corporation (PFC) and Rural Electrification Corporation (REC) have been instrumental in providing funds for T&D projects.

Figure 2.5: Investment Planned on Transmission & Distribution Systems (₹ '000 crore)



Source: Ministry of Power

2.1.2.7 Going forward, upgrading and modernisation of the existing infrastructure would be the key to efficient utilisation of resources for which the government has developed strong plans that include initiatives such as the Smart Grid and R-APDRP scheme.

2.2 Indian Electrical Equipment Industry

India's electrical equipment industry is highly diverse and manufactures a wide range of high and low technology products. The industry directly employs around half million persons and provides indirect employment to another one million people. The industry can be broadly classified into two sectors – generation equipment and T&D equipment. For 2011-12, the industry size is estimated at ₹ 1.20 lakh crore (US$ 25 billion), of which generation equipment segment consisting of BTG contributed ₹ 31,000 crore

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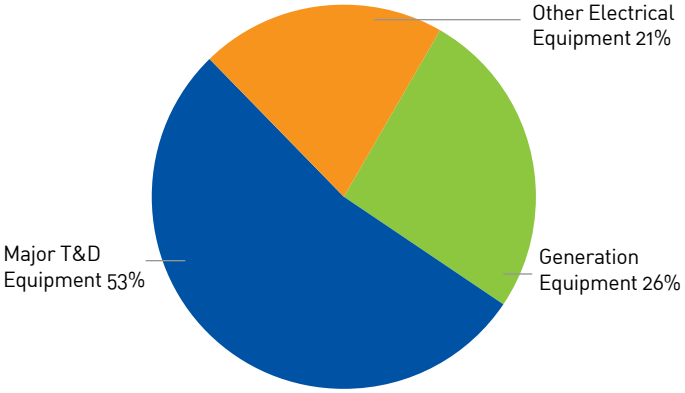
(US$ 6.5 billion) while the major T&D equipment segment of transformers, cables, transmission lines, switchgears, capacitors, energy meters, etc., provided the larger share of ₹ 64,235 crore (US$ 13.4 billion). Other electrical equipment, including instrument transformers, surge arrestors, stamping and lamination, insulators, insulating material, industrial electronics, indicating instruments, winding wires, etc., contributed to ₹25,000 crore (US$ 5.2 billion).

Figure 2.6: Estimated Segment-wise EE Industry Size (2011-12)



Source: IEEMA

Table 2.1: Estimated Segment-wise EE Industry Size (2011-12)

Equipment	₹ '000 crore
Boilers	19.5
Turbines	8.5
Generators	3.0
Cables	17.6
Transmission Lines and Conductors	15.0
Transformers	12.4
Switchgear & Controlgear	9.8
Rotating Machines	6.4
Energy Meters	2.5
Capacitors	0.5
Other Electrical Equipment	25.0
Total	**120.2**

Source: IEEMA

2.2.1 Domestic Demand for Electrical Equipment

2.2.1.1 The demand for electrical equipment in India is expected to witness a significant expansion on the back of the growth of the power sector. The government is likely to add around 88.5 GW and 93 GW, respectively, under its 12th and 13th Five Year Plans.

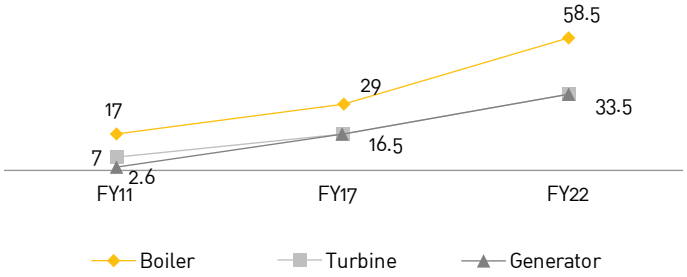
2.2.1.2 Based on investment estimates and capacity addition targets, it is expected that the domestic demand for BTG will be in the range of ₹ 125,000-150,000 crore (US$ 25-30 billion) by 2022, while that of the T&D equipment industry will be ₹ 350,000–375,000 crore (US$ 70-75 billion)[10].

Table 2.2: Plan-wise Equipment Demand (Cumulative)

Equipment	12th Plan (2012–2017) (₹ '000 crore)	13th Plan (2017–2022) (₹ '000 crore)
Generation equipment (BTG)	300–350	500-600
T&D equipment	700-750	1000-1150

Source: EY Analysis

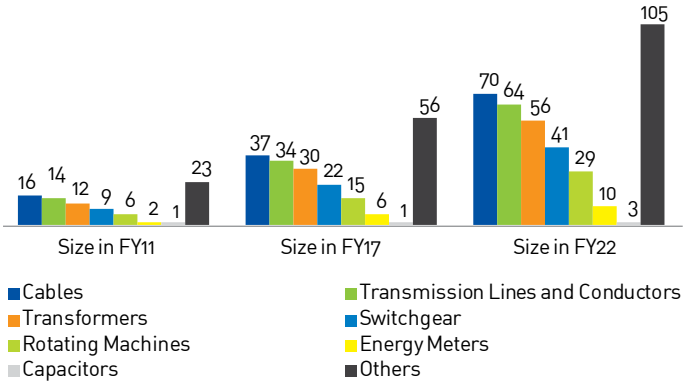
Figure 2.7: Generation Equipment-wise Demand Projection (₹ '000 crore)



Source: CEA, EY Analysis

10 EY Analysis

Figure 2.8: T&D Equipment-wise Demand Projection (₹ '000 crore)



Source: CEA, EY Analysis

2.2.1.3 There has been an overall growth in most segments of the electrical equipment industry — in boilers, turbines, generators, transformers, switchgears, and wires and cables due to the high demand from central and state power utilities.

2.2.1.4 India's EE industry is expected to grow steadily and witness growth opportunities as a result of the government's focus on capacity augmentation across generation, transmission and distribution. Earlier, the government had stipulated *"Power to All by 2012"* under its National Electricity Policy (NEP), with a target of achieving 1,000 KWh per capita consumption of electricity by 2012.

2.2.2 Generation Equipment

2.2.2.1 Generation equipment such as boilers and turbines are being produced at full capacity utilization to meet the growing demand in the country. Many companies have set up new capacities, while the existing ones are augmenting their capacities. Generation equipment production in India is estimated at around ₹ 31,000 crore (US$ 6.5 billion)[11] in 2011-12. The BTG equipment segment has witnessed significant investment from foreign players who are setting up their manufacturing facilities in India as it's an attractive market for these companies. There is significant import of BTG equipment in the boiler segment, which constitutes a major share of the sector. Imports are predominantly from countries such as China and South Korea.

BTG Industry in India

2.2.2.2 Indian players, as well as global players focusing on the Indian market, have put in place facilities to manufacture products based on supercritical technology. During the 11th Plan, the share of supercritical technology was 14%, while in the 12th Plan the share of supercritical technology will be more than 60%. More than 80 GW of supercritical sets have been awarded by India till date. Foreign players have been the recipients of the major share of such orders.

2.2.2.3 Foreign companies have received huge bulk orders, primarily from Indian private players, for power plants to be commissioned during the 12th and 13th Five Year Plans. As a result, most BTG equipment players in India do not have healthy order books. This scenario would lead to intensified competition for upcoming tenders.

2.2.2.4 A large share of India's current installed thermal capacity is more than 20 years old. Advanced ultra-supercritical boilers are being developed in the country. Retrofitting and refurbishing of old existing plants would become a major source of demand in the coming years.

Domestic Capacity and Utilisation

2.2.2.5 The capacity in the domestic BTG equipment industry segment is currently at 25 GW per annum and is expected to rise to 40 GW per annum by 2014–15. Many Indian companies have entered into partnerships with global players and there are significant capacity addition plans in the next few years.

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2.2.2.6 As stated earlier, two-third of the BTG requirement from the 12th Plan has already been ordered. If the present scenario continues, where close to 45% of the demand is catered to by foreign players, it would create significant overcapacity in the Indian industry in the coming years. The move by the National Thermal Power Corporation (NTPC) in enforcing an offset mechanism (where the supplier of major equipment needs to set up local manufacturing in Indian as qualifying criteria for the bid) is a welcome move to safeguard the interests of the domestic equipment industry.

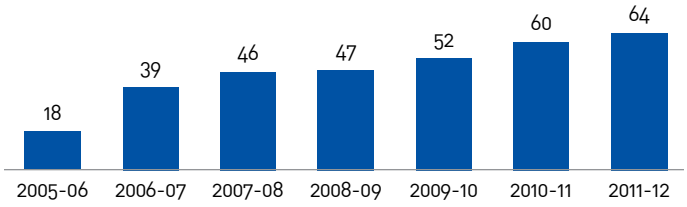
2.2.3 Transmission & Distribution Equipment

2.2.3.1 India's T&D equipment industry is heterogeneous and manufactures a wide variety of equipment from transmission line towers, transformers, switchgear to energy meters. The industry is also characterised by the presence of a large number of SMEs. The size of this industry (including other electrical equipment) is estimated to be ₹ 89,235 crore (US$ 18.6 billion)[12] in 2011-12.

T&D Equipment Industry in India

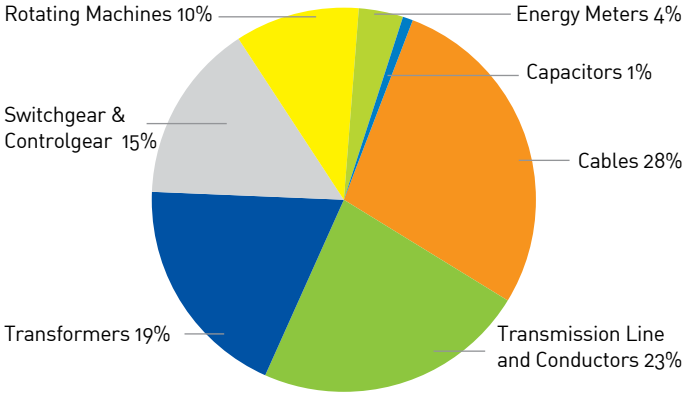
2.2.3.2 India's electrical equipment industry has witnessed significant growth in the last few years. The major T&D electrical equipment have grown at a CAGR of 23.6% from a small base of ₹ 18,000 crore (US$ 4 billion) in 2005-06 to ₹ 64,235 crore in 2011-12 (US$ 13.4 billion)[13].

Figure 2.9: Growth in Industry Size of Major T&D Equipment (₹ '000 crore)



Source: IEEMA

Figure 2.10: Market Size of T&D Equipment (2011–12)



Source: IEEMA

Domestic Capacity and Utilisation

2.2.3.3 There is significant capacity in India's T&D equipment segment, which is operating broadly at 70% capacity utilization. The domestic T&D segment is geared to cater to the expected growth in the demand for T&D equipment.

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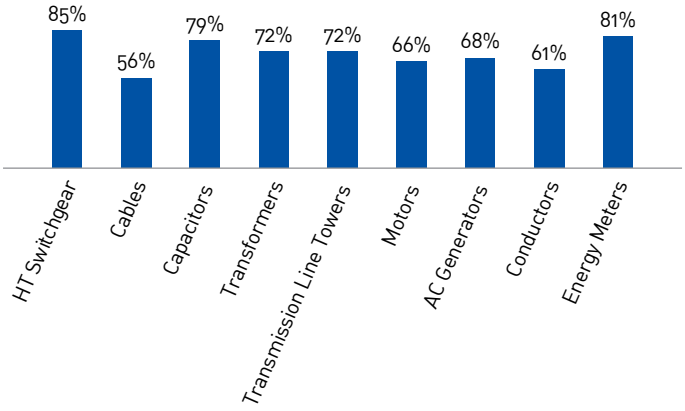
Figure 2.11: Domestic T&D Capacity Utilization (2011-12)



Source: IEEMA

Table 2.3: T&D Equipment Capacity and Actual Production in 2011-12

Equipment	Unit	Estimated Production Capacity	Actual Production in 2011-12
HT Switchgear	Nos.	100,000	84,908
Cables	Km	550,000	306,400
Capacitors	MVAR	70,000	55,110
Transformers	MVA	400,000	286,755
Transmission Line Towers	MT	1,800,000	1,300,000
Motors (FHP, LT, HT & DC)	MW	32,000	21,210
AC Generators	MVA	16,000	10,958
Conductors	MT	700,000	430,000
Energy Meters	000' Nos.	30,000	24,280

Source: IEEMA

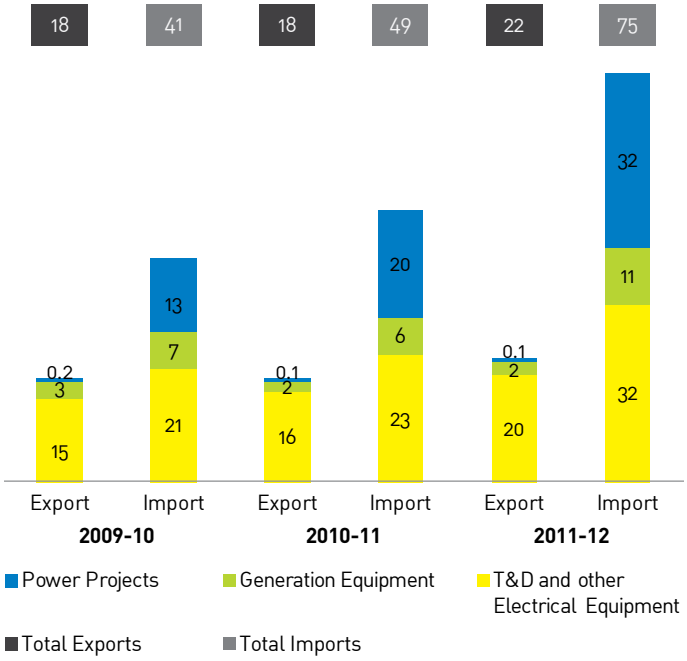
2.2.3.4 India has come a long way in electrical equipment manufacturing. Today, the country manufactures a large variety of electrical equipment. In the T&D segment, it makes and exports a wide array of equipment from transformers to cables. New technologies that are being introduced have been brought into the domestic manufacturing domain by foreign players. These players have come into India either independently and set up their own manufacturing facilities or through the JV route.

2.2.3.5 The domestic electrical equipment industry is expected to witness excess manufacturing capacities across generation, transmission and distribution segments. With a large share of generation equipment demand for the 12th Plan already ordered, there are lesser new orders for the generation equipment industry segment in the short term. Rising imports, in generation as well as in T&D segments, will add to the challenge of utilising existing capacities.

2.2.4 India's Foreign Trade in Electrical Equipment

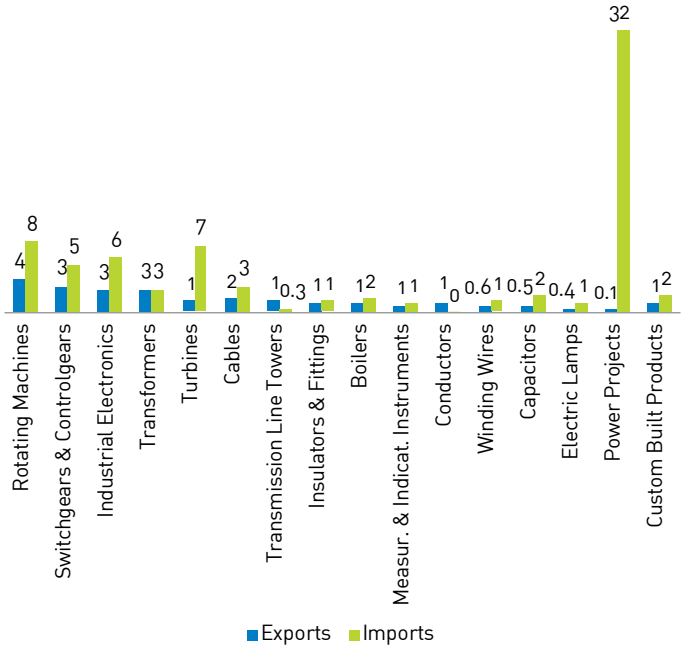
2.2.4.1 In 2011–12, India's exports of electrical equipment were ₹ 22,200 crore (US$ 4.6 billion), while imports were ₹ 75,057 crore (US$ 15.7 billion).

Figure 2.12: India — Segment-wise Total Imports and Exports of Electrical Equipment (₹ '000 crore)



Source: DGCIS

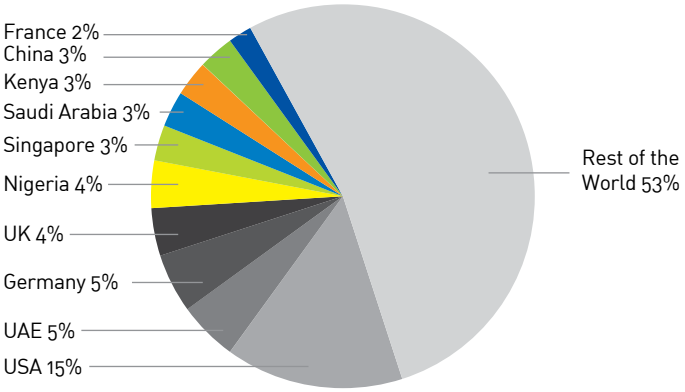
Figure 2.13: India — Product-wise Total Imports and Exports in 2011-12 (₹ '000 crore)



Source: DGCIS

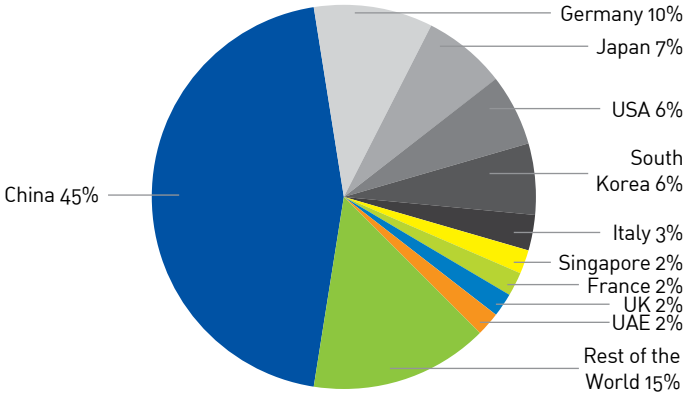
2.2.4.2 The US is India's top export destination with nearly 15% share. Other top exports destinations include the UAE, Germany, the UK, Nigeria and Singapore.

Figure 2.14: India's Export Destinations of EE (2011-12)



Source: DGCIS

Figure 2.15: India's Import Sources of EE (2011-12)



Source: DGCIS

2.2.4.3 China contributes 45% to the Indian electrical equipment imports, including power project imports. Germany, Japan, the US, South Korea and Italy are the other major countries from which significant imports are taking place.

2.2.4.4 Indian manufacturers need to explore international markets to address low capacity utilisation. Some large Indian electrical equipment manufacturers are already expanding their global presence. Indian companies are aggressively targeting exports, mainly to developing countries in Africa and Latin America.

2.2.5 Indian Electrical Equipment Industry – A SWOT Analysis

Strengths

- Diversified, mature and strong manufacturing base, with robust supply chain, fully equipped to meet domestic demand / capacity addition.
- Rugged performance design of domestic electrical equipment to meet tough network demand.
- Good mix of large private and public sector enterprises, multinational companies and small and medium companies.
- Domestic presence of major foreign players, either directly or through technical collaborations with domestic manufacturers.
- State-of-art technology in most sub-sectors at par with global standards.
- Domestic availability of low-cost skilled manpower.
- Emerging global reputation of Indian electrical equipment for sourcing products and components and also of Indian transmission and other EPC contractors.

Weaknesses

- Upward volatility in raw material and other metal prices.
- High cost, poor quality and shortage of raw materials and other inputs.
- Dependence of some sub-sectors on import of critical inputs.
- Low investment in R&D and no structured long-term approach for basic research.
- Looming shortage of skilled technical manpower and low productivity.
- Inadequate and costly domestic testing and calibrating facilities for electrical equipment.
- Lack of standardisation of product specifications, design parameters and ratings for generation & distribution equipment across different utilities.
- Bunching of orders by utilities, because of factors beyond their control such as government approvals, release of funds, etc., resulting in sub-optimal utilisation of available domestic manufacturing capacity.
- Badly designed and diverse procurement policies and qualifying criteria of utilities.
- Outdated tendering procedures and contract awarding based on L1 bidder by utilities.

Opportunities

- Domestic demand: to sustain the envisaged annual GDP growth rate of around 8-9% over the next 20 years, it has been estimated that India will require to increase its electricity generation capacity by around five times by 2032.
- Rapid growth in metros, airports and other infrastructure projects is expected to generate huge demand for matching BTG and T&D equipment.
- External demand: Currently, share of India's exports in the global market is less than 1 per cent. With the electricity sector being a sunrise sector across the entire developing world, there exists a significant export potential for the domestic industry.

Threats

- Problems of fuel linkages, land acquisition, environmental clearances, etc. are impeding growth in the country's power sector which may lead to less than anticipated growth in demand for electrical equipment.
- Absence of a level playing field for the domestic industry to compete with escalating imports of electrical equipment.
- Poor financial health of DISCOMs and very high AT&C losses may have a cascading effect on the growth of BTG as well T&D equipment industry.
- Rising global concerns on the trade-offs between economic growth, energy security and environmental sustainability.

3.0 Indian Electrical Equipment Industry Mission Plan 2012-2022

3.0 Indian Electrical Equipment Industry Mission Plan 2012-2022

3.1 Vision Statement:

"To make India the country of choice for production of electrical equipment and reach an output of US$ 100 billion by balancing exports and imports"

Figure 3.1: EE Market in India in 2011-12 (US$ billion)

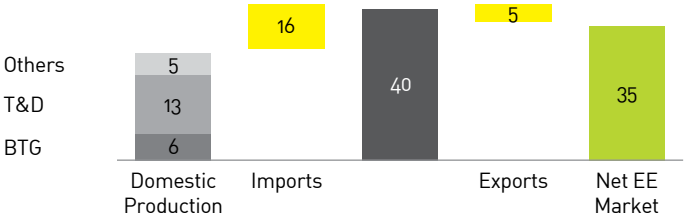
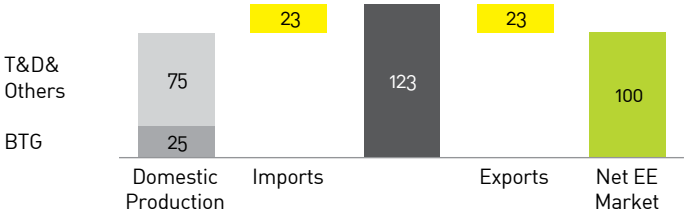


Figure 3.2: Estimated EE Market in India in 2021-22 (US$ billion)



3.1.1 The generation equipment segment is targeted to reach a size of ₹ 125,000 crore (US$ 25 billion) and the T&D equipment segment is targeted to reach a size of ₹ 375,000 crore (US$ 75 billion) by 2022. The electrical equipment industry, comprising these two segments, is targeted to reach a size of ₹ 500,000 crore (US$ 100 billion) by 2022.

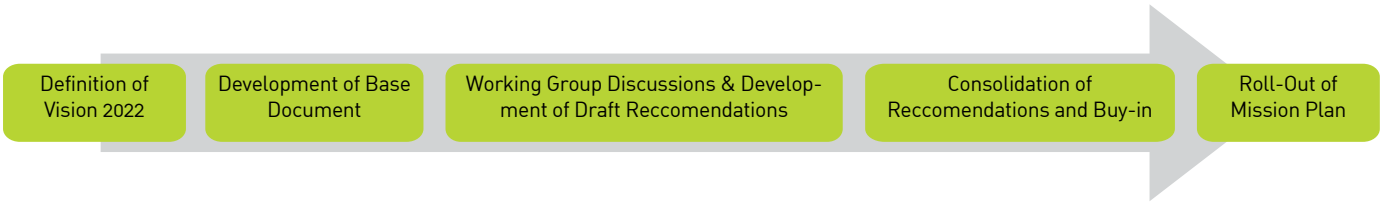
3.1.2 Indian exports in EE currently account for 0.8% of the global EE trade. EE imports into India are significant, with a total EE import of US$ 15.7 billion in 2011-12. Global trade in EE is expected to increase at around 2 %, similar to the equipment demand, which would make global EE trade reach US$ 575 billion in 2022.

3.1.3 Import of EE into India has been significant in the last few years. With increasing domestic industry competitiveness and levelling of the playing field, the rate of growth of imports is likely to reduce to 7-8% in the long term. India needs to target a 4% share in global EE trade by 2022 to balance its exports and imports, which is estimated to reach US$ 23 billion in 2022.

3.1.4 The Indian EE industry is projected to provide direct employment to 1.5 million people and indirect employment to 2 million in by 2022.

3.2 Process for Developing the Mission Plan

Indian Electrical Equipment Industry Mission Plan (2012–2022) was developed through five phases.



3.2.1 **Definition of Vision 2022 –** The vision reflects the ambitions and capabilities of the Indian electrical equipment industry. Various parameters were assessed to arrive at Vision 2022.

a. Global Scenario – Analysis of the global scenario of power & EE industry, supply and demand pressures on electrical equipment and projected future growth.

b. Indian Scenario –Analysis of the Indian power & EE industry, production, consumption, exports and imports, evolution of industry structure, market mechanisms and growth projections

c. Outlook on Enablers like:

I. *Policies* – Government support in encouraging the industry, e.g., export-import balance, etc.

II. *Technology* – Availability of state-of-the-art facilities for research, testing and production

III. *Infrastructure* —land for capacity additions, environment clearances/ sustainability issues, etc.

IV. *Finance* – Capital for project execution, technology up gradation, working capital, etc.

V. *Manpower* – Availability and skill of manpower

VI. *Raw Materials* –Availability of critical raw materials

VII. Industry's strengths and weaknesses

3.2.2 **Constitution of Steering Group -** A group comprising key stakeholder Ministries / Departments, private sector and related organisations was formed to provide direction to the exercise. Meeting of the group was held on 8th August 2011.

3.2.3 **Development of a Base Document –** A base document was prepared to identify the key thrust areas, constraints and concerns to be addressed in the Mission Plan.

3.2.3.1 This was conducted through extensive research on topics relevant to the EE industry (demand / supply scenario, finance requirements, energy concerns, availability of manpower, policies on foreign trade, new technology and substitutes), along with discussions with all concerned agencies (Government Ministries / Departments, industry, research organisations, regulatory bodies, end user industries, etc.), to analyse the present and future aspects.

3.2.3.2 The base document included:

a. Analysis of the Global & Indian EE industry and its future structure

b. Vision 2022 for Indian electrical equipment industry

c. Identification of challenges for Indian EE industry and strategic initiatives to overcome

d. Teams and approach for each of the initiative

e. Roadmap for development of Mission Plan including formation of working groups

3.2.3.3 Rollout of the base document:

a. The base document was released by the Hon'ble Union Minister of Heavy Industries & Public Enterprises, at the IEEMA Annual Session, on 26th September 2011.

b. The base document was put on the DHI website to obtain feedback from various stakeholders. It was also circulated extensively by IEEMA to industry.

c. Feedback received was discussed and analysed.

3.2.4 **Meeting of the Development Council** - A meeting of the Development Council for Heavy Electrical & Allied Industries, under the Department of Heavy Industry, was held on 14th December 2011, under the chairmanship of Secretary, DHI, where a presentation was made on the need for a Mission Plan, Vision 2022, the journey so far and the proposed roadmap for the future. The Development Council ratified the decision and broad concept to develop the Mission Plan.

3.2.5 **Constitution of Working Groups** - For the development of the Mission Plan, five different areas were identified for strategic and policy intervention. For these five areas, the following five different working groups were constituted in January 2012:

- **Working Group 1 —Upgrade Technology to meet Future Requirements**

  The group comprised members from Department of Science and Industrial Research, Ministry of Science and Technology, Department of Heavy Industry, Ministry of Power, Ministry of Steel, Planning Commission, Indian Institute of Technology (IIT) Delhi, Central Power Research Institute, BHEL, Larsen & Toubro Mitsubishi-(L&T-MHI), Nuclear Power Corporation of India Ltd. (NPCIL), PGCIL, NTPC, Delhi Metro Rail Corporation (DMRC), Airports Authority of India (AAI), Crompton Greaves, Siemens, Asea Brown Boveri (ABB), Alstom T&D, WS Insulators and IEEMA. The meeting of the working group was held on 14th February 2012.

- **Working Group 2 — Enhancement of Industry Competitiveness**

  The group comprised members from the Department of Heavy Industry, Department of Industrial Policy & Promotion, Ministry of Power, Planning Commission, REC, National Manufacturing Competitiveness Council, CPRI, National Productivity Council, Indian Institute of Technology, Delhi, Bureau of Indian Standards, North Delhi Power Ltd. (NDPL), Andhra Pradesh Distribution Companies, Gujarat Distribution Companies and IEEMA. The meeting of the working group was held on 24th February 2012.

- **Working Group 3 — Conversion of Latent Demand into Actual Demand**

  The group comprised members from the Ministry of Power, Department of Heavy Industry, Ministry of Environment and Forests, Planning Commission, Department of Industrial Policy & Promotion, PGCIL, NTPC, NPCIL, BHEL, L&T, RPG, Kalpataru, Crompton Greaves, Alstom T&D, ABB and IEEMA. The meeting of the working group was held on 7th March 2012.

- **Working Group 4 — Skills Development:**

  The group comprised members from Ministry of Human Resources Development, Department of Heavy Industry, Ministry of Power, National Skill Development Corporation, Planning Commission, National Institute of Technology (NIT) Kurukshetra, Polytechnic Delhi, Yamuna Gas, L&T, Siemens and IEEMA. The meeting of the working group was held on 13th March 2012.

- **Working Group 5 — Export of Electrical Equipment:**

  The group comprised of members from Department of Commerce, Department of Heavy Industry, Ministry of Power, Director General of Foreign Trade, Ministry of External Affairs, Planning Commission, EXIM Bank, ECGC, Indian Institute of Foreign Trade, BHEL, NTPC,

PGCIL, National Hydroelectric Power Corporation (NHPC), NPCIL, and IEEMA. The meeting of the working group was held on 28th March 2012.

3.2.5.1 After discussions with members of the five groups, a base paper was prepared and circulated to all the members of the group prior to the date of the meeting, so that members could actively participate in the discussion. This base paper identified all the areas of concern and suggested recommendations to address the concerns of the industry on a long-term basis.

3.2.5.2 In the meeting of each of the working groups, detailed presentations were made. During the presentations, each area of concern of the group and the recommended interventions were discussed in depth and views of the members were recorded.

3.2.5.3 Based on these discussions, draft notes were prepared and circulated to all the members of the respective groups along with the presentations made in the meetings for their additional comments / feedback.

3.2.5.4 After obtaining the comments / feedback from the members, the final draft notes for all the five working groups were prepared and circulated to all the members of the respective working groups along with the summary of recommendations for their final comments.

3.2.5.5 Various chapters of the draft Mission Plan were drafted, discussed and finalised.

3.2.6 **Feedback from Ministries / Departments** - Relevant extracts of the draft Mission Plan were sent to the concerned Ministries / Departments for their comments and feedback received was suitably incorporated.

3.2.6.1 The draft Mission Plan was put on the DHI website and a meeting of the concerned Ministries / Departments was held on 15th January 2013 for their final comments, which were subsequently suitably incorporated. The revised draft Mission Plan was again put on the DHI website.

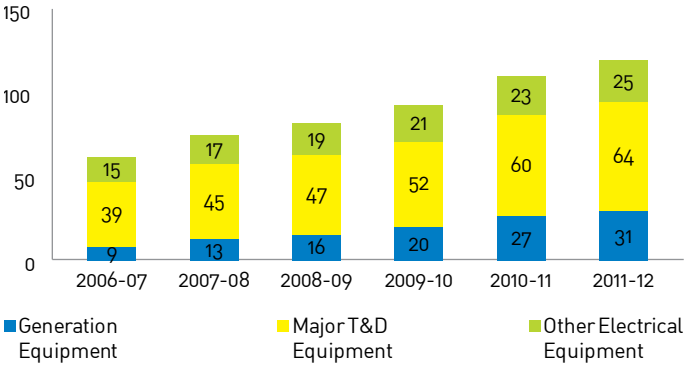
3.2.7 **Meeting of the Development Council** - A meeting of the Development Council for Heavy Electrical & Allied Industries, under the Department of Heavy Industry, was held on 11th February 2013, under the chairmanship of Secretary, DHI, and members were requested for their final comments, which were subsequently suitably incorporated.

4.0 Industry Competitiveness

4.0 Industry Competitiveness

4.0.1 The electrical equipment industry's performance has a massive bearing on the course of the country's economic growth. Countries with a strong manufacturing base and effective government policies for equipment industry have traditionally out-performed others in terms of growth and prosperity. Apart from being the backbone of the industrial growth, it is one of the major sources of employment.

Figure 4.1: Indian Electrical Equipment Industry Size in (₹ '000 crore)



Source: IEEMA

4.0.2 The total domestic electrical equipment industry size exceeds ₹ 1.20 lakh crore (US$ 25 billion), comprising 24% from BTG equipment and 76% from T&D sector. Exports from electrical equipment were approximately US$ 4.6 billion in 2011-12. The industry provides direct and indirect employment to around 1.5 million persons.

4.0.3 The Indian electrical equipment industry has performed strongly over the last decade. However, if the industry wants to become globally competitive and more importantly, if India is to achieve the planned power generation and transmission capacity addition targets along with growth of infrastructure and other industrial sectors, it is important that the electrical equipment industry maintains a high rate of growth and responds to domestic and global changes effectively.

4.0.4 The industry should be able to enhance its level of competitiveness by focussing on employee productivity, plant productivity, automation and upgrading of manufacturing practices, product innovation, etc. Government participation in these initiatives will accelerate the growth process. To enable domestic equipment manufacturers to compete in domestic and international markets with other multinational players, the policies of the Government of India along with the State Governments have to provide a level playing field in the country.

4.0.5 During the last three years, exports have remained virtually stagnant, while imports have grown rapidly, resulting in the widening of the trade deficit for electrical equipment.

4.0.6 Main plant equipment are imported across thermal (coal and gas), hydro and nuclear power plants along with power transformers and switchgear for the transmission sector and small transformers, isolators, etc., required for distribution projects. The extent of dependence on imports has increased over the 11th Plan period due to the increased share of the private sector in the development of power projects. A large share of orders from private players for supply of main plant equipment for thermal power plants is from China and South Korea.

4.0.7 Other developing countries have made efforts to promote indigenous industry and reduce dependence on foreign goods, by enforcing laws and regulations that encourage the transfer of technology and setting up of joint ventures. This provides a base for local companies to develop advanced technologies and enhance their ability to compete with the multinational companies in both domestic and international markets.

4.0.8 For the power generation capacity addition planned by the Government of India, the total manufacturing capacity of BTG by BHEL and seven other joint ventures is slated to increase to 40,000 MW by 2014-15. However, orders for around 60,000 MW of generation equipment have already been placed with foreign suppliers. If this trend is not reversed, the BTG sector will also be sitting on huge surplus capacity along with the T&D equipment industry, which currently has broadly 30% idle

manufacturing capacity. Therefore, both BTG and T&D sectors have to be supported and provided a level playing field against imported equipment.

4.0.9 In order to make the industry competitive, the following areas of concern need to be addressed:

4.1 Establish domestic level playing field,

4.2 Secure supplies of critical raw material / key inputs,

4.3 Improve the quality of the products in all the segments, especially SMEs,

4.4 Standardise product ratings and specifications,

4.5 Focus on international standardisation,

4.6 Upgrade of testing facilities,

4.7 Better working capital management and contract conditions,

4.8 Improve manpower productivity, and

4.9 Product innovation.

4.1 Establish Domestic Level Playing Field

Current Status / Areas of Concern

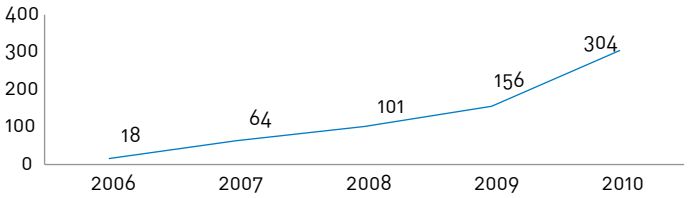
4.1.1 Import duty (basic customs duty) on electrical equipment is low, generally at 7.5% for most products, but also lower on some products, including 5% on project imports. Under some FTAs signed by India, import duty is being further reduced on some electrical equipment.

4.1.2 Domestic equipment manufacturers pay excise duty and other local taxes like value added tax (VAT), etc., which are not applicable to imported supplies. In addition to it, critical raw materials like CRGO electrical steel is fully imported by Indian industry and domestic transformer manufacturers are paying 5% basic custom duty on import of this critical raw material. These taxes and duties hinder the ability of domestic manufacturers to compete with imports. On the other hand, governments in some other countries are supporting their domestic industry by providing domestic preference and other incentives.

4.1.3 A study conducted by the insulator industry in the year 2011 revealed that the import of insulators from China by India over the last five years has increased exponentially.

4.1.4 The problem is further accentuated due to the reducing share of Indian insulator manufacturing companies (who traditionally used to export close to 40% of their production to developed markets such as North America and Europe) as compared to Chinese companies in these export markets.

Figure 4.2: Imports of Insulators from China (₹ crore)



Source: IEEMA

On the finding of the Director General (Safeguard) that the increased import of insulators from China have caused and threatened to cause market disruption to the domestic industry and producers of electrical insulators, the Central Government, vide notification dated 20th December 2012, has imposed a safeguard duty of 35% in the first year and 25% in the second year on imports of electrical insulators from China.

4.1.5 The reasons for the rise of China in the export market are:

- **Financial Sops** – Chinese manufacturers are given export subsidies, social security subsidies and access to financing at rates below 6% per annum – the combination of these three factors gives Chinese companies an estimated 24% pricing advantage over their Indian counterparts.

- **Access to Key Raw Materials** – Chinese manufacturers have access to key raw materials at subsidised prices. These raw materials are banned for export from China, whereas no such restrictions are applicable in India.
- **Non-Reciprocal Market Access** – In tenders issued by Chinese national power companies such as the State Grid of China, Southern Power Grid of China and the Chinese Provincial Utilities, foreign companies, including Indian, cannot participate directly, as they need a local presence. No such conditions exist in India.
- **Easy Acceptance of Performance Certificates** – Indian utilities accept performance certificates issued by Chinese utilities and do not insist on certification by reputed international agencies. There is no way in which Indian customers can verify the same.

Though in India, performance certificates issued by the Indian utilities / owners are accepted, but to be on the safer side, PGCIL / NTPC / BHEL or even private companies like L&T, are able to talk to the utilities or visit them and verify the performance of the equipment before release of orders. But, this is not possible in case of performance certificates from foreign utilities.

To sum up, a combination of factors like support and protection provided to the domestic industry by other countries, in addition to export subsidies, subsidies on raw materials and social security, conducive labour laws, etc., are not available to Indian industry, which makes Indian industry uncompetitive in its own country.

Recommendations

4.1.6 With effect from 19th July 2012, the government has imposed import duties at the rate of 5% basic customs duty, 12% countervailing duty and 4% special additional duty, along with cess as applicable, on import of equipment for ultra-mega power plants (UMPPs) / mega power plants (MPPs). This imposition of duty does not still nullify the disadvantage suffered by the domestic electrical equipment manufacturers fully vis-à-vis their foreign counterparts. Hence, there is a need to assess the impact of this duty imposition after a year or so to decide on the future course of action.

Import duty on electrical equipment should not be reduced further, and if possible, increased on some products for which sufficient capacities of good quality equipment are present in India (rotating machines, cables, transformers, conductors, etc.).

Further, FTAs, under which import duties are being reduced on electrical equipment, need to be reviewed and amended, keeping in view the surplus capacity of the domestic industry.

4.1.7 IEEMA, along with DHI, may prepare product-specific cases where industry has surplus manufacturing capacity in the country and the same is being imported at low import duties. The Finance Ministry's intervention should be sought based on these cases for increasing the basic customs duty on these products.

4.1.8 Levy safeguard duties on products that show significant surge in imports. IEEMA should identify the product segments in which domestic industry is getting hurt on account of a surge in imports.

4.1.9 Industry should identify imported products and prepare cases in which domestic industry faces unfair price competition, for the launch of anti-dumping investigations on a case to case basis.

4.1.10 State Governments to be requested to endeavour to reduce local taxes, duties, octroi, etc., on electrical equipment.

4.1.11 Local taxes, duties, octroi, etc., paid by Indian manufacturers, may be added to the final price of the imported equipment in order to bring it at par with bids from Indian manufacturers.

4.1.12 Domestic suppliers may be given preference in all tenders issued by domestic utilities for power transmission and distribution projects, where price, quality and delivery schedule are equal.

4.1.13 Government procurement may be utilised as a policy lever and preference should be given to Indian products in procurement by government utilities. There should be a fixed percentage of total procurement by any government utility for 'Made in India' products. Wherever the equipment of right quality is available, utilities can give preference to local manufacturers. This will help the utilities in getting after sales service and ensure availability of spares.

4.1.14 For long term and bulk quantity supplies, mandating the establishment of local manufacturing and repair facility should be introduced for foreign manufacturers, so that at a later date, the problems of maintaining the established infrastructure (by utilising the equipment of foreign origin) and spare parts is not faced. The Government of India may have to take a considered view for making phased manufacturing process (PMP) a requisite in the supply of electrical equipment to save the huge capacities created in the country.

CEA has already advised all the central and state power generating companies to incorporate the condition regarding setting up of indigenous manufacturing facilities in a phased manner in the bids to be invited for supercritical units. This advisory should be scrupulously followed.

- PMP for supply of all major equipment ought to be made mandatory in the country. Foreign suppliers of substation equipment may be required to establish presence within the country with a view to demonstrate their ability and intent to supply spares as may be required by the Indian owner for satisfactory operation of the substation for its normal life of 30 to 40 years.
- For BTG equipment imported by IPPs, the Ministry of Power may impose the condition on IPPs that their equipment suppliers set up facilities in the country; otherwise, they are bound to have problems in sourcing spares for the plant for 30 to 40 years of operation of the plants.

4.1.15 In case of imported equipment, performance certificates from the utilities of the concerned country can be accepted provided these are further verified by properly qualified / accredited independent international agencies.

For reciprocal market access, a level playing field needs to be ensured by making the reciprocating conditions on equal terms. For example, Chinese firms supplying EHV insulators in India should show the relevant qualifying experience that of India as is applicable in China for the Indian manufacturers. The terms on both sides should be on equal footing. Indian utilities may include such clauses in their procurement procedures.

Ministry of Power / CEA may issue a suitable advisory on both the above matters. This way, the quality of equipment / material sourced and reparability aspect would be properly ensured. Moreover, this move will also help in local employment generation in the country.

4.1.16 REC / Ministry of Power / utilities ought to introduce a provision for type testing of sample equipment picked up from site for R-APDRP projects, where the number of small equipment is very large, to discourage import of inferior quality equipment.

4.1.17 Efficiency criteria in terms of maximum allowed heat rates for various unit sizes have been stipulated in the CEA Technical Standards for Construction of Electric Plants and Electric Lines Regulations, 2010, which are mandatory to be followed by all upcoming stations. These efficiency criteria should be strictly monitored by CEA.

The Ministry of Environment & Forests (MoEF) have called for initiatives to review existing legislations and align / synergize various existing statues / regulations towards the environmental objectives and in this regard, it is suggested that compliance of efficiency criteria, as laid down in the CEA Technical Regulations, should be considered to be incorporated as a part of environmental clearance being granted by MoEF.

4.2 Secure Supplies of Critical Raw Material / Key inputs:

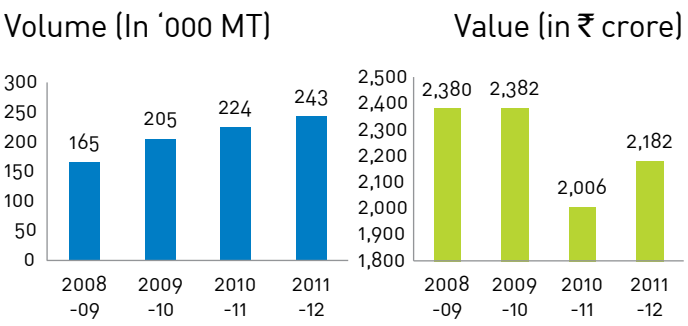
Current Status / Areas of Concern:

Most of the raw materials used by the electrical equipment is available in the country at competitive prices. However, a few critical materials are either not manufactured in India or domestic manufacturers are not able to meet the demand of the industry.

4.2.1 CRGO – Cold Rolled Grain Oriented Electrical Steel— is the most critical and major input raw material for manufacturing transformers. Very few mills in the world have the technology and capability to produce CRGO electrical steel. Moreover, the technology is not easily accessible. The world over, there are only 14 manufacturers of CRGO electrical steel, who influence prices and deliveries, leading to scarcity and high prices from time to time.

It is estimated that in the 12th Plan period (2012-17), 11,50,000 MT of CRGO electrical steel will have to be imported to meet the domestic requirement. In the 13th Plan period (2017-22), domestic requirement is estimated to be 13,50,000 MT. If no domestic manufacturing facility comes up, the entire requirement will have to be imported.

Figure 4.3: CRGO Electrical Steel Imports in India



Source: DGCIS

To check the use of seconds/defectives CRGO/CRNGO, a notification for mandatory BIS certification for CRGO and Cold-Rolled Non-Grain Oriented (CRNGO) electrical steel was issued by the Ministry of Steel in March 2012 and was to come into force on 12thSeptember 2012, extended later to 1st October 2013. If the order is implemented before enough foreign mills obtain BIS license, it may lead to acute material scarcity in the domestic market.

Recommendations:

4.2.1.1 Reduce basic customs duty on import of CRGO electrical steel from 5% presently to nil, till the time sufficient domestic production of CRGO electrical steel commences. The expected revenue loss on account of such change to the government will be approximately ₹ 100 crore per annum, but this will reduce the input cost of transformers, ensure timely availability of the core material and thus, timely delivery of the equipment to the projects.

4.2.1.2 Allow import of CRGO electrical steel from foreign mills as per the international standards, till at least 10 of the 14 foreign mills, covering at least two-third of the domestic demand, obtain BIS license, to avoid shortage of CRGO electrical steel in the domestic market. Validity of license issued by BIS to foreign mills should be for five years to make it attractive for the applicants.

4.2.1.3 Form a consortium of domestic steel manufacturers and user industry, to develop technology in India so that in a time frame of next 5-7 years, at least 50% of the domestic requirement is met by domestic production:

- There are some prospective proposals for setting up indigenous manufacturing facilities from SAIL/POSCO and Corus-Tata Steel-Nippon Steel. Concerted efforts are required by the Ministry of Steel to help the industry in such tie-ups so that indigenous production can be started at the earliest.
- Encourage R&D by BHEL, other transformer manufacturers and steel producers for development of alternate material to CRGO electrical steel / amorphous steel.

4.2.2 CRNGO — Cold Rolled Non Grade Electrical Steel— used for motors, is also in short supply in the country. Against industry's current requirement of about 360,000 MT per annum, only about 170,000 MT is being produced in the country.

Recommendations

4.2.2.1 IEEMA should prepare a long-term projection for the requirement of CRNGO in the country so that CRNGO manufacturers can gain confidence and increase production to match demand.

4.2.3 Boiler Quality Plates— Boiler quality plates of 63 mm and above thickness with required width and length are imported. Projected annual demand of these plates will be 100,000 MT per annum and there are only 4-5 manufacturers in the world. In India, capacities for these plates are being built by Welspun, JSPL and SAIL. However, they may only be able to partially meet this demand.

Recommendations

4.2.3.1 IEEMA, in consultation with BTG manufacturers, should prepare a long-term projection for the requirement of these plates in the country. Further, timely completion of power projects will also give confidence to these manufacturers and they will be encouraged to increase their production capacity.

4.2.3.2 For boiler quality plates, all Indian manufacturers should improve on two counts and add facilities pertaining to these at the earliest. DHI may facilitate interaction between BTG manufacturers and manufacturers of boiler quality plates to:

- Have slab caster to cast slabs beyond 260 mm. To meet specific requirement, these slabs have to be rolled with 3:1 ratio as per standards.
- Secondly, manufacturers to have rolling capacity to roll per unit weight of more than 20 MT so that wider width (minimum 2,500 mm) plates are available indigenously.

4.2.4 Material Required for Porcelain Insulators— Clay required for manufacturing of porcelain insulators is available in the country. However, mining of clay is undertaken by small miners who do not use modern technology for mining and hence, are not able to produce clay, of the quality, required by the industry. Large insulator manufacturers are importing clay from the US, Australia and other countries. During 2011-12, over 25,750 MT of clay for insulators was imported at an approximate cost of ₹ 27 crore.

Recommendations

4.2.4.1 A need is felt for a fund for training and technology development for small miners so that they can use beneficiation and other techniques to improve the quality of clay required for insulators, and to reduce dependence of insulator manufacturers on imported clay. The Indian Bureau of Mines has carried out beneficiation test works on large number of samples of feldspar, China clay, ball clay, quartz and quartzite. The technology developed may also be utilised for beneficiation of low grade ores and needs to be explored by the Ministry of Mines. Miners will obtain immediate benefit due to enhanced realisation per ton.

4.2.4.2 An SPV may have to be formed by miners and insulator manufacturers which, with the support of DHI, can approach DIPP to provide financial assistance to such clusters under the Industrial Infrastructure Up gradation Scheme (IIUS).

4.2.4.3 The model of Clay Institute in Meissen, Germany can be used to expedite work on the proposal to set up a clay institute at Bikaner, as this will benefit the insulator industry enormously. Alternatively, IBM's Ore Dressing Laboratories and Pilot Plants already working at Ajmer may be upgraded by introducing state-of-art equipment and specialised manpower.

4.2.4.4 Jawarharlal Nehru Aluminium Research Development and Design Centre, a joint venture of the Ministry of Mines and UNDP, provides major R&D support system for emerging modern aluminium industry in India. The Centre can help initiate specific tie-ups to address the need for speciality products like high alumina clay, bauxite, etc.

4.2.5 Other Materials for Advanced Ultra Supercritical Thermal Power Plants

The adoption of Adv-USC technology in thermal power plants will impose stringent requirements on materials used in high temperature zones. The properties required are high creep strength, resistance to corrosion and steam oxidation at high temperatures. Materials used currently in supercritical power plants will not be suitable at these conditions. Critical materials envisaged for use in Adv-USC, in addition to those already being used in supercritical power plants, are:

- Inconel 617, a nickel based super alloy, required for tubes in the hottest zones in super-heaters and re-heaters, headers, main steam and reheat steam pipes, initial stages of HP and IP steam turbines (rotors, blades), main steam and turbine valves.
- Super 304H Cu, an austenitic stainless steel, required for tubes in super-heaters and re-heaters.
- Inconel 625, a nickel-based super alloy, required for HP and IP turbine inner and outer casing castings.

Currently, materials like Inconel 617, Super 304H Cu and Inconel 625 are not manufactured in India.

Recommendations

4.2.5.1 DHI may support the following initiatives financially:

- Trial manufacture of Inconel 617 and Super 304H Cu, which has been placed on MIDHANI by IGCAR.
- Development of welding technology for these materials, which has been initiated by Welding Research Institute, BHEL Trichy, and IGCAR.
- Technology for forging of Inconel 617 and casting of Inconel 625, which is also proposed to be developed in the next 1-2 years by BHEL and IGCAR.

4.3 Improve Quality of the Products in all the Segments, especially SMEs

Current Status / Areas of Concern:

4.3.1 The quality of BTG equipment, power transformers, high voltage switchgear, insulators, etc., manufactured by large companies is good and can match the best in the world. The leading companies are constantly upgrading their manufacturing processes to improve quality and reduce the cost of raw material and improve manpower productivity.

4.3.2 90% of the companies manufacturing 33 kV and below equipment in T&D sector are SMEs. Some manufacturing companies in SME sector have also kept pace with technology development and have upgraded the manufacturing processes and manufacture good quality products. However, most SMEs have lagged behind in upgrading technology and hence, quality and productivity suffers over time.

4.3.3 Most SMEs are widely dispersed all over the country and have to spend large amounts in transporting their raw material to factories and finished products to the test labs for testing. Due to their small scale of operations, availing the services of experts for improving and modernizing the technology is often costly for these SMEs. In addition to this, there is an inadequate system of regular training of the engineers and skilled workers.

4.3.4 State utilities, who are the major buyers of 33 kV and below equipment, follow the L1 practice for procurement and there is no premium for better quality of material / equipment offered by equipment supplier

/ EPC contractor. Hence, EPC contractors quote the lowest rate to get the orders and source cheapest products and inferior quality products. There is no incentive for these manufacturers to modernize and improve quality of the products. The L1 system forces manufacturers to focus only on cost reduction and not on quality. To compete on prices, some EPC contractors source equipment from the cheapest sources abroad, including China.

4.3.5 33 kV and below equipment are being utilised for system upgrading and quality checks for these are not stringent. Even the three-tier quality control mechanism established by RGGVY projects is not proving to be effective. Inferior quality equipment results in short circuits, accidents, frequent tripping, etc. Power distribution companies are not incentivised for improving quality.

Recommendations

4.3.6 Establish Electrical Equipment Clusters for SMEs

4.3.6.1 Funds for technology up gradation can be made available for improving the technology in manufacturing to SME clusters in the form of support for license fee, cost of patents, technical knowhow fee, expenses on the travel of consultants, training expenses, etc. 50% of this cost can be borne by the industry.

4.3.6.2 Establish electrical equipment industrial parks in all the regions, particularly when industrial activities pertaining to the same sector is located within a geographically concentric area. All the new industries coming up in a region can be located in such a cluster and the following can be provided under the Industrial Infrastructure Up gradation Scheme (IIUS) of Department of Industrial Policy & Promotion (DIPP):

- Modern physical and social infrastructure,
- Procurement of modern technology and equipment,
- Financial support by institutions to implement modern manufacturing and trade practices.

4.3.6.3 The cost of establishing and maintaining such centres will be worked out by a committee after studying factors like nature of industries in a particular region, their actual requirement, etc.

4.3.6.4 For SMEs, services of domestic and foreign experts for giving advice on the latest technical developments in their area of operation, upgrading of technology, process and product quality should be made available in the clusters, on a cost sharing basis between the units and the government. These services can also be utilised by other SMEs in the region on a chargeable basis for upgrading the manufacturing processes.

4.3.6.5 Financial assistance may be provided by the government to organise benchmarking missions of domestic experts in various fields to regularly visit developed countries to study the latest developments in various fields and identify opportunity areas to make Indian industry at par with global players.

4.3.6.6 Develop regional innovation centres for SMEs and other existing industries of the region, near clusters of industries. Provide testing facilities in these centres, to be utilised by SMEs for testing and R&D. This initiative will save cost and time in transportation of equipment for testing.

4.3.6.7 Establish skill training centres for the workers and training of engineers and supervisors in the clusters, with the help of the NSDC.

4.3.7 Utilities should be made accountable for stable supply and quality of power.

- Have stringent specifications of the equipment to be supplied for system up gradation in the tender.
- Accept only type-tested equipment

and have a provision in the tender to pick up sample equipment from site for type testing.

- For failures, introduce penalties including forfeiting security deposit and extension of performance guarantee, etc.

This will discourage contractors from sourcing cheap equipment and thus manufacturers will have to produce good quality equipment only.

4.3.8 The bidding process should be made transparent and e-tendering should be encouraged at all levels for wider participation of reputed manufacturers. It should be ensured in the pre-qualification criteria that only experienced contractors with proven track record get qualified for the job. Two part bidding may be invited by utilities adopting the tender route:

- **Part one – Technical bid -** Once the contractor clears the technical part including verification of his pre-qualification, ensure that equipment being offered is from the reputed manufacturers, type-tested and is of the right specification.
- **Part two – Commercial bid -** Open only for those who clear the first part.

With this process, poor quality equipment will not find a market and thus, SMEs will be forced to improve quality in order to be competitive.

The Ministry of Power may ensure compliance of the above by utilities by devising a suitable mechanism.

4.4 Standardise Product Ratings and Specifications

Current Status / Areas of Concern

4.4.1 Even though desirable, standardisation of the layouts of power plants, both thermal and hydro, does not appear to be practical because layout depends on several site specific conditions and other factors. Standard unit size can help in sizing of the downstream equipment, especially the electrical systems, however mandating standard unit size may not be advisable as in certain cases, optimal unit size for specific site conditions could be different and also, in some cases, environmental conditions, etc. may require different unit sizes to be adopted.

4.4.2 In case of transmission line projects, PGCIL has standardised the design of towers, foundations, sub-station equipment specifications, its layout and foundation. This has resulted in cost saving, reduction in time of completion of projects and reduction in the cost of inventory for spares. Most utilities follow PGCIL specifications for their transmission projects.

4.4.3 Ratings of electrical equipment are not standardised and all utilities follow their own standard ratings. To meet their requirements, manufacturers have to constantly modify the design and spend resources in redesigning, etc. Type-testing of such electrical equipment is also time consuming and costly.

4.4.4 For state utilities responsible for power distribution, the problem is very serious. There is no standardisation of specifications of the equipment, layout of 33 kV / 11 kV stations, 11 kV / 440 v distribution transformer stations, standard construction methods of LT networks, etc. This leads to frequent failure of equipment, short circuit, tripping, accidents, high technical loss on the system and high cost of inventory for spares.

Recommendations

4.4.5 For the distribution system, standardise the distribution system layout from 33 kV transformers to the consumer premises for different localities, terrains, types of consumer mix and loads, etc. Freeze design basis for the system and guidelines for HVDS, aerial bunched HT / LT cabling, underground cabling, etc.

4.4.6 Involve IEEMA, NDPL, Torrent Power, and utilities from Gujarat, Andhra Pradesh who have brought down their losses to less than 15% in six to seven years' time in the standardization exercise. CEA / REC should freeze the layouts and guidelines.

4.4.7 Based on the above, specifications and tests required for the site and in the plant can also be frozen by CEA / REC / NPCIL / IEEMA members, meeting IEC requirements for each material and equipment. For utilities that utilise funds under R-APDRP, RGGVY and other centrally sponsored schemes, REC / PFC may make these specifications and tests mandatory. It will enable the T&D industry to reduce design cost, cost of inventory and improve the quality of products in the long run. AT&C losses of utilities will be reduced on a sustained basis. Also, manufacturers will be able to compete with global players for export.

4.4.8 Technical specifications and testing of equipment required for nuclear power plants are many times different than other power plants. NPCIL experts may intensively interact with domestic manufacturers so that the industry is able to meet their requirements and avail of the huge opportunities available in this area.

4.4.9 CEA should study the implementation of the three-tier quality control mechanism under RGGVY and take effective steps in case of any variation.

4.4.10 The Ministry of Power may take up the issue of lack of uniform product specifications in different state utilities at the Annual State Power Ministers' Conference for adoption in a time bound manner.

4.4.11 IEEMA, along with DHI, may undertake a study to identify gaps between Indian and international standards.

4.5 Focus on International Standardisation

Current Status / Areas of Concern

4.5.1 Standardization is an important area for the development of technology and to remain competitive in international markets. For the smooth integration of equipment and products in our system and for facilitating international trade, it is imperative that our standards are aligned with international best practices and international standards.

4.5.2 Indian standards for electrical equipment are based on international standards developed by the International Electro technical Commission (IEC). The Bureau of Indian Standards (BIS), the national standardization body in India, is a member of the IEC. In some of the IEC committees, India is a participating member whereas in others, it is an observer member.

4.5.3 On an average, IEC committee meetings are held once in a year. Working groups and maintenance teams under the IEC Technical Committee also meet at least once a year. As a participating or observer member, India is entitled to participate in Technical Committee activities.

4.5.4 It is observed that very few industry experts participate in IEC activities from India, whereas participation from advanced countries is generally large from industry or the user segment, or from testing and R&D institutions. Technical experts from other countries, mostly dominated by Europe, develop these standards to suit the equipment being developed by their own industry. Of late, participation from China has substantially increased in IEC for the very reason. The standards, once developed, are then followed in India but may have little relevance since they are developed based on prevailing conditions in Europe or other countries.

4.5.5 India has huge potential to participate in the IEC activities and influence the standards and technical work done by the committees / work groups. It is essential that technical experts from industry, test labs and research labs and user groups attend these technical meetings.

4.5.6 Lack of participation in IEC meetings has long-term implications on our trade and economy. India is not able to influence the decision-making process, resulting in India following international standards, with a time gap. Countries such as China follow a very well defined strategy and participate in large numbers at the IEC. They are, thus, able to influence the standards formulation process from the very beginning. This trend is increasing over the years, and is not good for India in the long run.

Recommendations

4.5.7 It is highly desirable that India's activities are increased at IEC level in a planned manner. For this, it is essential that:

a. The industry should increase participation in BIS Technical Committees, with IEEMA creating "mirror committees" for each of the BIS committees and actively work on standardization. The industry may also sponsor technical experts for working at the IEC. The industry should collaborate with research groups and participate in IEC working groups and prepare new proposals for standards through BIS. These mirror committees should work in coordination with the concerned IEEMA Product Division.

b. The BIS should encourage greater participation of industry and the user segment in its Technical Committees. It should also keep a closer watch on the activities at the IEC and proactively involve industry in such developments. Industry members of IEEMA's mirror committee should be same as the members of the respective BIS committee. Industry members of this committee may prepare comments on the amendments and suggestions received from IEC through BIS and finalise the same with the respective Product Division of IEEMA. These members may then represent Indian industry in IEC meetings.

c. The BIS is administratively controlled by the Department of Consumer Affairs. However, the larger stakeholders in the standardisation activities in electro-technology (manufacturers / utilities / testing and R&D agencies) fall under the ambit of DHI, DIPP and Ministry of Power. Hence, these Ministries / Departments should jointly develop an action plan for increasing India's activities at IEC. A corpus of fund may be created to support participation of Indian experts in IEC activities.

d. Members of the mirror committees should be considered for attending IEC meetings and their travel and related expenses should be met through the corpus created for this purpose.

4.6 Upgrade Testing Facilities

Current Status / Areas of Concern

4.6.1 The availability of adequate and modern test labs, approved by international utilities, is important for R&D and for timely delivery of the equipment. CPRI, under the Ministry of Power, has set up state-of-the-art research and testing facilities for short circuit and high power, high voltage and ultra-high voltage, insulation and power system, materials and transmission line towers and accessories. CPRI has got all the testing facilities in Bangalore, and has also created:

- An ultra-high voltage test lab at Hyderabad,
- Short circuit, high voltage, energy meter, transformer oil and allied electromechanical test facilities at Bhopal,
- Facilities for evaluation of cables, high voltage insulation and energy meters at Noida,
- The Nagpur Thermal Research Centre caters to the needs of thermal power stations,
- Transformer oil testing labs at Kolkata and Guwahati.

4.6.2 In addition, the National High Power Test Lab, being set up at Bina in Madhya Pradesh by NTPC, NHPC, PGCIL, DVC and CPRI, is expected to be ready by end 2013 and this will have complete testing facilities up to 765 kV, 500 MVA.

The Electrical Research and Development Association (ERDA) lab at Vadodara, in the cooperative sector, has facilities for the testing of medium and low voltage equipment.

4.6.3 However, CPRI can presently only test transformers up to 200 MVA. Hence, the transformers above 200 MVA are sent to KEMA in the Netherlands or CESI in Italy

for testing. This is costly and takes a lot of time for shipping. EPC contractors are not able to participate in many tenders because of this handicap and meeting the delivery schedules of the projects is challenging, resulting in time and cost overruns.

4.6.4 With huge investment for the improvement of distribution system, the demand of type testing of the electrical equipment is growing fast. Further, the capacity addition planned in the 12th Plan will increase the demand for type testing of equipment. In view of this, CPRI has submitted a strategy plan to the Ministry of Power for the next ten years to address the need for enhanced testing infrastructure and R&D facilities to meet the growth of the distribution system during the 12th Plan and further ahead.

4.6.5 Facilities for type test of EHV equipment are available only in Bangalore and Hyderabad. The transportation cost of equipment to South India from North and East India is high. Non-availability of sufficient testing facilities leads to delay in supply of equipment to site and hence, projects get delayed. Also, the demand for type testing of medium voltage equipment is very high. The current facilities are not able to fully meet the demand of the industry; therefore, there is strong need to strengthen testing infrastructure in the country.

4.6.6 The facilities of CPRI are accredited as per ISO IEC 17025 quality norms and have international accreditation viz. membership on Short Circuit Testing Liaison (STL). Certificate issued by CPRI is gaining acceptance in West and South East Asia. A number of utilities abroad have started accepting CPRI certification services for low and medium voltage equipment too, and also EHV insulators and equipment like disconnectors, lightening arrestors, etc.

Additionally, the National Accreditation Board for Testing and Calibration Laboratories (NABL) has accredited CPRI Bangalore, Bhopal and Hyderabad. NABL is signatory to mutual recognition agreement under Asia Pacific Laboratory Accreditation Cooperation (APLAC) and this is recognized by many countries including Australia, the US, China, South Korea, Singapore, etc.

However, some utilities abroad do not accept the type tested equipment by CPRI and insist on testing by KEMA or CESI. This disqualifies Indian equipment in many cases and hence, EPC contractors have to source equipment from China or South Korea. The establishment of National High Power Test Lab at Bina and regional test laboratories being set up by CPRI will help in partly overcoming this shortcoming.

Recommendations

4.6.7 The industry may undertake a study of the installed capacity of testing facilities in India, capacity utilisation, future expansion plans and the equipment manufactured in India that are sent abroad for type-testing.

4.6.8 Streamlining and continuously reviewing the procedure for obtaining test certification is essential. A committee comprising CPRI, industry, IEEMA and BIS representatives should review testing procedures from time to time.

4.6.9 CPRI should augment and expand its existing facilities, for which it has been allocated ₹ 1,368 crore in the 12th Plan.

There ought to be full testing facilities at Hyderabad and at other regional centres at Nagpur, Noida and Kolkata to cater to the demand for type testing of EHV equipment of all the regions and to reduce the type testing cost of equipment. CPRI is establishing regional test facilities under the 12th Plan; facilities comprise SC, HV and other allied electromechanical tests for the benefit of EPC contractors and utilities.

CPRI is in the process of setting up testing facilities in all the regions of the country with adequate funds from the Ministry of Power and by acquiring land through civic bodies with the support of local utilities. DHI administered PSUs have got land in all the regions. This land can be made available to CPRI on long term lease for setting of such facilities.

4.6.10 CPRI is in the process of establishing additional generator of 2,500 MVA capacity to cater to the needs of testing large power transformers up to 315 MVA. This high priority initiative of CPRI will promote Indian

electrical equipment exports and needs to be expedited. This facility, along with the National High Power Test Lab at Bina, will drastically reduce the dependency of Indian manufacturers on foreign laboratories.

4.6.11 The National High Power Test Lab, being set up at Bina, may be internationally accredited at the earliest, to be at par with KEMA and CESI. Else, the testing of equipment for exports in CPRI, Bangalore alone would result in delays.

4.6.12 To promote awareness among international players about Indian test facilities, CPRI may participate in international committees responsible for preparation / up gradation of international standards like IEC, IEEE, NEMA, etc. CPRI may aggressively promote its certification services globally for gaining acceptance for EHV and HV certification, to help EPC contractors to source equipment locally, apart from China and South Korea.

4.6.13 India being a large and growing market for electrical products, type testing of imported small electrical equipment in Indian test labs should be made mandatory. This would not only familiarize the foreign manufacturers to Indian test facilities but shall also give international recognition to our test facilities / certification. IEEMA should work on this suggestion for taking up with the Department of Commerce, in consultation with DHI and the Ministry of Power.

4.7 Better Working Capital Management and Contract Conditions

Current Status / Areas of Concern

4.7.1 No standard contract document is followed by major players like PGCIL, NTPC, BHEL and other utilities for EPC contracts, procurement of equipment, etc. In all the contracts, the clauses safeguard the interests of the owners, at times are one-sided, and are at times not fair to the equipment suppliers / EPC contractors. As a result, the following problems are faced while executing the contracts:

4.7.2 Indian companies have to hold inventories for about 75-80 days as compared to multinational companies (on an average 50 to 55 days). This high inventory is due to:

- Delays in forest and environmental clearances, fuel linkage, and approval for project reports, etc., lead to delays in power and transmission projects with long gestation periods. This results in retention of inventory by equipment manufacturers for a long time and overheads cost of developers increases.
- The shortage of imported raw material and fluctuating prices in the international market forces manufacturers to maintain a large inventory of raw material.
- Lack of standardisation of specifications and ratings in the distribution sector forces manufacturers to maintain inventory of equipment of different ratings, etc.
- Poor transportation infrastructure.

4.7.3 Receivables outstanding in case of domestic companies are almost 125 to 135 days, as compared to multinational companies, which have receivables in the range of 55 to 75 days. Hence, the working capital requirement of Indian companies is as high as 35% of their sales.

4.7.4 Payment terms and other terms of supply as well as EPC contracts: Most of the contracts floated by utilities do not provide for mobilisation advance. Other terms of payment are also unfavourable for suppliers/contractors. This results in money getting stuck, and the working capital requirement is at times, around 30-35% of the contract value.

4.7.5 Delay in completion of projects blocks payment to the suppliers / contractors. Additionally, utilities levy liquidity damages even if delay is not individually attributable to suppliers / contractor.

4.7.6 The process of timely takeover, completion certificate issuance and release of security deposit is not well defined.

4.7.7 Lack of experienced EPC contractors for power plants, particularly for the balance of plant, is also leading to litigation and delays in completion of projects.

Utilities make packages very small and big EPC contractors do not find these attractive since such packages are too much dependent on the main plant and other packages. Secondly, pre-qualification criteria for individual packages are diluted and utilities land up with inexperienced contractors, who are not able to complete projects in time.

4.7.8 The price variation clause (PVC) provided in the contracts does not compensate fully for fluctuations in international and Indian prices of the raw material, which are highly volatile. Some of the utilities for the distribution contracts do not provide PVC at all. Applicable base index is a matter of interpretation in many cases and leads to disputes and delays in release of payment against these PVC invoices.

Recommendations

4.7.9 Timely completion of generation and transmission projects is the key to the growth of the electrical equipment industry. Steps should be taken by government to remove the impediments that delay project completion. If not, this will increase the working capital needs of the industry and will affect the achievement of projected generation capacity target for the 12th Plan.

4.7.10 The Ministry of Power may examine to make it mandatory to follow standard contract terms for utilities availing R-APDRP and other central funds. Standard contract terms for the EPC contracts prepared by IEEMA, after discussions with NTPC, BHEL, PGCIL and other utilities were circulated to all and are believed to be fair to utilities and contractors both. These terms included timely completion of projects, penalties for delays, timely release of payments and taking over by the utilities, etc.

Standardised model bidding document needs to be prepared jointly by experts from Centre, states, PSUs and private sector for major electrical works to reduce bidding process complexities and contractual implementation difficulties.

4.7.11 Mobilisation advance may be made mandatory in all supply and erection contracts and the contract terms and conditions being followed by all utilities may be standardised.

4.7.12 For balance of plant, the packages may be made large enough to attract experienced EPC contractors and pre-qualification criteria may be made stringent. Small contractors can get jobs from the big EPC contractors, gain experience and then work independently.

4.7.13 The PVC clause may be made mandatory and uniformly provided in all supply and EPC contracts, to adequately compensate the manufacturers for the fluctuation in raw material prices. The base index applicable may be clearly defined and not be subject to interpretation. The clause should include domestic as well as international market price fluctuations.

4.8 Improve Manpower Productivity

Current Status / Areas of Concern

4.8.1 Global majors have high wage costs, i.e., almost 30 to 35% of the sales cost. This is one of the main reasons why foreign companies have set up manufacturing bases in India and started outsourcing their components and other services. The productivity of labour in these companies is generally high because of good management practices, economy of scale and better technology.

4.8.2 With the opening up of the economy in the nineties, competition from international players, particularly in the manufacturing industry increased, which forced the major domestic industries to look at the utilisation of their manpower. This led to restructuring of the processes, improvement in technology, etc., and productivity per employee doubled in three to four years after 1996-97 in both public and private sector undertakings.

4.8.3 In India, the overall manpower productivity is still far lower than the global players.

Chinese companies are able to impose strict adherence to standard operating practices (SOPs) at the shop floor and enforce productivity norms. According to a ICRIER Study on Cost Competiveness of Manufacturing in China and India, 2008, from 1995 to 2005, productivity in Chinese companies increased by 4 to 10 times against labour compensation, which increased by 2 to 4 times. Thus, unit labour cost reduced by 20 to 80%. Whereas In India, from 1993 to 2003, labour productivity increased by 1 to 2 times against labour compensation which increased by 1.75 to 2.75 times, thus increasing unit labour cost by 20 to 80%. Chinese white collar supervisors are 20% cheaper than their Indian counterparts but supervise five times the manpower than their Indian counterparts.

4.8.4 Indian companies are facing acute shortage of experienced and competent managers. Indian managers are, on average, 38% costlier than their Chinese counterparts.

4.8.5 The lack of modernization, especially in the case of SMEs, has led to the adoption of outdated processes and techniques, which increases their cost of production. This also leads to low efficiency and low productivity.

4.8.6 Outdated and rigid labour laws make it very difficult to enforce discipline in the factories. Outsiders interfere in labour-related matters of the industry. Workers' participation in policy matters and in the day-to-day operations of the industry is generally not being practised by the industry.

Recommendations

4.8.7 The present labour laws are outdated and have not kept pace with the socioeconomic changes over a period of time. The present day managements are generally fair to the workers and workers are very well aware of their rights and responsibilities. The existing labour laws have not kept pace with time and need to be changed to suit the present-day situation prevailing in the industry. For instance, first-come-last-to-go makes it extremely difficult for the management to remove a worker who is non-productive and not disciplined. In fact, a level playing field needs to be created for the employees and employers. There could be separate laws for permanent, semi-permanent and contract labour.

4.8.8 Labour wages need to be linked with productivity norms of the similar industry. Labour may accept to follow the standard operating procedures and productivity norms of the similar industry. No outsider should be permitted to interfere in the labour-related issues of the industry. The workers' union of the factory should be allowed to interact proactively with its management and sort out the disputes with the intervention of State Labour Department, if required.

4.9 Product Innovation

Current Status / Areas of Concern

4.9.1 It is generally seen that industry is always concerned about the day-to-day problems, turnover and profit, etc. Innovation in the processes of manufacture, which can lead to improvement in productivity, reduction in wastage of raw material, reduction in rejections and improvement in quality of the products and better utilisation of time and resources, etc., is not given much importance.

4.9.2 As a result, many bright engineers and even workers do not find their jobs interesting and challenging. This is one of the reasons for the high attrition percentage in the industry. Greater encouragement to workers and engineers to innovate will lead to lesser turnaround problem.

Recommendations

4.9.3 Innovations need a good environment to develop and should be encouraged and nurtured by the industry. The top management of the companies should create an environment that encourages employees to think in an unconventional, creative and out-of-the-box manner. Additionally, customer-centricity is very critical as most innovations can result from understanding the requirements of the customers and their regular and frank feedback.

4.9.4 There is scope for innovation in all the departments of the plant viz. shop floor, store design, transport department, administration, safety and quality, etc. Lean manufacturing techniques and practices, like 5S, Six Sigma, Kaizen, etc., are being increasingly adopted by manufacturers across the world to reduce their inventory cost and enhance cost competitiveness. Some companies have a practice of inviting suggestions from the workers and engineers of all their departments. Every month, these are evaluated and the best suggestions are awarded. This encourages people to think and innovate, leading to savings in cost and higher productivity. These good practices need to be universalised across the industry.

4.9.5 Students in engineering and vocational colleges are very keen to innovate as a team. Unfortunately, very few industries refer their problems to colleges. The industry should refer their technical problems to the institutes and encourage their own experts to have a regular interaction with them. Some incentive can be announced for the students in addition to the institute's fee. This can lead to an urge to innovate.

5.0 Technology Upgradation

5.0 Technology Upgradation

5.0.1 In order to meet the future demand arising out of the planned generation capacity addition of 88.5 GW and 93 GW for 12th and 13th Plans respectively, it is extremely important that domestic BTG equipment manufacturers are in sync with domestic transmission and distribution equipment manufacturers. In the absence of corresponding transmission and distribution equipment, capacity addition will be difficult to achieve. In order to meet this challenge, the domestic electrical equipment industry has to prepare itself holistically.

5.0.2 Hence, it is important that BTG and T&D equipment manufacturers keep pace with the latest global technological developments, not only to meet domestic demand but to ensure efficient generation, transmission and distribution of power comparable with the best solutions available across the globe for different environments. The domestic innovations in electrical equipment product design need to match the global pace, and also boost Indian exports as well as reduce dependence on imports. Use of latest technology to enhance plant automation and protection against cyber threats to protect the safety and security of power systems is another crucial area requiring attention.

5.0.3 For technology up gradation, the following areas need to be addressed:

5.1 Generation sector,

5.2 Transmission sector,

5.3 Distribution sector, and

5.4 R&D by Indian companies.

5.1 Generation Sector

Current Status / Areas of Concern

While BHEL continues to be the largest player in the BTG sector, L&T-MHI joint venture has also commenced supplies. Seven more joint ventures for manufacturing BTG equipment domestically are likely to commence production soon. By 2013-14, domestic manufacturing capacity of thermal sets (steam generators) is expected to include BHEL (17,500 MW), L&T-MHI (6,000 MW), Thermax-Babcock (3,000 MW) and BGR-Hitachi (3,000 MW). In 2014-15, new capacities of Cethar Vessel-Riley Power (4,000 MW), Ansaldo-Gammon (4,000 MW) and Doosan (3,000 MW) are also expected, increasing the total capacity to 40,500 MW. Similarly, in the case of thermal sets (turbine generators), by 2013-14, domestic manufacturing capacity is expected to include BHEL (13,020 MW), L&T-MHI (6,000 MW), Alstom-Bharat Forge (5,000 MW), BGR-Hitachi (3,000 MW) and Toshiba-JSW (3,000 MW). In 2014-15, capacities of Doosan (3,000 MW) and Ansaldo-Gammon (2,000 MW) are also expected, increasing the total capacity to 35,020 MW.

Coal, with about 66% of the share, is likely to remain the predominant source of fuel in the foreseeable future. However, coal-fired power generation is also the single largest source of carbon-dioxide (CO_2) emissions, which is contributing to climate change.

India is likely to face increasing international pressure to reduce its emission intensity. The National Action Plan on Climate Change (NAPCC) of the Government of India emphasises the use of clean coal technologies such as supercritical, ultra-supercritical and integrated gasification combined cycle (IGCC) that help minimise CO_2 emissions while giving the highest possible energy efficiency and reducing the coal required per unit of power generated.

Supercritical technology has already been adopted commercially in India. A large number of 660 and 800 MW supercritical thermal power plants are under construction.

Power plants with ultra-supercritical (USC) steam parameters (i.e., ³ 250 kg/cm² / ³ 600°C), which have higher efficiencies are likely to be set up in India in the next few years. Ultra supercritical plants are already in commercial operation in Europe, Japan, China, etc.

5.1.1 Integrated Gasification Combined Cycle (IGCC) - It combines the benefits of two highly efficient and environmentally clean processes, viz.

- Coal gasification and,
- Gas turbine based combined cycle.
- IGCC is currently in technology demonstration phase worldwide:
- Demonstration plants with capacities

up to about 600 MW are being established in the US, China and South Korea.

- Also, a 250 MW IGCC plant is in operation in Japan.

However, the technologies currently in use for this process world over have been found to be unsuitable for high ash content Indian coal.

5.1.1.1 In India, BHEL has been developing IGCC technology since the early eighties. During this period, it has designed, set up and operated various test facilities and established a 6.2 MW combined cycle demonstration plant at Tirchy. This plant is based on Pressurised Fluidised Bed Gasification technology, which is acknowledged to be the gasification technology most suited for Indian coal.

5.1.1.2 The benefits of the IGCC technology are:

- CO_2 capture is simpler and more economical with IGCC than with other technologies.
- Emissions of SOx and NOx, as well as particulates, are considerably less than that in case of other technologies.
- It requires lesser water than a pulverised coal plant of similar capacity. The requirement of water, for steam generation as well as condenser cooling, is less than 50% of that of a pulverized coal-fired plant of similar rating. Furthermore, the PFBG technology developed by BHEL requires lesser water than even the Entrained Bed Gasifier used abroad as the ash is extracted from the gasifier in the solid phase, and does not require quenching of molten ash by water (which is required in case of the Entrained Bed Gasifier).

5.1.1.3 The IGCC technology has a very promising development path ahead. Improvements in gas turbines with higher combustion temperatures (↑1,500 C) could lead to IGCC efficiency of over 50%. Similarly, Integrated Gasification with Fuel Cells promises even higher efficiencies, of 55% and above.

Recommendations:

5.1.1.4 As is the case for all major technologies, developed and applied on a large scale, costs are the highest in the demonstration stage. As the technology matures and commercial sized IGCC plants rated 450 MW to 600 MW are set up, the capital cost per MW is expected to reduce and performance in terms of efficiency, availability and reliability would improve considerably.

5.1.1.5 At this stage of technology, the governments in the US, Europe, Japan and China have funded IGCC plants up to 50%. This has been done in order to:

- Incentivise clean coal technology so that developers as well as utilities adopt this technology and,
- Mitigate risks associated with any development effort.

The support of the Government of India at this stage would greatly facilitate acceptance of the technology in the country.

5.1.1.6 BHEL is now setting up a 182 MW IGCC pilot plant for commercial operations with APGENCO at Vijayawada and 100 MW IGCC plant with NTPC at Dadri.

5.1.1.7 BHEL has already completed the technical development of IGCC and detailed engineering of scaled up rating has also been completed. It plans to operationalize the plant by 2015.

5.1.1.8 The Government may ensure that this technology, once put to commercial use, is accepted by NTPC, IPPs and all the utilities. Otherwise, other

manufacturers along with IPPs will try to promote some other specifications.

5.1.2 Advanced Ultra-Supercritical (Adv-USC)

5.1.2.1 Alstom, a pioneer in the ultra-supercritical technology in the world, is setting up a joint venture in India with Bharat Forge for BTG equipment. Additionally, the L&T-MHI joint venture is ready to supply ultra-supercritical boilers and generators rated up to 1,000 MW. BHEL, IGCAR, NTPC are in the process of developing this technology in order for it to use Indian coal.

5.1.2.2 R&D on the Adv-USC cycle, with steam parameters of 300 kg/cm^2 / ≥700°C, is in progress in the US, Europe and Japan. With such steam parameters, the efficiency of the power plant is expected to be in the range of 45-47% gross on Higher Heating Value (HHV) basis with Indian coal under Indian ambient conditions.

5.1.2.3 Under the National Mission for Development of Clean Coal (Carbon) Technologies, R&D Project for "Development of Advanced Ultra Supercritical (Adv-USC) Technology for Thermal Power Plants" is proposed to be taken up on Mission Mode, as a consortium project involving all concerned stakeholders. This will be followed by the establishment of 800 MW Adv-USC Demonstration Power Plant.

Recommendations

5.1.2.4 The project proposed by BHEL, Indira Gandhi Centre for Atomic Research (IGCAR) and NTPC, with funding from DHI, should be implemented early. It should be ensured that the technology, once developed, is accepted by all utilities and IPPs.

5.1.2.5 Development of advanced ultra-supercritical technology should be complete by 2015. The demonstration plant could be ready in 7 years' time.

5.1.2.6 An investment of ₹ 1,250 crore has been proposed for this project.

5.1.3 Coating Material for Turbines

5.1.3.1 Corrosion of turbine buckets / blades because of high silt content in the water is a serious problem faced by hydro power plants. The maintenance and replacement cost of these turbines and loss of generation, because of frequent shutdowns, is very high.

Recommendations

5.1.3.2 Some companies in the country have developed coating materials that reduce corrosion and increase the life of runners. These companies, along with Welding Research Institutes of BHEL and L&T could develop technology to carry out repairs at site. This will help in reducing the cost of repairs and down time of the units. Once this facility is available, then power plant developers will opt for turbines with proper coating.

5.1.4 Nuclear Power Plants

5.1.4.1 On the basis of the policy of the Government of India, NPCIL has drawn up a massive expansion programme in which number of Indian pressurized heavy water reactors and light water reactors, with collaboration with foreign companies, are planned. The Indian electrical equipment manufacturing industry needs to gear up to meet the challenges arising out of these plans. At present, for some of the key equipment, either limited numbers of domestic suppliers are available or the country is totally dependent on imports for supplies. Development of indigenous technology is required, not only to improve the local capability but also for export purposes.

Limited or no suppliers are available for the following equipment in India:

- 6.6 kV diesel generators (above 2,000 kW),
- Uninterrupted power supply

systems (above 500 kVA) and associated batteries,

- 6.6 kV motors,
- Automatic washing of disc and post insulators in outdoor switchyards,
- 400 / 765 kV GIS and underground cables.

Recommendations

5.1.4.2 Government of India is laying great stress on increasing the share of nuclear power in power generation to reduce dependence on coal and also address environment concerns. The domestic manufacturers need to understand the requirements of NPCIL and urgently gear up for the same. Most of the units of nuclear power plants are of 500 MW and 1,000 MW capacity and require 400 kV / 765 kV GIS and underground power cables and 765 kV bus ducts which are not being manufactured in the country today. Domestic companies need to forge tie-ups with world leaders and start manufacturing this equipment in the country. Same in the case with equipment for 765 kV outdoor switchyards, automatic washing of disc and post insulators for switchyards, etc. These equipment have huge scope for exports also. This is important as all these power plants are located near coastal areas and the switchyard insulators get polluted fast which can lead to regular faults. 6.6 kV rating motors are also in short supply. More domestic manufacturers should take up manufacture of these equipment.

There are limited suppliers of 6.6 kV (2,000 MW and above diesel generators), high capacity uninterrupted power supply systems with suitable batteries are also required by airports and metros. The existing domestic manufacturers need to augment their capacities and also new manufacturers should enter this area.

Technical requirements and quality checks of NPCIL are very stringent and sometimes, quite different from the industry norms. NPCIL needs to intensively interact with industry leaders and make them fully aware of their needs, understand the industry difficulties and freeze their requirements. This will help the industry to meet their needs and supply the equipment in time.

5.2 Transmission Sector

Current Status / Areas of Concern

The central transmission utility, PGCIL, has kept pace with the latest developments in the transmission sector. It has developed in-house expertise in the implementation of HVDC systems and has commissioned ±500 kV 2000 MW HVDC bipole between Talcher and Kolar, Asia›s longest HVDC bipole (about 1,400 kms). Further, ±500 kV, 2,500 MW Balia-Bhiwadi high voltage direct current (HVDC) bipole is ready for commissioning.

PGCIL now is in the process of implementing ±800 kV, 6,000 MW HVDC bipole line from the North Eastern region over a distance of 2,000 km. Research work for 1,000 kV HVDC system has also commenced.

5.2.1 PGCIL Bina Model for Development of 1,200 kV system

5.2.1.1 PGCIL is aiming towards development of 1,200 kV operations by optimizing their protective level so as to achieve economy in respect of 1,200 kV UHV system development. Very few countries have a 1,200 kV system in the world. Consequently, the number of equipment manufacturers for this voltage level is also limited.

Recommendations

5.2.1.2 PGCIL has successfully developed an experimental 1,200 kV switchyard at Bina with the involvement of equipment manufacturers, tower manufacturers and EPC contractors apart from a foreign expert. With the active involvement of all parties, PGCIL froze the layout and specifications of the equipment. Manufacturers produced the equipment as per these specifications

at their cost and brought these to the site for field testing. PGCIL paid the cost of development of the switchyard. Testing at the site has commenced.

5.2.1.3 Upon successful completion, PGCIL will adopt these specifications for 1,200 kV switchyards. All Indian equipment manufacturers will be advised to use these specifications for future developments. This way, EPC contractors, equipment manufacturers and tower manufacturers who participated in the development will get qualified for 1,200 kV sub-stations and will have an edge over other players.

5.2.1.4 This is an excellent model and win-win situation for all. With this approach, the industry will take much less time and money for development of 1,200 kV equipment, as compared with the quantum required for development of the 800 kV equipment. This way, with the joint efforts of PSUs and the private sector, new technologies can be developed much faster at the least cost.

5.2.2 High Surge Impedance Loading (HSIL) Line

5.2.2.1 In order to increase the load ability of lines, development of HSIL technology is gaining momentum. PGCIL is building up one HSIL line to increase carrying capacity from 650 MW to 750 MW.

5.2.3 High Temperature Low Sag (HTLS) Carbon Core Conductor

5.2.3.1 The maximum temperature limit of the Aluminium Conductor Steel Reinforced (ACSR) conductors is about 100°C. High temperature low sag conductors like INVAR, which can withstand temperature up to 230°C can be used instead. These give matching thermal ratings and have also been found to be economical due to considerable savings on structure. PGCIL has already implemented twin INVAR conductor, a loop-in-loop-out (LILO) 15 km line on an experimental basis.

5.2.3.2 Advantage and disadvantage of the technology:

- **Advantage** - Owing to space constraints, this type of conductor has high potential in urban / city areas for augmenting power carrying capacity of existing lines.
- **Disadvantage** - There is not enough manufacturing capacity in the country for these conductors and the cost is very high.

Recommendations

5.2.3.3 Carbon core conductors can take 2 to 2.5 times the current of conventional conductors. These conductors will be very useful for increasing the current carrying capacity of the existing lines. Existing ACSR conductors can be replaced by these conductors on the same towers. The cost and time required for additional line can be avoided. Crop compensation and right-of-way (RoW) are expected to become more and more difficult in the future. Aluminium conductor composite core (ACCC) conductor, new generation conductors which help in reducing line losses, will see increased demand in the foreseeable future as it can be used for replacing conductors on existing towers and transmit more power. A few conductor manufacturers are manufacturing ACCC conductors in India.

5.2.4 400 kV Gas Insulated Sub-stations (GIS) and 400 kV Underground Cables

5.2.4.1 With scarce land availability, there is a growing need for reduction of land use for setting up of EHV sub-stations systems, particularly in metros, other urban and hilly areas.

Recommendations

5.2.4.2 GIS are the way forward because:

- They require less space (about 70% reduction).
- The operation and maintenance cost

of GIS stations is far less as compared to conventional air insulated stations.

- Though GIS costs almost 2.5 times the price of air insulated stations, these are ideal for big cities, where either land is not available or the cost of land is exorbitant.
- Similarly, in hilly areas and underground power plants, GIS is the ideal solution. These are also ideal for coastal areas where corrosion of steel structures, used for air insulated stations is very high.

5.2.4.3 400 kV underground cables are also now being used for connecting 400 kV GIS stations to the overhead transmission lines in case of hydro power plants. This is also being used for connecting the transmission lines to the 400 kV GIS stations in metros and other cities, where it is not possible to extend the transmission lines within the cities for meeting the growing demand.

5.2.4.4 A number of companies in India have started manufacturing 220 kV GIS and 220 kV cables. However, 400 kV GIS equipment is being imported. One manufacturer has started manufacturing these stations in the country, however, they have not been type tested.

5.2.4.5 It is expected that there is going to be a huge demand for GIS in the future. The domestic industry should start manufacturing the same. A study may be undertaken by IEEMA to project demand for 400 kV and 765 kV GIS and 400 kV underground cables in India in the next 10 years.

5.2.5 Superconductivity

5.2.5.1 Superconductivity is the physical property of a conductor when its resistance becomes zero. The world over, this technology has not been developed commercially. However, on an experimental basis, superconducting materials have been developed in the world and have found application in several areas like cables, motors, transformers, etc. International experience in development of superconductivity can be suitably adapted in India.

5.2.5.2 Initiatives taken the world over to use superconducting material on a commercial scale:

- In the US, a Council on Superconductivity for America Competitiveness (CSAC) was formed in 1989. This was supported by Department of Energy (DOE) and jointly funded by private organizations. Its job was to commercialize the technology. This is called the Superconductivity Partnership Initiative of DOE and is a collaborated research agreement. By 2006, they were able to make commercial use of this technology in motors, transformers and cables. As a result of this well planned approach, the US today has 100 meters of cable made from superconducting material connecting transformers to the grid on trial basis.
- In Switzerland, an experimental 6.4 MVA transformer and current limiter using superconducting winding wires has been developed. Motors are being used with superconducting wires and in the rural areas of some countries, distributed superconducting magnetic storage system is being used.

5.2.5.3 With the transmission of bulk power over the national grid, superconductivity conductor can be a revolution in transmission of high volume power over long distance. Theoretically, the loss over transmission will come down to almost zero.

5.2.5.4 In India in 1987, a national coordinated programme, jointly by the Council of Scientific and Industrial Research

(CSIR) Laboratories, Regional Research Laboratories (RRL), Tata Institute of Fundamental Research (TIFR), Indian Institute of Science (IISc), universities and the IITs was started by setting up programme management board for superconductivity. Under this programme, the RR Laboratory at Trivandrum has developed a ceramic compound that can be used for high temperature superconductor. The contribution of CSIR, IISc, RRL, TIFR and BARC in the field of superconductivity is significant, but as compared to other countries, India has so far not been able to develop this for commercial use in the country's power sector.

PGCIL is trying to develop a showcase project on superconductivity on the lines of superconducting experimental work going on in other countries.

Recommendations

5.2.5.5 Based on the US model of CSAC, the Government of India should take the initiative, under the leadership of PGCIL with industry, CPRI, CSIR, TIFR, RRL, Bhabha Atomic Research Centre (BARC) and technical institutes with a mandate for developing this technology for commercial use in the country's power sector in the next 5-10 years. Funding from such sources as the *National Clean Energy Fund* (NCEF) could be availed for research and innovative projects in clean energy technology.

5.2.5.6 There should be a 'rewards and recognition' programme in place for the members who contribute to this research. Research scholars from engineering colleges and other research institutions should be involved for all R&D projects of this kind.

5.2.6 Power Electronic Devices

5.2.6.1 R&D needs to be taken up in the area of power electronic devices like static synchronous compensator (STATCOM), unified power flow controller (UPFC), Thyristor Controlled Series Compensator (TCSC) to increase the load ability of existing transmission lines. PGCIL, NTPC, BHEL, CPRI, and IITs should take up this research.

5.3 Distribution Sector

Current Status / Areas of Concern

5.3.1 Power Supply to Rural Areas

5.3.1.1 The entire power sector value chain crucially hinges on the financial viability of the power distribution sector. In fact, state power distribution companies are bulk buyers of power from power generation plants. AT&C losses of the majority of DISCOMs, on an average, are more than 27%. DISCOMs are not in a position to buy the power and sign long-term PPA with the developers.

5.3.1.2 In many cases, banks insist on long-term signing of PPAs and thus, the financial closure of power projects gets delayed. Consequently, many planned power projects and transmission projects are also put on hold. This, in turn, adversely impacts the entire growth of the BTG and T&D equipment sector.

5.3.1.3 Power supply to rural areas is very costly since the density of the consumers is very less, lines are long and there is no way theft can be controlled. The cost of supply to rural areas can be to the tune of ₹ 12-15 per unit if the capital cost of lines and the maintenance and replacement cost of conductors (which get stolen very often) is taken into consideration. Secondly, the power supply to rural areas is quite unreliable because of the frequent tripping due to poor maintenance of the rural lines.

Recommendations

5.3.1.4 For rural areas with a population of 500 to 1,000 inhabitants, supply from decentralised distribution-cum-generation (DDG) plants should

be considered by the concerned DISCOMs. This can be from the following sources:

- Small thermal power plants of 5 to 10 MW capacity,
- Biogas,
- Solar,
- Wind, and
- Micro hydel.

The Government of India provides subsidy under RGGVY for DDG. The budgetary support needs to be enhanced for RGGVY so that DISCOMs are encouraged to implement the above.

5.3.1.5 The Ministry of New & Renewable Energy is taking a number of initiatives to encourage research for the development and reduction of cost of generation from renewable sources. The cost of power from these sources in India already varies from ₹ 10 to ₹ 12.5 per unit, which is comparable to the grid supply cost to rural areas.

5.3.1.6 The T&D industry may be encouraged to set up these DDG units under the PPP mode for rural areas. The generation cost from renewable energy should be compared with the actual per unit cost of grid supply and incentives decided accordingly. In fact, the government will be able to avail of carbon credits by encouraging these initiatives.

5.3.1.7 This initiative will increase the demand for equipment required for these DDG plants and will motivate private parties to spend on R&D. Government will provide help by incentivising such initiatives of the industry. This will reduce peak demand on the grid and DISCOMs will not have to buy costly power for the urban areas.

5.3.2 Smart Grid

5.3.2.1 In developing economies like India, smart grids can save energy by efficiently harnessing the renewable energy resources which are abundantly available in the country. Smart grid uses digital communication and digital control technology and helps in reducing the loss on the distribution system.

5.3.2.2 Results show that when renewable energy sources are connected to the distribution system, the power flow gets altered and this would necessitate a change in the protection system settings. Also, sudden connection or disconnection of renewable energy sources due to faults may result in unacceptable transients in voltages in the distribution system, which needs to be mitigated. A smart grid is a digital upgrade of a power system that is capable of assessing its health in real-time, predicting its behaviour and initiating corrective action.

In case of rural areas, where DDG and other biogas and wind turbines will be running, the smart grids will help in feeding power from these generating units to the grid with minimum transients when this power is not required in the rural areas and also take power from the grid at the time when grid supply is the cheapest.

Recommendations

5.3.2.3 This technology is in an experimental stage in India, with some pilot projects underway, including PGCIL's smart grid project in Puducherry, and is yet to be commercially developed so far. This will need a great deal of research, development and industrialisation to obtain design which will optimise the cost, efficiency and reliability of the system. Standardisation of the equipment modules and operating procedures will be necessary for system proliferation. This will go a long way in the integrated operation of DDG with

the grid. PGCIL / DISCOMs / REC are trying to introduce this technology. They can consider the same for DDG plants too.

5.3.3 Power Generation through use of Advanced Class Fuel Cell

5.3.3.1 This process consists of realising direct power through the electro-chemical reaction of hydrogen obtained through the reforming of natural gas, coal gasification fuel and other kinds of fuel with atmospheric oxygen. This is an excellent alternative as it can give cycle efficiencies in excess of 55%.

5.3.3.2 A network of fuel cell (natural gas-based) power plants will enable development of highly efficient decentralised dedicated power plants for large hospitals, hotels, megamalls and rural areas. This would significantly reduce the load on the main distribution system and farmers / small industries will get supply of reliable power.

5.3.3.3 In the US, Cummins, in collaboration with DOE, is developing this technology. DOE is looking at this as an alternative source, which has great potential for reducing burden on the grid and also reducing carbon emission.

Recommendations

5.3.3.4 Similar projects may be undertaken in India under the technology mission. Private power distribution companies will be keen to work on such projects since it will reduce their peaking power requirements. BHEL and REC can pursue this research jointly under the Department of Science and Technology.

5.3.4 Quality of Power Supply

5.3.4.1 Communication equipment is being added in the distribution system every day without installation of harmonic filters. With this, the quality of power is deteriorating. For reduction of losses in the distribution system, the existing low tension system is being replaced with high voltage distribution. In this system, thousands of small transformers are being added up for the domestic as well as irrigation loads. But, this indiscriminate addition of small transformers is adding the inductive load in the system and this is leading to poor power factor.

Recommendations

5.3.4.2 Under the R-APDRP Scheme, PFC may introduce a clause that DISCOMs should strictly follow the CEA (Technical Standards for Connectivity to the Grid) Regulations, 2007 which give guidelines for keeping the voltage and current harmonics within the desired limit.

5.3.4.3 Power factor needs to be improved by installing automatic power factor control (APFC) panels in the system after proper designing. This can be a part of R-APDRP Scheme.

5.4 R&D by Indian Companies

5.4.1 All the three segments of the power sector, viz. generation, transmission and distribution, are interdependent on each other. Currently, equipment manufacturers are gearing up in accordance with the future plans of NTPC in the generation sector and PGCIL in the transmission sector. At present, equipment manufacturers are able to meet the demands of the generation, transmission and distribution sectors. However, the lack of a system or platform to regularly inform the entire industry on developments taking place in thermal/ hydro/nuclear generation and transmission sectors is resulting in inability to update the products for the future.

5.4.2 Large companies in the US, Europe, South Korea, China, etc. spend more than 4-5% on R&D, which is much higher than Indian companies, which spend less than 1% on an average. Considering the scale of operation of the global majors, actual spending by Indian companies on R&D is too small. In fact, many Indian companies do not spend on real R&D at all.

Recommendations

5.4.3 **Expert Committee on R&D for Electrical Equipment Industry –** A mechanism by which the Department of Science & Technology and CSIR have regular interaction with experts from generation, transmission and distribution companies (national platform),including BHEL, NTPC, NHPC, NPCIL, CPRI, PGCIL, IGCAR, etc., should be developed to:

- Review the developments in global technologies in each sector,
- Identify the gaps and prepare an action plan for the future,
- Inform the equipment manufacturing industry about technological developments.

5.4.4 While in large companies, R&D activities can continue as per their programme, other companies need to increase their spending on R&D, the lack of which will result in inability to compete in the global market.

5.4.5 For major R&D areas like IGCC, ultra-supercritical boilers, superconductivity, etc., a collaborative / consortium approach like PGCIL's Bina Model for a 1,200 kV system should be adopted. For testing, it should be along the lines of the Automotive Research Association of India (ARAI). This will result in faster outcomes at a much lesser cost. It is extremely important for the country that a suitable ecosystem should be put in place to encourage a consortium approach to R&D on PPP model for the development of cost-effective and energy efficient equipment under a national level nodal technical agency where the knowledge gets accumulated for future spin-off benefits.

Features:

- Each of such research should be treated as a separate project,
- Project teams to include major industries, PSUs, CPRI, CSIR, IGCAR, RRLs and leading technical institutes,
- Each team's responsibilities / areas of research to be well defined and funds allocated accordingly every year,
- The final user / major player of the industry who is going to derive the maximum benefit to guide the research and be made the team leader of the project, and;
- Each member of the team should be given incentives and recognition for their area of research.

5.4.6 CPRI is setting up infrastructure for R&D in the area of cutting-edge technology like UHV technology, nano material laboratory, power electronic devices, smart grid, fuel cell research and super conductivity, etc. CPRI may collaborate with NTPC / BHEL / PGCIL for taking up R&D projects of national interest identified by them.

6.0 Skills Development

6.0 Skills Development

6.0.1 As on 2011-2012, the Indian electrical equipment industry provided direct employment to 0.5 million people and indirect employment to more than 1 million. This requirement in 2022 is estimated to increase to 1.5 million for direct and 2 million for indirect employment. Therefore, the electrical equipment industry plays a very important role not only in the GDP growth, but also in providing employment in the country.

6.0.2 Under the Ministry of Labour & Employment, a large number of Industrial Training Institutes (ITIs), under the Craftsman Training Scheme, have been set up. The number has now increased to almost 9,000, including industrial training centres (ITCs) set up by private organisations. Under the Apprenticeship Training Scheme, companies impart training to workers in the skills required by the industry. Under the Skill Development Initiative, candidates are assessed as per the standard modules.

6.0.3 Though these initiatives are playing an important role in training youth in different skills, these schemes are not adequately addressing the needs of the electrical equipment industry. Therefore, the industry, in consultation with DHI and the Ministry of Labour & Employment, should also formulate appropriate schemes to fill the gap.

6.0.4 Over a period of time, the industry sector has grown fast and there is a sea change in the technical requirements of skilled manpower. The curriculum followed by ITIs has not fully kept pace with the requirement of the industry. Secondly, in most of the ITIs, the students are not able to get proper practical training as per the requirements of the industry. As a result, industry has to spend money and time on training of these workers before they can be appointed as skilled workers.

6.0.5 The electrical equipment industry alone requires 85,000 to 90,000 skilled workers every year, with the demand growing by 12% to 15% per annum. There is an acute shortage of skilled and employable workers in the industry. The findings of a study conducted by IEEMA in 2010 across the electrical equipment industry on the quality of manpower indicated that, for electrical engineers and diploma holders, out of the total number of engineering graduates employed by the industry, only 17% were found to be good, 35% mediocre and 48% were not employable and needed to be trained. Similarly, out of the diploma holders who were employed as supervisors, 29% were found to be good, 17% mediocre, and 54% were not employable and needed to be trained. Most students in the second and third categories were from private colleges. As per this study:

- The technical education being provided in ITIs, polytechnics and engineering colleges does not meet the expectations of the industry.
- Most of the engineering graduates coming out of the colleges lack the basic theoretical knowledge, analytical and communication skills and managerial capabilities.
- The majority of diploma holders coming out of the polytechnics and technicians from ITIs are not employable. They lack the practical training of the trade.

6.0.6 Because of the above factors, the labour productivity in India is far less than that in China and South Korea. This is one of the main reasons for making Indian industry non-competitive and impacting the timely completion of projects. Therefore, there is an urgent need to train the workforce for all segments of the industry and making critical changes in the curriculum of the polytechnics and engineering colleges.

6.0.7 The challenge before industry and government is to improve the education and vocational training system and train 500 million workers by 2022 for all the sectors of the economy.

6.0.8 Under skills development, the following areas need to be addressed:

6.1 Estimate requirement of manpower by the industry for different kind of skills,

6.2 Accreditation of ITIs and other ITCs,

6.3 Training by the industry,

6.4 Review of the working of private engineering colleges and polytechnics,

6.5 Review of the curriculum of engineering colleges and polytechnics,

6.6 Industry-institute interaction,

6.7 Summer training for students,

6.8 Guest lectures by qualified industry experts,

6.9 Shop floor training,

6.10 Faculty interaction with industry, and

6.11 Encourage innovation by Students.

6.1 Estimate Requirement of Manpower by the Industry for Different Kind of Skills

Current Status / Areas of Concern

6.1.1 Some of the large manufacturers of electrical equipment and central utilities have set up their own skill development centres and are able to train the skilled manpower as per their own requirement. However, 90% of the T&D equipment manufacturers are in the SME sector and are widely scattered all over the country. Therefore, this industry faces a serious problem in getting trained manpower for their operations.

6.1.2 At present, there is no formal mechanism to identify the type of skilled manpower required in a particular district / state and country. The quantum of skilled manpower required for different trades by different industries is also not known.

6.1.3 ITIs exist in practically all tehsils and districts. In the absence of formal mechanism to define the skill needs of the local industry, training provided in these ITIs may not meet the requirements of the local industry.

6.1.4 In small towns, students join these institutes mainly with the aim of obtaining a certificate that helps them in getting government jobs. As such, students coming out of these institutes are generally unemployable directly as skilled workers, and industry has to spend a lot on their retraining.

6.1.5 Because of this mismatch, the majority of students coming out of these vocational institutes do not get absorbed in the local industry and they move to the metros and larger towns for employment. Employment exchanges, State Labour Departments and DGET do not carry out studies regularly to determine the skills to be provided in these institutes or in vocational training centres.

Recommendations

6.1.6 To boost the private sector initiatives in skills development, the government, along with the industry, set up the National Skill Development Corporation (NSDC) in 2008. NSDC has the Prime Minister's mandate to skill 150 million people in India by 2022 for all the sectors of the economy by:

- Fostering private sector participation through funding,
- Facilitating and incentivizing skill development.

6.1.7 NSDC is tasked with developing an enabling environment for skills development and encouraging private sector investment and initiatives in training and skills development as a part of corporate social responsibility.

6.1.8 As part of its mandate, NSDC is providing support for setting up of Sector Skills Councils (SSCs) for the different sectors. Up till now, 10 SSCs have been sanctioned by NSDC, of which 3 are operational.

6.1.9 IEEMA, backed by the industry leaders like BHEL, L&T, ABB, Siemens, Crompton Greaves, etc., to identify the unique skills required for the electrical equipment industry. Some examples are:

- Transformer winding and transformer repair technicians,
- Motor winding and repair technicians,
- Panel fabricators,

- Wiremen for panel wiring and for cabling and termination at sites,
- Wiremen for house wiring and wiring in big malls and other commercial buildings,
- Cable jointers for 11 kV and above rating cables,
- Linemen for erection and repair and maintenance of the lines,
- Tower erection and stringing of conductor for the transmission lines,
- Testing and commissioning of electrical switchgear, transformers, etc.

6.1.10 Apparently, there seems to be a huge requirement for these skills all over the country for electrical equipment industry, generation and other power projects, real estate sector, metros, airports, etc.

6.1.11 A study should be undertaken to:

- Assess the requirement of these skills, region-wise,
- Assess and justify the financial viability of the SSC.

6.1.12 Assuming the number of manpower required for these skills is considerably large, IEEMA to put up a proposal to NSDC for setting up of an Electrical Equipment SSC.

6.1.13 SSC should have a mandate to:

a. Create skill data base:

- Estimate the type of skills required in different industries, their annual intake and the number of persons being trained in that area in different skills by ITIs and ITCs and establish the skill gaps in that area.
- Identify the current and future skills requirement, both in numbers and type of skills, at national and regional level.

b. Develop sector-specific competency standards:

- Map the typical job profile of the skilled manpower working in the industry and assess the competency requirement of the same in consultation with industry.
- Create a framework for evaluating competencies for each role, technical as well as the soft skills required.
- Grade the minimum standard / grade of competency required for each kind of job, depending on the nature of industry.

c. Act as career guide for the industry:

- Use experience and knowledge of other industries and guide the industry on the growth path of skilled workers.
- Help the industry pick up cross-functional skills that will be valued by the industry.

d. Benchmarking international standards:

- Study the skill training practices and the curriculum of other countries and pick up the practices best suited for the local industry.
- Study the productivity norms of other countries, compare the productivity of Indian industry, share experience with industry leaders and help them in improving their productivity.

e. Identify, upgrade and standardise the technology for training of teachers.

6.1.14 Once this SSC is operational, it may have regional centres which will interact with the local electrical equipment industry and prepare a database for the type of skill required and its numbers, keeping in view the industry expansion over the next ten years in a particular area.

6.2 Accreditation of ITIs and Other ITCs

Current Status / Areas of Concern

6.2.1 There are more than 9,000 vocational training institutions (government ITIs / private ITCs) in the country. Out of these, approximately 2,300 are government-run institutes and the rest are privately run. Generally, ITIs have good infrastructure

(classrooms, offices, etc.) and are located on big plots of land. However, their workshop and lab facilities are often outdated.
The location of many ITIs is not near the industrial estates.

6.2.2 Status of students:

- Students passing out are not well trained and are taken as helpers. They take up to 2-3 years to become skilled workers.
- No proper practical training is imparted in the institutes.
- There is limited interaction and no tie-ups with industry for their training.
- Students passing out are not directly employable by the industry and need time consuming on-the-job training.
- In small towns and rural areas, in particular, stress is on obtaining certificates which helps the students in getting government jobs.

6.2.3 Status of teachers:

- Teachers are not well trained in their trades.
- They are not well paid.
- There is no system to test or periodically update their skills.
- Skills being imparted are by and large, not in line with the requirements of industry.
- Accountability is limited.

6.2.4 Status of curriculums:

- Curriculum is not regularly revised over a period of time to keep pace with developments in the industry.

Recommendations

6.2.5 The majority of students joining the vocational training institutes come from rural background. As explained earlier, the majority of students joining schools are not able to pursue academic courses and opt out of school after the 3rd or 4th standard. For these students, an aptitude test should be conducted at the school level to find out the aptitude of the student for a particular skill. Children and their parents can be advised to follow that particular skill. Chances are that such students will excel in those skills.

6.2.6 SSC may provide accreditation to Industrial Training Institutes / Industrial Training Centres (ITIs / ITCs) and other training centres, which will take 2-3 years to gain momentum. By that time, the SSC through its regional centres should estimate the skills to be developed in a particular area. After survey of these training institutes, SSC should identify the institutes which are already imparting those skills in their institutes and estimate the students that can be trained in those institutes.

6.2.7 SSC may study the curriculum for these courses and the existing timeframe for those trades. It should compare the curriculum it has prepared in consultation with industry, and try to bridge the gap so that to start with, minimum changes are made in the curriculums that the institutes are already following. Emphasis should be on reorienting the teaching methodology towards problem-solving.

6.2.8 Next, SSC may examine the trainers to assess their capability to impart the training as per industry's requirement. If trainers are not seen to be qualified enough, then they will have to be trained first, by sending them to the relevant works of big companies where they could be trained by the company trainers (free of cost) for a period of one month or so. SSC will conduct a test and give a certificate to the trainers.

6.2.9 SSC may interact with local industry and persuade them to give six months on-the-job training to the workers. During this period, industry can engage these workers as helpers to the skilled workers and give them necessary rotation. During these six months, industry could pay them nominal stipend since they will be saving on the wages of the helpers. By the time this batch completes its training, the next batch can be sent to the same factory for training. This will provide continuity to the factory.

6.2.10 This arrangement can be made by the SSC for the ITIs / ITCs provided:

- ITIs / ITCs agree to change the teaching system and curriculum as per the industry requirement.
- Get the courses of the specific trades accredited to SSC.
- Recognise only the certificate issued by SSC.

6.2.11 This will have the following advantages for the institutes as well as the students:

a. Existing ITIs do not have latest machinery and live jobs to train students; e.g., for a wireman, panels for wiring are required. Institutes cannot provide new panels for wiring every day, whereas in the factories it is a continuous process. Trainees will be working on new panels every day and will get practical on-the-job training. The same will be true for cable jointers at power plant sites or transmission line erectors at the transmission line sites, or transformer winding electricians in transformer manufacturing plants, etc.

b. Students will acquire training on the latest machines.

c. Industry will save cost spent on their unskilled labour.

d. Many students, found good by the factory management, will be selected and absorbed by the industry.

e. Students will start earning during training.

f. Industry can insist on certification by SSC for providing employment to these students.

g. Industry will find students employable and will initially recruit them as semi-skilled workers and in a short time, they will work as skilled workers.

h. Since there will be surety of employment, students will not mind paying for the certification after a couple of batches. This will start generating income for the SSCs.

6.3 Training by the Industry

6.3.1 NHPC and NTPC are executing hydro and thermal projects respectively all over the country. Each of their projects takes around 5 to 6 years to become operational and then runs for a long period. These organizations either take over the local ITIs or set up their own training centres to train local people who are engaged in their projects.

6.3.2 NSDC provides financial assistance and technical guidance for setting up private training institutes. IPPs can avail of the same and start skill training institutes at their sites which will help the local people. NSDC can devise some model for the construction industry. At any point of time, more than 300 to 400 such large projects will be running in the country and there is a potential to train 20,000 to 30,000 construction workers at these sites every year.

6.4 Review of the Working of Private Engineering Colleges and Polytechnics

Current Status / Areas of Concern

6.4.1 In the last two decades, huge foreign direct investment was made in the country mainly owing to:

- Revolution in communication systems,
- Liberalization of the economy,
- Low wages and salary structure in India compared to Western countries.

6.4.2 Foreign companies started outsourcing their IT jobs to India. Because of the flood of demand from IT and communication sectors after the mid-1990s, there was a severe shortage of engineers in all the branches. Fresh graduate engineers from all branches began opting for IT since they found the same more glamorous and better paying.

6.4.3 In view of the fast growth of industry and the massive requirement of technically qualified engineers and supervisors, in 1980s, the Government of India gave a mandate to the All India Council for Technical Education (AICTE) to encourage private and voluntary organisations to set up technical and

management institutes in India. The AICTE Act 1987 was passed to provide for the establishment of AICTE with a view to ensure proper planning and coordinated development of technical education system throughout the country. In this Act, the detailed procedure has been laid down for the approval for setting up these institutions and their accreditation so that students obtain quality education in these institutions.

6.4.4 As a result of these initiatives, the number of engineering colleges increased from less than 450 in 2002 to around 3,500 in 2012. Intake of students has increased from 0.84 million in 2008 to more than 1.76 million in 2012. In the last 3-4 years, almost 0.23 million seats were added every year.

6.4.5 With the rapid growth of engineering colleges during the last 10 years, it seems the norms required for starting an engineering college have not been observed strictly and many colleges were started in sheds without any workshop and lab facilities. Two decades back, 1% of aspiring engineering students gained admission, whereas now 80% of the aspiring students get admission. This is a clear indication that somewhere along the way, the admission norms have been diluted.

6.4.6 Despite having around 3,500 engineering colleges in the country, it is difficult to name even a few hundred which impart cutting-edge training. Teachers are poorly paid in these colleges and the quality of teachers is quite poor.

6.4.7 The quality of students coming out of NITs, IITs, and some of the private colleges is good. It is seen that government polytechnics and engineering colleges fare much better than the private polytechnics and engineering colleges. The graduates coming out of private engineering colleges do not possess the basic knowledge of their branch. With basic knowledge of engineering missing, such graduates can become safety hazards for power plants and the industry when they reach a decision-making level.

Recommendations

6.4.8 The Charter of AICTE gives in detail, action to be taken, including the penalties, etc. to be imposed, on the institutes for violating any of the criteria of approval. This even provides for cancellation of the recognition of such colleges. This may be strictly implemented in a transparent manner.

6.4.9 With the slowing down of the US and other economies in 2008 and the recession that followed, the growth of the IT sector and other sectors of the Indian economy slowed down. As a result, the requirement of engineers and diploma holders is reducing every year. Considering the present situation, the intake of these colleges might need to be optimised to avoid unemployment in this sector.

6.4.10 National Occupational Standards should be prepared for all branches of engineering and circulated to HR departments of major engineering and manufacturing companies. They can be asked to assess the capability of the students and status of infrastructure of the colleges on those parameters when they go for campus interviews. Based on this feedback, colleges should be identified where the majority of students fail to meet the National Occupational Standards and lack the basic knowledge. A committee of experts from industry and AICTE should visit these colleges and assess the teachers and also assess the other criteria laid down for giving approval. If a majority of teachers are found to be lacking the desired knowledge and approval conditions have been violated, necessary action in accordance with the Act should be taken.

6.4.11 AICTE should interact with the industry and encourage feedback from the industry about the quality of students they are receiving. If the students from certain colleges are found to be lacking in the basic knowledge of the stream they have passed and the quality standard is seen to be very poor, industry should give feedback to AICTE with details of such colleges with their comments. It should then be followed by action on AICTE's part to carry out detailed inspection of such colleges and initiate action as per rules.

6.4.12 Remuneration paid to teachers needs to be made more attractive to attract and retain good talent. It should be seen as an investment for future rather than expenditure.

6.5 Review of the Curriculum of Engineering Colleges and Polytechnics

Current Status / Areas of Concern

6.5.1 AICTE is responsible for laying down norms and standards for course curriculum, physical and instructional facilities, staff pattern, staff qualification, quality instructions and examinations. However, it is seen that the curriculum is not keeping pace with the latest technological developments. As a result, students coming out of the colleges do not have the latest knowledge of the developments in their respective fields and find it difficult to adjust. Consequently, industry does not obtain the real benefit.

Recommendations

6.5.2 A special teachers' exchange programme across the country should be arranged to bring in global perspectives in technical education. AICTE, which is responsible for upgrading the curriculum to keep pace with the latest developments, should involve industry experts in this exercise.

6.6 Industry-Institute Interaction

Current Status / Areas of Concern

6.6.1 There are very few industries that interact with technical institutes or give their current problems to them. Industry is not putting forth, to the institutes, their exact need for which the curriculum is to be modified or sandwich course is to be introduced.

6.6.2 Industry does not encourage students for summer training, which is neither taken seriously by faculty, students nor the industry. On-the-job training of students is by and large, non-existent.

6.6.3 Faculty members do not periodically update their knowledge and make themselves aware of the developments taking place in equipment design, etc.

Recommendations

6.6.4 Larsen & Toubro (L&T) Model

L&T started a two-year post graduate course in construction management with IIT Delhi and Chennai for their own engineers for their construction sites. The course was jointly decided by L&T and IIT. The salient features of the course:

- Entrance examination is conducted by L&T, but papers are set by IIT,
- Final exams are conducted by IIT,
- L&T pays monthly stipend to these students,
- Students fill up a two-year bond with L&T,
- IIT gets paid for conducting this course,
- These students undergo planned six months training at different types of sites of L&T,
- Most of these students become fast-track managers in L&T.

6.6.5 Some other excellent initiatives include the setting up of National Power Training Institute (NPTI) by the Ministry of Power and Welding Research Institute by BHEL, Trichy. These models need to be replicated.

6.6.6 Transformer, switchgear and generation equipment manufacturers can join together and start a one-year refresher course in NITs or IITs in each region. The L&T model can be adopted with six months training in the industry sponsoring these students. The benefits will be:

- The one-year course will be decided strictly in line with the requirement of the industry,
- Students will be taught by the faculty in these fields,
- Industry can reduce the internal training period of these students and thus save cost,
- Only those students who are interested in these fields will join these courses,

- Students will start earning while they are acquiring an additional degree.

6.7 Summer Training for Students

6.7.1 Students are generally referred by someone for summer training. The industry does not find this to be of much use. As part of corporate social responsibility, industry should willingly accept these students, treat them as their own trainees, and give them serious training. Students and faculty should also take this seriously. At the end of the training, a joint assessment should be conducted by the manager of shop floor and the college of the students. Due weightage should be given in the final examination. In the process, industry would find some of these students to be potential future assets to the company.

6.8 Guest Lectures by Qualified Industry Experts

6.8.1 IEEMA should identify the experts from different fields of the industry and prepare a panel of guest lecturers for the polytechnic and degree colleges.

6.8.2 IEEMA, in consultation with NSDC, should tie-up with some colleges in each region and prepare a schedule of lectures by these experts, on rotation basis, throughout the year. At least two or three lectures can be arranged annually in one college. The lecture fee can be paid by NSDC / colleges. These experts will update the students with developments in different products, etc.

6.9 Shop Floor Training

6.9.1 Institutes should keep one semester exclusively for shop floor training in an industry. For this, one unit may not be able to accommodate more than 3 or 4 students. College training and placement cells will have to interact with IEEMA and its members and arrange for this training. It is very important that the industry gives importance to this and ensures disciplined and planned training throughout the semester. At the end, there should be a system of joint evaluation by industry and institution, which should have weightage in the final scoring of the student. In the process, the industry may obtain some good future managers from these trainees.

6.10 Faculty Interaction with Industry

6.10.1 It should be made mandatory for the teachers to spend 3 to 6 months 'sabbatical' in the industry, at least once in every three to four years. This will be very useful for industries that give importance to R&D. Faculty members from the relevant discipline can bring in knowledge regarding the research going on globally in their field and they will add value to such projects. Similarly, the faculty will remain updated with the developments taking place in their field in the country. Some formal arrangement could be evolved by which industry could also be benefit by their stay.

6.11 Encourage Innovation by Students

6.11.1 In the ELECRAMA exhibition organised by IEEMA, a Students' Pavilion has been created where students from colleges display their inventions / models. IEEMA encourages them by giving away prizes for the best three models. Larger companies and PSUs should send their R&D heads to visit the Students' Pavilion and evaluate whether some of the inventions and models can be commercialized. This will greatly encourage and motivate the students. The government needs to support such activities by rewarding the commercialization of the students' inventions / innovations.

6.11.2 IEEMA should encourage students to present papers and attend technical workshops, seminars and give them free entry. Students from all the regions may be encouraged to present their live models at ELECRAMA in the Students' Pavilion.

6.11.3 The regional centres of the electrical equipment sector skill council, along with the industry, could organize district level skill competitions for the ITI students for the innovative ideas in all the skills accredited by the councils. Students along with teachers can be awarded for the top two best innovations. This can be an annual event.

7.0 Exports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7.0 Exports

7.0.1 Global trade in electrical equipment reached US$ 453 billion in 2010. India accounts for less than 1% of the total share of global exports of electrical equipment.

Table 7.1: Status of Indian Exports and Imports

Year	Merchandise Exports	Merchandise Imports
2006-07	US$ 126 billion	US$ 186 billion
2008-09	US$ 185 billion	US$ 304 billion
2010-11	US$ 251 billion	US$ 370 billion
2011-12	US$ 306 billion	US$ 489 billion

Source: DGCIS

7.0.2 In 2011, the Export Strategy Paper of the Department of Commerce set a target of doubling exports in three years to US$ 500 billion by 2013-14, with the long-term objective of doubling India's share in global trade by the end of 2020 through appropriate policy support.

7.0.3 As per recent trends of exports, it may not be possible to attain a target of US$ 500 billion exports by 2013-14. The trade deficit which was US$ 183 billion in 2011-12, is projected to increase to US$ 256 billion by 2013-14.

Table 7.2: Indian Electrical Equipment Exports and Imports

Year	Exports	Share in Total Exports	Imports	Share in Total Imports
2006-07	US$ 2.9 billion	2.3%	US$ 4.7 billion	2.5%
2008-09	US$ 4.6 billion	2.5%	US$ 8.3 billion	2.7%
2010-11	US$ 4.1 billion	1.6%	US$ 10.9 billion	2.9%
2011-12	US$ 4.6 billion	1.5%	US$ 15.7 billion	3.2%

Source: DGCIS

7.0.4 In 2011-12, India's electrical equipment exports, including power project exports, were only US$ 4.6 billion as against total exports of US$ 306 billion, which was about 1.5% of the total exports from the country. Imports of electrical equipment in 2011-12 were US$ 15.7 billion as against total imports of US$ 489 billion dollars, amounting to about 3.2% of the total imports. During the last five years, exports of electrical equipment have increased at a CAGR of 9.7% whereas imports have increased at a CAGR of 27.2%. While the share of power projects in exports is negligible, their share in imports is growing rapidly and was about 43% in 2011-12. The trade deficit in electrical equipment is, therefore, increasing year by year.

7.0.5 In 2011-12, domestic T&D equipment manufacturers had about 30% idle manufacturing capacity. At present, BTG equipment manufacturing capacity is being fully utilized. However, with the setting up of manufacturing capacity by seven other joint ventures, capacity is likely to increase to 40,000 MW by 2014-15 and very soon, even the BTG sector will be sitting on huge surplus capacity. Therefore, efforts have to be augmented to increase export of electrical equipment and restrict the rapid growth in import.

7.0.6 EPC electrical contractors and power plant developers have established a very strong presence in Middle East, Africa, Kazakhstan and some of the Latin American countries. A number of equipment like meters, switchgear, transformers, cables, towers, power plant equipment, etc., are not only being exported to these countries, but also to Europe and other developed countries. Indian industry is able to match the quality standards with some of the best global players.

7.0.7 Indian industry is improving its image globally by taking part in international exhibitions, arranging visits of large number of foreign buyers to ELECRAMA (a showcase exhibition of the Indian electrical equipment industry by IEEMA, which is held once every two years). Industry also needs to focus on the emerging markets and take proactive and timely action to improve quality of products and productivity to be more competitive.

7.0.8 However, the Indian EE industry is not able to compete effectively in the world market because of strong support of governments of some countries to their industry, like China, Brazil, South Korea and Russia, in terms of export subsidy, subsidy on raw material, subsidy on social security, and long-term line of credit at low rates of interest, which are also helping those countries in their economic development.

7.0.9 In order to make the industry more competitive and increase exports, the following areas need to be addressed:

7.1 Transaction cost of exports,

7.2 Port infrastructure,

7.3 Exports to emerging markets,

7.4 Review of trade agreements,

7.5 Funds availability and long term buyers' credit,

7.6 Support from Government and Indian missions abroad,

7.7 Technical barriers to exports,

7.8 Industry initiatives, and

7.9 Policy support.

7.1 Transaction Costs of Exports

Current Status / Areas of Concern

7.1.1 Trade-related transaction costs refer to a large number of regulatory requirements, compliance measures, procedures, and infrastructure-related costs, including, communication costs with clients, domestic transport costs, time and money spent at ports for shipment, etc. These costs are significantly higher in India as compared to other comparable developing countries.

7.1.2 The Government of India has been providing a conducive policy environment through a mix of measures including fiscal incentives, institutional changes, procedural rationalization, and efforts for enhanced market access across the world and diversification of export markets. The Government has been trying to improve export-related infrastructure, lowering of transaction costs and providing full refund of all indirect taxes and levies. Various initiatives have been taken to simplify and rationalize the procedural complexities in exports.

7.1.3 Although the situation has considerably improved, Indian exporters still have time and cost issues associated with transportation, documentation and clearances of export and import cargo. Clearly, such costs have adverse impact on the competitiveness of exports. According to the latest World Bank data, in 2012, the cost of exporting a 20-foot container in India was US$ 1,120 as compared to US$ 435 per container in Malaysia and US$ 580 in China. In India, exporters have to submit 9 elaborate documents as compared to 2 in France and 4 in Denmark. The entire procedure is still too cumbersome and too many agencies are involved in approval / inspection, etc.

7.1.4 India's clearance time at ports/airports is still far from the best international practices. Delays increase not only the cost of compliance but lead to impediments to efficient trading across borders like congestion at the ports, etc.

7.1.5 Trade facilitation is a key determinant of a country's competitiveness in the international market. At the global level, ease of doing business is one of the important parameters on which the status of trade facilitation in a country can be benchmarked. As per the World Bank's *Doing Business Report,* 2012 India ranks 109 among 183 nations, in terms of ease of trading across borders. India is far behind comparable economies like China, Indonesia and Mexico in this regard.

7.1.6 To enhance and sustain the rapid growth in the country's exports, it is vital that the transaction costs associated with exports are brought down. Any mitigation in these transaction costs will be a permanent benefit accruing to the exporters.

Recommendations

7.1.7 A shift to a trust-based export administration, backed by a more liberal policy environment, in line with international standards, has become a necessity for enhancing trade.

7.1.8 A Task Force on Transaction Cost was constituted by the Department of Commerce in October 2009, under the Directorate General of Foreign Trade (DGFT). The mandate of the Task Force was to look into various issues of export transactions that were affecting the competitiveness of Indian exports, provide recommendations to the government and initiate a set of "executable" remedial measures towards reducing latencies and costs associated with trading across borders.

7.1.9 The Task Force identified 44 issues and gave recommendations to sort out those issues in a time-bound manner. Out of the 32 agreed issues, 21 have been implemented. It is expected that with the implementation of these 21 issues and further 2 issues pertaining to filing of a single running bond for all Custom locations and refund of service tax in the form of all Industry Service Tax rate, which are likely to be implemented in near future, the transaction cost have been mitigated by approximately ₹ 2,100 crore. Permanent reduction of transaction cost through these initiatives will have a long-term positive impact on the competitiveness of India's exports.

7.1.10 The balance 23 issues identified by the Task Force ought to be implemented at the earliest. This will not only reduce the transaction cost but will reduce the time of transaction, which is also one of the highest in the world.

7.1.11 IEEMA should study the recommendations and send their views on the same to DHI and Department of Commerce so that timely action can be taken if any change, etc. is required.

7.2 Port Infrastructure

Current Status / Areas of Concern

7.2.1 India has 7,517 kms of coast line, 12 major ports and about 200 minor ports operated by states and private sector. Against a total traffic of 912 million tonnes during 2011-12, 560 million tonnes was the traffic handled at 13 major ports. Even though, the port handling capacity has witnessed a marked improvement in the last few years, the demand for cargo handling at the ports is increasing rapidly, thus resulting in port congestion. This leads to pre-berthing delays and longer ship turnaround time. Several major ports lack sufficient draft for large vessels, which results in cargo being shifted to smaller vessels, which increases the cost of shipment.

7.2.2 Indian ports, which handle 90% of the country's foreign trade, require substantial physical modernisation and also better handling of administrative problems. Although, over a period of time, average ship turnaround time has reduced and was 4.47 days in 2011-12 (Ministry of Shipping), it still continues to be high as compared to the modern international ports (about 10 hours).

7.2.3 In 2006, under the aegis of the Ministry of Shipping, it was decided that all the 13 major ports would prepare a seven-year plan for expansion and modernisation based on the PPP model. A number of new ports have been constructed on the PPP model and existing port handling facilities have been improved. This has been instrumental in redefining the role of ports from mere trade gateways to an integral part of the global and logistic chain.

7.2.4 The Maritime Agenda 2010-2020 of the Ministry of Shipping has set a target of 3,130 million tonne per annum port capacity for the year 2020. The objective is to both create capacity and also augment port performance by reducing transaction costs, to make Indian ports globally competitive. The proposed investment in major and non-major ports by 2020 is expected to be around ₹ 2.96 lakh crore (US$ 59 billion), with most of the investment coming from the private sector under the PPP model. Already several projects are under execution under the National Maritime Development Project.

7.2.5 As a result, the productivity of the ports, in terms of average ship turnaround, has

reduced and average ship berth output has increased considerably, even though it is still far below the productivity of modern international ports.

Recommendations

7.2.6 All these initiatives have improved the situation to some extent. However, even at most of the major ports which have been modernised, congestion, particularly at the Chennai port continues to be there from time to time and exporters have to pay congestion charges and also have to shift the cargo to other ports for their timely shipment. Road connectivity to the ports is still a problem, which needs to be improved.

a. The exporters should not be charged congestion charges which they have to pay for no fault of theirs.

b. The two-lane approach road to the ports should be invariably converted to four lanes for smoother flow of traffic.

c. Container handling facilities at the ports should be further augmented to avoid congestion at ports.

d. Railway connectivity to ports should be improved

7.3 Exports to Emerging Markets

Current Status / Areas of Concern

Top export destinations of Indian electrical equipment currently include Western countries (the US, the UK, Germany and the Netherlands), Gulf countries (UAE, Oman, etc.) and Singapore, Brazil, etc.

7.3.1 Africa, a continent with 54 countries that are rich in natural resources but have several least developed nations, is the fastest growing region in the world. Africa is an emerging market and has continued to witness high growth rate in recent times. Indian electrical equipment manufacturers and EPC contractors can benefit by pushing exports to the African continent.

China has a significant presence in these countries. The UK and Europe have been the biggest trading partners of these countries since the time these countries attained independence. India has very little presence in these countries presently.

IEEMA commissioned a study of the African market for electrical equipment in 2010 and identified 10 high-opportunity countries – Algeria, Angola, Egypt, Ghana, Kenya, Morocco, Nigeria, Senegal, South Africa and Tunisia. As per this study, all of these countries have inadequate basic infrastructure such as roads, railways, power, connected transmission lines, sub-stations and power distribution systems. Presently, Indian exports of electrical equipment to Africa are less than US$ 500 million.

In Algeria, Egypt, Ghana, Kenya, Morocco, Nigeria, etc., ambitious plans for addition of generation capacity are being taken up, which will generate tremendous scope for exports of BTG and T&D equipment.

As per EXIM Bank's Study on South African Development Community (SADC), 2012, total trade of SADC countries has increased from US$95.8 billion in 2001 to US$339.1 billion in 2010. India's total trade with SADC countries increased from US$2.4 billion in 2001-02 to US$20.4 billion in 2010-11. This study also indicates that there is great scope of export of electrical equipment to these countries.

7.3.2 The Latin American countries also offer a significant potential for export of Indian electrical equipment. India's total exports to these countries have increased from US$ 5.4 billion in 2007 to US$ 11.7 billion in 2011. However, Indian exports of electrical equipment to Latin America presently are less than US$ 0.5 billion and there is ample scope to increase export of electrical equipment.

According to an EXIM Bank study on the LAC Region, 2011, US$200 billion is going to be spent by Brazil for Soccer World Cup 2014 and the Olympics 2016. Similarly, Colombia is expected to invest US$ 28 billion in the exploration and refinery and related production sector.

7.3.3 The Central Asian countries are amongst the fastest growing economies in the world. The Central Asian economies are still

in the process of economic and political transformation. These countries have made a significant progress in market reforms and business environment has improved considerably. This region is rich in oil and gas and holds strategic importance for India. Exports of Indian electrical equipment to Central Asia are presently very negligible and only one or two companies are active in these countries. There is good potential for exports of Indian electrical equipment and investment in the generation and transmission sectors in these countries.

India is looking at Central Asia from the point of view of its annual global trade with Europe, CIS, Afghanistan and Pakistan, which by 2015 is expected to grow to US$ 500 to 600 billion. This region is of special interest to India because of its vast natural and energy resources and its proximity to India, though India's private sector has been reluctant to go to this region so far. India is looking closely at Central Asia and the Government of India has announced "Connect Central Asia" Policy in June 2012. In the absence of direct surface transport route, India is trying to improve connectivity in the North-South corridor and also other routes that can make use of Chabahar port in Iran and Zaranj-Delaram road in Afghanistan.

7.3.4 Similarly, neighbouring countries like Bangladesh, Afghanistan, Pakistan, Sri Lanka as well, have good scope for exports. Iraq, which is at the stage of reconstruction, also has good scope for exports as well.

Recommendations

7.3.5 Several years back, China and some of the European and US companies took a long term strategic step towards their trade with Africa. Having realised the importance of Africa's support, both diplomatically as well as in terms of natural resources including oil and gas, these countries began investing significantly in Africa and were well supported by their respective governments and missions. They partnered with local Africa companies since early nineties and set up manufacturing facilities.

There is a fundamental difference in the nature of India's engagement and the approach of some countries. The approach of the countries mentioned above has been state-driven, whereas India's foray into Africa is led largely by the private sector. These countries focussed on oil-rich countries and provided cheap credit to the poor and underdeveloped African countries and helped them in the development of their infrastructure like roads, power, hospitals, schools, and provided training to the local people. In the process, they have earned the goodwill and struck lucrative energy and infrastructure deals.

India has committed US$ 5 billion line of credit for various projects including railways rehabilitation, industrial parks, rural electrification, hydroelectric power, installation of power projects, transmission lines, energy transmission and distribution projects, housing projects, etc. Industry can avail of the lines of credit made operational by the EXIM Bank. In addition, the Indian electrical equipment industry can also tap opportunities available in the tenders floated by multilateral funding agencies and regional development banks.

There is an urgent need to understand the standards applicable to electrical equipment in African countries and make sure that Indian equipment meets those standards. In order to gain confidence of the customers in Africa, Indian equipment manufacturers and EPC contractors need to ensure timely delivery of equipment and completion of projects, including under lines of credit.

7.3.6 Presently, only three Indian companies in the field of lighting, transformers and transmission lines have any presence in Latin America. Other Indian companies have great scope for export of electrical equipment and investment in these countries. Indian companies can bring in project specific proposals to the EXIM Bank for the lines of credit, which can make their proposals attractive to the local utilities. Such investment will generate good scope for exports to the neighbouring countries.

India is considering becoming a member of the Inter-American Development Bank,

which is a welcome step and can help the industry in participating in the tenders in which only the member countries are allowed.

7.3.7 Kyrgyzstan and Tajikistan in particular amongst the Central Asian countries, offer opportunities for hydropower generation and transmission projects. Indian electrical equipment industry and EPC contractors should harness the close political ties India enjoys with Central Asian countries.

7.3.8 India is importing oil and gas, coal, etc., from African and Central Asian countries. Barter arrangement with these countries for export of electrical equipment and power projects can be negotiated, which will help the industry. Industry can identify the projects and IEEMA can approach DHI with country specific projects for this arrangement, which can be taken up by DHI with the Department of Commerce and the Ministry of External Affairs.

7.3.9 The possibility of setting up Joint Working Groups / Joint Commissions between India and some of these emerging markets should be actively explored by the concerned Ministries.

7.4 Review of Trade Agreements

Current Status / Areas of Concern

7.4.1 India has signed several FTAs / RTAs with various countries / blocs in the recent past. Some trade agreements include the ones signed with South Korea, Singapore, APTA, ASEAN, Malaysia, Japan, etc. Over a period of time, these agreements have benefited Indian exports broadly to some extent.

Import duties on electrical equipment are already low in India. Under the various FTAs being signed by India, import duties on most electrical equipment are being further reduced, while the domestic industry is operating only at 70% capacity.

7.4.2 In spite of signing of FTAs with India, ASEAN countries like Malaysia, Thailand, Indonesia, etc., give preference to local manufacturers by providing a clause in the contracts, thus creating entry barriers for Indian products. Indian utilities do not have any such provision in their ICB tenders and no preference is given to domestic manufacturers.

India has signed preferential trade agreements (PTAs) with Chile and MERCOSUR, comprising Argentina, Brazil, Paraguay and Uruguay, but the entire range of electrical equipment is not covered under the PTAs though there is significant potential for exporting these products from India.

7.4.3 The government seeks the views of industry associations / chambers of commerce on negative / positive lists, rules of origin / product specific rules, etc. at the time of negotiations or signing of the FTA, but the time made available for industry associations / chambers of commerce to respond is not enough and at times, they are not able to collect the required data and respond quickly.

7.4.4 There is also the threat of third countries supplying goods to India utilising some FTAs with less stringent rules of origin.

Recommendations

7.4.5 IEEMA may carry out an analysis of the specific threats to the domestic electrical equipment industry arising out of FTAs / RTAs and present analytical reports to the government.

7.4.6 IEEMA may carry out a detailed study of the FTAs already signed, identify the electrical equipment for which India has got surplus manufacturing capacity and see if the quality of the equipment being produced matches with the best in the world. If imports of such equipment are significant and the import duty on such items is already low or is likely to come down further because of signing of a FTA, then IEEMA may take this up with the Department of Commerce, through DHI, to review the FTA under the trade defence instruments inbuilt in the agreement.

7.4.7 In the focused markets of Africa, Central Asia, Latin America and Caribbean countries, there exist immense opportunities for exports of electrical equipment from India. IEEMA may conduct a study of all these countries to ascertain

the status of the manufacturing of electrical equipment in these countries and identify the type of competition that Indian industry is likely to face and the exact scope of export potential in these countries. Based on this study, IEEMA may recommend to DHI / Department of Commerce to sign FTAs, along with the negative and positive lists of the equipment they would like to be included in the FTA, including the expansion of existing PTAs already signed. This will ensure right benefit to the industry through these FTAs.

7.4.8 If any electrical equipment is not put on India's negative list, the rules of origin should be strong so that no third country exports take place under the FTA being signed — the origin criteria (Product Specific Rule) should be CTSH (change at the six digit level) with a regional value content of not less than 40%.

7.4.9 Ministry of Power may consider asking Indian power utilities to provide domestic purchase preference to Indian companies, as is being provided by Malaysia, Thailand, Indonesia, China, Brazil and other countries.

7.4.10 The industry needs to seriously pursue the option of imposition of anti-dumping duty, safeguard duty, etc., in cases where domestic industry is getting hurt due to rapidly escalating imports at very cheap prices.

7.5 Funds Availability and Long Term Buyer's Credit

Current Status / Areas of Concern

7.5.1 Presently, the types of financing options available to exporters are:

- Government of India's concessional lines of credit through EXIM Bank to developing countries in Asia, Africa and Latin America,
- EXIM Bank's own lines of credit to economically strong developing countries and regional development banks,
- Pre and post shipment credit, buyer's credit, supplier's credit, term loans, etc. from EXIM Bank, and
- Pre and post shipment finance, etc. from commercial banks.

7.5.2 As on 1st March 2013, EXIM Bank had 168 operational lines of credit covering 75 countries in Africa, Asia, Latin America, Europe, Oceania and the CIS, with credit commitments of over US$ 8.69 billion, available for financing exports from India. The time taken for activation of a line of credit and release of funds is long and the procedure is time-consuming. The interest rates in India are not as competitive as compared to what companies from other countries have access to, based on which they bag contracts on a long-term finance basis.

Recommendations

7.5.3 While it may be difficult to extend lines of credit on commercial basis by EXIM Bank for power projects, which generally require a longer credit period, the Government of India should consider extending long-term lines of credit for the power sector at attractive interest rates, equivalent to prevailing best global interest rates for such projects, with credit periods of 10-15 years. Alternatively, the Government could consider providing interest equalisation support to EXIM Bank for such project specific lines of credit.

Lines of credit should be project-specific, depending on the specific project requirements of the recipient country and procedures need to be further simplified. Project-specific lines of credit will benefit the industry significantly. More funds need to be allotted to the banking sector to finance project exports from India.

7.5.4 Goods and services for minimum 75% value of the contracts covered under the lines of credit should be sourced from India. A suitable relaxation not exceeding 10% may be considered on a case-to-case basis for exceptional reasons, especially in case of projects having civil construction. Sometimes, EPC contractors availing Indian lines of credit, source some equipment from China, South Korea and other countries to derive cost advantage and improve their profitability. Supplies of Indian products against Indian lines of credit / grants should

be made mandatory to the maximum extent possible in the recipient countries.

7.5.5 Buyer's Credit under the National Export Insurance Account (NEIA), launched last year by EXIM Bank and ECGC, under which credit is provided to foreign buyers of project exports from Indian companies, is a welcome step and needs to be expanded. Buyer's credit should be extended by EXIM Bank to foreign private companies also, subject to appropriate security being available. The Government of India recently announced the introduction of a "pilot scheme" with 2% interest subvention for project exports through EXIM Bank for countries in the SAARC region, Africa and Myanmar. The objective of the scheme is to boost India's exports in these countries by providing long term concessional credit through the EXIM Bank. Such intervention should be expanded and be available for a longer period.

7.5.6 More value of lines of credit specifically dedicated to the power sector should be provided. For such products, equipment successfully tested in CPRI should be acceptable to host countries.

7.5.7 There are clear guidelines for issue of lines of credit by EXIM Bank. However, no clear guidelines are available for allocation and utilisation of other type of grants, or bilateral aid which is extended by the Government of India to other countries like Sri Lanka, Bhutan, Nepal, Bangladesh, etc. In the absence of these guidelines, the projects financed by Government of India often land up with foreign companies. Therefore, clear guidelines need to be issued in this regard.

7.6 Support from Government and Indian Missions Abroad

Current Status / Areas of Concern

7.6.1 Some foreign governments very actively support their investors and traders in Africa and other countries. They provide concessional loans for the development of underdeveloped countries, which generates goodwill, and the industries from these countries get preferential treatment.

7.6.2 The missions of some countries are very actively involved with their respective industry. They have full information about the local industry and the potential of investment available in that country, the type of competition available in different sectors and the support the host country is looking for in respect of finance, training of workers and technology tie-ups. They arrange meetings and other gatherings to introduce the industry leaders from their country to the local industry.

7.6.3 Important political leaders and government representatives from these countries make frequent visits to emerging markets to reiterate support and build trust.

Recommendations

7.6.4 The Focus Africa Programme was launched in India in 2001 for seven countries and later extended to almost all countries in Africa. Under this programme, the Government of India extends assistance to exporters and export promotion councils to visit countries and sponsor trade delegations. These efforts need to be supplemented, even for the Focus LAC and Focus CIS Programmes.

7.6.5 Support from Indian Missions

Indian missions in different countries are providing assistance for exports of Indian products, including carrying out market surveys, arranging buyer-sellers meets, facilitating Indian business delegations, promoting trade fairs, etc. Indian electrical equipment manufacturers should more effectively avail of the assistance provided by Indian missions and also provide continuous feedback to the Indian missions on the specific assistance required.

Indian missions could also provide active support to Indian industry by providing basic information about the long-term development plans of the country, the type of competition Indian companies are likely to face and the number of countries and the companies who are already operating in that country, including details of MNCs operating and their operating mode. Indian missions could also help industry by putting them in touch with local chambers of commerce

/ industry associations for identification of reliable agents and business partners for collaboration, etc. Feedback about the perception of local utilities and EPC contractors about Indian products could be very useful. System of monitoring and feedback to the industry will ensure full support from these missions in all the countries.

The number of trade promotion activities conducted by the Indian Government and missions in the emerging markets need to be expanded.

7.7 Technical Barriers to Exports

Current Status / Areas of Concern

7.7.1 Some countries insist on type-testing of equipment by ASTA, UK; KEMA, Netherlands; CESI, Italy, etc. They do not recognise the test carried out in CPRI. In this situation, not only do the products become costlier but it also becomes impossible to meet the delivery schedules by utilising Indian equipment. As a result, either EPC contractors cannot participate in the tenders or they participate but offer equipment from other countries.

7.7.2 The experience of executing projects in India is not considered for prequalification by some utilities outside India and they insist on project experience outside the country. On the contrary, utilities in India accept the test certificates issued by Chinese labs and accept certificates issued by Chinese utilities.

Recommendations

7.7.3 National Accreditation Board for Testing and Calibration Laboratories (NABL) has accredited CPRI Bangalore, Bhopal and Hyderabad. NABL is signatory to mutual recognition agreement under Asia Pacific Laboratory Accreditation Cooperation (APLAC) and this is recognized by many countries including Australia, the US, China, South Korea, Singapore, etc. CPRI should identify the countries where their certification is not accepted and take it up with their counterparts in those countries. If required, it can be taken up even at the government-to-government level.

7.7.4 Many SMEs are not able to upgrade technology and meet the international standards. The Government of India may provide for technology up gradation fund to the domestic electrical equipment industry to improve the quality of products for exports.

7.7.5 The experience of companies within India should be considered at par with experience abroad for similar jobs particularly for power projects, transmission lines and distribution projects. Specific cases where customers in some countries do not consider this experience should be taken up with those countries through the Department of Commerce.

7.8 Industry Initiatives

Current Status / Areas of Concern

7.8.1 Participation of the domestic electrical equipment industry in specialized international trade fairs is limited and participation of domestic industry in international technical seminars is also limited. Participation of domestic electrical equipment industry in trade delegations accompanying high dignitaries like Ministers / Prime Minister / President is negligible.

Recommendations

7.8.2 International trade fairs offer brand-building opportunities to the exhibiting companies to reach out to the right target group, with an opportunity to interact with actual buyers face-to-face and receive first-hand feedback. International trade fairs also provide exporters with the opportunity to demonstrate their advantages over their competitors as well as benchmark against their rivals to identify areas of improvement.

The participation of Indian manufacturers of electrical equipment in specialized trade fairs abroad should be actively encouraged. Focused trade delegations to potential target markets should be regularly organized.

7.8.3 IEEMA may give specific proposals to DHI for the visits of business delegations to target markets along with Indian dignitaries and buyer-seller meets. CPRI representatives

could accompany such delegations to showcase the institute's capabilities.

7.8.4 Other promotional activities such as information booths, catalogue shows and online marketing, generate attention without necessitating higher expenditure, and should be explored by Indian manufacturers.

7.8.5 IEEMA may present a proposal for the study of markets in Central Asia and Latin America to DHI to identify target markets and products.

7.8.6 Training programmes on exports for capacity-building of Indian SMEs manufacturing electrical equipment should be organized.

7.8.7 A Pan-Africa portal should be created which should have a database of the tenders in English, and developments going on in these countries, etc. This can have the information about the prospective countries for the Indian exporters to target. There are a number of business forums in African countries with whom IEEMA should establish a working relationship.

7.8.8 Some BTG equipment and EHV switchgear is manufactured in India under license from foreign collaborators. Indian companies may insist on a clause allowing them to export to other countries.

7.8.9 EPC electrical contractors should consciously insist on equipment of Indian origin in their contracts.

7.8.10 Continuous innovation in industry operations and products can lead to better productivity and better service to the customers by resulting in cost reduction, product quality improvement, improvement in delivery schedules, etc. This will lead to competitive Indian products in overseas markets. Companies which undertake product innovations for export markets should be suitably incentivized.

7.9 Policy Support

Current Status / Areas of Concern

7.9.1 Under the Foreign Trade Policy (FTP), a number of incentives have been announced by the Department of Commerce to promote exports. Specific incentives for exports of electrical equipment are not present.

Recommendations

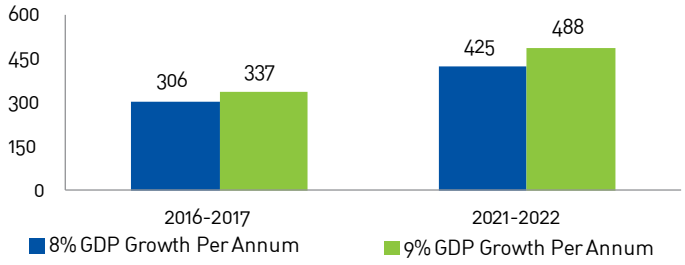
7.9.2 IEEMA should conduct a study to identify the products with export potential and the potential markets, across the full range of potential markets and products, and make out a case for grant of the Market Linked Focus Product Scheme (MLFPS) benefit. IEEMA may give detailed and specific recommendations to the government in this regard.

8.0 Conversion of Latent Demand

8.0 Conversion of Latent Demand

8.0.1 The Government of India has enhanced its focus on power sector over the last decade. The participation of the private sector has increased considerably in power generation, transmission and distribution segments which has resulted in a significant increase in the availability of funds.

Figure 8.1: Installed Capacity Required as per Integrated Energy Policy (GW)



Source: Integrated Energy Policy, August 2006

8.0.2 As per the Ministry of Power, fund requirement for the power sector in the 12th Plan will increase to approximately ₹ 13.72 lakh crore (US$ 275 billion) as against ₹ 10.32 lakh crore in the 11th Plan. Out of this, investment planned for generation, transmission and distribution is ₹ 6.39 lakh crore (US$ 128 billion), ₹ 1.80 lakh crore (US$ 36 billion) and ₹ 3.06 lakh crore (US$ 61 billion) respectively. Funds required in other areas like renewables, captive power, R&D, renovation and modernization, etc. would be ₹ 2.48 lakh crore (US$ 50 billion).

8.0.3 It is estimated that currently, the total domestic electrical equipment industry size exceeds ₹ 1.20 lakh crore (US$ 25 billion). This industry not only caters to the demand of the power sector but also the other sectors of the economy. Hence, the performance of this industry affects the overall economy of the country.

8.0.4 As per IEEMA estimates, the production of major T&D equipment has grown from ₹ 38,920 crore (US$ 8.6 billion) in 2006-07 to ₹ 64,235 crore (US$ 13.4 billion) in 2011-12 at a CAGR of 10.5%. Production of BTG equipment has increased from ₹ 8,933 crore (US$ 2 billion) in 2006-07 to ₹ 31,000 crore (US$ 6.5 billion) in 2011-12 at a CAGR of 28.3% and the production of other electrical equipment was ₹ 25,000 crore (US$ 5.2 billion) in 2011-12.

8.0.5 The growth of the entire electrical equipment industry is dependent on the generation capacity addition, which results in the growth of transmission and distribution sectors. BTG equipment manufacturers and the manufacturers of transformers and other equipment required for generation, transmission and distribution are already geared up to meet the expected demand of all the sectors in the 12th Plan and beyond.

8.0.6 In the 11th Plan, an addition of record 53,922 MW has been achieved in the power generation capacity, with a highest ever annual capacity addition of 19,459 MW in 2011-12. Though the achievement in 11th Plan is more than two and a half times that of the 10th Plan, it is 68.5% of the initial target of 78,700 MW and 86.5% of the revised target of 62,374 MW set for the 11th Plan.

Table 8.1: Planned and Achieved Generation Capacity from 2007-08 to 2011-12

Year	Planned Addition in MW	Achievement in MW
2007-08	12,039	9,263
2008-09	7,530	3,454
2009-10	14,507	9,585
2010-11	20,359	12,161
2011-12	17,601	19,459

Source: CEA

Table 8.2: Status of Power Plants Commissioned in the 11th Plan

Sector	Number of Plants under Construction	Capacity in MW	Number of Plants Commissioned	Capacity in MW
Central	55	35,824	22	16,175
State	70	26,783	42	17,237
Private	36	16,093	23	18,651

Source: CEA

8.0.7 In the 12th Plan, addition of about 88.5 GW is expected, excluding 30 GW of renewable capacity addition. On an average, annual

capacity addition was 4,200 MW in the 10th Plan, which increased to 10,800 MW in the 11th Plan. In the 12th Plan, 17,700 MW is expected to be added per year. Considering the fact that the share of private sector has increased in the last 2-3 years, the target is achievable provided the right kind of support is made available to the power generation sector.

8.0.8 Private companies have already announced a capacity addition of nearly 100 GW in the coming 6 to 7 years. The share of the private sector in capacity addition is expected to increase from 36% in 11th Plan to 53% in the 12th Plan.

8.0.9 It is interesting to note that the maximum number of power plants have been commissioned in the state sector in the 11th Plan. In comparison to the central and private sector, states are able to complete their projects quicker perhaps due to the following reasons:

- Absence of problems arising due to land acquisition,
- Forest and environment clearance is granted on priority,
- Road connectivity and construction power are provided for by the concerned State Government.

8.0.10 Various studies have shown that complexities in acquiring multiple approvals for primary resources like infrastructure, land acquisition, construction power, etc., and disproportionate level of details sought with applications are among the major difficulties in the implementation of projects. These delays have a cascading effect on the capacity utilisation and growth of the BTG and T&D equipment industries.

8.0.11 The electrical equipment industry will make the necessary investment to cater to the 12th and 13th Plans' projected capacities to meet the demand of generation, transmission and distribution sector, but if there is a slippage in achieving these planned capacities, then the industry will be left with idle capacity, which will not only retard the growth of the industry but will also affect the GDP growth and employment potential of this industry.

Timely completion of generation projects is extremely important for the healthy growth of the electrical equipment industry, and in turn overall growth of the country.

8.0.12 The factors contributing to the delay in completion of power projects, and as a result adversely impacting the growth of the electrical equipment industry, include:

8.1 Lack of infrastructure,

8.2 Land acquisition,

8.3 Environment and forest clearances,

8.4 Construction power supply,

8.5 Fuel linkage, and

8.6 Signing of PPAs and financial closure of projects.

8.1 Lack of Infrastructure

Current Status / Areas of Concern

Coal pithead thermal power projects located in remote areas, hydro power plants located at far-flung hilly areas and nuclear power plants located near the sea coast, face very serious problems because of the lack of infrastructure facilities in these areas. This leads to considerable delay in completion of these mega projects.

8.1.1 Approach Road to Site

8.1.1.1 Manufacturers of heavy electrical equipment face serious problems in transporting heavy and oversized dimension consignments (ODC) ↑98 MT on the state roads and bridges due to non-availability of bridges and roads equipped to carry such heavy weight ODC. There is not much problem in transporting the OD consignments on the national and state highways, but most of the other state and district roads and bridges approaching the project sites are not suitable for transporting heavy consignments.

8.1.1.2 At certain project sites, particularly in case of hydro projects and coal pithead power plants, even motor able roads are not available. For most of

the time, transporters are required to strengthen the bridges and roads in order to transport such heavy consignments to the site. This causes delays in movement of items like TG stators, rotor, boiler drums, gas turbines, power transformers, etc., to project sites, affecting commissioning schedules and hence, increasing the cost charged on the manufacturers and power plant developers.

8.1.1.3 National and state highways generally do not create any handicap. State and district roads leading to the identified projects need to be widened or constructed and bridges need to be strengthened. If these roads and bridges are constructed by the developer, then it takes longer since there are multiple procedures that need to be completed (IPP has to conduct survey of the route, carry out geological surveys, get alignment approved, acquire land and then construct the road. If the road passes through a forest, then forest clearance has to be obtained.) These procedures can easily take more than one year for a small stretch of road, resulting in project delays.

Recommendations

8.1.1.4 Most of the hydro projects are identified by CEA before being advertised for bidding, though total capacity, as well as unit size of individual projects, may vary at detailed project report / CEA concurrence stage. Since the capacity of such projects and the unit sizes are generally known, CEA may develop a mechanism so that data regarding ODC can be collected by the concerned State Government. Based on the same, the size of road and types of bridges can be decided and the concerned State Government can approach the Central Government, if needed, for funding of the construction of the desired roads and bridges after consulting the Ministry of Road Transport & Highways. States should be provided funds for construction of these roads and bridges before the bid process is initiated. This will enable the developers to move the construction machinery faster and the construction will start immediately. The cost of such project-specific roads and the overhead costs can be recovered from the IPP by the State Government. If this is indicated in the bid, then IPPs will take this cost into consideration for the bidding. The cost of such roads is not going to be high but this initiative can save almost one to two years of the project schedule and in turn, benefit the states too.

8.1.2 Transportation of ODC by Railways

8.1.2.1 Getting the approval of the railway authorities for transportation of ODC on the railway lines and to the particular station siding is very time-consuming. Allotment of low bed, high capacity railway wagons for ODC is also a big constraint. There being no separate freight corridor, it takes a lot of time to transport heavy consignments from factory to the site.

Recommendations

8.1.2.2 Vision 2020 of Indian Railways, prepared in 2009-10, envisages the share of goods transport to increase from 35% to 50%. The railways are to strengthen their position in the bulk segment they serve at present. Adequate number of wagons, including high speed and high capacity wagons, will be procured. Two dedicated freight corridors from Ludhiana to Dankuni and Mumbai to Delhi will be made operational by 2020. In addition, four more dedicated corridors will be taken up. The railways will also establish and improve connectivity to all the ports. With these plans, the movement of ODC on the railways will improve considerably. However, till such time these plans are implemented, the movement of wagons carrying power plant equipment should be given priority with tracking through GPS.

8.2 Land Acquisition

8.2.1 Land for Power Projects

Current Status / Areas of Concern

8.2.1.1 One of the major reasons for the shortfall in planned versus achieved capacity addition in generation is the problem of land acquisition.

8.2.1.2 Half of the loans sanctioned remain unutilised because of delays in land acquisition, forest and other clearances. As a result, banks are not prepared to increase their exposure to the power sector, which leads to further delays in project completion. This negatively impacts the growth of BTG and T&D equipment industry.

8.2.1.3 Acquisition of government forest and private land is very cumbersome and a long drawn process. The existing Land Acquisition Act has several flaws. In case of power plants awarded to IPPs, land is to be acquired by them. Because of the outdated Land Acquisition Act, private developers face a number of problems, which include:

- There being no clear cut policy for the compensation of land and resettlement of displaced persons, agreement by all the owners becomes a very serious issue.
- The moment the landowners and local leaders find that the project is being developed by a private developer, they look to obtain the maximum benefit. Occasionally, even the private developers try to exploit the landowners. Then there is always the likelihood of some landowner going to court and stalling the entire process for years.
- There is a gap of years between the time the project is conceived, tendered and awarded and land is acquired. During this period, the cost of construction, cost of power plant equipment, etc., shoots up and at times, the project itself becomes unviable at the quoted tariff.

Recommendations

8.2.1.4 A Land Acquisition Act, which will make land acquisition process fair and fast, needs to be enacted at the earliest.

8.2.1.5 State Governments are able to generally acquire land much quicker for the development of industrial estates, SEZs, Metros and highway projects and power plants as people do not raise many objections. The State Government gets the support of local leaders and NGOs. Landowners accept the price paid by the State Government and agree to the resettlement plan of the government.

8.2.1.6 Considering the fact that State Governments derive many benefits with upcoming power plants in the state, the following is suggested:

8.2.1.7 Once the projects are identified, location is known, feasibility report is ready, it is possible to estimate the land required for a particular project, except in the case of hydro power projects which are site specific, with almost 80 to 90% accuracy. CEA can issue guidelines for the same. There have been cases when the developers acquire land much more than the actual requirement and later on use the surplus land for other purposes. This also leads to resentment on the part of the landowners. CEA can assess the land for most of the thermal power projects based on the actual land required for similar capacity power plants already under operation.

8.2.1.8 The responsibilities of the State Government may, inter alia, be:

- To acquire the land (government / private / forest) for the power project (like they

are doing for other purposes) and also negotiate at its own terms with land owners as per the policy adopted by respective State Governments.

- Solve issues of resettlement and rehabilitation associated with projects through the developer.

8.2.1.9 Once the State Government decides on the land compensation and R&R policy for the project site, the cost of same with overhead cost and escalation provision, etc., can be indicated in the tender so that developers can pay the State Government upfront on being awarded the power project. If a developer wants to acquire more land than that estimated by CEA then the additional land should be acquired by the developers on their own.

8.2.2 Land for Substations

8.2.2.1 The land for switchyards and other substations is normally government land or private land. Even though land required for switchyards and other substations is much less as compared to power projects, PGCIL and other EPC contractors face problems similar to that of power projects in acquiring the land from private parties and even from government. Construction of many stations is held up due to land acquisition problems. This affects the T&D equipment manufacturers very badly.

Recommendations

8.2.2.2 To reduce the requirement of land for the construction of substations, use of Gas Insulated Sub-stations (GIS), which require only about 30% area as compared to conventional sub-stations, should be increasingly adopted in metros, hilly and urban areas.

8.2.2.3 While planning for new suburban areas and industrial centres, provisions for laying substations and transmission lines within the towns should be kept in mind. Town planners should get the requirement of land for the sub-stations and for extension of the transmission lines to meet the future demand of the town from the planning departments of the DISCOMs / transmission companies of the state.

8.2.2.4 As explained in case of power projects, the onus for land acquisition for the substations and transmission towers should lie with the State Governments. The contractor can pay the price of land with cost of overheads, escalation, etc. This will avoid delays and litigations. The state is the direct beneficiary of these stations and for them to acquire these small pieces of land will be much easier.

8.3 Environment and Forest Clearances

Current Status / Areas of Concern

8.3.1 Environment and forest clearances, perhaps, take the longest time and cause maximum delays in projects.

8.3.2 Major delays in case of power projects are mainly due to:

- Cumbersome procedures for environmental and forest clearances,
- Appraisal by the Central and State Appraisal Committees,
- Approval by the Regulatory Authority.

8.3.3 The entire process takes more than a year and one is still not sure after going through all the steps as the clearance may come with some conditions that may not be possible to fulfil. These delays lead to cost overruns and at times, even before clearances are available, the cost overruns make the project unviable at the contracted power tariff.

8.3.4 Steps involved in the process:

- Proposal for diversion of forest land has to be submitted to the State Forest Department,
- The State Department carries out the survey and identifies the land for afforestation,

- The developer has to acquire that land for the development of the alternate forest,
- The developer sends the proposal to the Department for approval,
- This is then sent to the State Forest Minister for his approval,
- Finally, MoEF grants the final approval.

8.3.5 Forest clearance is required for transmission line projects. Transmission projects are planned along with the upcoming generation projects and any delay / mismatch in commissioning of associated evacuation lines may result in delay in evacuation of power. While finalizing the route alignment for transmission lines, the main emphasis is on avoidance of forests, national parks, wildlife sanctuaries and other ecologically sensitive areas. However, it is not possible to avoid such areas completely. Forest clearance is a mandatory requirement for the portion of the line traversing through the forest. Getting forest clearance takes considerable time due to lengthy process and involvement of different levels of officials at the State and Central Government level.

8.3.6 Also, as per MoEF circular dated 3 August 2009, the written consent of Gram Sabha has been made compulsory under the Forest Rights Act 2006 for all the proposals involving diversion of forest land under the Forest Conservation Act 1980. Proposals where consent is pending with the Gram Sabhas are unlikely to get forest clearance.

8.3.7 Transmission projects mainly for evacuating power from for UMPPs / MPPs normally traverse through forest and pass through many state boundaries involving a large number of revenue districts and villages / talukas, etc. The number of Gram Sabhas involved in acquiring clearance for transmission lines is substantial and obtaining their written consent under Forest Rights Act 2006 is extremely difficult.

Recommendations

8.3.8 The forest and environment clearance can be arranged by the developer. However, for utilising the forest land for the project, developers have to develop equivalent area as forest for which they have to prepare a compensatory afforestation plan. They do not have the technical competence nor do they have the knowledge of the alternate land available. This job should be left with the District Administration / Forest Department who are experts in this field.

Since the Forest Department will be in a better position to get a faster approval from their Department and MoEF, they may conduct the following procedures:

- Identify area for the preparation of an afforestation plan along with district administration,
- Conduct a survey, assess the damage to the forest and prepare a compensatory plan,
- Develop the alternate forest area.

The entire cost, along with the overhead cost, should be borne by the developer and compensatory forest can be directly developed by the State Forest Department. This way, this clearance would be obtained very quickly and the developers can concentrate on the completion of the projects.

For the transmission lines being developed by PSUs and state utilities the above procedure is being adopted but this facility is not extended to the private developers. This should be extended to them as well.

8.3.9 Since transmission projects have negligible impact on forest / environment and its habitants including the tribal people, therefore, it is suggested

- Transmission projects may be examined to be exempted from obtaining consent of the Gram Sabhas under Forest Conservation Act 1980, as a special case.
- At present, the Regional Offices of MoEF are competent to issue clearance for diversion of forest land up to 5 hectares. Forest proposal involving more than 5 hectares and up to 40 hectares are processed at

Regional MoEF offices and forwarded / recommended to MoEF, New Delhi for the Minister's approval. After the approval of the Minister, the proposal is again sent back to the Regional MoEF, who then issues the forest clearance. As a special case, power of Regional Offices of MoEF, to grant approval, should be enhanced from the present 5 hectares to 40 hectares for transmission projects and in case of UMPPs and MPPs this may be increased to 200 hectares, with clear cut powers and guidelines, in order to expedite clearances.

8.4 Construction Power Supply

Current Status / Areas of Concern

8.4.1 This problem is serious in case of hydro and nuclear power projects, which are remotely located and in totally underdeveloped areas. At times, there is no power in these areas. For construction purposes, such projects require 10 to 30 MW power.

- Once the developer begins his infrastructure activities, there is no power and getting approval for construction power is a time consuming process. He has to manage the development activities with DG sets. At times, getting diesel at these sites itself is difficult and a costly proposition.
- For 10 to 30 MW power, a 132 kV line is required to be constructed. This will require site survey, design, approval, ROW clearance, supply of towers, transformers and other switchyard equipment, erection and commissioning. Before the line is commissioned approval of electrical inspector is needed. All these activities take a very long time even if the line length is only 10 to 15 km.

Recommendations

8.4.2 Once the project is identified and feasibility report is ready, the requirement of construction power can be ascertained. Subsequently, local DISCOM should be asked to construct the line for construction power by the State Governments. They may have ready designs for such lines and type tested towers. It will be very easy for them to complete these lines in a short time. They can take up this activity immediately after the power project is awarded so that by the time the developer mobilises site, the line is ready. Developers will be happy to pay the cost of these lines along with overhead costs, etc., to the DISCOM. The Ministry of Power / CEA may issue guidelines for the same.

8.5 Fuel Linkage

Current Status / Areas of Concern

8.5.1 This has become a very serious problem. Coal India is not equipped to meet the coal demand of so many thermal power plants and to add to that, many mining projects of the private sector have been stalled due to the environment issue and the land acquisition problem. Even the import of coal and gas has become a serious problem because of cost escalation. Banks will not be willing to finance power projects without the Fuel Supply Agreement (FSA).

8.5.2 Since January 2012, IPPs have taken up this issue strongly with the Government of India, fuel linkage is being given top most importance and is being addressed by the government. Once the fuel supply is assured to the power plants, financial closure will be quick and power plants will get commissioned quickly, which will give confidence to the industry for investment.

8.6 Signing of Power Purchase Agreements (PPAs) and Financial Closure

Current Status / Areas of Concern

8.6.1 All the above factors, including road connectivity, land acquisition, transportation, construction power availability, forest and environment clearance, etc., cause delay at the start of the project and the element of uncertainty of the date of commissioning and commercial operation of the project is very high. Because of these delays, the resources deployed at the project site remain underutilized for a long period, which leads to cost escalation and thus, the cost of generation increases. Equipment

manufacturers lose confidence and therefore, refrain for making investment for the future.

8.6.2 Towards the end of 2011, according to the RBI, the total exposure of the banks to the power sector, was about ₹ 3 lakh crore. Most public sector banks have reached their 20% limit of exposure to the power sector. Because of slow progress at the plants, half of the loans sanctioned are not being utilized and fund flows to new projects have dried up.

8.6.3 Before sanctioning the loan for such projects, banks have started insisting on:

- Availability of land,
- Forest and other clearances,
- PPA in position.

8.6.4 The major consumers of power in the country are power distribution companies. They are not able to open an Escrow account because of the poor financial health of most of these DISCOMs on account of very high AT&C losses. Together, DISCOMs have close to ₹ 1.90 lakh crore bank debt (as on 31st March 2011) and further loans to these companies are being refused. As a result, PPAs are not getting finalized. This will delay completion of many projects and thus will impact the growth of electrical equipment industry.

Recommendations

8.6.5 As explained above, states are the major beneficiaries of the power projects, including 12% free power from hydro power projects in central and private sectors. If they are getting 12% free power from a 200 MW hydro power plant, at 60% load factor, they will get almost ₹ 100 crore worth of power free in a year plus other benefits. If the project gestation period can be reduced by two years they will save almost ₹ 200 crore against purchase of power. As such, states should take initiatives for:

- Expeditious acquisition of land for power generation / T&D projects, etc.,
- Making water and construction power available for power projects,
- State Forest Departments should take the responsibility of creating alternate forest. IPPs should reimburse cost to the state along with the overhead cost. In this situation, bankers will be willing to finance the projects and IPPs will be able to start construction much earlier and the project gestation period will also reduce. This will be a win-win situation for all.

8.6.6 For signing of PPAs, it is important to reduce AT&C losses and improve the financial health of the DISCOMs. DISCOMs make the maximum losses in the rural areas. They are not able to recover even 10% of the billed amount from rural areas. The CERC is asking states to give the distribution areas to the private parties on input-based franchisee for 10 to 20 years. The investment required for improving the areas is also to be made by the franchisee. This is an excellent initiative as:

- The revenue realization of DISCOMs increases from day one,
- Their O&M cost becomes zero and system gets renovated / improved and made theft-proof without having made any investment.

8.6.7 Urban areas with high losses may be given to reputed good performing private parties on input-based franchisee model and for the rural areas, DDG power plants from bio gas, solar, wind or small thermal units should be set up. The parties who are awarded input based franchisee for the urban areas can be asked to set up DDG plants in rural areas for which the cost of generation can be subsidised by the government. Investment for improvement of the system will be made by franchisee. The revenue will increase from the day the franchisee takes over. Losses on rural areas, which are more than 80%, will reduce. The irrigation load in the rural areas can be met by segregated feeders which can feed power for the specified period of the day. The Ministry of Power, in consultation with state utilities, can pursue the same.

8.6.8 The announcement by the Government of India in 2012 of the package on 'Financial Restructuring of DISCOMs' should positively

impact the entire power sector. As part of the package, the government has mandated concrete and measurable action by the DISCOMs, including annual revision in tariffs, bringing in private investment in distribution, etc., which hopefully will be strictly monitored. If what is envisaged is put in place, then it should help in substantially reforming the ailing distribution sector. With the debt restructuring and improvement in the financial health of the DISCOMs, banks will regain confidence in sanctioning loans to them. The package should be implemented expeditiously.

Summary of Key Recommended Interventions

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Category A: Short-Term to Medium-Term
Category B: Medium-Term to Long-Term

Recommended Interventions	Long-Term Benefit to Industry	Long-Term Benefit to Government / Country
4.0 Industry Competitiveness		
4.1 Establish Level Playing Field		
Category A IEEMA may prepare the case for the products which are being imported at low import duties, where there is surplus capacity existing in the country and submit to DHI and Ministry of Finance for increasing the basic customs duty on such products (*Refer para 4.0, 4.1.6, 4.1.7*).	Import of products that have surplus capacity in the country will get discouraged.	Trade deficit will get reduced.
Category A Ministry of Power / CEA may consider to issue a suitable advisory to incorporate the following clauses in all the tenders for power projects and transmission and distribution projects:		Imports of products that are already available in surplus quantity in the country will reduce.
1. Local taxes, duties, octroi, etc., paid by Indian manufacturers to be added to the final price of the imported equipment in order to make it at par with bids from Indian manufacturers (*Refer para 4.0, 4.1.10, 4.1.11*).	Will be a good support to domestic industry, which will be able to compete with foreign suppliers.	
2. In all the tenders issued by domestic utilities for power generation, transmission and distribution projects, price, quality and delivery schedule being equal, domestic suppliers to be given preference (*Refer para 4.0, 4.1.12*)	Will encourage domestic industry.	
3. Preference to Indian products may be stipulated in procurement by government utilities. Some percentage of total procurement by any government utility may be of 'Made in India' products (*Refer para 4.0, 4.1.13*).	Will encourage domestic industry.	
4. Foreign suppliers of BTG equipment, GIS, power transformers of large capacity, etc. may be required to set up manufacturing facilities in the country (*Refer para 4.0, 4.1.14*).	Utilities will be assured of spares.	Will ensure operations of power plants without interruptions.
5. Provide a condition in the contract that foreign manufacturers should submit performance certificate of the products offered from independent international agencies. Performance report submitted by the utilities of the parent country should not be acceptable (*Refer para 4.0, 4.1.15*).	Provide a level playing field to domestic industry.	Will ensure only quality products are imported in the country.
6. For reciprocal market access, Indian utilities may consider inclusion of similar clauses in their procurement procedures as done by foreign utilities in their respective countries. (*Refer para 4.0, 4.1.15*).	Provide a level playing field to domestic industry.	Promote domestic industry.

Recommended Interventions	Long-Term Benefit to Industry	Long-Term Benefit to Government / Country
Category A For R-APDRP and other distribution contracts, where the amount of small equipment is very large, REC / PFC / utilities may introduce a provision for type testing of sample equipment picked up from site (*Refer para 4.0, 4.1.16*).	Contractors will not have any incentive to import poor quality cheap products from outside.	Quality of products will improve and O&M cost of distribution systems will come down.
Category B Ministry of Power to consider making phased manufacturing process (PMP) mandatory in the country for supply of all major equipment (Refer para 4.0, 4.1.14).	Sector will not face problem of spares and industry will acquire new technology.	Will bring in FDI into the country.
4.2 Secure Supplies of Critical Raw Material / Key inputs		
Category A Ministry of Finance to consider to reduce the basic customs duty on import of CRGO electrical steel from 5% presently to nil, till the time sufficient domestic production commences (*Refer para 4.2, 4.2.1, 4.2.1.1*).	Input costs of transformers will reduce.	Project cost will come down.
Category A Ministry of Steel to consider allowing import of CRGO electrical steel from foreign mills as per international standards, till at least 10 of the 14 foreign mills, covering at least two-third of the Indian demand, obtain BIS license. License issued by BIS to foreign suppliers may be made valid for five years at a time (*Refer para 4.2, 4.2.1, 4.2.1.2*).	Transformer industry will not face shortage of CRGO steel and will be able to keep its commitments.	Projects will not get delayed because of delay in supply of transformers.
Category B Ministry of Steel to take the lead to undertake concerted efforts to ensure indigenous manufacture of CRGO electrical steel in a time bound manner. IEEMA to consolidate annual requirement of CRNGO electrical steel and boiler quality plates and give to Ministry of Steel to increase production of the same in the country (Refer para 4.2, 4.2.1, 4.2.1.3).	This will bring down the cost of products.	Government will be able to save foreign exchange.
Category A Ministry of Mines, through the Indian Bureau of Mines, may initiate special scheme to assist clay miners in using beneficiation and other techniques to improve the quality of clay required for insulators. This can be provided by giving (a) technology support on clay blending and treatment; (b) setting up of a sophisticated lab, which can be accessed by the miners for testing; (c) training on quality systems and control practices (*Refer para 4.2, 4.2.4, 4.2.4.1*).	Miners will be able to improve technology and the quality of domestic clay will improve.	Import of clay by insulator manufacturers will not be required.

Recommended Interventions	Long-Term Benefit to Industry	Long-Term Benefit to Government / Country
4.3 Improve Quality of the Products in all the Segments, especially SMEs		
Category B IEEMA may appoint a consultant for preparing a detailed proposal for establishing electrical industry clusters of SMEs in all the four regions. Based on this proposal, IEEMA will prepare the type of funds required for setting up of cluster, upgrading the technology of the existing units near those clusters, posting of foreign experts, setting up labs and the infrastructure required in these clusters and submit to DHI. Technology up gradation fund may be then made available to these SMEs (Refer para 4.3, 4.3.6).	SMEs will get expert advice for technology up gradation at the least cost, nearby lab facilities, availability of cheap and quality power, benefit of developed infrastructure, etc.	The quality of products will improve and exports will increase.
Category A Ministry of Power may devise a suitable mechanism to ensure that utilities follow a transparent two part bidding process and e-tendering is encouraged at all levels (*Refer para 4.3.8*).	Experienced contractors with proven track record will get qualified for the jobs.	The quality of products will improve.
4.4 Standardise Product Ratings and Specifications		
Category B CEA may standardise specifications of transformers and equipment required for distribution systems, in collaboration with IEEMA, NTPC, NPCIL, PGCIL, BHEL, REC, etc. (Refer para 4.4, 4.4.3, 4.4.4, 4.4.5, 4.4.6, 4.4.7).	Cost of inventory of equipment and spares will come down. Competition from abroad will reduce.	There will be a possibility of shifting of equipment from one site to other site in case of delays and projects will get completed fast.
4.5 Focus on International Standardisation		
Category B For each product, industry is represented on the concerned BIS committee. There may be mirror committees for all the electrical products in IEEMA. These committees will work in coordination with the respective Product Divisions in IEEMA. Industry members of the respective BIS committee will be the members of the mirror committee. All amendments, new specifications will be referred to this mirror committee. The industry members on this committee to prepare comments on behalf of the industry, finalise and send to BIS for forwarding the same to IEC. These members may also represent the country in the meetings of IEC (Refer para 4.5, 4.5.1, 4.5.7).	Indian products will be more aligned to international standards. Risk of change in specification which will adversely impact Indian equipment will get reduced.	India will be able to influence standardisation at the base level.
4.6 Upgrade Testing Facilities		
Category A IEEMA, along with CPRI, may identify testing facilities that are not available in CPRI and also the regions where testing facilities are not available. DHI may identify the land available with the sick PSUs which can be offered to CPRI for establishing test labs (*Refer para 4.6, 4.6.7, 4.6.9*).	Industry will not have to send equipment for type testing to Netherlands, Italy, or elsewhere.	Exports will improve.

Recommended Interventions	Long-Term Benefit to Industry	Long-Term Benefit to Government / Country
Category A CPRI may aggressively promote its certification services for its EHV and HV for gaining wide acceptance in the international markets. CPRI may also be invited to join the delegations to other countries to promote its services / capabilities (*Refer para 4.6, 4.6.6, 4.6.12*).	The equipment manufactured and tested in India will get accepted and industry will become competitive.	Type tested equipment will get accepted in other countries and exports will increase.
Category B Type testing of imported small electrical equipment in Indian test labs may be made mandatory. IEEMA to work on this suggestion for taking up with the Department of Commerce, in consultation with DHI and the Ministry of Power (Refer para 4.6, 4.6.13).	This will give international recognition to our test facilities / certification.	Only equipment of the right quality will be imported.
4.7 Better Working Capital Management and Contract Conditions		
Category A Ministry of Power to consider to constitute a committee of experts from centre, states, PSUs and private sector to prepare a standardised model bidding document for major electrical works to reduce bidding process and contractual implementation difficulties. (*Refer para 4.7, 4.7.10*).	The document will be fair to all and will help in timely execution / closing of the contracts.	The chances of litigation will reduce, and this will help in timely execution of contracts.
4.8 Improve Manpower Productivity		
Category B Ministry of Labour & Employment may, along with the industry, review the present labour laws and amend the same to encourage productivity and performance linked wages. These changes may take into consideration the socio economic progress made by labour over the years (Refer para 4.8, 4.8.7, 4.8.8).	Managements will be able to have good relations with labour and will be able to reduce cost of production.	Investors will be encouraged to invest in India and set up production facilities.
5.0 Technology Up gradation		
5.1.4 Nuclear Power Plants		
Category A Domestic companies need to forge tie-ups with world leaders and start manufacturing domestically 400 / 765 kV GIS and cables and 765 kV bus ducts, 500 kVA and above uninterrupted power supply systems with batteries and automatic insulator washing equipment for outdoor switchyards of nuclear power plants. NPCIL may make domestic manufacturers aware of their technical requirements for major equipment (Refer para 5.1.4, 5.1.4.2).	Domestic industry will get associated with technology development for specialised products.	Country will gain due to technology development and by reducing imports of such equipment.

Recommended Interventions	Long-Term Benefit to Industry	Long-Term Benefit to Government / Country
5.2.5 Superconductivity		
Category B Department of Science & Technology may, along with all stakeholders, review the present status of the research in superconductivity, superconducting cables, and cryogenic technology along with PGCIL, CSIR, BARC, TIFR and others. Based on the review, PGCIL can be asked to prepare a project report for this research indicating the fund requirement, responsibilities of different agencies and estimated time required to develop demonstration equipment with this material. PGCIL may lead this research project. This can possibly be funded through the National Clean Energy Fund (NCEF) (Refer para 5.2.5, 5.2.5.5, 5.2.5.6).	Size of the equipment will get reduced, and there will be a phenomenal increase in the loading capacity of the equipment.	The current carrying capacity of transmission lines will increase manifold. A major constraint in designing higher capacity transformers and generators will be removed.
5.3.1 Power Supply to Rural Areas		
Category A CEA and Ministry of Power may consider DDG from solar, wind, small local thermal, micro hydel, biogas as an alternative to grid supply for rural areas which is very costly and is adding to the high AT&C losses of the DISCOMs. Industry is prepared to set up such DDG plants in rural areas, if government can subsidise the cost of this generation based on the actual cost of grid supply. Ministry of Power and Ministry of New & Renewable Energy can jointly develop a model for the same. Budgetary support needs to be enhanced for RGGVY so that DISCOMs are encouraged to implement DDG (*Refer para 5.3.1, 5.3.1.4, 5.3.1.6*).	It will open up new market for the industry. Utilities will have to buy less power at higher cost during peak hours.	AT&C losses of the DISCOMs will come down on a long-term basis. Demand on the grid will reduce. Maintenance cost for utilities will come down.
Category A The parties who are awarded input based franchisee for the urban areas can be asked to set up DDG plants in rural areas for which the cost of generation can be subsidised by the government. The revenue will increase from the day the franchisee takes over. Losses on rural areas, which are more than 80%, will reduce. Investment for improvement of the system will be made by franchisee. The Ministry of Power, in consultation with state utilities, can pursue the same (*Refer para 5.3.1.1, 5.3.1.2, 5.3.1.3, 8.7.7*).	This will open up huge potential for distribution companies. The input franchisee model will pick up fast.	The government will have to invest less for improving the distribution system. Financial health of DISCOMs will improve.
5.3.3 Power Generation through use of Advanced Class Fuel Cell		
Category B R&D on advanced class fuel cell technology may be taken up under technology mission. There being no rotating part, these produce no noise, emission is negligible, waste heat can be used for heating / air-conditioning, etc. (Refer para 5.3.3, 5.3.3.4).	This technology will be very useful for decentralised power plants for malls, hospitals, etc.	Such distributed generators will reduce the demand on the grid and reduce emissions.

Recommended Interventions	Long-Term Benefit to Industry	Long-Term Benefit to Government / Country
5.3.4 Quality of Power Supply		
Category A Under the R-APDRP Scheme, PFC may introduce a clause that DISCOMs should strictly follow the CEA (Technical Standards for Connectivity to the Grid) Regulations, 2007 which give guidelines for keeping the voltage and current harmonics within the desired limit (*Refer para 5.3.4.2*).	Quality of power will improve.	
Category A Power factor needs to be improved by installing automatic power factor control (APFC) panels in the system after proper designing. This can be considered to be a part of R-APDRP Scheme (*Refer para 5.3.4.3).*	Quality of power will improve.	
5.4.3 Expert Committee on R&D for Electrical Equipment Industry		
Category A Committee of R&D experts from BHEL, NTPC, NHPC, NPCIL, CPRI, PGCIL and BTG manufacturers and reputed T&D equipment manufacturers may be formed under DHI which will meet on regular basis and understand the technological advancements taking place in generation, transmission and distribution sectors, identify the gaps and put up proposals to DHI. They will also share their global experience and identify the areas where Indian industry needs to upgrade their technology (*Refer para 5.4, 5.4.3*).	Industry will be aware of the developments taking place in different sectors in a structured manner in time and will be ready for the future.	Technologies which will have long-term benefits for the country could be identified and research for the same can be taken up.
Category A For major R&D areas like IGCC, advanced ultra-supercritical technology, superconductivity etc., a collaborative, consortium approach like PGCIL Bina Model for 1,200 kV system may be adopted on PPP model. This will result in faster development at the least cost (*Refer para 5.4, 5.4.3, 5.4.6*).	Industry will be able to develop new products at least cost and time.	R&D in the basic research will improve.

Recommended Interventions	Long-Term Benefit to Industry	Long-Term Benefit to Government / Country
6.0 Skills Development		
6.1 Estimate Requirement of Manpower by the Industry for Different Kind of Skills		
Category A IEEMA to identify the unique skills required mainly for the electrical equipment industry and estimate the type of skills required in different industries, their annual intake and the number of persons being trained in that area in different skills by ITIs and industrial training centres (ITCs) and establish the skill gaps in that area (*Refer para 6.1, 6.1.2, 6.1.9*).	Region-wise data will be available to the industry and IEEMA can plan for their training.	This will help NSDC to achieve its goal, reduce unemployment, etc.
Based on this study, IEEMA will submit a proposal to NSDC, with support of DHI, for forming of a Sector Skill Council (SSC) for electrical equipment industry (*Refer para 6.1, 6.1.10, 6.1.11, 6.1.12*).		
SSC will map the typical job profile of the skilled manpower working in the industry and assess the competency requirement of the same in consultation with industry (*Refer para 6.1, 6.1.13, 6.1.14*).	The industry will be able to set the competency standard for each skill and devise the curriculum accordingly.	Employability of the students locally will improve and they will not move to metros for employment.
6.2. Accreditation of ITIs and other ITCs		
Category A Selection of Training Institutes: After survey of existing training institutes, SSC will identify the institutes which are already imparting the unique skills identified for electrical industry and estimate the students that can be trained in those institutes. SSC will study the curriculum for these institutes and try to bridge the gap. Emphasis should be on reorienting the teaching methodology towards problem-solving (*Refer para 6.2, 6.2.6, 6.2.7*).	The curriculum of training institutes will be in line with the requirement of industry.	The quality of education and training system in the existing institutes will improve.
Category A Training of Trainers: SSC will examine the trainers and arrange for updating their skills and free of cost training in the industry (*Refer para 6.2, 6.2.8*).	The quality of training will improve.	Knowledge of the teachers will get updated on a regular basis.
Category A Practical Training of Students in Industry: SSC will interact with local industry and get them to agree to give up to six months on-the-job training to the workers by engaging them as helpers to the skilled workers on nominal stipend. After six months, these students will be replaced by ITI to maintain continuity. This arrangement can be made by SSC for the ITIs / ITCs provided (a) they agree to change the teaching system and curriculum as per the industry requirement; (b) get the courses of the specific trades accredited to SSC; (c) recognise only the certificate issued by SSC given to students who clear the final test conducted (*Refer para 6.2, 6.2.9, 6.2.10, 6.2.11*).	The students will be very well trained in their trade and will be employable directly as skilled workers. The industry will have to spend very little on their training after joining.	This will help in accreditation of training institutes and the quality of training will improve with the involvement of industry.

Recommended Interventions	Long-Term Benefit to Industry	Long-Term Benefit to Government / Country
6.3 Training by the Industry		
Category A NHPC, NTPC, NPCIL and IPPs who are executing long gestation projects can interact with the local ITIs or set up their own training centres for giving training to local people who are engaged in their projects. NSDC can devise some model for the construction industry. There is a scope of training 30,000 to 40,000 students every year (*Refer para 6.3, 6.3.1, 6.3.2*).	The industry will be able to get skilled manpower locally, which will be much cheaper.	Local persons will be able to get training and get employment in the project sites and they will not have to migrate to big cities for jobs.
6.4 Review of the Working of Private Engineering Colleges and Polytechnics		
Category B SSC will develop National Occupational Standards for degree and diploma courses as per industry needs. These will be circulated to HR departments of major manufacturing companies. Based on this, industry can assess the students and infrastructure of the colleges during campus interviews and give feed back to AICTE for taking action as per rules (Refer para 6.4.10, 6.4.11).	Once students are assessed and selected based on the National Occupational Standards, the quality of engineers / supervisors passing out from colleges will improve.	Will improve the employability of students and reduce unemployment.
Category B Remuneration paid to teachers in degree and polytechnic colleges is very poor and may be adequately enhanced to attract and retain good talent (Refer para 6.5, 6.5.12).	Industry will get better qualified engineers.	Quality of education will improve.
6.5 Review of the Curriculum of Engineering Colleges and Polytechnics		
Category B In order to make sure that curriculum meets the needs of the industry and is keeping pace with the latest development, AITCE may enhance the involvement of industry experts in review of curriculum(Refer para 6.5, 6.5.1, 6.5.2).	Engineers coming out will have updated knowledge.	Unemployment will get reduced.
6.6 Industry-Institute Interaction		
Category A Transformer, switchgear and generator equipment manufacturers can join together and start a one-year specialized course in NITs or IITs in each region in line with a construction management course started by L&T. As a part of this course, 6 months' training can be in the industries that are sponsoring these students (*Refer para 6.6.1, 6.6.2,6.6.3, 6.6.4, 6.6.6*).	The industry will acquire specialists in their field and will have to spend less time and money for training.	This will improve the managerial skill of the engineers, and overall working efficiency and productivity will improve.
6.7 Summer Training for Students		
Category A If industry wants good students, they need to cooperate with institutions and encourage students to come for summer training and treat this as a serious responsibility (*Refer para 6.7.1*).	The industry will get an opportunity to assess the students and get good candidates for employment.	Summer training will not remain a mere formality and student will gain practical knowledge of the industry.

Recommended Interventions	Long-Term Benefit to Industry	Long-Term Benefit to Government / Country
6.8 Guest Lectures by Qualified Industry Experts		
Category A IEEMA, in consultation with NSDC, may tie-up with some colleges in each region and prepare schedule of lectures by these experts by rotation throughout the year. At least two or three lectures per year can be arranged in one college in a year. Lecture fee can be paid by NSDC / colleges. These experts will update the students with developments in different products (*Refer para 6.8.1, 6.8.2*).	This will improve interaction of the industry with institutes and will benefit both.	Quality will improve.
6.9 Shop Floor Training		
Category B One semester should be kept exclusively by the institutes for the shop floor training in an industry. College training and placement cells should interact with IEEMA and its members and arrange for this training. At the end of the semester, there may be a system of joint evaluation by industry and institution which should have weightage in the final scoring of the student (Refer para 6.9.1).	The industry will in the process get some very good future managers out of these trainees.	
6.10 Faculty Interaction with Industry		
Category B It may be made mandatory for the teachers to spend 3 to 6 months in the industry / institutes of higher learning, etc., at least once in every three / four years. Some formal arrangement could be evolved by which industry could also be benefitted by their stay in the industry (Refer para 6.10.1).	This will be very useful for the industries which give importance to R&D in their industry. Faculty members from the relevant discipline can bring in a lot of knowledge.	Will update knowledge of teachers continuously and will benefit all.
6.11 Encourage Innovation by Students		
Category A In ELECRAMA, a Students' Pavilion has been created where students from colleges can display free of cost their inventions / models. Some of these models could have potential for commercial exploitation (*Refer para 6.11.1, 6.11.3*). IEEMA may encourage students to present papers and attend technical workshops, seminars and give them free entry (*Refer para 6.11.2*).	Industries can pick up some models which could be of great commercial value for the future.	Will encourage students to innovate and usher in a culture of innovation.

Recommended Interventions	Long-Term Benefit to Industry	Long-Term Benefit to Government / Country
7.0 Exports		
7.1 Transaction Costs in Exports		
Category A Transaction cost of exports in India is amongst the highest in the world. The balance 23 issues out of the 44 identified by the Task Force on Transaction Cost of Exports, constituted by the Department of Commerce in October 2009, need to be addressed at the earliest. IEEMA to study the recommendations on urgent basis and send their views on the same to DHI and Department of Commerce so that timely action can be taken if any change, etc. is required (*Refer para 7.1, 7.1.8, 7.1.9, 7.1.11*).	Will simplify the procedures for exports. Time taken and shipment cost will come down.	Will help to enhance competitiveness of Indian exports.
7.2 Port Infrastructure		
Category A Port Authority of India may consider to not charge congestion charges, which exporters have to pay for no fault of theirs, and improve container handling facilities at the ports. Ministry of Road Transport & Highways to provide four lane approach road to all the major ports (*Refer para 7.2, 7.2.6*).	Once issues identified by the Committee on Transaction Cost of Exports are addressed, the cost of shipment per container will get reduced.	Indian ports will be at par with the world's best ports and their cargo handling capacity will increase.
7.3 Export to Emerging Markets		
Category A *Export to African Countries*: Various studies have shown that there is significant potential for exports of Indian electrical equipment. Large investment is being planned in some African countries in power generation, transmission and distribution. *Exports to Central Asian Countries*: Over a period of time, the investment environment in these countries has improved. These countries are rich in minerals and oil and gas. They need investment in power and other infrastructure projects. Department of Commerce, Ministry of External Affairs, along with Ministry of Petroleum & Natural Gas, can extend long term credit to these countries for improving their infrastructure like roads, power generation, transmission and distribution and realise payment through import of oil and gas and other minerals. This can open avenues for export of equipment and also business for EPC contractors (*Refer para 7.3, 7.3.5*).	This will open up very good export opportunities for the Indian industry.	India will be able to import oil and gas and other minerals.

Recommended Interventions	Long-Term Benefit to Industry	Long-Term Benefit to Government / Country
Category A India is considering becoming a member of the Inter-American Development Bank. This will help the industry and may be expedited by the Government of India (Refer para 7.3, 7.3.6). In the Latin American countries, there are significant export opportunities for India. Indian companies can identify project specific proposals and take up with the EXIM Bank for the lines of credit. Such investment will have good scope for exports to neighbouring countries (*Refer para 7.3, 7.3.5, 7.3.7, 7.3.8*). The possibility of setting up Joint Working Groups / Joint Commissions between India and some of these emerging markets may be explored by the government (*Refer para 7.3.9*).	This will open up very good export opportunities for the Indian industry.	This will improve the balance of trade with these countries.
7.4 Review of Trade Agreements		
Category A IEEMA to carry out a detailed study of the FTAs and highlight the specific threats to the domestic electrical equipment industry due to surge in imports, so that the FTAs can be reviewed by the Department of Commerce under the trade defence instruments inbuilt in the agreements (*Refer para 7.4, 7.4.5, 7.4.6*).	This way, the industry will be able to put up its case and safeguard its interests effectively.	Domestic industry will not get harmed.
7.5 Funds Availability and Long-Term Buyer's Credit		
Category A Government of India may consider extending long-term lines of credit for the power sector at attractive interest rates, equivalent to prevailing best global interest rates for such projects, with credit periods of 10-15 years. Alternatively, the Government could consider providing interest equalisation support to EXIM Bank for such project specific lines of credit. Lines of credit should be project-specific, depending on the specific project requirements of the recipient country and procedure to be further simplified. More funds need to be allotted to the banking sector to finance project exports from India (*Refer para 7.5, 7.5.3*).	This will help the industry to become globally competitive.	Exports will increase.
Category A EXIM Bank may consider to make it mandatory to the maximum extent possible for the country availing Indian lines of credit to source equipment manufactured in India only. CPRI testing may be acceptable to these customers (*Refer para 7.5, 7.5.4*).	EPC contractors will not source cheaper equipment from other countries.	Domestic industry will grow.

Recommended Interventions	Long-Term Benefit to Industry	Long-Term Benefit to Government / Country
Category A EXIM Bank / ECGC may extend the scope of Buyer's Credit under the National Export Insurance Account (NEIA), under which credit is provided to foreign buyers of project exports from Indian companies, and provide buyer's credit to foreign private companies also, subject to appropriate security being available (*Refer para 7.5, 7.5.5*).	This will help the industry to become globally competitive.	Exports will increase.
Category A Ministry of Finance may consider to issue clear guidelines for allocation and utilisation of other types of grants or bilateral aid which is extended by Government of India to other countries like Sri Lanka, Bhutan, Nepal, Bangladesh, etc., to ensure that the projects financed by the Government of India benefit Indian manufacturers (*Refer para 7.5, 7.5.7*).	Indian manufacturers will gain.	Exports will increase.
7.6 Support from Government and Indian Missions Abroad		
Category A Indian electrical equipment manufacturers should more effectively avail of the assistance provided by Indian missions and also provide continuous feedback to the Indian missions on the specific assistance required. Indian missions to help the Indian industry by organising meetings with local industry and the decision makers of the country, provide information on the long term development plans and policies of the host country and also facilitate, through local chamber of commerce and industry associations, identification of local partners, etc. They can help in organising the visits of local authorities / foreign buyers to ELECRAMA organised by IEEMA and like events (*Refer para 7.6, 7.6.5*).	Indian companies will be able to get the right support and establish faster in other countries.	Exports will increase.
7.7 Technical Barriers to Exports		
Category A CPRI to identify the countries where their certification is not accepted and take it up with their counterparts in those countries. If required, CPRI may put up the proposal to DHI for taking up at government-to-government level (*Refer para 7.7.3*).	Indian equipment will get accepted for exports.	Exports will increase.
Category B IEEMA to identify the specific cases where the experience of Indian companies within India is not considered at par with experience abroad for similar jobs. These to be forwarded to the Ministry of External Affairs and Department of Commerce for taking up at appropriate level (Refer para 7.7, 7.7.5).	Indian manufacturers will get fair treatment abroad and chances of qualification will improve.	Exports will increase.

Recommended Interventions	Long-Term Benefit to Industry	Long-Term Benefit to Government / Country
7.8 Industry Initiatives		
Category A IEEMA to motivate domestic manufacturers of electrical equipment to participate in specialised trade fairs abroad. IEEMA to organise periodic visits of business delegations abroad to emerging markets. CPRI representative(s) may also accompany such delegations to showcase its capabilities (*Refer para 7.8, 7.8.2*).	Acceptance of Indian products abroad will improve.	The country's image will improve.
Category A IEEMA to submit a proposal for study of markets in Central Asia and Latin America to DHI to identify target markets and products (*Refer para 7.8, 7.8.5*).	Identification of target markets / products will benefit Indian exporting companies.	Exports will increase.
Category A IEEMA to establish a working relationship with counterpart organisations in the emerging markets (*Refer para 7.8, 7.8.7*).	Better global networking will help Indian manufacturers.	
Category B Indian companies manufacturing BTG equipment and EHV switchgear, under license from foreign collaborators, to insist on a clause allowing them to export to other countries (Refer para 7.8, 7.8.8).	Restrictions imposed on Indian manufacturers for exports will reduce.	Exports will increase.
Category A Department of Commerce may incentivise exporting companies which undertake product innovations for export markets (*Refer para 7.8.10*).	Innovations in industry operations and products will lead to better productivity and service to the customers.	Indian products becoming more competitive in the overseas markets.
7.9 Policy Support		
Category A IEEMA to conduct a study to identify the products with export potential and the potential markets and make out a case for grant of the Market Linked Focus Product Scheme (MLFPS) benefit (*Refer para 7.9, 7.9.2*).	Incentivize exports of electrical equipment.	Exports will increase.
8.0 Conversion of Latent Demand		
8.1 Lack of Infrastructure		
Category A Once the power project is identified for bidding, the road linking the project site from the state highway to the project may be constructed by the respective State Government for which funds may be provided by the Central Government to the concerned State Government and later on reimbursed with interest and overheads by the successful bidder / developer (*Refer para 8.0, 8.1.1, 8.1.1.4*).	If the cost is indicated in the bid, then IPPs will take this cost into consideration for the bidding. This initiative can save almost one to two years of the project schedule.	The probability of timely completion of project will improve.

Recommended Interventions	Long-Term Benefit to Industry	Long-Term Benefit to Government / Country
Category A Railways to fast track projects for improving connectivity of the railway tracks to the ports and to pit heads (*Refer para 8.1.2, 8.1.2.2*).	This will reduce the cost and time of transportation of the equipment to site and from ports to the plants.	This will help in reducing the overall cost of the project and in turn the cost of power.
8.2 Land Acquisition		
Category A Based on the assessment made by CEA, responsibility for acquisition of land for the power projects and rehabilitation and resettlement of displaced persons may be expedited by the concerned State Government. Private developers to reimburse the cost of land with overheads to the State Government. On similar lines, the onus for land acquisition for the substations and transmission towers may also lie with the State Governments (*Refer para 8.2, 8.2.1, 8.2.1.5, 8.2.1.7, 8.2.2, 8.2.2.4*).	Developers will know the cost of land and R&R and provide the same while bidding for the project. Developers will not lose any time in land acquisition and will be able to plan and start the projects immediately.	Bankers will feel comfortable in extending loan for such projects. States will derive the maximum benefit because of early commissioning of the projects. They will enjoy benefit of 12% free power in case of hydro power projects.
A Land Acquisition Act, which will make the land acquisition process fair and fast, needs to be enacted at the earliest (*Refer para 8.2, 8.2.1.4*).	This will avoid delays and litigations and contractors will be able to complete the projects fast.	This will avoid litigation which delay the projects by years. The state is the direct beneficiary of these substations and for them to acquire these small pieces of land will be much easier.
8.3 Forest and Environment Clearance		
Category A Responsibility for identifying the land creating the alternative forest in case of power projects and transmission lines passing through forest area should lie with the State Forest Department / District Administration. Developer can pay the cost with over heads to the Forest Department (*Refer para 8.3, 8.3.8*).	Getting forest clearance will be easy and fast and IPPs will be sure of completing the project in time.	The possibility of timely completion of project will improve and the states will start deriving the benefits much earlier.
Category A Transmission line projects may be considered to be exempted from obtaining consent of the Gram Sabhas, Ministry of Environment and Forests to issue necessary amendment to Forest Conservation Act 1980.	Forest and environment clearance for transmission lines for evacuation of power will get expedited and this will help the EPC contractors to complete the projects in time.	Inter-regional / inter-state transmission lines required for the national grid will get completed fast and will help in transfer of power from power surplus to power-deficit states.
In case of transmission lines for UMPP / MPP, enhance the powers of Regional Offices of Ministry of Environment & Forests for giving clearance from 5 hectares to 200 hectares for the lines passing through inter-state forests and in case of other projects to 40 hectares. (*Refer para 8.3, 8.3.9*).		

Recommended Interventions	Long-Term Benefit to Industry	Long-Term Benefit to Government / Country
8.4 Construction Power Supply		
Category A Ministry of Power may consider to ask state DISCOMs to construct the lines for supplying construction power to the projects. Developers to pay the cost of these lines along with overhead cost, etc. to DISCOMs (*Refer para 8.4, 8.4.2*)	Developers will not have to spend huge amounts on diesel for the construction power supply at the initial stage of the projects.	This will help the government in their efforts in reducing diesel consumption on which government is paying huge subsidy.
8.6 Signing of Power Purchase Agreements (PPAs) and Financial Closure		
Category A Sometimes banks insist on signing of PPA before loan disbursement. For signing of PPAs with DISCOMs, it is important to improve the financial health of the DISCOMs. DISCOMs can give the urban areas on input-based franchisee with a provision for investment by franchisee for system improvement. With this, the revenue realization of DISCOMs increases from day one, its O&M cost becomes zero and the system gets renovated / improved and made theft-proof without any investment by DISCOMs. DISCOMs will thus be able to sign PPAs (*Refer para 8.6, 8.6.6, 8.6.7*).	IPPs will be encouraged to make investment in power projects.	States will be the biggest gainers because of timely completion of projects.
These measures will improve the confidence of the banks and financial closure will be faster.	Electrical equipment industry can confidently make investments to cater to the planned addition of generation, transmission, improvement projects for distribution and equipment required for DDG and renewable energy projects.	Distribution is the back bone of the entire power sector. Once the AT&C losses come down on sustainable basis, entire chain will benefit. Banks will be able to recover dues and lend further. Due to the reduced project gestation period, State Governments will benefit the most.

The Way Forward

To carry forward the recommendations arising out of the Mission Plan, a proper review mechanism through the Development Council / Inter-Ministerial Group / Sub-Groups comprising representatives of the Department of Heavy Industry (DHI) and other concerned Ministries / Departments, IEEMA, industry and other stakeholders may be constituted for monitoring the implementation of the recommendations and for periodic follow-up of its status.

Abbreviations

AAI	Airports Authority of India
ABB	Asea Brown Boveri
ACCC	Aluminium Conductor Composite Core
ACSR	Aluminium Conductor Steel Reinforced
AICTE	All India Council for Technical Education
APLAC	Asia Pacific Laboratory Accreditation Cooperation
AT&C	Aggregate Technical & Commercial
BARC	Bhabha Atomic Research Centre
BEE	Bureau of Energy Efficiency
BHEL	Bharat Heavy Electricals Ltd
BIS	Bureau of Indian Standards
BPL	Below Poverty Line
BTG	Boiler Turbine Generator
CAGR	Compounded Annual Growth Rate
CEA	Central Electricity Authority
CFD	Container Freight Depot
CPRI	Central Power Research Institute
CRGO	Cold Rolled Grain Oriented
CRNGO	Cold Rolled Non-Grain Oriented
CSIR	Council of Scientific and Industrial Research
CVD	Countervailing Duty
DDG	Decentralised Distribution-cum-Generation
DGFT	Directorate General of Foreign Trade
DHI	Department of Heavy Industry
DIPP	Department of Industrial Policy & Promotion
DISCOM	Power Distribution Company
DMRC	Delhi Metro Rail Corporation
ECA	Export Credit Agency
ECGC	Export Credit Guarantee Corporation of India Ltd
EE	Electrical Equipment
EHV	Extra High Voltage
EPC	Engineering, Procurement & Construction
ERDA	Electrical Research and Development Association
EXIM Bank	Export Import Bank of India
FSA	Fuel Supply Agreement
FTA	Free Trade Agreement
FTP	Foreign Trade Policy
GDP	Gross Domestic Product
GIS	Gas Insulated Sub-Station
GST	Goods and Services Tax
GW	Gigawatt
HSIL	High Surge Impedance Loading
HTLS	High Temperature Low Sag
HV	High Voltage
ICD	Inland Container Depot
ICT	Information & Communications Technology
IEC	International Electro technical Commission
IEEMA	Indian Electrical & Electronics Manufacturers' Association
IGCAR	Indira Gandhi Centre for Atomic Research
IGCC	Integrated Gasification Combined Cycle
IISc	Indian Institute of Science
IIT	Indian Institute of Technology
IIUS	Industrial Infrastructure Up gradation Scheme
IPP	Independent Power Producer
ITC	Industrial Training Centre
ITI	Industrial Training Institute
JNNSM	Jawaharlal Nehru National Solar Mission
kV	Kilovolt
kWh	Kilowatt Hour
L1	Lowest One
L&T-MHI	Larsen & Toubro – Mitsubishi Heavy Industries
MoEF	Ministry of Environment & Forests
MLFPS	Market Linked Focus Product Scheme
MPP	Mega Power Project
MVA	Mega Volt Ampere
MW	Megawatt

NABL	National Accreditation Board for Testing and Calibration Laboratories
NAPCC	National Action Plan on Climate Change
NDPL	North Delhi Power Ltd
NEIA	National Export Insurance Account
NEP	National Electricity Policy
NHPC	National Hydroelectric Power Corporation
NHPTL	National High Power Test Lab
NPCIL	Nuclear Power Corporation of India Ltd
NPTI	National Power Training Institute
NTPC	National Thermal Power Corporation
NSDC	National Skill Development Corporation
ODC	Oversized Dimension Consignment
OECD	Organisation for Economic Cooperation and Development
PFC	Power Finance Corporation Ltd
PGCIL	Power Grid Corporation of India Ltd
PMP	Phased Manufacturing Process
PPA	Power Purchase Agreement
PPP	Public-Private Partnership
PSE	Public Sector Enterprise
PVC	Price Variation Clause
R-APDRP	Restructured - Accelerated Power Development & Reforms Programme
R&D	Research & Development
REC	Rural Electrification Corporation Ltd
RGGVY	Rajiv Gandhi Grameen Vidyutikaran Yojana
RoW	Right of Way
RRL	Regional Research Laboratory
SEB	State Electricity Board
SME	Small and Medium Enterprises
SOP	Standard Operating Practice
SSC	Sector Skill Council
STL	Short Circuit Testing Liaison
T&D	Transmission and Distribution
TG	Turbine Generator
TIFR	Tata Institute of Fundamental Research
TLT	Transmission Line Tower
TWh	Terawatt hour
UMPP	Ultra Mega Power Project
USC	Ultra Super Critical
VAT	Value Added Tax

List of Participating Stakeholders / Organisations

Department of Heavy Industry, Ministry of Heavy Industries & Public Enterprises

Department of Industrial Policy & Promotion, Ministry of Commerce & Industry

Department of Commerce, Ministry of Commerce & Industry

Ministry of Power

Ministry of Environment & Forests

Department of Revenue, Ministry of Finance

Ministry of External Affairs

Directorate General of Employment & Training, Ministry of Labour & Employment

Ministry of Mines

Ministry of Steel

Planning Commission

Directorate General of Foreign Trade

National Manufacturing Competitiveness Council

Central Power Research Institute

Central Electricity Authority

National Skill Development Corporation

Bureau of Indian Standards

National Productivity Council

Technical Institutes (IITs, NITs, ITIs, Polytechnics)

Export Import Bank of India

Indian Electrical and Electronics Manufacturers' Association

Central Public Sector Undertakings (NTPC, NHPC, NPCIL, PGCIL, BHEL, etc.)

State and Private Sector Utilities

Private Sector Manufacturers