# Covid-19 Effect on Power Sector

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***Abstract***

*On 25th march, 2020 Government of India decided to start 21 day lock down. Indian Power Sector is having less immunity to the adverse effects of the pandemic. Due to pandemic nearly 50 percent of the load has been in the shutdown condition which created a revenue deficit for distributed companies (DISCOMS) of India. Harmony of electricity in society is more evident than before. There are some early effects on COVID-19 on Indian Power Sector. This paper discusses the early effects and creates a future discussion in mitigating these adverse effects along with ongoing events*

**Keywords** — *COVID-19, Indian Energy Exchange, DISCOMS, 9 Minutes 9p.m. Event*

## I. INTRODUCTION

The novel Corona virus (COVID-19) has created an unrivalled global health and economic crisis. On other hand energy sector is uniquely affected by the pandemic. On 25th march 2020 Government of India started 21 day lockdown to fight against the spread the pandemic. Due to which many firms issued work from home, increased shut down of industrial and commercial loads, stoppage of railway services. This as adversely impacted the all India electricity demand. Due to increase in the domestic loads cash flows for DISCOMS is turn down and lead to payment delay for power generation companies this is because many of the DISCOMS of the state has been under long term purchase contract with power generation and transmission companies of the state [1].

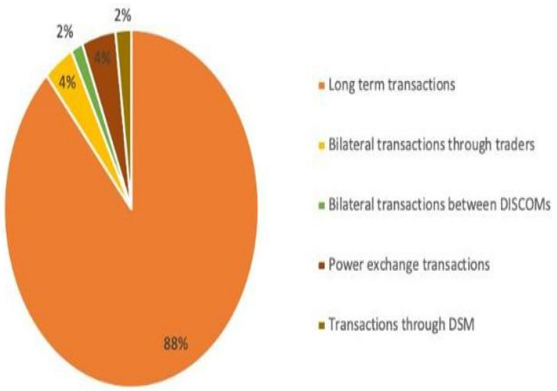



Fig:1 Share of market segments in total Electricity Generation (2018-2019)

The figure 1 shows the market transactions in total electricity generation. From figure we can say that 88 percentage is the transactions made by DISCOMS with generation and transmission companies under long term contract. Remaining percentage is contributed between traders, DISCOMS, power exchange with IEX (Indian Energy Exchange) and PXIL (Power Exchange India Limited).

## II. ELECTRICITY SECTOR OF INDIA IN 2019

**Electricity sector of India**

| Data | |
|---|---|
| Electricity coverage | 99.7% (9 January 2019)[1][2] |
| Installed capacity | 368.79 GW[3] |
| Share of fossil energy | 79.8% |
| Share of renewable energy | 17.3% |
| GHG emissions from electricity generation (2017) | 2,194.74 $MtCO_2$[4] |
| Average electricity use (2018-19) | 1,181 kWh per capita |
| Transmission & Distribution losses (2017-18) | 21.04%[5] |
| Residential consumption | 24.76% (2018-19[5]) |
| Industrial consumption (% of total, 2018-19) | 41.16%[5] (2018-19) |
| Agriculture consumption (% of total, 2018-19) | 17.69%[5] |
| Commercial consumption (% of total, 2018-19) | 8.24%[5] |
| Traction consumption (% of total, 2018-19) | 1.52%[5] |

Fig:2 Electricity Sector of India

From figure 2 the percentage of electricity consumed by industrial, commercial, and traction loads is around 52 percentage. Due to outbreak of pandemic this 52 percentage of load has been

reduced. Officials says that this portion of load constitute to subsidiary segments and account for higher percentage of DISCOM sales, revenues. This situation had driven the DISCOM's of the state to payment delays with the power generation and transmission companies.

## III. CURRENT ENERGY SCENARIO AFTER LOCKDOWN

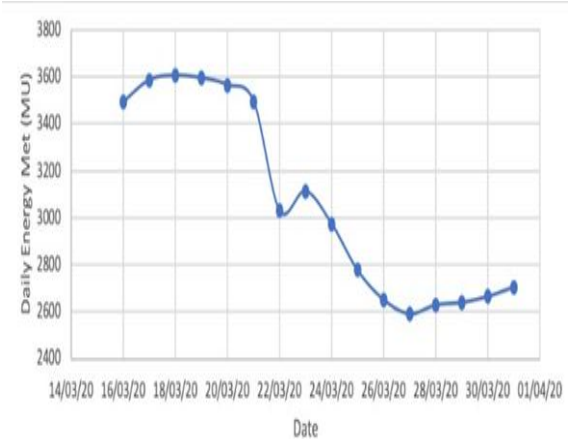
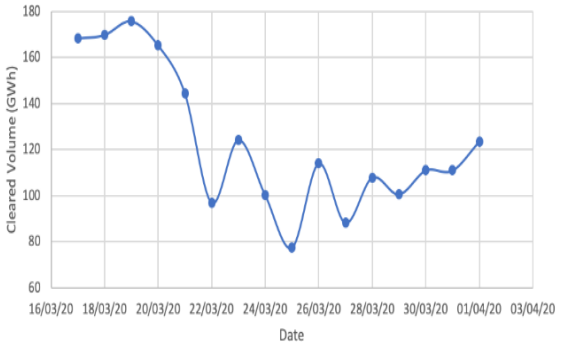



Fig:3 Energy graph

From figure 3 we can observe that the energy consumption has been reduced due to imposition of lockdown of many commercial utilities and many people are compiled to confine within their homes. According to POSOCO (Power System Operation Corporation of India) energy met on 16th march 2020 is 3494 MU as compared to 23rd march 2020 which is about 3113MU and it is further reduced its range between 2600-2800 MU between 25th to 31st march 2020. Pandemic effected distribution companies in India from reduction in revenue due to depletion of commercial and industrial loads and in ability to pay cross subsidiaries. Distribution companies account for deviation in demand and supply patterns at locational level.

## IV. MEASURE TAKEN BY GOVERNMENT AGAINST PANDEMIC



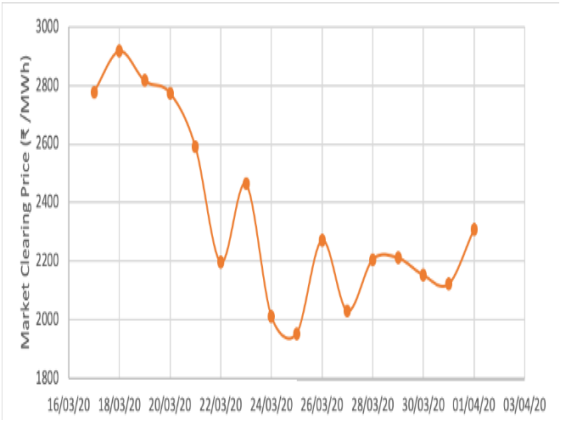




Fig:4 Volume and Market Clearing Price of IEX in the month march 2020

In present scenario IEX says that price of electricity in spot market is reduced in the month of march 2020 and volume of power traded on IEX has been raised as consumers shifted to option of buying on the market. The average market clearing price in day a head market in decreased from 3.12 rupees/kWhr (march-2019) to 2.46 rupees/kWhr (march-2020). On other hand there is an increase in volume of energy traded and officials says that this was increased to about 18 percentage over march 2019 and in term a head market there was an increase of 30 percentage, peak demand as been increased to about 270 GW over march 2019 (169 GW). It is quit logical to say that traded power volume is increased when economic activity was slim. Due to lockdown DISCOMS found economical to buy the power from spot market instead of their suppliers, but still have to pay their long term suppliers the fixed charges. With the wake of pandemic IEX made the ample power available at low prices so that distribution utilities and open access customers can access the power exchange platform. Moreover Government of India has given moratorium of 3 months to DISCOMS regarding payments to generation and transmission companies.

## V. 9 MINUTES 9 P.M. EVENT ON GRID

In order to stay unite against COVID-19 there is an event call by PM on 5th April, 2020. This is all about switching off lights for 9 minutes at 9 p.m. due to which "There is a sudden loss and surge of the demand". This event corresponds to massive decrease in the load and adversely affects the power grid. Due to lockdown the load is decreased about 50 percent additionally, this event will further decrease the load and grid may lose its stability has frequency ramp up beyond its limits followed by large voltage surges leading to cascading outages and finally black out is seen. According to Indian Electricity Grid Code (IEGC) the frequency band is to be maintained between 49.90Hz-50.05Hz for frequency stability in the grid.

Due to imposition of lockdown the peak demand has been stood at 125000MW. Advisories said that switching off lights will contribute to (12000-13000) MW reduction in load. During this 9min the load will remain around 112000MW. Moreover, street lights, essential services like hospitals, police stations, municipal services, offices, etc. will stay in ON state.

In India, Hydro based power generation and Gas based power generation are 44594 MW and 17706 MW respectively, these resembled the primary sources of maintaining grid stability during the 9 p.m. event. Some of the states have taken initiative to curtail the instability in power system. For instance, Tamil Nadu observed maximum drop and surge will be about 2000MW and made its Hydel reservoir ready which is of capacity 650MW. Uttar Pradesh planned for load shedding in phased manner from 8 to 9 p.m. and made all its reactors in services, capacitors out of service.

Meanwhile, advisories of the POSOCO had designed an action plan to maintain the frequency stability at grid according to this plan they desired to keep the grid frequency at lower side of IEGC band that is 49.9Hz at 8:30 p.m. so that, when the frequency ramp up due to curtailment of lightning load my not exceed the higher side of IEGC band that is 50.05Hz. For reverence of this action plan in association with event certain measures are taken by officials during this event:

- Identified peak hour has (6:00-8:00) p.m.
- Called for Hydropower generation to be ramped down and conserved during the peak hours
- i.e. 6:00 to 8:00 p.m. Since, Hydropower station takes less amount of time to switch on or off this feature is utilised during 9:00 p.m. event.
- Thermal and Gas based generations has been schedule in manner to manage the peak demand during peak hours.
- Eventually, after 8:00 p.m. Thermal interstate generating stations generation is bought to minimum by 8:55 p.m. simultaneously, Hydro based generation is increased to maintain the balance between generation and load since, essential load still prevail on the system.
- At 8:57 p.m. the Hydro and Gas based generation has been bought down by maintaining system frequency. Nearly, Hydro generation is managed at (0-10) % of rating and ensured not to stray Hydro out of system.
- On other hand Gas based generation has been bought to low levels.
- Ramping up the Thermal based generation has been increased from 9:05 p.m.
- From 9:09 p.m. Hydro is also ramped up to meet increase in the load.
- Later stabilization of system parameters and Hydro units is withdrawn by consulting RLDC and SLDC.

| All India Demand Profile during Lighting Off Event on 5th April'20 | | | |
|---|---|---|---|
| Time | 20:55 | 21:08 | Change |
| Frequency (Hz) | 49.714 | 50.248 | 0.534 |
| All India Demand Met (MW) | 117542 | 87972 | -29570 |
| All India Thermal (MW) | 75897 | 67948 | -7949 |
| All India Hydro (MW) | 25547 | 8743 | -16804 |
| All India Gas (MW) | 7090 | 5613 | -1477 |
| NTPC Group (MW) | 26987 | 23562 | -3425 |
| NTPC Coal (MW) | 22805 | 21432 | -1373 |
| NTPC Gas (MW) | 1938 | 978 | -960 |
| NTPC Hydro (MW) | 868 | 130 | -738 |

Fig:5 (a)

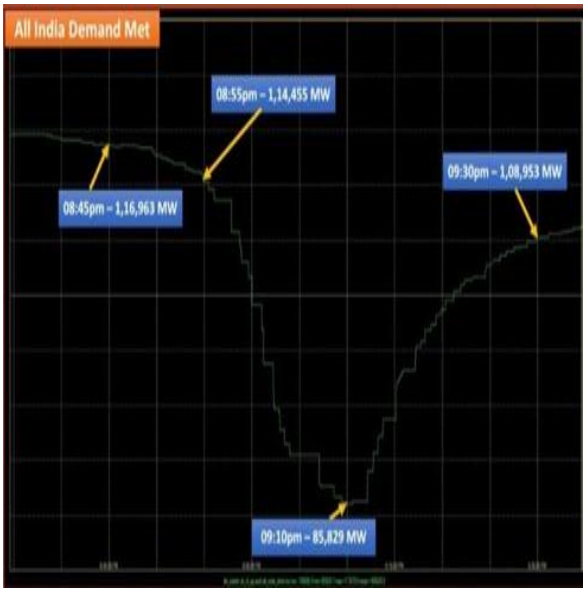



Fig:5(b)

## VI. CONCLUSION

Instead of having long term purchase contracts by implementing real time electricity market the adverse effect of such events (COVID-19) can be ruled out [2],[4],[6],[7],[8]. In real time electricity market the power generation and consumption can be scheduled in a day and it enables to do trade with electricity within the day [10],[13],[14]. By adopting decentralisation method and integrating it with any renewable source of energy can reduce the revenue deficit issues of DISCOMS in such events and adverse effect of it.

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