INDIAN ELECTRICAL EQUIPMENT INCLUDING CONSUMER ELECTRONICS INDUSTRY

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Table of Contents

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1. Executive Summary

The Indian economy is a developing mixed economy. It is the world's seventh-largest economy by nominal Gross Domestic Product (GDP) and the third-largest by purchasing power parity (PPP). The country ranks 139th in per capita GDP (nominal) with INR 1.51 lakh (~1870 Euros) and 122nd in per capita GDP (PPP) with INR 5.53 lakh (~6840 euros) as of 2018. After the 1991 economic liberalisation, India achieved 6-7% average GDP growth annually. Since 2014 with the exception of 2017, India's economy has been the world's fastest growing major economy, surpassing China.

The Indian electrical Industry can broadly be categorised into Electrical Equipment sector and Electricity sector for power generation. The rise of India as a super economy has also reflected tremendously in the growth and development of this sector both in the Power generation as well as manufacturing of Electrical equipment .

Indian Electrical Equipment industry contributes 8.1% of the manufacturing sector in terms of value and 1.35% of India's GDP, providing a direct employment to 5 lakh (0.5 million) persons and indirect employment to 10 lakh (1 million) people and over 50 lakhs (5 million) across the entire value chain. This sector consists of generation, transmission and distribution (T&D) equipment. The T&D equipment sector is 85% of the industry whereas generation equipment sector is 15%. During FY18, the production of electrical equipment industry has witnessed a growth of 9.9% to INR 1,75,000 crore (~21.7 bn euros) over the previous year. Power distribution and transmission equipment like transformers, conductors, meters, cables and switchgears registered good growth as the government is enhancing transmission capacity and pushing states to improve distribution network. Exports and Imports of Electrical Equipment have been growing steadily. At the end of FY18, exports stood at INR 41,792 crore (~5.2 bn euros), while Imports has reached to INR 55,603 crore (~6.9 bn euros).

Government had recognized its high growth potential in coming years and formulated a 'Vision 2022' for the industry. It identifies five key areas for action: (i) Industry competitiveness; (ii) Upgrading technology (iii) Skill development (iv) Promotion of exports and (v) Conversion of latent demand.

Indian electricity sector has also witnessed tremendous growth in its energy demand, generation capacity, transmission and distribution networks. India has become world's third largest producer and consumer of electricity with electricity production of 1,201.54 billion units during FY18, up 3.57% from the previous year.

As of December 2018, India's total installed power capacity has reached to around 350 GW (which includes Thermal Energy (223.5 GW), Renewable energy (over 74 GW), Hydro (over 45 GW) and Nuclear (around 7 GW).

NITI Aayog had rolled out **draft National Energy Policy** with aims to install 175 GW of renewable energy capacity by the year 2022. Other schemes like Deen Dayal Upadhyay Gram Jyoti Yojana (DDUGJY), Power to all, Integrated Power Development Scheme (IPDS) etc. are also expected have a significant positive impact on the market in the ensuing years.

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To make electric utilities sustainable, it is necessary to make them smart to reduce Aggregate Technical and Commercial (AT&C) losses. The average AT&C losses in India in T&D is about 23%. To reduce AT&C losses, it is necessary to implement smart grid and smart metering. Keeping this in mind, Government of India is aiming at fast deployment of smart grid and smart meter concepts at distribution as well as transmission level. To accelerate smart grid deployment, Government has established **National Smart Grid Mission** (NSGM) in 2015. Energy Efficiency Services Limited (EESL), a Joint Venture (JV) of Public Sector Undertakings (PSUs) under MoP is implementing **Smart Meter National Programme** to deploy smart meters across the country.

In electronics industry, the Consumer Electronics segment (includes Mobile Phones & Home Appliances, viz., Refrigerator, Washing Machine, Air Conditioner & Microwave Oven etc.) with production of INR 205,524 crore (~25.5 bn euros) is the leader of industry and has market share of 53%. As of FY18, consumer electronics export and import stood at around INR 43 billion (~0.54 bn euros) and INR 531 billion (~ 6.5 bn euros) respectively. Within consumer electronics industry, Mobile handsets sector has registered a massive growth and India has emerged as the new manufacturing destination for mobile handsets and components. As many as 120 manufacturing units of Mobile handsets and components have been set up in India during the past three years.

With a target of 'Net Zero Imports' by 2020 Government has embarked several initiatives like **Make in India**, **Digital India, Modified Special Incentive Package Scheme (M-SIPS)** and **Electronic Development Fund (EDF)** to promote manufacturing in the country. Recently Government has unveiled National Electronics Policy 2018, aiming for a turnover of $400 billion in domestic electronics manufacturing and production of one billion mobile handsets by 2025 and for pushing the startup ecosystem in emerging technology areas such as 5G, Internet of Things, artificial intelligence and machine learning, and their applications in areas such as defence, agriculture, health, smart cities and automation.

In Indian Electrical Equipment including Consumer Electronics sector, Bureau of Indian Standards (BIS) and Telecommunication Engineering Center (TEC) are working towards developing standards.

BIS is actively involved in formulation of standards in this sector through its two technical division councils i.e. Electronics and Information Technology Division Council (LITDC) and Electro-technical Division Council (ETDC). In 2015, TEC had released a technical report titled "**M2M Enablement in Power Sector**" introducing and explaining the need of M2M/IoT in power sector.

Through this report it has been our endeavour to provide you with the holistic overview of the Indian Electrical Equipment including consumer electronics sector. The report is mainly divided into three main parts i.e.

- Market trends for both Electrical Equipment and Electronics/consumer electronics sector with future projections and key market players.
- The new policy and regulatory approach by the government for augmentation of these sectors
- The key standards development bodies in India & status update

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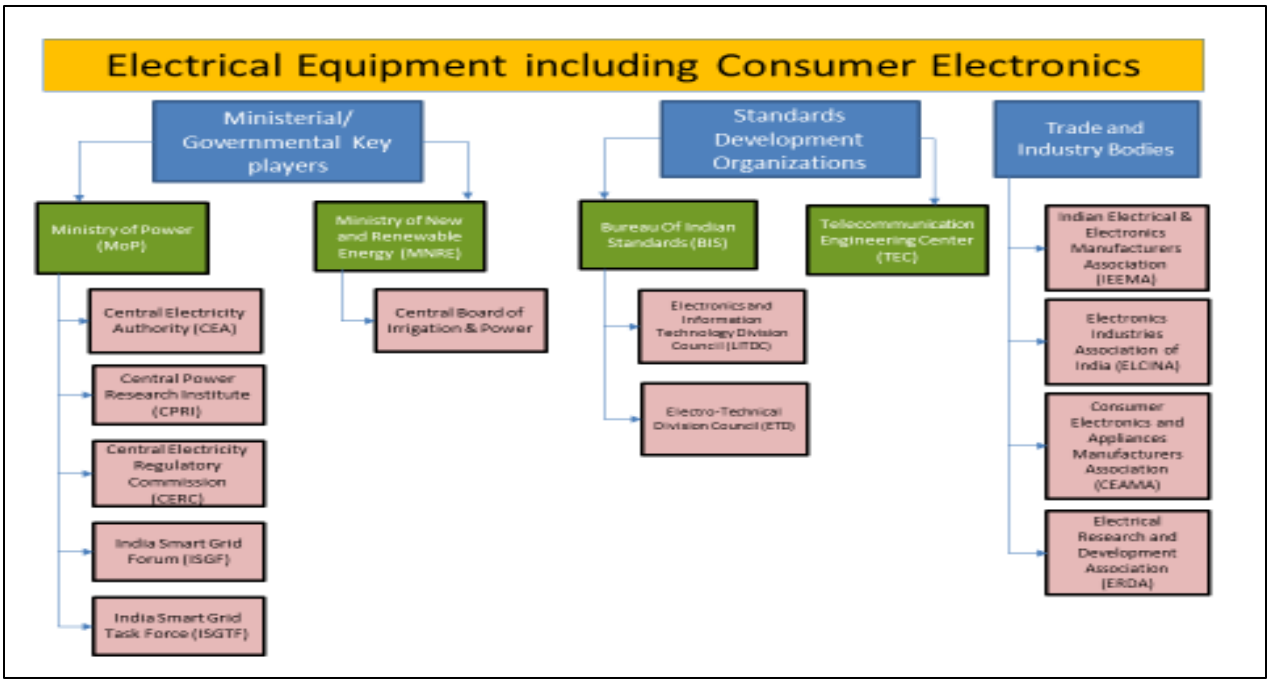


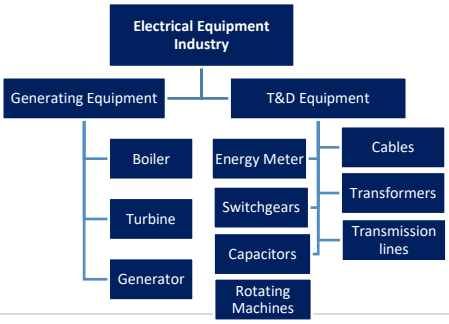
Note: *detailed information about Governmental/ministerial players, Standards Development Organizations (SDOs) and Trade & Industrial bodies in Indian Electrical Equipment including Consumer Electronics sector is available is our report titled "Indian Standardizations Report". This report can be downloaded here*

2. Indian Electrical sector

2.1 Introduction

India's Electrical Equipment Industry can be broadly segmented into following two sectors:

- Generation equipment (boilers, turbines, generators)
- Transmission & distribution (T&D) equipment includes energy meters, transformers, cables, transmission lines, switchgears, capacitors etc.



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The generation equipment sector accounts 15% of the total market, while T&D equipment sector is estimated to account for 85% of the total market. In the last couple of years, the Government has been taking transformative change in the power sector for achieving its ambitious target of providing affordable 24x7 power for all its citizens. It has taken several initiatives such as increasing private participation in the transmission segment, increasing contribution of renewables in the energy basket, developing the National Power Grid to boost growth in the T&D (transmission and distribution) industry, etc.

India is the world's third largest producer and consumer of electricity. The electricity production is stood around 1,201.54 billion units during FY18, up 3.57% from the previous year. An indication of growing appetite for electricity in India, the country's per capita electricity consumption has reached 1149kWh in 2017-18.

The sources of power generation are as below:

- **Thermal power**: Thermal power includes coal, lignite, gas and diesel
- **Renewable Power**: Renewable Energy includes Wind energy, Solar power, Small Hydro Power (SHP), Bio-Power (BP), Waste to Power)
- **Hydro Power**
- **Nuclear Power**

The government of India targets capacity addition of around 100 GW under the 13th Five-Year Plan (2017–22), focusing more on hydro, renewable, and gas–based power, besides looking at the adoption of clean coal technology and has set a target of 175 GW renewable power installed capacity by the end of 2022.

Increase in power generation and transmission capability is likely to lead to fresh demand of about INR 1000 billion (~ 12.4 bn euros) for electrical equipment in the next four years. Between April 2000 and June 2018, the industry attracted US$ 14.18 billion in Foreign Direct Investment (FDI), accounting for 3.64% of total FDI inflows in India.

With development of new technologies, the smart grid and smart meters across the world are undergoing a massive transformation, bringing to fore immense potential and opportunities for a region like India, in the areas of power electronics, sensing, communication, data management and data analytics. New power generation capacity additions and adaption of new technologies such as smart grid and smart meter has the potential to bring new opportunities for electrical sector's players in India and for new entrants as well.

2.2 Current status

Production of Electrical Equipment:

According to Indian Electrical and Electronics Manufacturers' Association (IEEMA)**, t**he production (estimated) of electrical **equipment** industry has witnessed a growth of 9.9% to INR 1,75,000 crore (~21.7 bn euros) during 2017-18 over the previous year.

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Production (INR Crore)					
Year	2013-14	2014-15	2015-16	2016-17	2017-18*
Production	1,28,823 **(~€16 bn)**	1,37,198 **(€17 bn**	1,44,861 **(€18 bn)**	1,59,221 **(€19.7 bn)**	1,75,000 **(€21.7 bn)**

Source: Ministry of Heavy Industries and Public Enterprises annual report 2017-18

The industry contributes 8.1% of the manufacturing sector in terms of value and 1.35% of India's GDP, providing a direct employment to 5 lakh persons and indirect employment to 10 lakh people and over 50 lakhs across the entire value chain.

Significant infrastructure investments have been planned across the generation, transmission and distribution segments to realize this target. Government in its "Indian Electrical Equipment Industry Mission Plan 2012-2022" 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. The growth of the Indian power sector will entail exponential demand for electrical equipment. Expected investment in the 12th Five Year Plan period in the generation and T&D segment was INR 6,390 billion (€79 billion) in generation, INR 1,800 billion (€22 bn) in transmission and ` INR 3,060 billion (€37.9 bn) in distribution. Based on investment estimates and capacity addition targets, domestic demand for generation equipment (BTG) could be in the range of €22-26 billion by 2022; for the T&D equipment industry, it may be €61–66 billion.

Exports and Imports of Electrical Equipment:

Exports of Electrical Equipment from India have been growing steadily. During 2017-18, exports registered an annual growth of around 6.4% and stood at around INR 418 billion (~€5.2 billion) as compared to around INR 393 billion (€4.9 billion) in 2016-17.

Year	Exports (INR billion)	Imports (INR billion)
2013-14	292.27 (€3.62 billion)	583.54 (€7.2 billion)
2014-15	354.18 (€4.4 billion)	559.87 (€6.9 billion)
2015-16	385.80 (€4.8 billion)	539.86 (€6.7 billion)
2016-17	392.80 (€4.9 billion)	552.91 (€6.8 billion)
2017-18*	4,17.92 (€5.2 billion)	556.03 (€6.9 billion)

Source: Ministry of Heavy Industries and Public Enterprises annual report 2017-18,
* Estimated values

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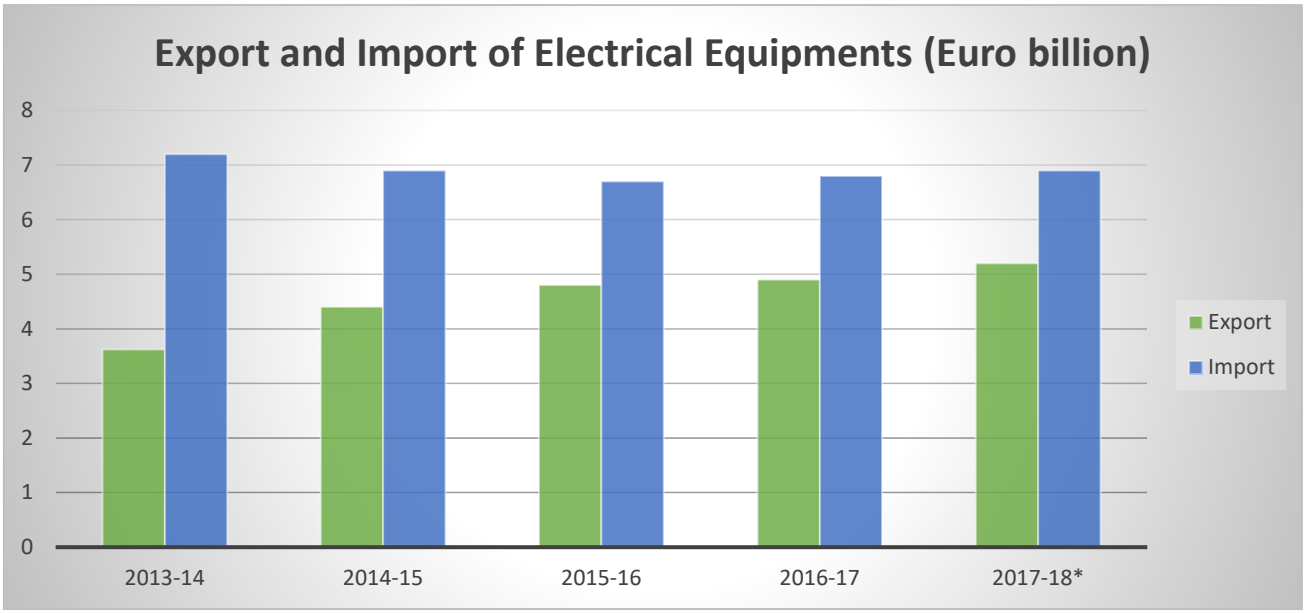

According to IEEMA, the growth in exports is helping the industry to grow especially in power transformer & high voltage switchgear products, energy meters, and cables**.** The major export markets for Indian Electrical Equipment are United States of America, United Arab Emirates, Germany, United Kingdom, Nigeria, Saudi Arabia, Australia, Brazil, Canada, and France.

The major Export Products are Switchgear and Control gear, Transformers & Parts, Industrial Electronics, Cables, Transmission Line Towers, Conductors, Rotating Machines (Motors, AC Generators, and Generating Sets) & Parts.

Imports of Electrical Equipment registered a marginal growth of 0.56% to around INR 556 billion (**€**6.9 billion) from around INR 553 billion (**€**6.8 billion).

Power generation scenario:

As per the data available on CEA website, India's total installed power capacity stood at around 350 GW at the end of December 2018. Thermal power (which includes coal, lignite, gas and diesel) is the predominant source of power in the country with its cumulative installations reaching 223.5 GW, representing around 64% of the total installed power capacity. Coal power accounts for over 191 GW of the total installed generation, which is 54.57% of the total installed power capacity, followed by natural gas at 7.12% (24.9 GW), lignite at 1.71% (6.36 GW) and diesel with a minute 0.18% (0.64 GW) share.

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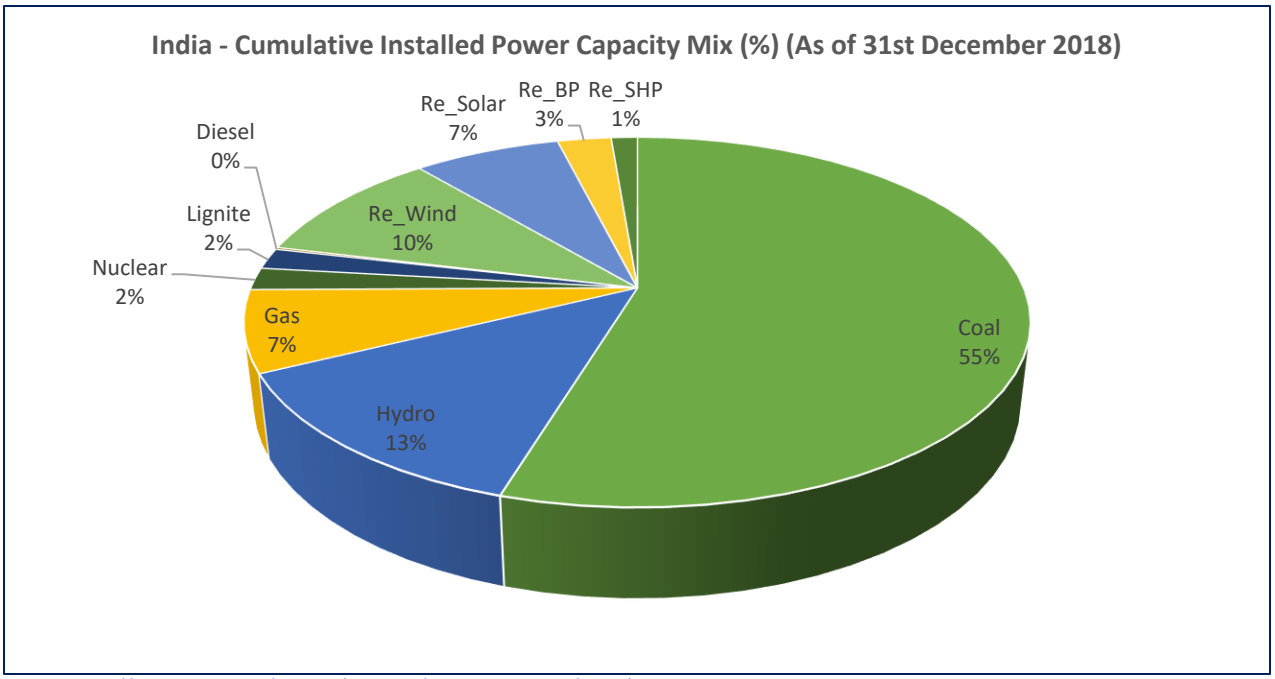
Source	Thermal (63.85%)	Renewable (21.2%)	Hydro (13%)	Nuclear (1.94%)	Total
Share (GW)	223 GW	74	45.5 GW	6.7 GW	349.2 GW



Source: http://www.cea.nic.in/reports/monthly/installedcapacity/2018/installed_capacity-12.pdf

Renewable Energy (includes Wind energy, Solar power, Small Hydro Power (SHP), Bio-Power (BP), Waste to Power) accounting for over 74 GW, representing around 21% of the total installed power capacity, as compared to 62.8 GW during the same period last year. Solar Power accounted for approximately 25 GW of the total installed generation, which is 7.14% of the total installed power capacity. The share of solar energy in energy generation mix grew from approx. 5.1% in December 2017 to 7.14% in December 2018. Among the renewables, solar accounted for approximately 34% of the installed capacity.

Wind accounts for 35.1 GW of the total installed power capacity and nearly 10% of the overall power capacity mix as of December 2018. Small hydro had a cumulative installed capacity of 4.5 GW, representing 1.28% of the total installed capacity at the end of December 2018.

At the end of December 2018, Bio Power (BP) (which includes Bio-Mass Power/Cogen and Waste to Energy) stood at 9.2 GW as compared to 8.5 GW in December 2017. Hydro power's cumulative installations stood at 45.4 GW, making up 12.97% of India's total installed capacity, a decline compared its share of 13.5% at the end of 2017. The share of nuclear power has declined from 2.01% at the end of December 2017 to 1.91% as of December 2018.

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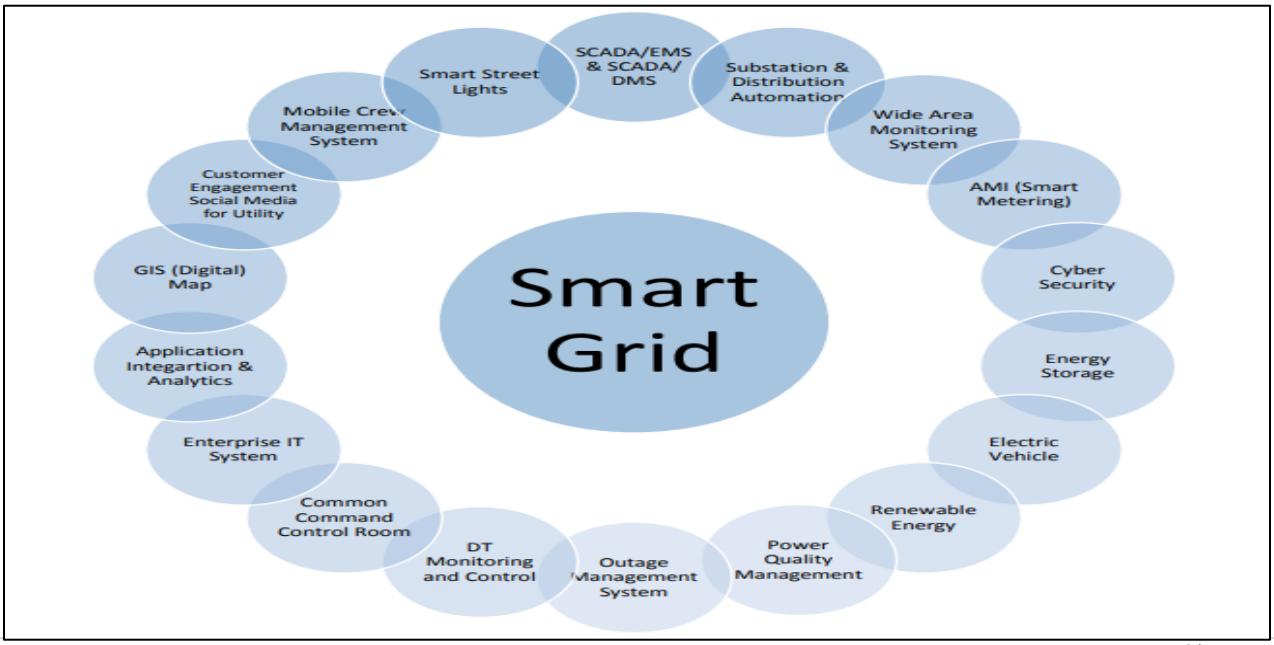
Current installation trends show the country's steady transformation from fossil fuels towards renewable energy. The Government of India has released its roadmap to achieve 175 GW capacity in renewable energy by 2022, which includes 100 GW of solar power and 60 GW of wind power. The Union Government of India is preparing a 'rent a roof' policy for supporting its target of generating 40 gigawatts (GW) of power through solar rooftop projects by 2022.

According to the Indian government, the aggregate technical and commercial losses (AT&C), which reflects transmission and collection efficiency, came down to 18.75% from 20.7% in FY16 and the plan is to reduce it to below 12% by 2022, and below 10% by 2027. To reduce AT & C losses, it is necessary to implement the smart grid and smart metering. India is aiming at fast deployment of smart grid and smart meter concepts at distribution as well as transmission level.

a) Smart Grid in India

The Vision of India on Smart Grids is to "Transform the Indian power sector into a secure, adaptive, sustainable and digitally enabled ecosystem that provides reliable and quality energy for all with active participation of stakeholders". Smart Grid facilitates efficient and reliable end-to-end intelligent two-way delivery system from source to sink through integration of renewable energy sources, smart transmission and distribution. In this way Smart Grid technology shall bring efficiency and sustainability in meeting the growing electricity demand with reliability and best of the quality. Smart Grid will act as a backbone infrastructure to enable new business models like smart city, electric vehicles, smart communities apart from more resilient and efficient energy system and tariff structures.

Smart Grid functionalities:



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Recognizing the growing importance of smart grid technologies, the Ministry of Power (MoP) had taken early pioneering steps in 2010 by constituting the India Smart Grid Task Force (ISGTF) and the India Smart Grid Forum (ISGF).

In 2013, Ministry of Power released "Smart Grid Vision and Road map for India". The Smart Grid Vision and Roadmap offers a series of time-framed, specific, target driven measures, across these different areas, with which to enable the development of an Indian Smart grid model. It offers hundreds of millions of Indians are possibility of accessible, reliable power: a fundamental requirement of inclusive growth.

In 2015, Government of India established **National Smart Grid Mission (NSGM)** to accelerate smart grid deployment in India. NSGM has its own resources, authority, functional & financial autonomy to plan and monitor implementation of the policies and programs related to Smart Grids in the country. The efforts for the development and deployment of Smart Grids in India are presently being carried out through India Smart Grid Task Force (ISGTF) and India Smart Grid Forum (ISGF) under the aegis of Ministry of Power (MoP).

So far, following projects have been sanctioned under National Smart Grid Mission:

- CED, Chandigarh (Sub Division 5)
- CED, Chandigarh (Complete City excluding Sub Div 5)
- KSEB, Thiruvananthapuram (Kochi)
- JBVNL, Jharkhand (Ranchi)
- OPTCL, Odisha (Rourkela)

The Smart Grid pilot projects sanctioned by Ministry of Power which are completed / under implementation are as follows:

- AVVNL, Ajmer
- APDCL, Assam
- CESC, Mysore
- HPSEB, Himachal Pradesh
- PED, Puducherry
- TSECL, Tripura
- TSSPDCL, Telangana
- UHBVN, Haryana
- UGVCL, Gujarat
- WBSEDCL, West Bengal
- IIT Kanpur
- SGKC, Manesar

Government of India is promoting deployment of Smart Grid projects under the NSGM through funding support of 30% on capital expenditure.

Department of Science & Technology (DST), Government of India has funded around US$ 46.5 million towards R&D on Smart Grids. Indian academic institutions including Indian Institute of Technology (IITs),

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Indian Institute of Science (IISc) and private industries have been engaged in R&D on Smart Grids in India. Some of the projects undertaken by the academic institutions, which are funded by Department of Science & Technology, Government of India, are at advance stage of completion. These funded projects include national as well as bilateral programmes with countries like US, UK and Netherlands.

As smart grid system is a power network used to supply electricity to consumers via two-way digital communication, which is more vulnerable to cyber-attacks and there is an urgent need to develop a cyber security framework to address specific security needs of the power sector in India. The Ministry of Power (MoP) had tasked the Central Electricity Authority (CEA), the apex policy advisory body in the electricity sector, with constituting a committee to discuss various issues including cyber security issues in the power sector. In July 2017, CEA had come up with a report titled "**Cyber Security in Power System**" and submitted it to Ministry of Power.

The CEA's report recommended new "testing standards" for power utilities, the creation of a "test bed" at Central Power Research Institute (CPRI), modified procurement guidelines for equipment used in power utilities and security audits of all Supervisory Control and Data Acquisition (SCADA) systems and Energy Management Systems (EMS). The CEA informed the Power ministry that two working groups at the Bureau of Indian Standards (BIS) have been working on "draft standards" to enhance cyber security.

The first group "is currently working on the part two of Indian Standard 16335 which would consider India Smart Grid Forum (ISGF) cyber security manual as reference document". In 2015, the BIS published the part one of Indian Standard 16335 'Power control systems — Security Requirements', which specified the requirements for identification and protection of all critical assets involved in generation, transmission, distribution and trading of power.

The second group at the BIS is currently studying and exploring the adoption of IEC 62443, which has been issued by International Electro-technical Commission, as an Indian standard. IEC-62443 is a series of standards that define procedures for implementing electronically secure Industrial Automation and Control Systems (IACS).

b) Smart Meters in India

A smart meter is an electronic device that records consumption of electricity, gas or water and communicates that information for monitoring and billing. Smart meters send meter readings to the utility company automatically. They also come with in-home displays, which give users real-time feedback on their energy or water usage and what it is costing. With electricity demand expected to rise by 79% in the next 10 years, India is on a path of transforming its energy mix with innovation. Along with enhancing energy production, the nation also needs to cut **Aggregate Technical and Commercial (AT&C) losses** to below 12% by 2022, and below 10% by 2027.

Enabling India to achieve this imperative is the smart grid, the first step of which, is the creation of **Advanced Metering Infrastructure**. Advanced Metering Infrastructure (AMI) refers to systems that

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measure, collect, and analyze energy usage, and communicate with metering devices such as electricity meters, gas meters and water meters etc. either on request or on a schedule. These systems include hardware, software, communications, consumer energy displays and controllers, customer associated systems, meter data management software, and supplier business systems.

The **National Tariff Policy 2016** had mandated that consumers with monthly consumption of over 500 units (or kilowatt hour) had to be switched to smart meters by December 2017; and consumers with monthly usage above 200 units, has to be switched to smart meters by December 2019.

The India Smart Grid Forum (ISGF)-BNEF has published a knowledge paper on 'Advanced Metering Infrastructure: Rollout Strategy for India' in order to help the power distribution companies to tackle the challenge of capital availability to implement the projects. According to the paper, the distribution companies should be stipulated to buy the smart meters only from vendors whose smart meters and communication devices adhere to the BIS standards. The paper states that if India is to have a successful rollout of the new metering system, the country needs to implement projects using either the Leasing or Service model.

The government is procuring smart and prepaid meters to be deployed across the country. It has urged electricity meter manufacturers to scale up production in India, as it plans to shift all connections to smart prepaid meters over the next three years, starting from April, 2019. This initiative by the Ministry of Power (MoP) is expected to reduce the aggregate technical and commercial (AT&C) losses, improve the financial health of distribution companies, incentivize energy conservation, and make bill payments hassle free and environmentally friendly by doing away with the paper copies.

Many state governments have begun installing smart meters under Smart Cities Mission. This program aims at urban renewal with the mission to develop 100 cities across the country that are energy efficient, citizen friendly, and sustainable.

- For instance, recently, the Uttar Pradesh Electricity Regulatory Commission (UPERC) approved a petition filed by Uttar Pradesh Power Corporation Ltd. (UPPCL) regarding the rollout of smart meters in the state. UPPCL has roped in Energy Efficiency Service Limited (EESL) for the installation of smart meters due to their expertise in low cost bulk procurement and working as demand aggregators. The UPPCL is targeting 4 million consumers across five distribution companies (DISCOMs). In Phase-I, smart meters will be installed in towns with high energy input >500 million units (MUs) and high AT&C losses. In Phase-II, towns with energy input >=250 MU will be benefited and in Phase-III, towns with energy input >=150 MU and <250 MU will be benefited.
- In October 2018, Indore Smart City Development Limited had issued a tender for 30,000 smart meters to be installed under Indore Smart City project. The estimated cost is ₹157.9 million (~$21.3 million) and the time for completion of contract is 24 months.
- In August 2018, the Energy Efficiency Services Limited (EESL), a joint venture of the public-sector units of the Ministry of Power and the Government of India, entered two memoranda of understanding

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(MoU) with North Bihar Power Distribution Company Limited (NBPDCL) and South Bihar Power Distribution Company Limited (SBPDCL) to deploy smart meters in 130 towns and adjacent rural areas covering approximately 1.8 million customers in the state.

- In July 2018, EESL signed memorandum of understanding (MoU) with Haryana state DISCOMs to install 1 million smart meters across the state.
- Back in March 2018, EESL issued a tender to procure 5 million smart electricity meters. The meters will be deployed pan India and the bid-submission deadline is April 12, 2018. The smart meters procured by EESL will utilize GPRS technology to allow two-way communication between the DISCOM and consumers.

2.3 Market players

Here is the list of top companies in electrical sector:

I. **Bharat Heavy Electricals Limited (BHEL):** BHEL is India's largest power generation equipment manufacturer. It is offering a range of products including Gas & Steam Turbines, Boilers, Electric Motors, Generators, Heat Exchangers, Pumps, Switchgears, Sensors etc. BHEL is engaged in the engineering, design, manufacturing, construction, commissioning, testing, and servicing of a wide range of products. Read more>>

II. **ABB India Ltd:** ABB India is operating mainly in power, heavy electrical equipment and automation technology areas. ABB is leading builder of electricity grids. The company is active into many sectors and mainly operating into power and automation technologies. ABB is planning to install microgrid with battery energy storage at the campus of Indian Institute of Technology, Roorkee (IITR) as part of the smart campus development project. Read more>>

III. **CG Power and Industrial Solutions Limited:** Crompton Greaves is an Indian multinational company engaged in design, manufacturing, and marketing of products related to power generation, transmission, and distribution. CG has been aggressively investing in R&D, product certifications, product quality, productivity enhancement and operational excellence. Read more>>

IV. **Diamond power infrastructure limited:** Diamond Power Infrastructure Limited manufactures and sells power transmission equipment. The company provides wires and cables, transmission and distribution conductors, power and distribution transformers, transmission towers, control and relay panels, and isolators. It also engages in planning, designing, and commissioning of turnkey transmission and distribution projects. Read more>>

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V. **GE T&D India Limited:** GE T&D India is a leading player in the Power T&D business with a product portfolio ranging from Medium Voltage to Ultra High Voltage (1200 kV) for Power Generation, Utility, Industry and Infrastructure markets. GE T&D India has a predominant presence in all stages of the power supply chain, with a wide range of products that include Power Transformers, Circuit Breakers, Gas Insulated Switchgears, Instrument Transformers, Substation Automation Equipment. Digital Software Solutions, Turnkey Solutions for Substation Engineering & Construction, Flexible AC Transmission Systems, High Voltage DC & Services suite of offerings. Read more>>

VI. **NTPC Limited:** NTPC Limited is an India-based company, which is engaged in the generation and sale of electricity. The total installed capacity of the company is 52,946 MW (including JVs) with 20 coal based, 7 gas based stations, 1 Hydro based station and 1 Wind based station. 9 Joint Venture stations are coal based and 11 Solar PV projects. NTPC was ranked 512th in the '2018, Forbes Global 2000' ranking of the World's biggest companies. Read more>>

VII. **Power Grid Corporation of India Limited:** Power Grid Corporation of India Limited (POWERGRID), is an Indian state-owned electric utility company. POWERGRID transmits about 50% of the total power generated in India on its transmission network. Presently, it operates and maintains more than 151,380 circuit km transmission line and 239 substations. Read more>>

VIII. **Reliance Power:** The Company has more than 35,000 MW of power generation capacity, both operational and under development. Reliance Power has an operational power generation capacity of close to 6 GW in FY18. Reliance Power will double the capacity of its Rosa power plant in Uttar Pradesh to 2,400 MW and Butibori power plant in Maharashtra to 1,200 MW. Read more>>

IX. **Suzlon Energy Ltd.:** Suzlon is one of India's leading renewable energy companies with an installed capacity of 18000+ MW. Its services span the entire life of wind energy projects. It designs, develops, manufactures wind turbine generators (WTGs). It also provides allied services, providing it a strong presence across the wind power value chain. Read more>>

X. **Tata Power Solar Systems Ltd:** Tata Power Solar Systems Ltd is part of the Tata Group and the largest integrated solar power player in the country. It has three separate business segments – manufacturing of solar cells and modules, engineering, procurement and construction (EPC) for solar power projects and other solar products. The company has an installed capacity of 10,757 MW in FY18. By 2022, the company plans to increase the generating capacity to 18 GW, distribution networks by 4 GW and energy resources by 25 million tonnes per annum. Read more>>

2.4 Growth Drivers

- **Growing demand of electricity**: Increasing population & growing penetration of electricity connections, along with per-capita usage would impetus to the power sector.
- **Addition of superior technology:** Addition of superior technology enabled transmission and distribution networks (factoring sub-transmission) coupled with need to avoid congestion and creation

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of adequate evacuation infrastructure for the generation units are driving the growth of T&D segment in power sector. "Besides, with more renewable energy based power generation need for creating dedicated infrastructure for T&D networks will also be important in order to make these sources of generation completely grid integrated,".

- **Policy support:** Government support in terms of introducing favourable trade policies for protecting the domestic EE market is one of the key reasons for such high demand projections of domestic power equipment in the country. Other initiatives like Power to All, Deen Dayal Upadhyay Gram Jyoti Yojana (DDUGJY), Integrated Power Development Scheme (IPDS) etc. are expected have a significant positive impact on the market in the ensuing years.
- **Higher Investments:** India's power sector is anticipated to attract investment worth US$179.31 billion between "2017-22" in thermal, hydro, nuclear and renewables segments

3 Electronics Sector

3.1 Introduction

Electronics industry can be broadly segmented into the following sectors:

- **Consumer Electronics**
- Industrial Electronics
- Electronic Components
- Communication & Broadcasting (C&B) Electronics
- Computer Industry
- Strategic Electronics
- Automotive Electronics

India's electronic products industry can be further divided into the following broad end-user segments:

Segment	**Products covered**
Consumer electronics	**Mobile Phones, Televisions, Refrigerators, Set-top Boxes, Digital Cameras, Air Conditioners, Washing Machines etc.**
Industrial electronics	Process Control Equipment (PCE), Automation and Analytical Instruments (A&AI), Power Electronics Equipment (PEE), Test & Measuring Equipment (T&ME) etc.

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Electronic Components	**Electro Mechanical Components** include Printer Circuit Boards, Connectors, etc. **Active Components** include Integrated Circuits' Diodes, Transistors, Picture Tubes, etc. **Passive Components** consist of Wound Components, Capacitors, Resistors, etc. **Associated Components** consist of Optical Discs, Magnets, RF Tuners, etc.
Communication & Broadcasting (C&B) Electronics	Fixed-line and mobile telecommunication equipment, modems, routers, switches, IP PBX, BTS (GSM, CDMA), WiMax (BTS,CPE), PON/GPON ONT/OLT and DWDM.
Computer Hardware	Desktops, notebooks, tablets, monitors, servers, storage flash memory cards, USB drives and printers/MFDs
Strategic Electronics	Military Communication Systems, Radars and Sonars, Network Centric Systems, Electronic Warfare Systems, Weapon Systems Satellite Based Communication, Navigation and Surveillance Systems, Navigational Aids, Underwater Electronic Systems, Infra-Red (IR) Based Detection and Ranging System, Disaster Management System, Internal Security System, etc.
Automotive Electronics	Electric vehicles and connected mobility

The electronics industry in India has been growing steadily since its inception. The market for electronics in India is huge and is expected to reach $400 billion (**€**351.5 billion) by 2022. In electronics industry, consumer electronics is one of the fastest growing segments and has a market share of 53% in total production of electronics goods.

3.2 Current status

The total global electronics hardware industry is about US$ 2 Trillion (**€**1.8 trillion), out of which, India's Production was about 3,173 billion **(€39.2 billion**) billion during the year 2016-17. The domestic consumption in India was about **€**76 billion (INR 6153.74 billion) during the year 2016-17, while exports were about **€**5.3 billion (INR 429 billion). The current value addition in the sector ranges from 5-30% in India, depending upon the constituent of value chain. The Electronics sector has several verticals in terms of its main constituents.

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Production profile of the Electronics Sector

As per Meity annual report 2017-18, the production profile of the Electronics Sector is as follows:-

Production of Electronics Sector (INR billion (bn))						
S. No.	**Item/Vertical**	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18***
1	**Consumer Electronics@**	**742.5 (€9.2 bn)**	**747 (€9.25 bn)**	**1,097.6 (€13.55 bn)**	**1,547.4 (€19.1 bn)**	**2,055.2 (€25.4 bn)**
2	Industrial Electronics	336 (€4.15 bn)	393.8 (€4.9 bn)	450.8 (€5.6 bn)	622.1 (€7.7 bn)	690.5 (€8.5 bn)
3	Electronic Components	321 (€4 bn)	397.23 (€4.9 bn)	453.83 (€5.6 bn)	521 (€6.4 bn)	583.5 (€7.2 bn)
4	Strategic Electronics	138 (€1.7 bn)	157.00 (€1.95 bn)	180.5 (€2.2 bn)	207.6 (€2.56 bn)	235.6 (€2.9 bn)
5	Computer Hardware	174.9 (€2.15 bn)	186.91 (€2.3 bn)	198.85 (€2.5 bn)	203.8 (€2.5 bn)	214.01 (€2.6 bn)
6	Light Emitting Diodes	19.4 (€0.25 bn)	21.7 (€0.27 bn)	50.9 (€0.6 bn)	71.3 (€0.9 bn)	96.3 (€1.2 bn)
Total		**1,731.76 (€21.4 bn)**	**1,903.66 (€23.5 bn)**	**2,432.63 (€30 bn)**	**3,173.31 (€39.2 bn)**	**3,875.25 (€47.9 bn)**

Source: https://meity.gov.in/writereaddata/files/Annual_Report_2017%E2%80%9318.pdf
@ Includes home appliances, mobile phones
* Estimates are as provided by respective industry associations

The total production of the above-mentioned verticals of electronics sector in India is estimated to be about INR 3,875 billion (€47.9 billion) in 2017-18 as compared to about 3,173 billion (€ 39.2 billion) in 2016-17, exhibiting a growth of about 22%. As a result of various initiatives taken by the Government and efforts of Industry, production of electronics in India has shown significant growth during the last three years.

The **Consumer Electronics** segment (Includes **Mobile Phones** & **Home Appliances**, viz., Refrigerator, Washing Machine, Air Conditioner & Microwave Oven etc.) is the leader of the Indian Electronics sector with market share of 53%. This is followed by Industrial Electronics having a share of 18%, Electronic Components with 15% market share. Strategic Electronics, Computer Hardware and Light Emitting Diodes have market share of 6%, 5.5% and 2.5% respectively.

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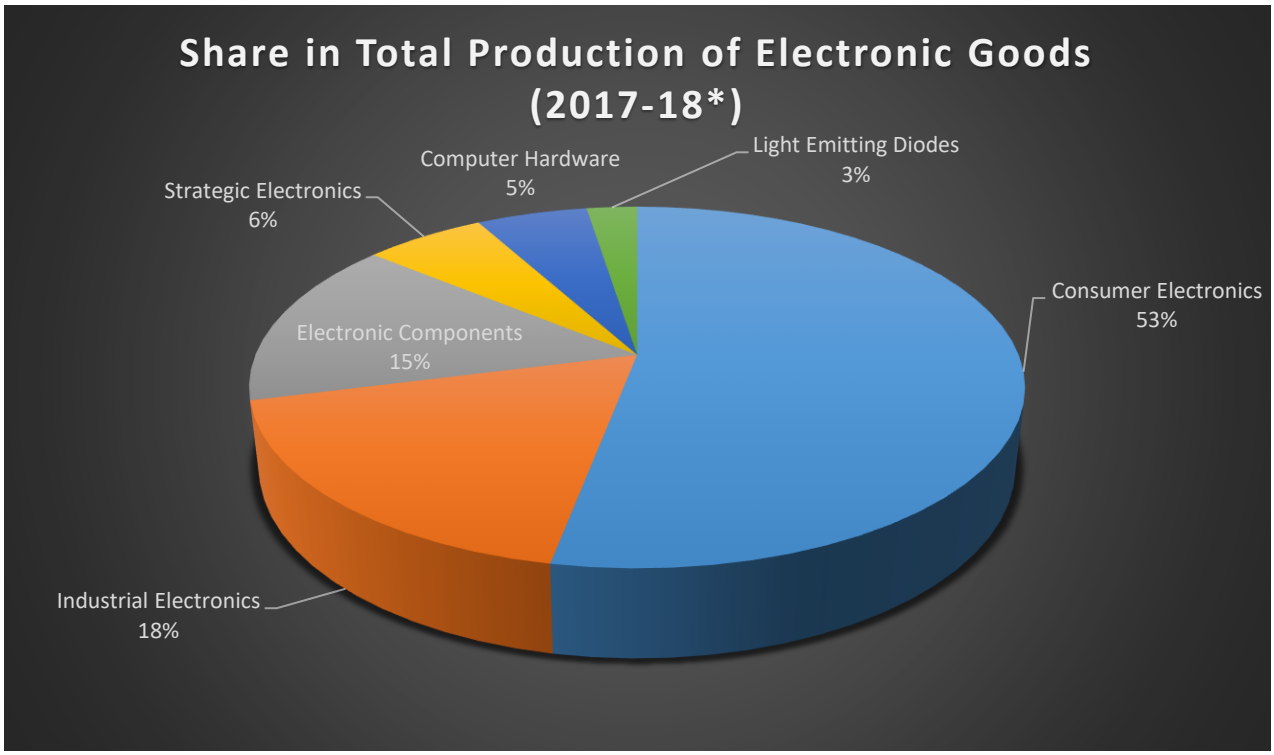

Source: https://in.nec.com/en_IN/pdf/ElectricalsandElectronicsManufacturinginIndia2018.pdf

Consumer Electronics:

The overall production of Consumer Electronics was stood at INR 1,547.42 billion (€19.1 billion) in 2016-17 compared to INR 1,097.65 billion (€13.5 billion) in 2015-16, registered a growth of about 40%. The overall production of this segment of electronics industry is estimated to reach INR 2,055.24 billion (€25.4 billion) during FY 2017-18.

Production of Consumer Electronics (in INR billion)						
S. No.	**Item/Vertical**	**2013-14**	**2014-15**	**2015-16**	**2016-17**	**2017-18***
1	Mobile Phones	266.5 (€3.3 bn)	189 (€2.34 bn)	540 (€6.7 bn)	900 (€11.1 bn)	1,320 (€16.3 bn)
2	Consumer Durables & Others (TV, Home Theater etc.)	476 (€5.9 bn)	558 (€6.9 bn)	557.65 (€6.9 bn)	647.4 (€8 bn)	735.2 (€9 bn)
Total		**742.5 (€9.2 bn)**	**747 (€9.24 bn)**	**1,097.65 (€13.55 bn)**	**1,547.4 (€19.1 bn)**	**2,055.2 (€25.4 bn)**

Source: Meity

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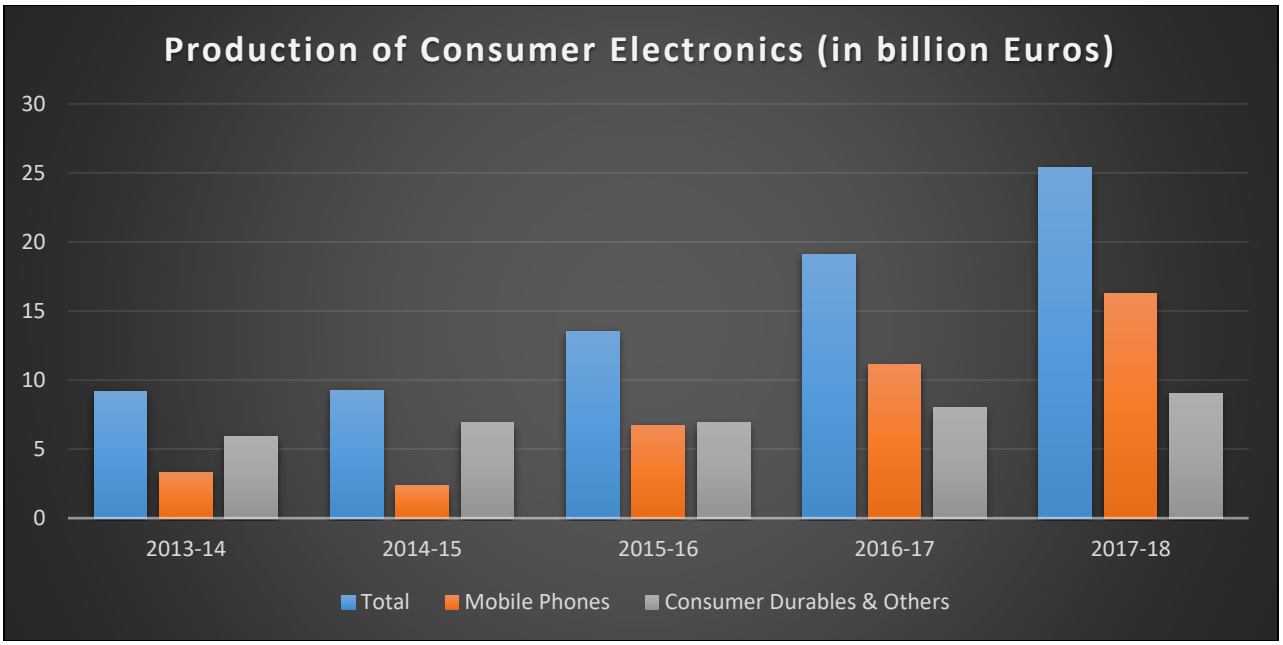

The production of **Mobile Phones** grew to approx. INR 900 billion (over €11 billion) in 2016-17 compared to INR 540 billion (€6.7 billion) in 2015-16, exhibiting a growth rate of about 66%, whereas, the production of Mobile handsets is estimated to be about INR 1,320 billion (over €16 billion) in 2017-18. In volume terms, production grew to about 175 million in 2016-17, over 110 million in 2015-16, exhibiting a growth of about 60%, which is further estimated to grow to 225 million units in 2017-18. India has the second largest wireless network in the world. The country has witnessed a significant rise in manufacture of mobile handsets during the last three years. The value share of mobile handsets industry in the total electronics segment in India is estimated to be nearly 35%, which makes mobile handsets industry the largest electronics vertical.

Consumer Durables / Home Appliances (Includes Air Conditioners, Washing Machines, Refrigerators and Microwave Ovens) has shown a growth rate of about 17.2% with a value of INR 445.9 billion (€5.5 billion) in 2017-18, as against INR 380.35 billion (€4.7 billion) in 2016-17. As per CEAMA, the overall production of this segment of consumer electronics was around INR 647.4 billion (€8 billion) in 2016-17 and is estimated to grow by 13.6% to about INR 735 billion (€9 billion) in 2017-18.

- The Flat panel TV market has shown a substantial growth in the last 5 years as a result of digitalization of broadcast sector and increased affordability due to reduction in price. As a result of conducive Government policies, the production of LCD/LED TVs got a boost and has increased to 16.0 million numbers valued at about INR 264 billion (€3.3 billion) in 2017-18, from 14.5 million numbers valued at about INR 239 billion (€3 billion) in 2016-17, exhibiting a growth rate of about 10%.
- The production for Home Theaters is estimated to witness a growth of about 0.76 million numbers valued at about INR 9240 million (€114.8 million) in 2017-18, compared to 0.7 million numbers valued

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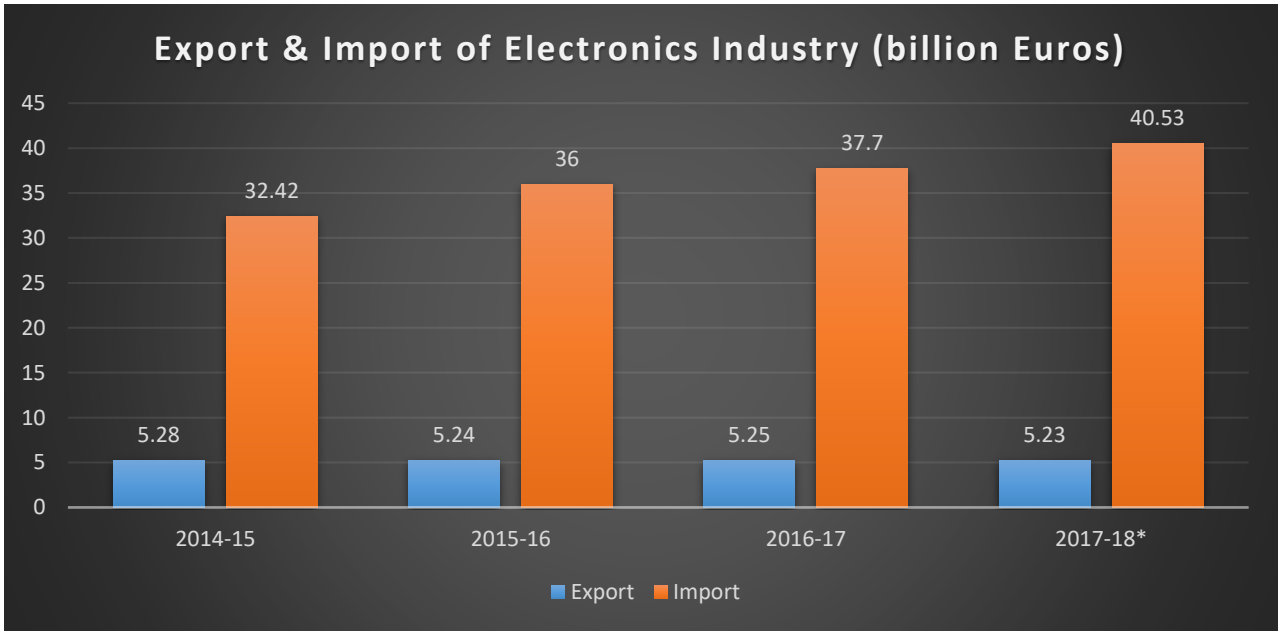
at INR 8400 million (€104.3 million) in 2016-17. With the advancement of technology, the conventional TV (with Picture Tube / CRT), in contrast to the LCD / LED segment, has continued to register negative growth of production.

- As per CEAMA, production of CRT TVs is estimated to be one million during 2017-18 valued at INR 4000 million (€49.7 million). Similarly, production of DVD players has continued to decline due to rapid growth of DTH sector, digitalization of TV network and use of set Top Boxes (STB). Public Address System segment of consumer electronics is estimated to continue to grow steadily by about 10% in 2017-18, with an estimated production value of about INR 12,100 million (over €150 million), as against INR 11,000 million (€136.6 million) in 2016-17.

Electronics Export & Import of Electronics sector:



Source: https://in.nec.com/en_IN/pdf/ElectricalsandElectronicsManufacturinginIndia2018.pdf

The export of electronics goods is estimated to reach around USD 6 billion (~€5.25 billion) during FY18. Exports have remained constant at around €5.25 billion in contrast to the imports, which have been growing year on year. With such rising imports, there lies a huge opportunity for companies to look at the Indian market as their next destination and cater to the burgeoning domestic Indian demand for electronic goods.

Consumer Electronics exports and imports:

Consumer Electronics export is stood at INR 43.2 billion (**€**0.54 billion) in FY18 as compared to INR 53.8 billion (€0.67 billion) in FY17, registered a decline of around 20% during 2017-18.

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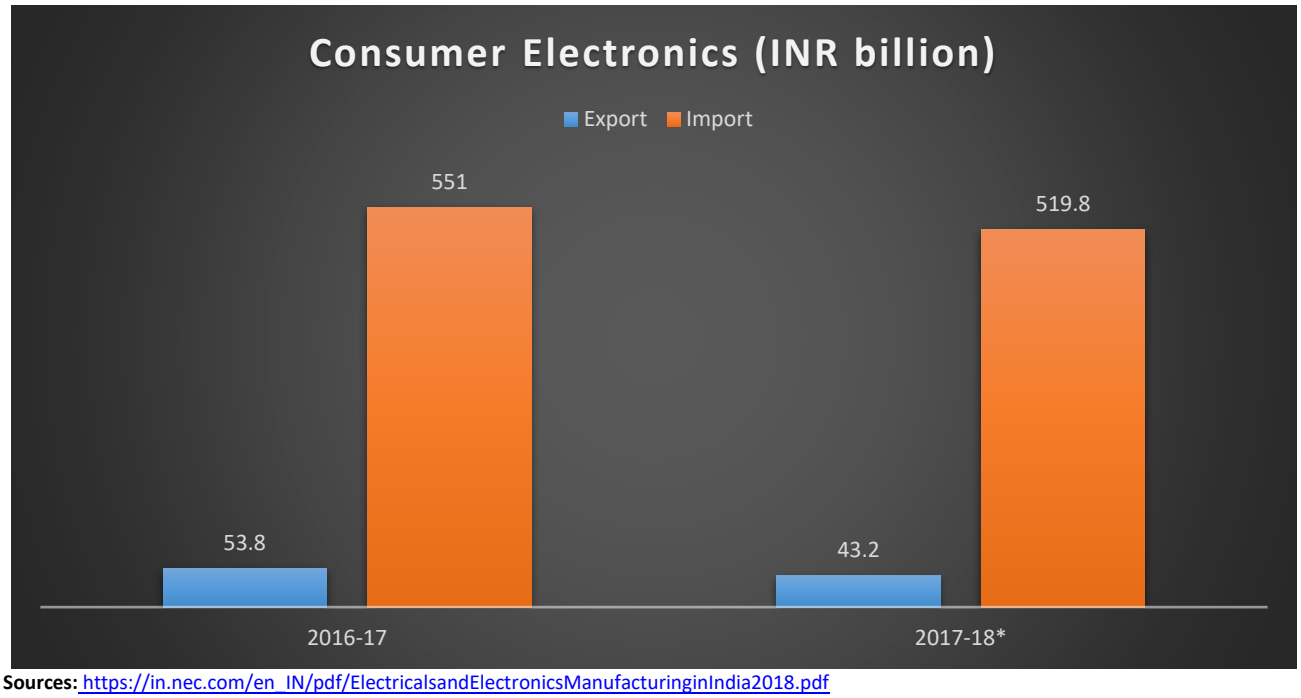
- Mobile Phones exports have remained constant at around INR 11.3 billion (€0.14 billion) during FY18.
- Consumer Durables exports declined by around 11% to INR 28.3 billion (€0.35 billion) in FY18 from INR 31.9 billion (€0.4 billion) in FY17.
- Exports of other items such as TV, Home theater etc. declined from about INR 9.9 billion (€0.12 billion) in FY17 to INR 3.5 billion (€ 0.04 billion) during FY18.

Consumer Electronics import has declined to INR 519.8 billion (€6.45 billion) during FY18 from around INR 551 billion (€6.84 billion) in FY17.

- Mobile Phones import has declined to around INR 235 billion (€2.9 billion) in FY18 from INR 268.4 billion (€3.3 billion) in FY17.
- Consumer durables import increased to INR 120.4 billion (€1.5 billion) during FY18 from INR 114 billion (€1.4 billion) in FY17.
- Imports of other items such as TV, Home theater etc. stood at around INR 164.3 billion (€2 billion) in FY18, compared to INR 168.5 billion (€2 billion) in FY17.



Sources: https://in.nec.com/en_IN/pdf/ElectricalsandElectronicsManufacturinginIndia2018.pdf

3.3 Market Players

India is known as one of the fastest emerging markets for all companies. The population is large and the buying power of people is rising. As a result, most companies are interested in setting their base and gaining market share in India.

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Here is the list of top consumer durable companies in India which are dominating the consumer durable market.

I. **LG Electronics India Pvt Ltd**: LG Electronics India Pvt Ltd is South Korean MNC Company. LG comprises four business units: Home Entertainment, Mobile Communications, Home Appliance & Air Solution, and Vehicle Components, with Starion India as its main production vendor for refrigeration and washing machines in the Indian sub-continent. It is global company serving worldwide. LG Electronics' products include televisions, home theater systems, refrigerators, washing machines, computer monitors, wearable devices, smart appliances, and smartphones. Read more>>

II. **MIRC Electronics Ltd (ONIDA)**: MIRC Electronics Ltd (ONIDA) is offering a huge range of products including LCD, Plasma, Televisions, DVD, Air Conditioners, Washing Machines, Microwaves Ovens, Mobile Phones, LED TV, LCD Monitor, LCD TV and smartphones. It is among the most trusted brands in India. Read more>>

III. **Panasonic India Pvt Ltd**: Panasonic India Pvt Ltd formerly referred as Matsushita Electric Industrial Co., Ltd. It is Japanese MNC Electronics Company. It is one of the largest consumers durable product manufacturing companies in India. Read more>>

IV. **Philips India Ltd**: Philips India Ltd is one of the top consumer durables companies in India. It is offering a range of products including Home Appliances, lighting, medical equipment and audio equipment. Read more>>

V. **Samsung India Electronics Pvt Ltd**: Samsung India Electronics Pvt Ltd leading consumer durable companies in flagship division of Samsung Group. Samsung electronics is manufacturing a range of electronics components batteries, chips, flash memory, semiconductors and hard drive devices. It has marked its worldwide presence. It is one of the world's largest manufacturer of smartphone and mobile phones. Read more>>

VI. **Sony India Pvt Ltd**: Sony India Pvt Ltd has its footprint across all major towns and cities in the country through a distribution network. Sony's principal Indian businesses include Marketing, Sales and After-Sales Service of electronic products & software exports Products. Read more>>

VII. **Godrej & Boyce Manufacturing Company Ltd**: Godrej and Boyce**,** a Godrej Group Company, has a presence across 14 diverse businesses. Its journey began in 1897 with the manufacture of high quality locks, then extending to other durables (refrigerators, washing machines, air conditioners, home security systems and safes, furniture), products for institutions (office furniture, audio-visual solutions, access control systems, perimeter security solutions, bank security solutions, beverage vending machines, interior solutions, hospital and laboratory furniture) and industrial products. Read more>>

VIII. **Bajaj Electricals Ltd**: Bajaj Electricals Ltd (BEL) is an Indian consumer electrical equipment manufacturing company. The company offers wide range of products including Home Appliances, Fans, Lighting & Engineering and Products. Read more>>

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IX. **Whirlpool of India Ltd**: The Whirlpool Corporation is an American multinational manufacturer and marketer of home appliances. Read more>>

3.4 Growth Drivers

- **Increasing domestic demand & Huge middle-class population:** Demand for consumer electronics such as mobiles, modern computers, LEDs, etc. are growing rapidly because of rising disposable income, and awareness about benefits of using these modern electronic products.
- **Increasing adoption of high end technology devices:** Consumers are becoming increasingly technology-conscious and are demanding products with built-in artificial intelligence. This has led to the development of electronics and consumer durable products that come with intelligent functions. For example, washing machines can now sense the load and decide the appropriate washing cycle. Artificial intelligence will move beyond consumer products, and will be available in several medical electronics and industrial electronic products with CNC controlled functions.
- **Availability of easy credit options:** With all major players offering easy EMI schemes and with the increased penetration of credit cards, it has become easier for Indian consumers to buy consumer electronics.
- **Favourable government Policies:** Government's initiatives like Make in India and Digital India and providing special focus to schemes like Modified Special Incentive Package Scheme (M-SIPS) and Electronic Development Fund (EDF) are fueling the growth of sector and attracting huge investments.

4. Government policy initiatives

4.1. Electrical Sector

4.1.1 Draft National Energy Policy (NEP): NITI Aayog

The NITI Aayog, policy think tank of the Government of India released draft National Energy policy (NEP) in June 2017. The National Energy Policy (NEP) aims to chart the way forward to meet the Government's recent bold announcements in the energy domain. According to the draft NEP, the period 2017-2040 is expected to witness a quantum leap in the uptake of renewable energy, drastic reduction in energy intensity, doubling of per-capita energy consumption and tripling of per-capita electricity consumption.

The key objectives -

i. Access at affordable prices
ii. Improved security and Independence
iii. Greater Sustainability
iv. Economic Growth

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Targets of National Energy Policy:

- The intention of the National Energy Policy is to present a broad framework for the overall energy sector, taking into account the multiple technology and fuel options.
- All the Census villages are planned to be electrified by 2018, and universal electrification is to be achieved, with 24×7 electricity by 2022.
- The share of manufacturing in our GDP is to go up to 25% from the present level of 16%, while the Ministry of Petroleum is targeting reduction of oil imports by 10% from 2014-15 levels, both by 2022.
- NDCs (Nationally Determined Contributions) target at reduction of emissions intensity by 33 percent-35 percent by 2030 over 2005.
- Achieving a 175 GW renewable energy capacity by 2022, and share of non-fossil fuel based capacity in the electricity mix is aimed at above 40% by 2030.

India Vision 2040:

- The NEP aims at supporting the Indian ambition to emerge as a well-developed and resilient economy with high level of human development.
- Additionally, it helps prepare the nation to anticipate the technological and market related changes in the energy sector.

Read more/Download>>

4.1.2 National Smart Grid Mission (NSGM)

Ministry of Power (MoP) launched **National Smart Grid Mission** in 2015 with aims to accelerate Smart Grid deployment in India. Smart Grid is an evolving set of various technologies, especially information and communication technologies (ICT), working together to improve the present grid. Being an evolving technology, it is difficult to define it. Further, the applications of smart grid shall depend on the location and the requirements, henceforth its definition. India is presently spearheading some of the largest transformation projects with technology interventions for building smart cities, renewable energy and power grid modernization.

NSGM functions with three tier hierarchical structure as follows:

- 1st Level – Governing Council, headed by Minister of Power.
- 2nd Level – Empowered Committee, headed by Secretary (Power).
- Supportive Level – Technical Committee, headed by Chairperson CEA.
- 3rd Level – NSGM Project Management Unit.

The Government of India has committed to provide 24x7 reliable supply of electricity to all the citizens. In order to achieve this noble objective, several targeted programs have already been launched by Government of India which include:

- Deen Dayal Upadhyaya Gram Jyoti Yojana with an investment of around INR 490 billion (€6 billion)

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- Integrated Power Development Scheme that covers 5000 towns with an investment of around INR 420 billion (€ 5.2 billion)
- North Eastern Regional Power System Improvement Project (NERPSIP) with an investment of around INR 70 billion (€0.9 billion)
- New RE Program with a target of 175 GW by 2022 and investment commitment of INR 18,200 billion (€226 billion).

NSGM has its own resources, authority, functional & financial autonomy to plan and monitor implementation of the policies and programs related to Smart Grids in the country.

Read more India Smart Grid Vision & Roadmap.

Smart grid has several positive features that give direct benefit to consumers. Real time monitoring, automated outage management and faster restoration facilitated by Smart Grids enables consumers to enjoy improved reliability and better quality of power. Dynamic Pricing Mechanisms incentivize consumers to alter their usage during different times of day based on pricing signals, enabling them to optimize their electricity bills through better energy management. In-house displays, programmable control thermostats, portals and energy information tools like mobile apps will allow consumers to track and manage their energy usage and identify opportunities to reduce and conserve electricity. Smart Grid will also facilitate distributed generation, especially the roof top solar generation, by allowing movement and measurement of energy in both directions using control systems and net metering that will help "prosumers" i.e. the consumers who both produce and consume electricity, to safely connect to the grid.

The efforts for the development and deployment of Smart Grids in India are presently being carried out through India Smart Grid Task Force (ISGTF) and India Smart Grid Forum (ISGF) under the aegis of Ministry of Power (MoP). MoP has allocated 14 Smart Grid pilot projects that will be implemented by various state-owned distribution utilities in India.

India Smart Grid Forum (ISGF)

India Smart Grid Forum (ISGF) is a Public Private Partnership initiative of Ministry of Power (MoP), Government of India for accelerated development of smart grid technologies in the Indian power sector. Mandate of ISGF is to advise government on policies and programs for promotion of Smart Grids in India, work with national and international agencies in standards development and to help utilities, regulators and the Industry in technology selection, training and capacity building.

The main objectives of ISGF are:

- To help the Indian power sector deploy smart grid technologies in an efficient, cost effective, innovative and scalable manner by bringing together all key stakeholders and enabling technologies.
- To create a platform for public and private stakeholder members, **research institutions and power utilities** to exchange ideas and information on smart grids and develop use case scenarios for India.

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- To bring together experts from regulation, policy, and the corporate sector to build support for smart grid policies.
- To conduct **research on the capabilities of smart grids** in the Indian context through case studies, cost-benefit analysis, study of technical advancements in renewable energy sources and other ancillary activities.
- To make recommendations to the Government, Regulators, Utilities and Consumers through reports, white papers, technical seminars, etc.

Working Groups of ISGF:

- WG1: Advanced Transmission
- WG2: Advanced Distribution
- WG3: Communications
- WG4: Metering
- WG5: Load Control
- WG6: Regulatory & Policy
- WG7: Architecture & Design
- WG8: Pilots and Business Models
- WG9: Renewables and Microgrids
- WG10: Cyber Security

ISGF has 8 working groups focused on different aspects of smart grid such as: WG1: Grid Modernization & Smart Cities; WG2: IoT, Smart Metering, AI & Analytics; WG3: Digital Architecture and Cyber Security; WG4: Policy, Regulations and Business Models; WG5: Renewables & Microgrids; WG6: Flexibility & Electric Mobility; WG7: Smart Gas; WG8: Smart Water.

ISGF work closely with government institutions such as CEA, CPRI, CERC, NSGM and NCIIPC; ministries such as MNRE, DoT, MoUD, MoHI etc and other stakeholders like state governments, electric utilities and electricity regulatory commissions. With 170+ members comprising of ministries, utilities, technology providers, academia and research, ISGF has evolve as a Think-Tank of global repute on Smart Grids and Smart Cities. Read more about ISGF>>

India Smart Grid Task Force (ISGTF)

The India Smart Grid Task Force is an inter-ministerial group and will serve as government focal point for activities related to SMART GRID. The Main functions of ISGTF pertaining to Smart Grid are:

- To ensure awareness coordination and integration of diverse activities related to Smart Grid Technologies.
- Practices & services for **research & development** of SMART GRID.
- Coordination and integrate other relevant inter- governmental activities.
- Collaborate on interoperability framework.
- Review & validate recommendations from India Smart Grid Forum etc.

ISGTF has 5 Working Groups-

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- WG1: Pilots on New Technologies
- WG2: Loss Reduction & Analysis
- WG3: Power to Rural/Urban Areas
- WG4: Distributed Generation & Renewables
- WG5: Cyber Security

Above mentioned five Working Groups are focusing on the various facets of Smart Grid development in India such as trials/pilots on new technologies / ideas, loss reduction & theft control, access of power to rural areas & reliability and quality of power to urban areas, distributed generation & renewables and physical cyber security, standards and spectrum. The activities of these Working Groups are being coordinated by Ministry of Communications & IT, Ministry of New and Renewable Energy, POWERGRID, CEA, CPRI, NTPC, BIS, PFC and REC etc. POWERGRID is actively working in WG-1-Pilots & WG-5-Cyber Security as a prominent player.

Read more about NSGM here>>

4.1.3 Smart Meter National Programme

The Smart Meter National Programme is being implemented by Energy Efficiency Services Limited (EESL), a Joint Venture (JV) of Public Sector Undertakings (PSUs) under Ministry of Power to deploy smart meters across the country. Smart metering is essentially the first step towards a smart grid. A new range of 'smart meters' can bring efficiency to how India manages its electricity, by checking data-entry errors and billing efficiencies, and cutting the costs of manual meter reading through web-based monitoring system.

With its pioneering role in India's energy efficiency journey, EESL's Smart Meter National Programme (SMNP) is working to eventually replace 25 crore (250 million) conventional meters with smart meters across India. By bringing standardized solutions based on the GPRS technology, these meters will ease integration in the sector, while cutting capital costs and boosting efficiency in billing and collection. Customers will also benefit from accurate bill readings, and real-time understanding of their electricity usage, catalysing a pan-India movement towards energy efficiency.

Read more>>

4.1.4 New Electric Vehicle Charging Station guidelines

The Ministry of Power (MoP) has announced guidelines and standards for the development of electric vehicle charging infrastructure in India. Through these guidelines, the government aims to enable faster adoption of EVs, promote an affordable tariff rate, and support the development of EV charging business throughout the country.

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4.1.5 Saubhagya scheme

Government of India launched Pradhan Mantri Sahaj Bijli Har Ghar Yojana also known as Saubhagya scheme in September 2017, with the objective of electrifying all left-out Indian households. The scheme covers both urban and rural households. Under it, free electricity connections are provided to Below Poverty Line (BPL) households, while other households have to pay INR 500 (about 6 euros) for the connection. Under the Saubhagya scheme, 2,52,51,880 (over 25.25 million) unelectrified households were to be electrified by March 31. The total cost of the Saubhagya project is pegged at INR 163.20 billion (about 2 billion euros), of which, 60% is funded by the Centre, 30% by bank loans and the remaining 10% by State governments. Of the total outlay, a chunk of INR 140.25 billion (about 1.7 billion euros) is proposed for rural areas.

The scheme envisages electricity connection for each household by drawing a service cable from the nearest electricity pole to the home, installing an energy meter, and wiring for a single light point with an LED bulb and a mobile charging point.

For more Information please click here

4.1.6 Deen Dyal Upadhaya Gram Jyoti Yojana (DDUGJY)

The Government of India has launched “Deendayal Upadhyaya Gram Jyoti Yojana” for rural areas having following objectives:

- To provide electrification to all villages
- Feeder separation to ensure sufficient power to farmers and regular supply to other consumers
- Improvement of Sub-transmission and distribution network to improve the quality and reliability of the supply
- Metering to reduce the losses

Scheme has an outlay of INR 760 billion (€9.4 billion) for implementation of the projects under which Government of India shall provide Grant of INR 630 billion (€7.8 billion). The erstwhile Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY) scheme for village electrification and providing electricity distribution infrastructure in the rural areas has been subsumed in the DDUGJY scheme. Rural Electrification Corporation is the Nodal Agency for implementation of DDUGJY.

The deadline for the Centre's rural electrification programme was May 2018. However, it was achieved before the deadline in April 2018.

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4.1.7 Ujwal Discom Assurance Yojana (UDAY)

Ujwal DISCOM Assurance Yojana (UDAY) was launched by Ministry of Power (MoP) in 2015. UDAY provides for the financial turnaround and revival of Power Distribution companies (DISCOMs), and importantly also ensures a sustainable permanent solution to the problem. It aimed to help to make discoms financially and operationally healthy so they can supply adequate power at affordable rates.

Salient Features of the Scheme

For Financial Turnaround

- State Governments were to take over up to 75% of their respective discoms' debt by issuing sovereign bonds to pay back the lenders.
- Maturity period of bonds - 10-15 years.
- Moratorium period – up to 5 years.
- Rate - G-sec plus 0.5% spread plus 0.25% spread for non-SLR.
- Borrowing not to be included for calculating fiscal deficit of the State.

Achieving Financial Turnaround

- Balance 25% of debt to remain with the DISCOMs in the following manner:
  - Issued as State-backed DISCOM bonds; or
  - Re-priced by Banks/FIs at interest rate not more than bank base rate + 0.10%
- States to take over future losses of DISCOMs as per trajectory in a graded manner. [0% of loss of 14-15 & 15-16; 5% of 16-17; 10% of 17-18; 25% of 18-19 & 50% of 2019-20]
- Balance losses to be financed through State bonds or DISCOM bonds backed by State Govt guarantee, to the extent of loss trajectory finalised with MoP.
- Jharkhand and J&K given special dispensation for take over of outstanding CPSU dues.

Read more>>

4.1.8 Integrated Power Development Scheme (IPDS)

Ministry of Power (MoP) launched Integrated Power Development Scheme (IPDS) in 2015 with following components:

i. Strengthening of sub-transmission and distribution networks in the urban areas.
ii. Metering of distribution transformers / feeders / consumers in the urban areas.
iii. IT enablement of distribution sector and strengthening of distribution network under R-APDRP for 12th and 13th Plans by carrying forward the approved outlay for R-APDRP to IPDS.
iv. Schemes for Enterprise Resource Planning (ERP) and IT enablement of balance urban towns are also included under IPDS. Scope of IT enablement has been extended to all 4041 towns as per Census 2011.

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v. Underground cabling to include additional demand of States and smart metering solution for performing UDAY States and Solar panels on Govt. buildings with net-metering are also permissible under the scheme.

The scheme has been launched with an outlay of around INR 440.11 billion (€5.5 billion) for 12th and 13th plans. All discoms including private discoms and state power depart are eligible for financial assistance under the scheme.

Read more>>

4.1.9 Indian Electrical Equipment Industry Mission Plan 2022

Indian Electrical Equipment Industry Mission plan seeks to steer, coordinate and synergise the efforts of all stakeholders to accelerate and sustain the growth of the domestic electrical equipment industry. It identifies five key areas for action:

(i) **Industry competitiveness**;
(ii) **Upgrading technology**;
(iii) **Skill development**;
(iv) **Promotion of exports**; and
(v) **Conversion of latent demand**.

Detailed recommendations have been formulated for strategic and policy interventions in these five critical areas that need to be addressed by the industry, with support from the government. The Mission Plan envisages to make India the country of choice for the production of electrical equipment and reach an output of US $100 billion by balancing imports and exports. It has been evolved by the Department of Heavy industry through an elaborate exercise involving all stakeholders and with the support of the Indian Electrical and Electronics Manufacturers' Association (IEEMA).

I. **To enhance industry competitiveness**, the Mission Plan calls for providing a level playing field in the country to domestic electrical equipment manufacturers vis-à-vis foreign manufacturers, 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 of electrical equipment, providing funds at globally competitive rates of interest to domestic manufacturers, establishing clusters of electrical and component manufacturers and providing them funds for technology up gradation.

II. **For technology up gradation**, the Mission Plan recommends a coordinated and collaborative effort by industries and utilities. 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. It also recommends public-private partnership (PPP) for fast development of new technology / systems.

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III. **Under skills development**, it is suggested to set up a Sector Skill Council (SSC), which will undertake skill mapping and 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. The Mission Plan calls for greater involvement of industry in the periodic review of the curriculum of technical institutes, summer training of students and for guest lectures by industry experts.

IV. **To boost exports of electrical equipment**, the Mission Plan recommends providing policy support to domestic manufacturers to enhance their competitiveness in the global market and address issues of quality of the products, high transaction costs, non-recognition of test certificates of CPRI by some countries, high cost of production, high cost of finance, etc. The Mission Plan calls for more project specific lines of credit by the EXIM Bank to other countries with an emphasis on acceptance of equipment / material only from India for such projects.

V. **To convert the latent demand for power in the country**, the Mission Plan calls for timely completion of power generation projects and the downstream transmission projects for evacuation of power and improvement in the health of power distribution companies. It recommends the State Governments to acquire land, construct approach roads, and arrange construction power supply and other clearances, with the project developers reimbursing the costs. It suggests that urban areas with high aggregate technical & commercial losses be handed over to private sector on the input-based franchisee model with the provision for investment by the franchisee for system improvement, with the franchisee being asked to set up decentralised distribution-cum-generation (DDG) projects in identified rural areas.

Read more/Download>>

4.1.10 100% FDI and delicensing

Indian government has allowed foreign direct investment up to 100%, through the automatic route in the electrical equipment industry and fully delicensing making it easy for investors to set up their manufacturing units in India.

4.2. Electronics Sector

4.2.1 National Electronics Policy

In February 2019, The Cabinet has approved National Policy on Electronics 2019 for the Electronics System Design and Manufacturing (ESDM) sector of India. NPE 2019 is a final version of the draft policy prepared by the Ministry of Information Technology and Telecommunication in 2018. NEP 2019 replaces NEP 2012.

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Vision:

To position India as a global hub for Electronics System Design and Manufacturing (ESDM) by creating an enabling environment for the industry to compete globally.

Key Objectives:

- The policy aiming for a turnover of USD 400 billion (about €351 billion) in domestic electronics manufacturing industry by 2025.
- The policy targets production of one billion mobile handsets by 2025, valued at about INR 13,000 billion (€161 billion) including 600 million mobile handsets valued at about INR 7000 billion (€86.8 billion) for export.
- The policy aims to improve ease of doing business for the entire Electronic System Design and Manufacturing (ESDM) sector.
- It aims to encourage Industry-led R&D and Innovation in all sub-sectors of Electronics.
- It also aims to support a comprehensive Start-up ecosystem in emerging technology areas such as such as 5G, loT/ Sensors, Artificial Intelligence (Al), Machine Learning, Virtual Reality (VR), Drones, Robotics, Additive Manufacturing, Photonics, Nano-based devices, etc.
- To become a global leader in the Electronics Manufacturing Services (EMS) segment by promoting progressively higher value addition in manufacturing of electronic products.
- It includes promotion of research, innovation and support to industry for green processes and sustainable e-Waste management, including safe disposal of e-Waste in an environment friendly manner, development of e-Waste recycling industry and adoption of best practices in e-Waste management.

Read more/Download>>

4.2.2 Make in India

Make in India is a major new national programme of the Government of India designed to facilitate investment, foster innovation, enhance skill development, protect intellectual property and build best in class manufacturing infrastructure in the country. The primary objective of this initiative is to attract investments from across the globe and strengthen India's manufacturing sector. It is being led by the Department of Industrial Policy and Promotion (DIPP), Ministry of Commerce and Industry, Government of India. The government is driving reforms in IT and Electronics Manufacturing sector through initiatives like 'Make in India' and creating favorable policies to enable an investor-friendly environment.

The focus of Make in India programme is on 25 sectors and **Electronic System Design and Manufacturing** is one of the major sectors of 'Make in India'.

Read more about Make in India>>

Public Procurement (Preference to Make in India) Order 2017

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Public Procurement (preference to Make in India) order was passed in 2017 by Ministry of Electronics and Information Technology to promote manufacturing of goods and services in India. Under public procurement order, the government targeted 10 domestically manufactured electronic products for providing preference on the basis of prescribed domestic value addition, ranging from 40% to 70%.

4.2.3 Digital India

Digital India is a campaign launched by the Government of India on 1 July 2015 to ensure that Government services are made available to citizens electronically by improved online infrastructure and by increasing Internet connectivity or by making the country digitally empowered in the field of technology. As part of the "Digital India" agenda of the Government, it is envisaged to develop the **Electronics System Design and Manufacturing (ESDM) sector** to achieve **"Net Zero Imports"** by 2020.

For more information please click here

4.2.4 Electronic Development Fund (EDF) Policy

As part of Digital India initiative, Government launched **Electronics Development Fund (EDF) policy** as a Fund of Funds which will foster R&D and innovation in technology sectors like electronics, IT and nano-electronics. EDF supports Venture Funds and Angel Funds, which will be professionally managed and are dedicated to these sectors. EDF Policy therefore enables creation of an ecosystem for providing risk capital to both industry and academia to undertake research and development in these technology areas. It will, in the process, enrich the intellectual property in the country and encourage more entrepreneurs towards product and technology development. The government also has a plan to develop the Electronic System Design and Manufacturing (ESDM) and achieve the target of "Net Zero Imports" in another 4 years by 2020.

According to information available on Ministry of Electronics and IT (Meity) website, the total corpus recommended to be invested by 22 daughter fund in technology firms is around Rs 109.06 billion (1.35 billion euros), in which government has proposed to contribute Rs 12.27 billion (0.15 billion euros). The contribution, however, is subjected to final approval of the EDF board.

So far, investment in 13 daughter funds has been approved by the Government with a total targeted corpus of Rs 69.5 billion (0.86 billion euros). The amount committed by EDF to these 13 daughter funds is Rs 8,570 million (106.3 million euros) which will be invested in them over a period of 4-5 years. According to the website, nine of the daughter funds with a corpus of around Rs 26,760 million (332 million euros) under EDF are currently in investment mode. EDF is being promoted by the Department of Electronics and Information Technology (DeitY), Ministry of Communications and IT, Government of India as a Digital India initiative.

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4.2.5 National Policy on Universal Electronic Accessibility

Government of India has approved the National Policy on Universal Electronic Accessibility in 2013 that recognized the need to eliminate discrimination on the basis of disabilities as well as to facilitate equal access to electronics and Information and Communication Technologies (ICTs).

The policy facilitated equal and unhindered access to electronics and ICTs products and services by differently abled persons (both physically and mentally challenged). This shall be achieved through universal access to electronics and ICT products and services to synchronize with barrier free environment and preferably usable without adaptation. Differently abled persons all over the country will benefit from this policy.

The following strategies are envisaged for the implementation of the policy:

- Creating awareness on universal electronics accessibility and universal design.
- Capacity building and infrastructure development.
- Setting up of model electronics and ICTs centres for providing training and demonstration to special educators and physically as well as mentally challenged persons.
- Conducting research and development, use of innovation, ideas, technology etc. whether indigenous or outsourced from abroad.
- Developing programme and schemes with greater emphasis for differently abled women/children.
- Developing procurement guidelines for electronics and ICTs for accessibility and assistive needs.

Accessibility Standards

Accessibility Standards and Guidelines be formulated or adapted from prevailing standards in the domain including W3C accessibility standards and guidelines such as given below amongst others:

- ATA G (Authoring Tools Accessibility Guidelines)
- WCA G 2.0 (Web Content Accessibility Guidelines)
- UAAG (User Agent Accessibility Guidelines)

In addition to the Government Web sites and those dealing with the disabilities issues, accessibility compliance of citizen centric sites shall be monitored and due diligence shall be maintained by thoroughfare traffic and consumer transaction sites of high impact to the public.

Read more/Download>>

4.2.6 Compulsory Registration Scheme

In 2012 **Compulsory Registration Scheme (CRS)** was introduced by Ministry of Electronics and Information Technology (MeitY) along with Bureau of Indian Standards (BIS). The scheme then covered 15 electronic and consumer products and added another 15 products in 2014. MeitY has further added 13 product categories in August 2017. Ministry of New and Renewal Energy (MNRE) has notified Solar Photovoltaics,

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Systems, Devices and Components Goods (Requirements for Compulsory Registration) Order, 2017 for 6 products through notification dated 05 September 2017.

Bureau of Indian Standards (BIS) is operating Compulsory Registration Scheme (CRS) as per the provision of Scheme - II of the BIS (Conformity Assessment) Regulations, 2018 for the product categories notified by MeitY and MNRE. Under this scheme it is mandatory for manufacturers to get their products registered before launching them in market.

Overseas Manufacturers are required to have a local representative in India who will represent the manufacturer locally and will be responsible for placing the product in the market. To make this program robust, Market Surveillance has been designed to ensure compliance.

Click here to read more about CRS
For list of product categories, please click here

4.2.7 Modified Special Incentive Package Scheme (M-SIPS)

In 2012, The Government of India has approved M-SIPS scheme to boost large scale manufacturing and attractive investments in the Electronic System Design and Manufacturing (ESDM) sector. The scheme provides subsidy for capital expenditure 20% for investments in Special Economic Zones (SEZs) and 25% in non-SEZs. For some high capital investment projects, it provides for reimbursement of central taxes and duties. Originally 29 electronic verticals were covered under the scheme. M-SIPS was modified in August 2015 by extending the scheme to 2020, and adding 15 new product categories like smart cards, liquid crystal modules, consumer appliances, Internet of Things products, multi-functional electronic devices and optical fibre etc.

Meity notified amendments to revised M-SIPS in January 2017. The following amendments are applicable with immediate effect:

- Incentives will be given to applications received till 31st December 2018 or till total incentive commitment reaches Rs 100 billion (1.24 billion euros); whichever is earlier.
- The incentives under the scheme will be available for the period of five years from date of approval of the application under M-SIPS.
- After receiving the incentives, the unit should undertake production for a period of at least 3 years.
- An appraisal Committee recommending approval of projects will be chaired by Secretary of Ministry of Electronics and Information Technology.
- A separate Committee headed by Cabinet Secretary and comprising of CEO, NITI Aayog, Secretary Expenditure and Secretary, MeitY will be set up in respect of mega projects, envisaging more than Rs. 68.5 billion (0.85 billion euros) investments.

For more information about M-SIPS please click here>>

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4.2.8 Electronic Manufacturing Clusters (EMCs) scheme

In 2012, Government of India approved Electronics Manufacturing Clusters (EMC) scheme to provide support for creation of world-class infrastructure for attracting investments in the Electronics Systems Design and Manufacturing (ESDM) Sector. For effective functioning of the scheme, a set of guidelines for operationalization of the EMC scheme were issued in April 2013. The guidelines for EMC contains the requisite project parameters, detailed terms and conditions of the scheme along with the applications forms for making preliminary and final application. The EMCs scheme provides grant assistance for setting up of both Greenfield and Brownfield EMCs across the country. The financial assistance under the scheme is in the form of grant-in-aid only.

The grant assistance offered are as:

- For Greenfield EMCs, grant of 50% of project cost is provided subject to ceiling of INR 500 million (6.2 million euros) for every 100 acres of land. As on date, 20 Green EMCs have been final approved.
- For Brownfield EMCs, grant of 75% of project cost is provided subject to ceiling of INR 500 million (6.2 million euros). As on date, 3 Brownfield EMCs have been final approved.

More information about EMCs scheme is available here

4.2.9 100% FDI

Indian government has allowed foreign direct investment up to 100%, through the automatic route in the Electronics sector. As a result, the Government of India (GOI) received around INR 126 Billion FDI in 2017 in Electronics sector.

5. Standardization Bodies

5.1 Electrical sector

5.1.1 Bureau of Indian Standards (BIS)

BIS is the National Standards Body of India functioning under the aegis of Ministry of Consumer Affairs, Food and Public Distribution, Govt. of India. BIS as National Standards Body has been actively participating in the activities of International Organization for Standardization (ISO) and the International Electro-technical Commission (IEC) and projecting India's interest during various stages of the development of International Standards. BIS is actively involved in formulation of standards in the Electrical sector through Electro-technical Division Council (ETDC).

5.1.1.1 Electro-technical Division Council (ETDC)

This Division Council of BIS Standardization in the field of electrical power generation, transmission, distribution and utilization equipment; and insulating materials, winding wires, measuring and process

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control instruments and primary and secondary batteries. There are over 1600 standards issued by ETD. ETD has divided the work into following division council as follows:

- **ETD 28: Solar Photovoltaic Energy Systems:** ETD 28 is responsible for preparing standards for systems of photovoltaic conversion of solar energy into electrical energy and for all the elements in the entire photovoltaic energy systems In this context, the concept photovoltaic energy systems includes the entire field from light input to solar cell and including the interface with the electrical system(s) to which energy is supplied.

Division Council	Corresponding IEC TCs
ETD 28: Solar Photovoltaic Energy Systems	IEC TC-82 (P): Solar photovoltaic energy systems

- **ETD13: Equipment For Electrical Energy Measurement and Load Control (Smart Meter)**: ETD 13 is responsible for preparing standards for equipment for electrical energy measurement, tariff - and load control, customer information, payment, local and/or remote data exchange, using electromechanical and/or electronic, technologies for applications ranging from electrical energy generation to residential. The standards may include requirements and test methods to cover mechanical, environmental, electrical, safety, metrology dependability aspects as well as functional requirements and data models.

Division Council	Corresponding IEC TCs
ETD13: Equipment For Electrical Energy Measurement And Load Control	IEC TC-13 (P): Electrical energy measurement and control

To simplify and standardize **advanced metering infrastructure (AMI)** in India, the ministry of Power (MoP) requested the Bureau of Indian Standards (BIS) to develop a national standard for smart meters. The development resulted in the creation of following smart meters standards:

IS No. & Year	Title
IS 15959 (Part 2) : 2016	Data Exchange for Electricity Meter Reading Tariff and Load Control - Companion Specification Part 2 Smart Meter
IS 15959 (Part 3) : 2017	Data Exchange for Electricity Meter Reading Tariff and Load Control-Companion Specification Part 3 Smart Meter Transformer Operated kwh and kVARh Class 0 2 S 0 5 S and 1

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IS 16444 : 2015	a c Static Direct Connected Watthour Smart Meter Class 1 and 2 - Specification
IS 16444 (Part 2) : 2017	a c Static Transformer Operated Watthour and Var-Hour Smart Meters Class 0 2 S 0 5 S and 1 0 S Part 2 Specification Transformer Operated Smart Meters

- **ETD 46: Grid Integration**: ETD 46 is responsible for preparing standards in the field of Grid Integration comprising of LT (ON Grid, Off Grid and Hybrid with and without storage), HT and EHT for all capacities.
- **ETD 50 – LVDC Power Distribution System: ETD 50** is responsible for standardization work on:
  a) LVDC System Requirements, Safety and Installation Guidelines
  b) LVDC products including electrical wiring accessories and Applications
  c) Integration of DC Infrastructure
  d) Non Traditional Distribution Networks/Microgrids

Division Council	Corresponding ISO/IEC TCs
ETD 50 – LVDC Power Distribution System	IEC TC-SyC LVDC (P): SyC LVDC Low Voltage Direct Current and Low Voltage Direct Current for Electricity Access

Full List of technical committees of ETD of BIS with their published standards is available here

Ministry of Power (MoP) through **Central Electricity Authority (CEA),** the apex policy advisory body, **specifies following as below:**

- Technical standards for construction of electrical plants, electric lines and connectivity to the grid;
- Safety requirements for construction, operation and maintenance of electrical plants and electric lines;
- Grid Standards for operation and maintenance of transmission lines;

Ministry of New and Renewable Energy (MNRE) through **Central Board of Irrigation and Power** has enabled Indian power sector to set higher benchmarks and attain international standards in excellence by creating a unique platform for growth and progress of this sector.

5.1.2 Telecommunication Engineering Centre (TEC)

Telecom Engineering Centre (TEC) of Department of Telecommunications (DoT), Ministry of Communications (MoC) has come out with 12 technical reports on M2M detailing sector specific requirements/use cases to carry out gap analysis and future action plans with possible models of service

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delivery. Out of twelve technical reports, one technical report titled "**M2M Enablement in Power Sector**" comprehensively introduced the need of M2M communication in the power sector. the report has also identified use cases this sector which include smart metering, Supervisory Control and Data Acquisition (SCADA), Wide Area Monitoring System (WAMS), Electric Vehicles, Distributed Generation, Energy Storage, Microgrids and so on.

Read more/ Download>>

5.2 Electronics sector

5.2.1 Bureau of Indian Standards (BIS)

BIS is actively involved in formulation of standards in the electronics sector through its Electronics and Information Technology Division Council (LITDC).

5.2.1.1 Electronics and Information Technology Division Council (LITDC)

LITDC is in charge of electronics and telecommunications including information technology. This division council has developed more than 1600 standards till date.

- **LITD 10: Power system Control and associated Communications:** To prepare Indian Standards relating to: a) Power system control equipment and systems including EMS (Energy Management System) b) DMS (Distribution Management System) c) SCADA (Supervisory Control and Data Acquisition) d) Distribution automation, **Smart Grid**, teleprotection and associated communications used in planning, operation and maintenance of power systems.

Division Council	Corresponding IEC TCs
LITD 10: Power system Control and associated Communications	IEC TC- 57 (P): Power systems management and associated information exchange ;IEC TC- SC-PC 118 (P): Smart Grid User Interface

Full List of technical committees of LITDC of BIS with their published standards is available here

5.2.2 Compulsory Registration Scheme

As mentioned above in clause 4.2.6 of this report, Ministry of Electronics and Information Technology (Meity) along with Bureau of Indian Standards (BIS) introduced **Compulsory Registration Scheme (CRS)** in 2012.

In 2012, Ministry of Electronics & Information Technology (MeitY) has notified "Electronics and Information Technology Goods (Requirement for Compulsory Registration) Order, 2012" for fifteen

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categories of electronics products. Another 15 product categories were added by MeitY under this order in 2014.

In order to eliminate the substandard solar modules flooded in India, the Ministry of New Renewable Energy (MNRE) issued new set of quality norms and standards for all solar equipments in 2017. The order mandates the sellers and makers of solar modules, one of the key components of solar projects, to get their products registered under quality parameters set by the Bureau of Indian Standards (BIS).

So far, the scheme covers 49 product categories notified by Meity and MNRE and the scheme is being operated by Bureau of Indian Standards (BIS) as per the provision of Scheme - II of the BIS (Conformity Assessment) Regulations, 2018.

Click here to read more about CRS
For list of product categories, please click here

6. Research, Development & Innovation

6.1 Central Power Research Institute (CPRI)

Central Power Research Institute (CPRI) is the power house of the Indian electrical industry. It functions as a centre for applied research in electrical power engineering assisting the electrical industry in product development and quality assurance. CPRI also serves as an independent authority for testing and certification of power equipment. CPRI's governing body includes eminent professionals from industries & utilities, prestigious academic and research institutions & the government. With its state-of-the art infrastructure and expertise, CPRI has made significant contributions to the power sector in the country for improved planning, operation and control of power systems. Besides in-house R&D, CPRI also undertakes sponsored research projects from manufacturers and other agencies in different areas of specialization.

Read more about CPRI>>

6.2 National Perspective Plan (NPP)

The NPP scheme has the following objectives:

- To promote innovation by sharing the expertise and experience.
- To forge industry-institute cooperation
- To strengthen the National Innovation capability
- To strengthen R&D infrastructure
- Develop and sustain man power for R&D in power sector

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Towards achieving the above objectives, the MoP provides partial financial support to New Product / Process Development projects taken up by Indian Industry, academia in all sectors, for research projects relevant to Power Sector.

Read more about NPP>>

6.3 Electrical Research and Development Association (ERDA)

Electrical Research and Development Association (ERDA) is a not-for-profit professional organization created by the Indian Electrical Industry and Utilities with the support of Governments of India and Gujarat. ERDA was established at Vadodara on the land provided by Gujarat government free of cost. ERDA's services are provided under the following three business verticals:

- Testing & Evaluation
- Field Services and
- R&D and Expert Services.

Read more about ERDA>>

6.4 Centre for Development of Advanced Computing (C-DAC)

Centre for Development of Advanced Computing (C-DAC) is the premier R&D organization of the Ministry of Electronics and Information Technology (MeitY) for carrying out **R&D** in IT, Electronics and associated areas. Real time Systems Group (RTSSG) of C-DAC, Bangalore has developed the COPS SMART ProGate Protocol Converter and currently the recent version of respective technology is available for transfer to manufacturing industries. With the advent of the standard protocol and for coexisting of legacy SCADA System, a multiprotocol gateway is needed. The interoperability issues are of main concern, the ProGate is developed to achieve interoperability by converting standard or proprietary protocol to a suitable standard protocol.

The ProGate uses the C-DAC Multi Agent Framework (CMAF) for self-healing from any logical port failures. This product has been developed in adherence to standards and compliance to IEC 60870. The indigenously developed ProGate software has unique feature of the self-healing from logical port failures using agent technology. C-DAC would continue to support with advances in software and develop newer products and versions with the continuing research in the field of real time systems and Smart Grid areas.

Read more about C-DAC>>

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6.5 Centre for Materials for Electronics Technology (C-MET)

C-MET has been set up as a Registered Scientific Society under DeitY as a unique concept for development of viable technologies in the area of materials mainly for electronics. C-MET is operating with 3 laboratories located at Pune (Head Quarters), Hyderabad and Thrissur with specialized research mandate at each place. Electronic Materials & Components Development division is providing programme support for C-MET.

Read more about C-MET>>

6.6 NETRA (NTPC Energy Technology Research Alliance)

As a leading player in the world energy sector, NTPC recognized the potential of cutting edge technology in further improving its services and efficiency. The company is fully aligned to the needs of adapting to emerging technologies and upgrading the technologies through research and development. The company is particularly sensitive to Research & Development and the paradigm shift which it can make. Its core areas of research are: climate change, waste management, carbon capture and Utilization, new & renewable energy, efficiency improvement and cost reduction besides providing scientific support to NTPC and external utilities for improving availability, reliability and efficiency.

A Research Advisory Council (RAC) comprising of eminent scientists and experts from India and abroad has been constituted to steer NETRA for high end research. In-house Scientific Advisory Council (SAC) has also been constituted to provide directions for improving plant performance & reducing cost of generation.

NETRA has expanded its horizon and emerged out as a global technological partner by collaborating with national and international organizations. At National level, NETRA has recently signed MoU with MIDHANI, TERI, IIT Bombay, IIT Kanpur, NIT Calicut IIT Madrras, BHEL and IGCAR to name a few. NETRA is in the process of development of Advanced Ultra Super Critical technology, jointly with BHEL & IGCAR.

Read more about NETRA>>

7. Conclusion

The Indian Electrical Equipment including Consumer Electronics sector is witnessing a major transformation in respect of demand growth, energy mix and market operations. Various socio-economic factors and technology developments are contributing to this.

Electricity is the cleanest fuel at the user-end and a key driver in the economic development of a nation. Government of India (GoI) has achieved an ambitious target of electrifying all villages in April 2018 and following up with a $2.5 billion program, Saubhagya, to provide power connections to nearly every household by the end of March 2019. As per World Bank report, nearly 85% of the country's population has access to electricity and India is all set to achieve the target of universal access to electricity before the

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2030 target date. In order to achieve this noble objective several targeted programs have already been launched by Government of India which include: (1) Deen Dayal Upadhyaya Gram Jyoti Yojana (2) Integrated Power Development Scheme that covers 5000 towns (3) New RE Program with a target of 175 GW by 2022 (4) 100 Smart Cities and Rejuvenation of 500 towns where smart grids will provide clean and sustainable energy, (5) National Smart Grid Mission (NSGM) that will take up development of smart grids on fast track in coordination with the above programs. Smart Meters are being deployed in India on the basis of pilot projects by various utilities. Deployment of smart meters needs proper selection and implementation of a communication network depending on the features that the situation demands. In nutshell, GoI's efforts to facilitate domestic production and its other initiatives like Power to All, Housing for all, smart cities, etc are likely to provide enough power for the electrical equipment industry to witness electrifying growth in the near future.

As technologies continue to evolve, Indian Consumer Electronics industry is at the threshold of a decisive phase and the mantra of the industry today is convergence - whether of technologies or products or markets. Consumers are becoming increasingly technology-conscious and are demanding products with built-in artificial intelligence. Based on the latest innovations, it's clear that IoT, 5G, and AI-powered voice assistant technologies will drive the consumer electronics market. Understanding how these technologies add value to consumers' lives will be vital for making informed investment decisions and ensuring product success. Government of India has approved National Electronics Policy with aims to support a comprehensive Start-up ecosystem in emerging technology areas such as 5G, IoT, Artificial Intelligence, Machine Learning, etc. and targets to create a $400 billion electronic manufacturing ecosystem by 2025. Other scheme such as Make in India, Digital India, Modified Special Incentive Package Scheme (M-SIPS) and Electronic Development Fund (EDF) etc. are fueling the growth of sector.

Government of India is getting future ready and has started serious work on identifying and formalizing standards for implementing new emerging technologies such as Smart Grid, Smart Meter, 5G, AI, IoT/M2M, Blockchain etc. Work must be carried out at the international as well as national level for early adoption and implementation of these new emerging technology.

For additional information on smart energy Covering Smart Grid, Smart Meter, LVDC, Micro Grid please click here and download the study report which was released during 3rd Indo European Conference of standards and Emerging Technology, held in April 2018 in New Delhi.

8. Glossary

S. No.	Acronym	Expansion
1	GDP	Growth Domestic Product
2	CAGR	compound annual growth rate

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3	DDUGVYJ	Deen Dayal Upadhyaya Gram Jyoti Yojana
4	EDF	Electronic Development Fund
5	EMCs	Electronic Manufacturing Clusters
6	ESDM	Electronic System Design & Manufacturing
7	ETDC	Electrotechnical Division Council
8	FDI	foreign direct investment
9	GoI	Government of India
10	INR	India Rupee
11	IoT	Internet of Things
12	IPDS	Integrated Power Development Scheme
13	ISGTF	India Smart Grid Task Force
14	LCD	Liquid Crystal Display
15	LED	Light Emitting Diode
16	LITDC	Electronics & Information Technology division council
17	LTE	Long Term Evolution
18	MoP	Ministry of Power
19	M-SIPS	Modified Special Incentive Package Scheme
20	NEP	National Electricity Policy
21	R & D	Research& Development
22	T & D	Transmission & distribution (T&D)
23	USD	United States dollar
24	PPP	Purchasing Power Parity
25	GW	Gigawatt
26	AT&C	Aggregate Technical and Commercial
27	EESL	Energy Efficiency Services Limited
28	PSUs	Public Sector Undertakings
29	TEC	Telecommunication Engineering Center
30	BIS	Bureau of Indian Standards
31	M2M	Machine to Machine Communication
32	IEEMA	Indian Electrical and Electronics Manufacturers Association
33	kWh	kilowatt-hour
34	CEA	Central Electricity Authority of India
35	WG	Working Group

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36	REC	Rural Electrification Corporation
37	NSGM	National Smart Grid Mission
38	DST	Department of Science & Technology
39	AMI	Advanced Metering Infrastructure
40	GSM	Global System for Mobile Communication
41	CDMA	Code-division multiple access
42	CRT	Cathode Ray Tube
43	CEAMA	Consumer Electronics and Appliances Manufacturers Association
44	DTH	Direct to Home
45	CNC	Computer Numerical Control
46	ICT	Information and Communication Technologies
47	SMEs	Small and Medium Enterprises
48	DISCOMs	Distribution companies
49	C-DAC	Centre for Development of Advanced Computing
50	C-MET	Centre for Materials for Electronics Technology
51	NETRA	NTPC Energy Technology Research Alliance

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