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The Evolution of Power Sector in India

Table of Content

Indian Power Sector: A Snapshot

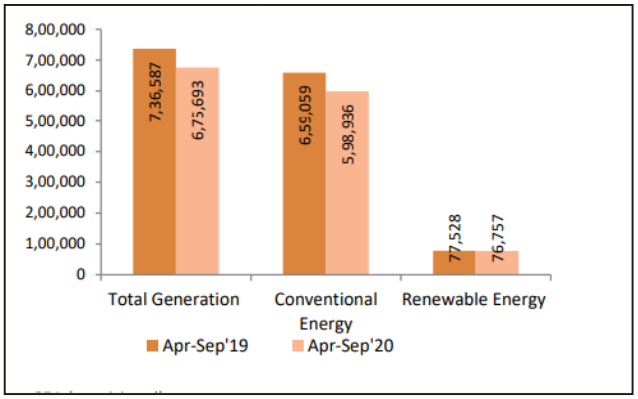
Power Sector plays vital role in the economic growth and Human development of any country. It definitely improves the quality of life of human beings and the biotic of this sphere. Electricity consumption is one of the most important indices for measuring the development level of a nation. Power is one of the most critical components of infrastructure and crucial for the welfare of the Nations. India's power sector is one of the most diversified in the world. India's power sector is one of the most diversified in the world. Sources of power generation range from conventional sources such as coal, lignite, natural gas, oil, hydro and nuclear power to viable non-conventional sources such as wind, solar, and agricultural and domestic waste. Electricity demand in the country has increased rapidly and is expected to rise further in the years to come. In order to meet the increasing demand for electricity in the country, massive addition to the installed generating capacity is required. In May 2018, India ranked fourth in the Asia Pacific region out of 25 nations on an index that measured their overall power. India was ranked fourth in wind power, fifth in solar power and fifth in renewable power installed capacity as of 2018. India ranked sixth in the list of countries to make significant investments in clean energy at US$ 90 billion. India is the only country among the G20 nations that is on track to achieve the targets under the Paris Agreement.

Sector	MW	%of Total
Central Sector	96,187	25.4%
State sector	103,628	27.5%
Private sector	179,315	47.3%
Total	3,79,130	

Total Capacity Installed

Facts and Figures

As of July 2020, India has a total Thermal installed capacity of 231.45 GW. Almost 86% of the thermal power is obtained from coal and the rest from Lignite, Diesel and Gas. The private sector generates 46.9% of India's thermal power whereas States and Centre generate 27.9% and 25.3% respectively. The electricity generation target of conventional sources for the year 2020-21 has been fixed as 1330 Billion Unit (BU). i.e. growth of around 6.33% over actual conventional generation of 1250.784 BU for the previous year (2019-20). This target comprises of 1138.533 BU thermal; 140.357 BU hydro; 43.880 nuclear; and 7.230 BU import from Bhutan.

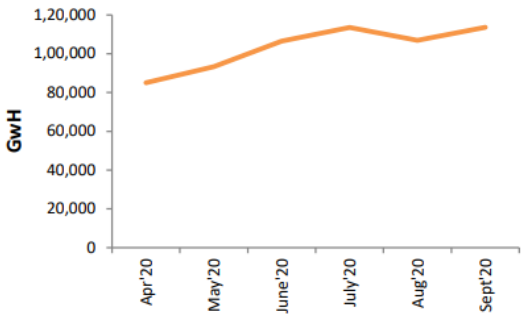


All India Electricity Generation

Power supply position

The growth in availability of electricity during the current year 2019-20 (upto December 2019) was 1.1 % as compared to the same period last year. During the year 2019-20 (upto December 2019), peak shortage was 0.7% and the energy shortage was 0.5% as compared to 0.8% and 0.6% respectively last year.

Electricity Consumption



Power Generation Performance

The total electricity generation including generation from renewable sources in the country during the year 2019-20 (upto December 2019) was 1054.075 BU as against the generation of 1048.068 BU during the same period last year, showing a growth of 0.6%. The target of electricity generation from conventional sources for the year 2019-20 (upto December 2019) was fixed as 1330 Billion unit (BU). The actual generation during the year 2019-20 (upto December 2019) was 950.397 BU as compared to prorata generation target of 1006.553 BU for the period and actual generation of 949.933 BU during the same period last year, representing an achievement of 94.4% and a growth of about 0.05%. *(Source: Annual Report "Ministry of Power")*

Year	Total Generation	% of growth
2009-10	808.498	7.56
2010-11	850.387	5.59
2011-12	928.113	9.14
2012-13	969.506	4.46
2013-14	1,020.200	5.23
2014-15	1,110.392	8.84
2015-16	1,173.603	5.69
2016-17	1,241.689	5.80
2017-18	1,308.146	5.35
2018-19	1,376.095	5.19
2019-20	1,389.102	0.95
2020-21	1,249.827	-2.49

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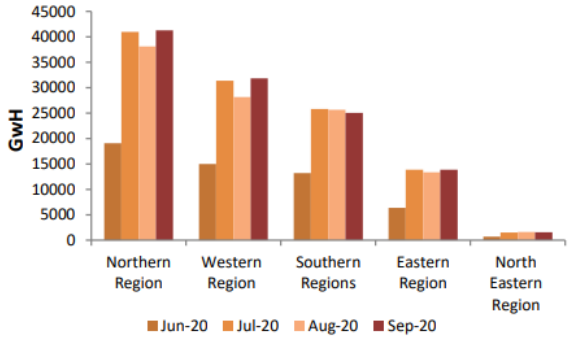
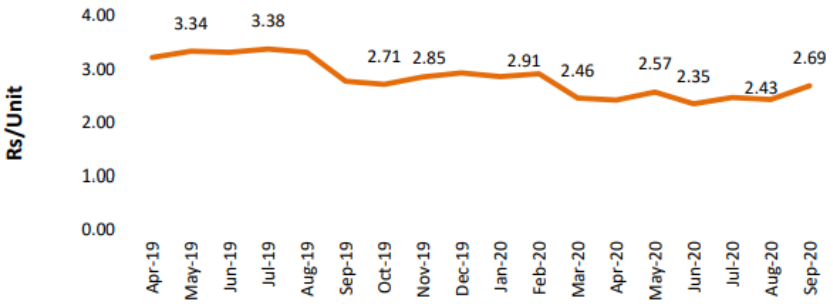
Pick-up in demand

Electricity consumption rose to a 14 months high in September'20, suggestive of the higher levels of activity in the economy. On a monthly basis, electricity consumption rose by 6.3% in September'20, reversing the 5.8% decline of month ago. It was around 6% higher than that in September'19 and 34% higher than the lows of April'20. In terms of regional demand, while there has been an improvement in electricity consumption in the northern, western and eastern regions in September'20 from a month ago, the southern and north-eastern regions witnessed a decline. The western region, which is home to the most industrialised states of the country registered a 13% monthly increase in power consumption, affirming to the higher activity here. The northern and eastern regions saw electricity consumption increase by 8% and 4% respectively from that in August'20. The lower power consumption in the southern states (2.4% lower than in August'20) indicates that industrial activity here has been lacklustre despite the easing of the lockdown and restrictions

Regionwise Electricity Consumption



Average Price of electricity in the day ahead market



Increase in short term electricity prices

The increase in power consumption was being reflected in the trades on the power exchanges. There has been an increase in the volume of trade transacted on the power exchanges - the traded volumes on the Indian Energy Exchange in September'20 at 4780 MU was 7% higher than month ago and 37% more than year ago (September'19). Prices in the day ahead market (DAM) rose to 7-month highs in September'20. The average prices of electricity in the DAM Rs.2.69 per unit in September'20 were 11% higher than that in August'20. It was however 3% lower than year ago (September'19).

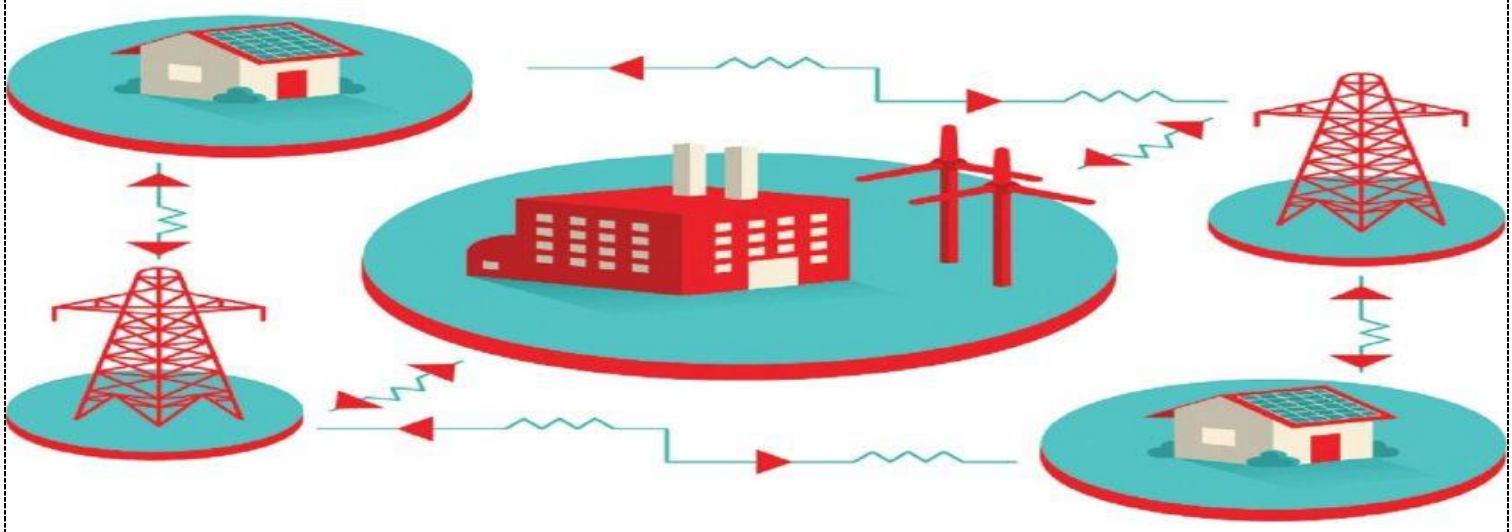
DISCOM dues to power generator mounting

The fall in power demand and disruptions in the billing and collections consequent to the pandemic led lockdown since March'20 has led to cash flow problems for DISCOMS that has further aggravated their financial stress. The absence of cost reflective tariffs, rising operational expenditure, high AT &C losses and delays in receipt of subsidy from the governments has been pressuring the finances of state distribution utilities over time. The outstanding dues owed by DISCOMs to power generators as of Aug'20 amounted to Rs.1.19 lakh crores, which is a 13% increase from January'20. As of August'20, the outstanding dues were the highest for the DISCOMS of Rajasthan (Rs.36,475 crs),Tamil Nadu (Rs.19,648 crs), Uttar Pradesh (Rs.12,671 crs), Karnataka (Rs.9,306 crs) and Maharashtra (Rs.7,314 crs). The DISCOMs of these 5 states accounted for 71% of the total outstanding dues owed to the power generators.

State-wise DISCOM Dues as of end August'20

States	Overdue Amount: Rs Crs
Rajasthan	36,475
Tamil Nadu	19,648
Uttar Pradesh	12,671
Karnataka	9,306
Maharashtra	7,314
Jammu & Kashmir	6,649
Telangana	5,310
Jharkhand	4,732
Andhra Pradesh	4,646
Haryana	3,441
Total	**119,892**

Source: PRAAPTI



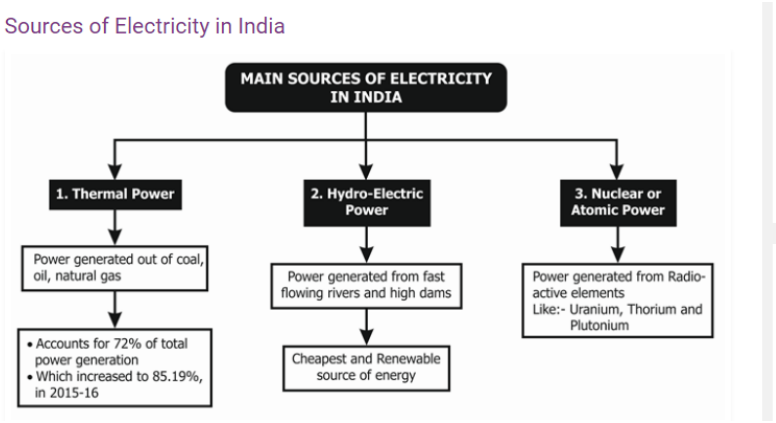
Sources of Power in India

Thermal (61.9%)

India has large reserves of **coal**. By November 2020, the total installed coal thermal power capacity in India stood at 199.59 GW. By 2022, it is expected to witness total installed capacity addition of 47.86 GW. India's **gas thermal** power capacity stood at 24.95 GW, as of November 2020. By 2022, it is expected to witness total installed capacity addition of 0.41 GW. Lignite thermal power capacity stood at 6.26 GW as of November 2020. India's diesel thermal power capacity was ~0.50 GW, as of November 2020

Hydro (12.2%)

With a large swathe of rivers and water bodies, India has an enormous potential for hydropower. As of November 2020, India's hydro power generating capacity stood at 45.69 GW. By 2022, it is expected to witness total installed capacity addition of 6.82 GW.



Nuclear (1.8%)

As of November 2020, India had 6.78 GW of installed nuclear capacity. With one of the world's largest reserves of thorium, India has a huge potential in nuclear energy. By 2022, it is expected to witness total installed capacity addition of 3.30 GW

Renewable (24.0%)

Wind energy is the largest renewable energy source in India. Projects like the Jawaharlal Nehru National Solar Mission (aims to generate 20,000 MW of solar power by 2022) are creating a positive environment among investors keen to exploit India's potential. There are plans to set up four solar power plants of 1 GW each. As of November 2020, India had 90.40 GW of renewable energy capacity. The target is to achieve installed capacity of 227 GW by FY22.

INTER-CONNECTION WITH NEIGHBOURING COUNTRIES

India, being centrally placed in South Asian region and sharing political boundaries with SAARC countries, namely, Nepal, Bhutan, Bangladesh & Sri Lanka, is playing a major role in facilitating planning of interconnections with these countries for effective utilization of regional resources. India has developed expertise in implementation of HVDC and UHVAC projects and it will be beneficial to connect the neighboring countries electrically with HVDC/UHVAC transmission lines. This shall give rise to mutual cooperation amongst neighboring nations and resource sharing in the region. This will also ensure Energy Security of the region. India is already having interconnections with SAARC countries as listed below:

India – Nepal

Nepal has been historically interconnected with India at various places through 11 kV, 33 kV, 132 kV and 220 kV lines radially. The present power transfer capacity between India and Nepal is about 600 MW. The Muzaffarpur (India) - Dhalkebar (Nepal) 400 kV D/c line is expected to be operated at its rated voltage shortly which would further enhance the power transfer capability to Nepal by about 300-400 MW (total about 1000 MW). Further, 2nd High Capacity 400 kV Gorakhpur – New Butwal D/c (Quad) line is taken up for implementation to facilitate reliable transfer of power between the two countries.

India – Sri Lanka

Cross border interconnection has been proposed between India and Sri Lanka through 2x500 MW HVDC line between Madurai (India) and New Habarana (Sri Lanka) with overhead line (including sea portion) in two phases of 500 MW each. The DPR for India – Sri Lanka interconnection is under preparation

India – Myanmar

About 3 MW power is being supplied to Tamu (Myanmar) from Moreh (Manipur) through 11 kV line between the two countries. The feasibility of establishment of following low capacity interconnections is under preparation to facilitate power supply to its border villages. l Nampong (Arunachal Pradesh, India) – Pansong (Myanmar) 11 kV line l Behiang (Manipur, India) – Cikha (Myanmar) 11 kV line l Zokhawthar (Mizoram, India) – Rikhawdar (Myanmar) 11 kV line l Upgradation of Moreh (Manipur) – Tamu (Myanmar) 11 kV line at a higher voltage

Challenges in Power Industry

Power is one of the basic components of infrastructure that defines the country's economic development and the quality of life of an individual. Power is the most visible form of energy that is generally known as electricity. Out of all the power resources available for consumption in India, thermal sources counted 67 percent of power production capacity, 14 percent Hydel power, and 2 percent nuclear power.

- **Insufficient Electricity Generation-** In India, the installed capacity to produce electricity is not enough to support an annual economic growth of 7 to 8 percent. Currently, India only adds 20,000 MW a year to generate power.
- **Poor Management-**The State Electricity Boards (SEBs) incurred losses of more than Rs.500 million because of improper transmission of electricity, wrong pricing, and other incompetence. Few scholars have come to the conclusion that the main reason for the losses is the circulation of power to farmers (they have to only pay minimum chargers or is free), electricity is stolen, that result in losses under the account of SEBs.
- **Lack of Investments:** When it comes to power and energy, the private sector does not play any part or there are any foreign investors. The public sector is almost having a monopoly in the power generation sector.
- **Poor Infrastructure:** Too many power cuts in various parts of the country and huge power tariff.
- **Shortage of Raw Material:** In India, the thermal power plant the main source of generating power is facing a high deficit of coal and raw materials supplies.
- **Limited Role Of Private And Foreign Entrepreneurs:** The public sector is almost having a monopoly in the power generation sector. Due to the lack of management facilities, the public sector is not able to cope up with challenges of power generation. Private and foreign entrepreneurs have not got a chance to prove their capabilities.
- **Policy Paralysis**: The micro level policies governing the fuel cost pass-through, mega power policy; competitive bidding guidelines are not in consonance with the macro framework like The Electricity Act 2003 and the National Electricity Policy.

Five Solutions to Combat the Foregoing Challenges

a. Fuel Reforms: Various aspects like ramping up coal production by both public and private sector in a time-bound manner, increased participation of private sector in coal production and easing of regulatory framework, clearances and approvals for allocation and development of coal blocks & gas infrastructure need to be addressed while formulating such reforms.

b. Arriving at an optimal fuel mix: There is a dire need to develop both conventional and non-conventional forms of energy, wherein, three key factors must be kept in view for developing an energy mix: (i) the pattern of energy demand seen in the country (ii) the availability of fuels, and (iii)fuel production and import costs. It would be effective to adopt coal thermal as a fundamental component of the fuel mix for the next 20-30 years, with solar occupying 5-8 percent of the total mix.

c. Balanced Regulatory Interventions: Regulators need to be sensitized to the challenges faced by the sector and policy framework needs to be crafted and enforced to ensure a win-win situation for all the stakeholders. They must pro-actively intervene to resolve the immediate issues ailing the power sector.

d. Increased Financing Facilities for Energy Sector: A robust and sustainable credit enhancement mechanism for funding in Energy Sector needs to be put in place through increased participation by global funding agencies like The World Bank, ADB etc. in the entire value chain.

e. Public private partnership model: There is a strong need to push for wider-scale implementation of public private partnership models. The private sector has been playing a key role in generating power, a more supportive environment will help in bridging the energy deficit of the country.

Opportunities in Power sector

The Data Centre Wave

In addition to this, the pandemic also increased our reliance on IT systems significantly, thus increasing data traffic and adding to rising demand for bandwidth and storage devices. TheIndian data centre market is expected to have a CAGR of 12 percent from 2019-2024. To take India forward in this realm, our government also further announced plans to set up 1 crore data centres in the country. However, the question we should be asking is, are we prepared for a data centre wave? The amount of energy data centres consume is enormous. Handled inefficiently, it can significantly impact the electric grid, especially the largest synchronous one in the world that is ageing as well. Ergo, there is an urgent need to upgrade the power transmission and distribution infrastructure to improve energy efficiency. The volume of data utilities produce continues to grow.

The EV Revolution

- During the year, we also witnessed a 20 percent jump in electric vehicle (EV) adoption with central and state governments further incentivizing buying, and auto manufacturers going ahead with their earmarked investments and planning roll outs. But to achieve the 30 percent EV adoption target by the end of the decade, the vital thrust to operationalise a nationwide network of accessible charging infrastructure remained largely amiss, more so in the public transport space. It is hard to imagine a sustainable transition to clean mobility without a proper functional support system. We may fall in a "you-first" mentality where automakers will think let charging kiosks come first before we go full swing; station operators will think of more EVs before adding more EV charging kiosks. Fleet managers will await competitors to make the switch to EVs before they test the waters.

- In June 2019, Government launched US$ 5 billion of transmission-line tenders in phases to reach 175 GW target by 2022.
- In June 2020, Government launched pan-India Real Time Market in electricity.

Trends that will rule Power sector in India

Going forward, the focus on implementation of smart technologies like an evolved grid system, smart metering, digital asset management will help transform the seemingly traditional, manpower-heavy sector into a smarter, more efficient power system with each element in the value chain re-imagining their processes and streamlining infrastructure.

Green Energy: The way forward

Renewable energy is expected to form 70% of fresh capacity expansion expected over the next 5 years. This would help achieve India's commitment to increase renewable share in total generation to 40% by fiscal 2030 from current 25% as part of the Paris climate deal. While most of the upcoming PPAs under the central level schemes have at least two layered payment mechanisms (i.e. letter of credit and payment security funds), going forward with the finalization of competitive bidding guidelines by MNRE, even state nodal agencies and discoms will have to keep provisions for dual payment security mechanism.

Transmission: The missing link

Going forward, significant development in the transmission sector would be triggered by the aggressive renewable expansion plans. Large scale grid connected solar and wind plants are usually located in the far-flung areas, where there is limited existing transmission infrastructure. Renewable power generating companies have urged for adequate grid availability in the past. This will urgently need an expansion of grid connectivity in the next two years to be able to accomplish the renewable energy target. Furthermore, rising private sector participation with favorable risk-return profile of transmission projects will also support growth in transmission sector in India.

Private Participation: The fuel for future growth

Over the last few months, we have witnessed a liquidity glut across major economies on the back of fiscal support by central banks. This liquidity is chasing returns and higher yields which augment well for India as India has managed to recoil from the shock of coronavirus faster than other country.. A huge amount of this foreign capital is expected to flow into Indian infrastructure sector. One mode which is expected to facilitate this flow is InvITs and REITs.

Policy reforms: Unfinished business

Over the last few years, Indian power sector has undergone a significant transformation that has redefined the industry outlook through path-breaking policy initiatives like UDAY, Power for All, UJALA, among others. But going forward, a similar privatization drive for state transmission companies should be undertaken to free-up government capital and allow parity with industry efficiency. The government may also want to re-initiate discussions around "carriage and content separation" which would effectively allow end-consumers to choose who they want to buy electricity from, similar to the way telecom operators wor

Major Investments in Power sector

Around 293 global and domestic companies have committed to generate 266 GW of solar, wind, mini-hydel and biomass-based power in India over the next 5–10 years. The initiative would entail an investment of about US$ 310–350 billion. Between April 2000 and March 2017, the industry attracted US$ 11.59 billion in Foreign Direct Investment (FDI).

Some major investments and developments in the Indian power sector are as follows:

- International Finance Corporation (IFC), the investment arm of the World Bank Group, is planning to invest about US$ 6 billion through 2022 in several sustainable and renewable energy programmes in India.
- GE Energy Financial Services (GEEFS) plans to invest US$ 90 million to develop a solar power project of 500 megawatt (MW) in partnership with Rattan India Group.
- Greenko Energy Holdings has raised US$ 155 million from its existing investors, Abu Dhabi Investment Authority (ADIA) and Singapore's sovereign wealth fund GIC, which will be utilised for expanding its clean energy portfolio to 3 gigawatts (GW) from 2 GW at present.
- Private equity (PE) investment firm, Actis LLP, is planning to invest about US$ 500 million in Solenergi Power Pvt Ltd, its second renewable energy platform in India.
- Mahindra and Mahindra Ltd is planning to invest in high-end electric powertrain technology in a move towards the future of mobility as well as for the electrification of its existing and future line-up of products.
- Hero Future Energies Pvt Ltd is planning to foray into the battery storage business and set up solar charging stations for electric vehicles (EV) in India to capitalise on India's emerging EV market.
- The Asian Development Bank (ADB) and the Punjab National Bank (PNB) have signed a financing loan worth US$ 100 million.
- Tata Capital Ltd and International Finance Corporation (IFC) have invested Rs 200 crore (US$ 31.05 million) in their joint venture (JV), Tata Cleantech Capital Ltd (TCCL), to increase its loan book for investing in renewable energy projects.
- CDC Group Plc, a development finance institution, plans to set up its own renewable energy platform in the eastern states of India like Bihar, Odisha and Assam, and other neighbouring countries to focus on developing hundreds of megawatts (MWs) of high-quality Greenfield generational capacity.
- Renewable energy company ReNew Power has announced securing US$ 390 million debt funding from its existing investor Asian Development Bank (ADB) for developing and expanding capacities of 709 megawatt (MW) across various states of India.
- International Finance Corporation (IFC), along with IFC Global Infrastructure Fund, the private equity fund of IFC Asset Management Company, has announced investment of US$ 125 million equity in Hero Future Energies.

Reforms Announced by Government

RURAL ELECTRIFICATION INITIATIVES

In order to electrify all the remaining villages and facilitate availability of adequate, quality & reliable power supply in rural areas, Ministry of Power launched Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY). Further, Ministry of Power launched Pradhan Mantri Sahaj Bijli Har Ghar Yojana - Saubhagya inOctober 2017, to achieve universal household electrification by providing last mile connectivity and electricity connections to all remaining unelectrified households. All the census villages in the country stand electrified as on 28April2018 and all the states reported electrification of all households as on 31March2019, except few households in LWE affected Bastar region of Chhattisgarh. Now the focus is on improvement in quality and reliability of power supply to facilitate 24x7 power for all. The projects sanctioned under DDUGJY, which also provides for strengthening and augmentation of capacity in sub-transmission & distribution network; feeder separation works and metering of consumers/distribution transformers/feeders, are under implementation at various stages

Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY)

All the census villages in the country stand electrified as on 28 April, 2019 Components of Scheme:

(i) Separation of agriculture and non-agriculture feeders facilitating judicious rostering of supply to agricultural & nonagricultural consumers in the rural areas

(ii) (ii) Strengthening and augmentation of sub-transmission & distribution infrastructure in rural area

(iii) (iii) Metering of distribution transformers/feeders/consumers (iv) Ongoing rural electrification works of erstwhile scheme subsumed in DDUGJY as Rural Electrification (RE) component.

Scheme Outlay

The outlay of the scheme is Rs.43,033 crore which includes a budgetary support of Rs.33,453 crore from Government of India. The erstwhile rural electrification scheme has been subsumed in DDUGJY as Rural Electrification (RE) component and the balance outlay of the erstwhile scheme amounting to Rs. 32,860 crore including budgetary support of Rs. 29,574 Crore has been carried forward to the DDUGJY. Thus the total outlay of the scheme is Rs.75,893 crore which includes a budgetary support of Rs.63,027 crore from Government of India. Salient Features The states have been given complete flexibility for selecting scope of works as per their requirement and priorities. All Villages are eligible without any minimum

population criterion. Gram Panchayat included in SansadAadarsh Gram Yojana (SAGY) are also to be covered under the DPRs. E-tendering and Standard Bidding Document is mandatory under the scheme. There is a provision of 100% subsidy for deployment of Project Management Agency (PMA) to ensure effective project management and timely completion. All Discoms including Private Discoms, RE Cooperative Societies are eligible under the scheme. District Development Co-ordination & Monitoring Committee - DISHA (administrated by Ministry of Rural Development) headed by senior most Member of Parliament (Lok Sabha) have been constituted to review and monitor implementation of scheme.

Funding Pattern:

States are provided grant up to 75% (90% for special category states) including additional grant of 15% (5% for special category states) admissible in case of

(i) timely completion of projects
(ii) AT&C loss reduction as per trajectory and
(iii) Upfront release of subsidy by State Govt. based on metered consumption.

Measure towards reduction of cost of power to the consumer

a) As a major reform, there is a shift from state level merit order to National level merit order for Inter State Generating Stations (ISGS). Under this mechanism, the cheapest station is being scheduled to its full capacity and other stations are being optimized at national level. This mechanism has resulted in savings of approximately Rs. 3 Crores every day and has a potential of saving Rs. 1200 Crores in a year towards power procurement cost of Distribution licensees. Thus, there would be reduction in power purchase cost which will be passed on to the consumer.

b) An Order was issued by Ministry of Power on 15.11.2019 on "Reduction in cost of power due to pre-payment in entire value chain of power sector". Due to pre-payment by the consumer to Distribution licensee or advance payment by Distribution Company to Generating Company, the working capital requirements of these companies would get reduced. This would therefore result in reduced generation tariff and the retail tariff to the consumer.

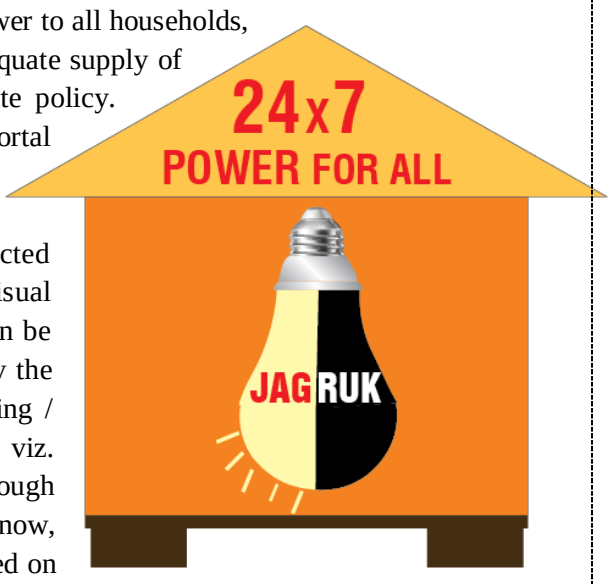
Pradhan Mantri Sahaj Bijli Har Ghar Yojana (Saubhagya)

Ministry of Power launched the scheme Pradhan Mantri Sahaj Bijli Har Ghar Yojana (Saubhagya) to achieve universal household electrification by providing last mile connectivity and electricity connections to all remaining un-electrified households in rural and urban areas. Th e total outlay of the scheme is Rs. 16320 Crore including budgetary support of Rs. 12320 Crore from Government of India. States are provided grant up to 75% (90% for special category states) including additional grant of 15% (5% for special category states) admissible on completion of 100% household electrification by December 2018. As the name of the new scheme itself suggests, the scheme has inherent features of 'Sahaj' i.e. Simple / Easy / Effortless and 'Har Ghar' i.e. universal coverage. The other key elements of the scheme are as under:

(i) No upfront fee for availing electricity connection: Absolutely free for economically poor households. For other households, Rs.500 to be charged after release of connection in 10 installments to be adjusted in monthly electricity bills
(ii) Organisation of camps in villages / cluster of villages for on spot registration and release of connections
(iii) Use of Mobile App for identification of beneficiaries and electronic registration including requisite documentation
(iv) SPV based standalone systems for households located in remote and inaccessible areas
(v) Web based near real time monitoring and updating of progress

24 x 7 Power For All

All States and UTs have signed 24 x 7 Power For All roadmap documents with Government of India to achieve the target of providing reliable, affordable and quality power to all households, industry, commercial businesses and public needs along with adequate supply of electricity for agricultural use in predefined manner as per state policy. Ministry of Power, through CEAhas deployed National Power Portal (www.npp.gov.in) for the collation and dissemination of information on all the segments of power sector viz. Generation, Transmission and Distribution in the country. The data thus collected is disseminated through various analytical reports, graphs and visual charts on National, State, Discom and Feeder level. This data can be utilised effectively for analysis, planning and decision making by the utility management. There is provision on the portal for capturing / input feeder level information / data on important parameters viz. number of interruptions, duration of interruptions etc. acquired through the feeder meters and modems for regular monitoring. As of now, 1,02,606 rural feeders and 37,608 urban feeders have been mapped on NPP. Electricity supply to the rural domestic consumers is good representative of quality of overall power supply. As reported on the NPP, 79.78% of the rural feeders are supplying more than 20 hours electricity to rural households.



The Government established National Smart Grid Mission (NSGM)

In 2015 to plan and monitor implementation of policies and programmes related to Smart Grid activities in India. National Smart Grid Mission envisages transformation of Last mile connectivity Ecosystems i.e. Distribution through AMI, micro grids, distributed generation, outage management, power quality improvement, peak load management and EV charging infrastructure etc. The mission provides only up to 30% of the project cost in form of grant to nudge DISCOMs towards innovative financing models. The focus is on sustainable deployment of Smart Grids and the year 2019 has seen first milestone achieved in

the form of widespread acceptance of AMI deployment on opex model amongst utility, funding agency and Smart Grid Implementation Agencies. Smart Grid Projects under NSGM NSGM has four projects worth Rs.595.73 Cr. under implementation viz. two in Chandigarh (Sub Division No. 5 and entire city), one each at Rourkela and Ranchi towns for about 6.6 lakh consumers. Smart Grid project at Sub Division 5 in Chandigarh is in advanced stage of implementation and is likely to be completed by June 2020. The three other Projects are under various stages of approval for funding and/or award. Smart Grid Pilot Projects The year under review saw successful closure of all the eleven pilots. The impact assessment study by M/s QCI reaffirmed the belief that technology aids in organisational transformation Domestic

Impact of Covid-19 on power sector

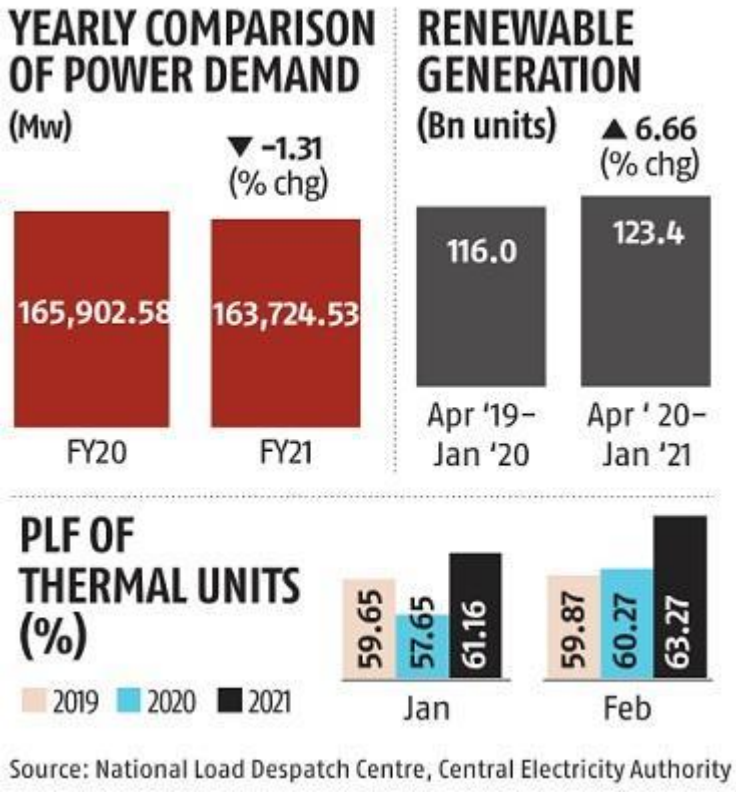
India's power sector has to be both financially and physically resilient to secure the investments it needs to meet the country's electricity demand and shift to cleaner energy. However, in 2020, the coronavirus pandemic has exacerbated many of the existing challenges the sector faces to its financial and physical resilience. It is this crisis and the government's response that could create the strongest momentum for power market reform in over a decade. Covid-19 has had a debilitating impact on most businesses. Indian power and utilities sector which is usually resilient, is also reeling under its impact as peak consumption dipped more than 25 percent in April and ~14 percent in May despite lockdown being eased in many areas—this is in line with global trends. It may be worth noting that this fall in demand does not account for the hit that captive power generation (~18 percent of India's thermal installed capacity) may have taken. As companies battle out short-term concerns around liquidity and operationalisation, it is imperative for power sector players to identify mid and long-term implications and adapt themselves to be in an advantageous position, or in some cases, not be disadvantaged. As real time markets open up, inefficient power producing units may continue to be under stress. Electricity is also a political subject, so the sector may need to bear some part of the brunt of any stimulus that needs to be passed on to general public, further aggravating the sector. Discussions on rebates and disallowance of fixed costs for this period are already ongoing.

DEMAND IMPROVING SEQUENTIALLY

	Peak power demand* (in Mw)			'20 vs '19	'21 vs '20
	2019	2020	2021	(%)	(%)
Jan	157,275	159,438	171,644.0	*1.38*	*7.66*
Feb	156,023	166,160	171,791.0	*6.50*	*3.39*
Mar	163,922	157,480	170,601.3	*-3.93*	*8.33*
Apr	172,093	129,200	-	*-24.92*	-
May	176,381	153,089	-	*-13.21*	
Jun	175,610	162,796	-	*-7.30*	
Jul	172,360	167,037	-	*-3.09*	
Aug	174,132	166,764	-	*-4.23*	
Sep	171,092	175,332	-	*2.48*	
Oct	160,515	169,057	-	*5.32*	
Nov	152,391	159,072	-	*4.38*	
Dec	153,179	168,311	-	*9.88*	

*Data reflects the maximum power demand met during the month

Peak power demand in India in FY21 was 1.31 per cent lower than in the previous financial year even though the country has come out of the shadows of the Covid-induced slowdown. This indicates robust growth is missing with demand towards the end of the financial year rebounding to just mid-2019 levels.



Power supply saw a decrease of 25% during the lockdown (year-on-year)

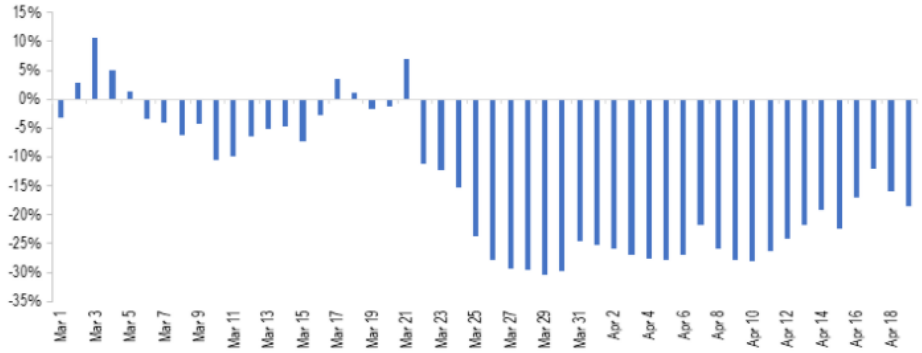
As electricity cannot be stored in large amount, the power generation and supply for a given day are planned based on the forecast for demand. The months of January and February in 2020 had seen an increase of 3% and 7% in power supply, respectively as compared to 2019 (year-on-year). In comparison, the power supply saw a decrease of 3% between March 1 and March 24. During the lockdown between March 24 and April 19, the total power supply saw a decrease of about 25% (year-on-year).

Finances of the power sector to be severely impacted

Power distribution companies (discoms) buy power from generation companies and supply it to consumers. In India, most of the discoms are state-owned utilities. One of the key concerns in the Indian power sector has been the poor financial health of its discoms. The discoms have had high levels of debt and have been running losses. The debt problem was partly addressed under the UDAY scheme as state governments took over 75% of the debt of state-run discoms (around 2.1 lakh crore in two years 2015-16 and 2016-17). However, discoms have continued to register losses owing to underpricing of electricity tariff for some consumer segments, and other forms of technical and commercial losses. Outstanding dues of discoms towards power generation companies have also been increasing, indicating financial stress in some discoms. At the end of February 2020, the total outstanding dues of discoms to generation companies stood at Rs 92,602 crore.

Due to the lockdown and its further impact in the near term, the financial situation of discoms is likely to be aggravated. This will also impact other entities in the value chain including generation companies and their fuel suppliers. This may lead to reduced availability of working capital for these entities and an increase in the risk of NPAs in the sector. Note that, as of February 2020, the power sector has the largest share in the deployment of domestic bank credit among industries (Rs 5.4 lakh crore, 19.3% of total).

Figure 1: % change in power supply position between March 1 and April 19 (Y-o-Y from 2019 to 2020)



Following are some of the factors which have impacted the financial situation during the lockdown:

- **Reduced cross-subsidy:** In most states, the electricity tariff for domestic and agriculture consumers is lower than the actual cost of supply. Along with the subsidy by the state governments, this gap in revenue is partly compensated by charging industrial and commercial consumers at a higher rate. Hence, industrial and commercial segments cross-subsidise the power consumption by domestic and agricultural consumers.
- The lockdown has led to a halt on commercial and industrial activities while people are staying indoors. This has led to a situation where the demand from the consumer segments who cross-subsidise has decreased while the demand from consumer segments who are cross-subsidised has increased. Due to this, the gap between revenue realised by discoms and cost of supply will widen, leading to further losses for discoms. States may choose to bridge this gap by providing a higher subsidy.
- **Moratorium to consumers**: To mitigate the financial hardship of citizens due to COVID-19, some states such as Rajasthan, Uttar Pradesh, and Goa, among others, have provided consumers with a moratorium for payment of electricity bills. At the same time, the discoms are required to continue supplying electricity. This will mean that the return for the supply made in March and April will be delayed, leading to lesser cash in hand for discoms.
- Some state governments such as Bihar also announced a reduction in tariff for domestic and agricultural consumers. Although, the reduction in tariff will be compensated to discoms by government subsidy.
- **Constraints with government finances**: The revenue collection of states has been severely impacted as economic activities have come to a halt. Further, the state governments are directing their resources for funding relief measures such as food distribution, direct cash transfers, and healthcare. This may adversely affect or delay the subsidy transfer to discoms.

- The UDAY scheme also requires states to progressively fund greater share in losses of discoms from their budgetary resources (10% in 2018-19, 25% in 2019-20, and 50% in 2020-21). As losses of discoms may widen due to the above-mentioned factors, the state government's financial burden is likely to increase.

As we move into the post COVID-19 era, here are the top ten reform measures that will be critical for the power sector to move towards a strong and resilient recovery.

1. The focus on lower carbon, green growth needs a central space not only in the policy and planning processes but also in corporate action. The transition towards green will require making choices related to renewables energy, lower-carbon vehicles, cleaner fuels and industrial and building efficiency, etc.

2. Structural reforms need to be pursued at an accelerated pace. The Government of India has rightly identified private-sector participation as a key lever for improving the power sector. While this will be rolled out across the union territories, the time is ripe to proactively engage with states and prepare them up to facilitate private participation through the available routes.

3. Investment in grid and utility modernisation needs to be strongly pursued to upgrade the infrastructure. This can be a key driver for economic recovery and job creation.

4. Expanding and modernising the electricity infrastructure will require financing. The National Infrastructure Pipeline (NIP) envisages INR23 lakh crore of investment in the power and renewable energy in the next five years, i.e. around 21 per cent of the total investment under NIP. Exploring ways to expand institutional financing – through DFIs, NBFCs, IDFs etc. and financial market sources such as bonds, securitisation of assets and private equity funds – will be critical. Public-private partnerships need to be expanded as a key mode for expanding infrastructure development.

5. Rapid digitalisation across the board for utilities is critical both from an internal and external perspective. COVID-19 has brought to fore the need for online systems and tools even as basic as online file management required for business continuity and effective functioning. The restrictions related to the pandemic also accentuated the need for widespread digital payment, infrastructure for payments and customer management. Utilities with existing digital payment channels were able to collect the due revenue and, hence, are likely to recover much faster.

6. Provision of good quality and reliable power supply in the rural/non-urban areas needs to be a priority. While India's Saubhagya scheme enabled last-mile connectivity to consumers, a more coordinated approach focused on electricity-led rural enterprise creation will be critical for equitable and inclusive development.

7. Utilities must focus on customer centricity. Customers have become more demanding due to the relatively seamless experience across sectors and would appreciate an omnichannel interface, easy accessibility to customer care services, personalised services etc. Several sectors that were earlier served by monopolies have witnessed a transition to a competitive market (e.g. telephony

services, aviation, banking, broadband and cable television services). Customers of these sectors have the freedom to make choices. Power utilities also need to respond to the changing market trends and move towards more customer-centric business operations.

8. Linked to the above is the idea of Ease of Doing Business in the power sector. 'Getting electricity' is considered as one of the most important parameters in these rankings defined through the average cost of availing of a connection, number of days and steps required to get an electricity connection. It is time that India evolves its own rankings for power distribution companies (discoms). This will not only help in creating peer pressure but also prepare India as sample of discoms in such rankings expand from private discoms to a wider sample of public discoms.

9. Focus on energy efficiency and regulatory changes is a must. On the efficiency side, there is a need for continued focus on improving efficiencies across the value chain from fuel and transportation costs to the efficiency of power generation companies, including heat rate improvement, power purchase cost including utilising the newer avenues like recently launched real time markets, and across user segment i.e. appliances and buildings. On the regulatory side, better tariff design reflective of market changes and efficiency in subsidy delivery need to be enabled. Direct benefit transfer as a mode for subsidy delivery is also being mandated through the amendments to the Electricity Act, 2003. This is imperative to decouple utility cash flows from the subsidy and improve targeting.

10. Last but not the least building resilience across the sector that hinges upon secure, reliable and affordable provision of electricity services. Power systems are vulnerable to natural, technological or threats caused by humans. The impact of these threats can be disastrous at times, leading to disruption of critical services. There is massive need for resilience planning in the power sector to manage and mitigate the impact of such an event in the future.

Budget Highlights 2021

- One of the key areas ailing the power sector in India has been the weak finances of state-owned power distribution companies (discoms). The budget has announced a scheme to assist discoms for infrastructure building, by creating a fund of INR3,000bn over five years.
- The budget has also announced putting in place a framework to give consumers alternatives to choose from more than one Distribution Company.
- The budget has provided a higher allocation of INR25bn to the two agencies focused on renewable energy development – Solar Energy Corporation of India (SECI) and Indian Renewable Energy Development Agency (IREDA). This will provide a significant boost to the renewable energy sector, which suffered from dismal capacity addition in 2020 owing to the COVID-19 pandemic. According to Global Data estimates, India has added around 5GW of solar PV and 1.7GW of wind power capacity has been added in 2020. To encourage domestic production of solar power, the duty on solar invertors has been increased from 5% to 20% and on solar lanterns from 5% to 15%.
- The budget has also announced the launch of a Hydrogen Energy Mission in 2020-21 for generating hydrogen from renewable energy sources. This will bring the country at the forefront of the energy transition.
- In the transmission sector, assets worth INR70bn will be transferred to Power Grid Infrastructure Investment Trust (InvIT) for monetization of these assets. This will help in financing income-generating infrastructure projects like inter-state transmission networks, thus helping to create infrastructure in this critical area.

"Overall, the budget 2021 has hit the right spots, which are the growth drivers of the power sector. It also reaffirms India's commitment to climate goals, which will help in making the country a leader in the global community."

Future ahead in power sector

In coming years when we will be having abundance of clean energy from renewable, quality of energy will also take equal importance. India's aggregate transmission and commercial (AT&C) losses were nearly 21.35 per cent in 2017-18.This compares unfavorably to the total AT&C loss in the electricity sector of the United States, which was only 9.43 per cent out of 4,113 billion kWh electricity supplied during the year 2013. The Indian government has set a target of reducing losses to 17.1 per cent by 2017 and to 14.1 per cent by 2022. Further, the stability of grid will be a great challenge in coming years. As we are pumping solar power increasingly, in coming years frequent load through-off of thermal plants will increase considerably. Technology wise it is difficult for a thermal plant to switch-on and off frequently and this will be required because most of the time solar will cater to load in day time and thermal will come into picture in evening. This daily load through off will decrease efficiency of thermal plant significantly and hence will increase its carbon footprint. So, this technological gap of existing plants will be challenge for grid stability in future years. Decommissioning of old thermal plants and poor efficiency of running ones will make them economically less viable and hence time has come now to think seriously for nuclear plants in the country and time has come to overcome the technology gaps in field of nuclear power. Fate of Indian power industry will lot depend on fast breeder reactor technology in future years.

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