Chapter 39
Impact and Scope of Electric Power Generation Demand Using Renewable Energy Resources Due to COVID-19

Manish Kumar, Muralidhar Nayak Bhukya, Anshuman, and Sachin

Abstract This paper highlights the drop in demand of electricity all over the globe during and after COVID-19. The effect of COVID-19 pandemic on electric power generation was hugely unpredictable. The Government of India (GOI) has planned to launch a few projects and schemes regarding the usage of renewable energy in the early quarter of 2020, which is not succeeded due to the pandemic situation. Therefore, this paper presents a review on global energy and fuel usage by the country in the first quarter of the year.

39.1 Introduction

Latest data represents that, in the First Quarter (Q1) of 2020 the global energy demand is decreased by 3.8% compared to the Q1 of 2019. If the lockdown is extended for few more months the demand for energy will be approximately decreased by 6% in the Second Quarter (Q2) of 2020. In Q1 2020, there are different restrictions on economic activities, which reduced the coal demand by 8% as compared to Q1 2019 [1]. The thermal power generation sector is affected abruptly across the world due to crisis and dropped to $-2.5\%$ which is numerically equal to power generated by natural gas [2]. Apart from this, there is decrease in oil demand around the world by 5%. Due to COVID-19 crisis, there are several restrictions on travelling and transportation across the borders [3]. The demand for natural gas is decreased by 2%, which affects the price value in the market. In the period of covid-19 the use of renewable energy is increased by 1.5% in first quarter of the year, as wind power plants and solar panels are installed across the world to produce huge amount of electrical energy [4].

Due to lockdown in India, the generation of electricity is reduced by 30% per week and the annual energy demand is reduce by 0.6% [5]. If the situation continuous,
the annual energy demand will be reduced by 1.5% [6]. China is the first nation to implement lockdown and the energy demand is collapsed by around 15%. They had the most significant drop in energy demand which decreased by 7% compared to the earlier year. Similarly, in the United States the demand for energy is decreased by 6% [7].

### 39.2 Decline in Energy Demand

The projected 6% decline in energy demand would be more than seven times the impact of 2008 financial crisis on global energy demand. All fuels except the renewable sources are going to set demand for the next decades.

- The demand of oil could be dropped by 9% across the year.
- The demand of coal could be dropped by 8%, due to fall in electricity the average drop is 5% across the year.
- The demand of gas reduced further in first quarter of the year due to less demand in industries and workplaces.
- Less demand of nuclear power due to lower electricity demand.
- Renewable sources are expected to launch some new projects online in coming 2020, they are expected to boost the output and raise the demand of electricity across world.
- Renewable sources projects are the future in these kinds of situations, they are cheaper at operating and installment and provide a sufficient amount of energy required.

Due to crisis, the demand for energy across all the regions has gave the impression to be declined gradually. In China, there is a decline of 4% and the annual growth demand is nearly 3% in between 2010 and 2019. If the pandemic is completed and the lockdown is not further extended without any restrictions by the government there is a chance of speedy recovery in global demand of electricity across the world [8]. In this recovery, the renewable energy is the only source to reach the demand of electricity. Figure 39.1 shows the impacts of energy demand with different resources for power generation and it is clear that the overall energy demand is in the negative side [9].

### 39.3 Demand for Electricity

The electricity demand is decreased by 2.5% in the first three months of the year 2020, as the lockdown occurred. Similarly, there was a huge drop of electricity demand in several other countries across the world, numerically global energy demand is depreciated by 2.5–4.5% in Europe, Japan and Korea [10].
The most affected sector by the lockdown is the service sector which includes the retail shops, education institutes, hospitality, offices and the tourism activities all are restricted in the lockdown and it causes a major economic crisis among the country [11]. Some of the industries and the factories are resumed to work under the precautionary measures to protect workers. Country-wise reduction of electricity demand after lockdown in a day-wise pattern is shown in Fig. 39.2. It is observed that the depreciation of global electricity demand is 5%. Every country has their own crisis due to covid-19 affect. China and India are not similar in terms of electricity demand.
energy demand, they both are dealing with the crisis on their own and the electricity demand is reduced for both the countries.

39.4 Renewable Energy

Renewable energy has been the most strong and easiest source for the covid-19 lockdown, as it was unaffected by the global energy demand and produce energy being unaffected and make proper uses of renewable energy sources. By doing so, there is a major growth in using renewable energy by 1.5% in Q1 2020 as related to Q1 2019. This will increase the global rate of using renewable energy around the world. By the collected data, we came to know that there is an increase in use of renewable energy by 1% in 2020 [12]. There is an expansion of renewable sources like solar, wind, and hydro plants to increase the use of renewable energy generation by 5% in coming years.

39.4.1 Q1 of 2020

The use of renewable energy in Q1 was 1.5% times more than the Q1 of 2019. This was done by the completion of solar PV projects and wind projects respectively of 100 GW and 60 GW, these projects were completed in 2019, by the help of these projects there is an increment of 3% in generation of electric power through renewable energy [13]. During lockdown, there is a major lifting in the share of renewable energy sources which was now around 28%.

39.4.2 2020 Projection

According to estimate data, the renewable energy demand increased by 5% in the crisis of covid-19. This actually affects in increase of demand in power generation through renewable energy sources by 30% around the world. The hydro power plants share the highest power generation as it holds more than the 60%. It is dependent on rainfall and there are no any such crucial conditions for generating power. The Photovoltaic system is the fastest and widest among renewable source of energy around the world [14]. This can be installed in the large, small, and even on rooftops. It can also be used by the individuals at their houses for generating sufficient amount of energy.

Wind power plants are growing in the field of power generating sources steadily and smoothly. There are several wind projects launched around the world which generate a huge amount of power. The weather is expected to be windy in the first quarter of year and help the plants to generate the essential amount of energy and
boost the global energy demand [15]. The annual growth for renewable electricity generation for the year 2108–2020 has been shown in Fig. 39.3. It is observed that the impact of the annual growth of the current year is less as compared to the other years [16].

### 39.5 Impact of Renewable Energy Projects

There was a major impact on the renewable projects due to covid-19 outbreak. Countries like China, Vietnam and Thailand are interdependent on the sources of renewable energy, more than 40% supply reliant on global sector in China. Many countries are dependent on raw wind material imports around the world [17]. China and Europe hold more than 60%. The global wind industry imports the wind project equipments from the different countries around the world. Global report says that the major concern was all about the renewable sources revolve around the demand of energy. As the renewable sources solar and wind having the issues of delaying their projects to be launched. On April 17, 2020, Ministry of New Renewable Energy (MNRE) declared that the projects which are ongoing under renewable energy sources are extended until the period of lockdown and some more time to develop the project [18].
39.6 Impacts of Power Sector in India

The global economy has been hit hard by the crisis of the covid-19. The renewable sector was already dealing some difficulties with the geographical and multiple sectors in the country and here come the new problem of covid-19 outbreak. Solar projects are largely affected by covid-19 as the solar modules are imported from China but since the lockdown was from December 2019 [19]. The implementation of new projects was delayed because of lockdown as the developers could miss the deadlines. Similarly the wind turbines manufacturer in India were also got suspended. This would cause a delay in the wind and solar projects till the lockdown goes on, after the lockdown things get back to normal. Rooftop solar projects are most affected projects by the outbreak of covid-19 in the renewable energy generating sources [20]. These rooftop projects are affected more than the grid-connected which was under essential services. The individual dealing with the problems of financial crisis have the best option rooftop solar projects installation on their list leading to a good source of power generation. MNRE stated that the status of projects going on under the RE projects remain unchanged during the lockdown period. India announced a target energy generation of 175 GW by 2022 of renewable energy, coal which share more the half of nation’s power generation would be replaced by the renewable energy sources.

39.7 Impacts of Renewable Energy in India

The solar plants which are planned to be operated in this period of time, now have the shortage of modules [21]. The prices of modules are expected to be high due to this covid-19 outbreak, because there is shortage of module glass and wafers to create these systems. These plants are expected to generate 2–4 GW amounts of power. If the things are going on it is very difficult to develop these projects in the future. In the time of crisis, wind energy industry in India has the expected to raise the prices of wind turbines, according to the global report [22]. The prices are expected to be increased by 10% in the second quarter of 2020. The wind energy industry is expected for the recovery at the end of second quarter of 2020. The lack of production and importation of wind turbine equipment into India is expected to drive the costs for turbines to $864/KW to $904/KW in the first quarter of 2020 and $943/KW in the second quarter of 2020. The impact on renewable energy pre-virus and post virus has been shown in Fig. 39.4. It is clear that wind energy reduces in −11.4% and the solar energy reduce the -24.8% in India due to the COVID-19 [23].
This paper presents impact and scope of electric power generation demand using renewable energy during COVID-19. During the crisis many plants had the shortage of fuel and hence result in less production of electricity. On the other hand, renewable energy has a gradual increase in producing electricity during pandemic. The Covid-19 crisis is also influencing the path for clean energy transitions. Global CO₂ emissions are set for the largest year-to-year reduction on record. The least emission of carbon recorded all over the world in time of pandemic. It has been clear that wind energy reduces in $-11.4\%$ and the solar energy reduce the $-24.8\%$ in India due to the COVID-19.

References

1. Central Collection and Publication of Electricity Generation, Transportation and Consumption Data and Information for the Pan-European Market (2020). https://transparency.entsoe.eu
2. Bhukya, M.N., Kota, V.R., Depuru, S.R.: A simple, efficient and novel standalone photovoltaic inverter configuration with reduced harmonic distortion. IEEE Access 7, 43831–43845 (2019)
3. Electric Power Statistics Information System, Average Electric Power by Month (2020). http:// epsis.kpx.or.kr/epsisnew/selectEkgeEpsAepChart.do?menuld=040103&locale=eng
4. IEA, Monthly OECD Electricity Statistics: Data up to Jan 2020 (Statistics Report—Apr 2020) (2020). https://www.iea.org/reports/monthly-oecd-electricity-statistics
5. Kota, V.R., Bhukya, M.N.: A simple and efficient MPPT scheme for PV module using 2-dimensional lookup table. In: IEEE Power and Energy Conference at Illinois, Feb 2016. https:// doi.org/10.1109/peci.2016.7459226
6. International Energy Agency, World Energy Balances (2019). https://www.iea.org/reports/ world-energy-balances-2019
7. Kota, V.R., Bhukya, M.N.: A novel global MPP tracking scheme based on shading pattern identification using artificial neural network for photovoltaic power generation during partial shaded condition. IET Renew. Power Gener. 13, 647–659 (2019)
8. National Bureau of Statistics of China, Energy Production in the First Two Months of 2020 (2020). https://www.stats.gov.cn/english/PressRelease/202003/20200317_1732703.html
9. Bhukya, M.N., Kota, V.R.: A quick and effective MPPT scheme for solar power generation during dynamic weather & partial shaded conditions. Eng. Sci. Technol. Int. J. 22, 869–884 (2019)
10. National Energy Administration Releases. http://www.nea.gov.cn/2020-03/23/c_13890839.html
11. Réseau de Transport d’Électricité, Electricity Demand (2020). Available: https://www.rte-france.com/en/eco2mix/eco2mix-consommation-en
12. IEA based on U.S. EIA, POSOCO (India), RTE (France), TERNA (Italy), ELEXON (UK), China NBS, Red Electrica (Spain) and ENTSO-E
13. Kota, V.R., Bhukya, M.N.: A novel linear tangents based P&O scheme for MPPT of a PV system. Renew. Sustain. Energy Rev. 71, 257–267 (2017)
14. Global Energy Review 2020 “The Impacts of the Covid 19 Crisis on Global Energy Demand and CO_2 Emissions” (2020) Available: www.iea.org/corrigenda
15. Bhukya, M.N., Kota, V.R.: DCA-TR based MPP tracking scheme for photovoltaic power enhancement under dynamic weather conditions. Electr. Eng. 100, 2383–2396 (2018)
16. OCCTO (Organization for Cross-Regional Co-ordination of Transmission Operators, Japan): Demand Data Provided by Regional TSOs and Sources Provide Therein (2020). Available: https://www.occto.or.jp/index.html
17. Bhukya, M., Kota, V.: A novel P&O_T—Neville’s interpolation MPPT scheme for maximum PV system energy extraction. Int. J Renew. Energy Dev. 7, 251–260 (2018)
18. Choudhary, S.: GAIL expects gas demand to pick up soon. The Economic Times (2020). Available: https://economictimes.indiatimes.com/industry/energy/oil-gas/gail-expects-gas-demand-to-pick-up-soon/articleshow/75145258.cms?from=mdr
19. EIA (Energy Information Administration): Natural Gas Weekly Update, US Department of Energy (2020). Available: https://www.eia.gov/naturalgas/weekly
20. Enagás, Demanda de gas natural - Historico de demanda [Natural gas demand – demand history] (database) (2020). Available: https://www.enagas.es/enagas/es/Gestion_Tecnica_Sistema/DemandaGas/SeguimientoDemanda
21. ENTSOG (European Network of Transmission System Operators for Gas): Transparency Platform (database) (2020). Available: https://transparency.entsog.eu
22. COVID-19 Impact: Indian Renewable Sector (2020). Available: https://www.saurenergy.com/research/care-ratings-report-on-covid-19-impact-indian-renewable-sector
23. National Grid, Transmission Operational Data (database) (2020). Available: https://www.nationalgridgas.com/data-and-operations/transmission-operational-data