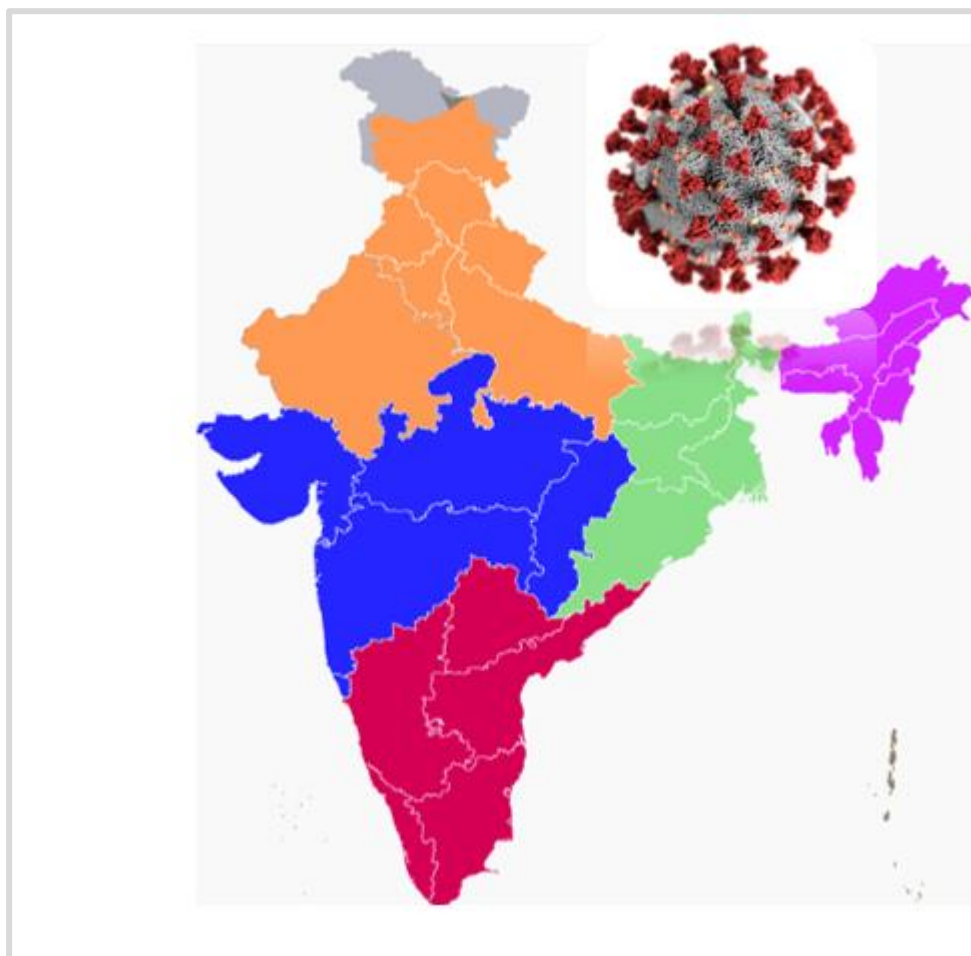


# Impact of Covid-19 on the Regional Power Demand and Generation in India

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### Introduction

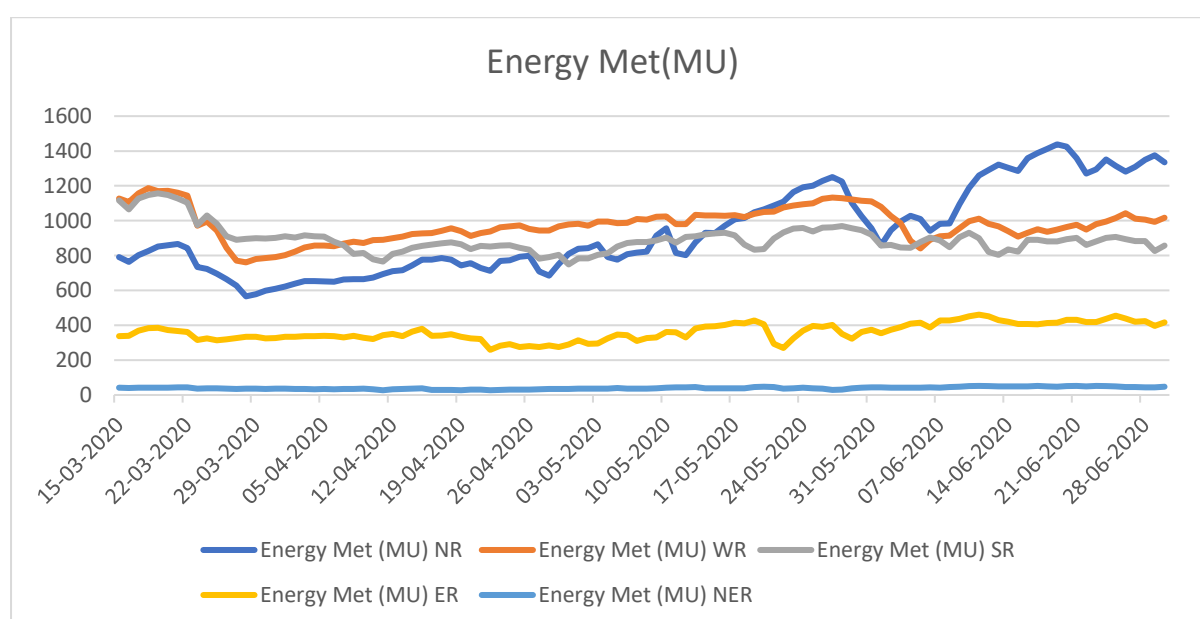
The COVID 19 pandemic has played havoc with people's lives around the world. Countries declared lockdown on differing dates, depending on the perception of the leaders of the respective countries, which has been extended in some countries with some relaxations, and in some countries through renewed lockdown to some extent, as they try to grapple with the virus. During the complete lockdown, people were confined indoors, except for essential services. This has had an impact on the power sector as well, in all countries, as well as in India. The impact on the power consumption in the country as a whole has been examined and written about, and some conclusions drawn.

This paper examines the Region-wise impact on the power consumption in the country and tries to come out with reasons, and how the respective utilities in the regions have responded.

India has five Regional grids - Northern, Southern, Western, Eastern and North-Eastern, which are integrated with each other, but still governed separately to some extent, with Regional System Operators or Regional Load Despatch Centres. The day-wise power consumption in each of the Regions was obtained from the POSOCO (Power System Operation Company) website, the independent System Operator of India, and plotted from 15<sup>th</sup> March 2020 till 30<sup>th</sup> June 2020, to see how the energy consumption has changed, along with examination of possible reasons for the same. Further, the source-wise reduction in generation and the year-on-year comparison of electricity consumption and peak demand for the months before COVID 19 and after that, has also been examined.

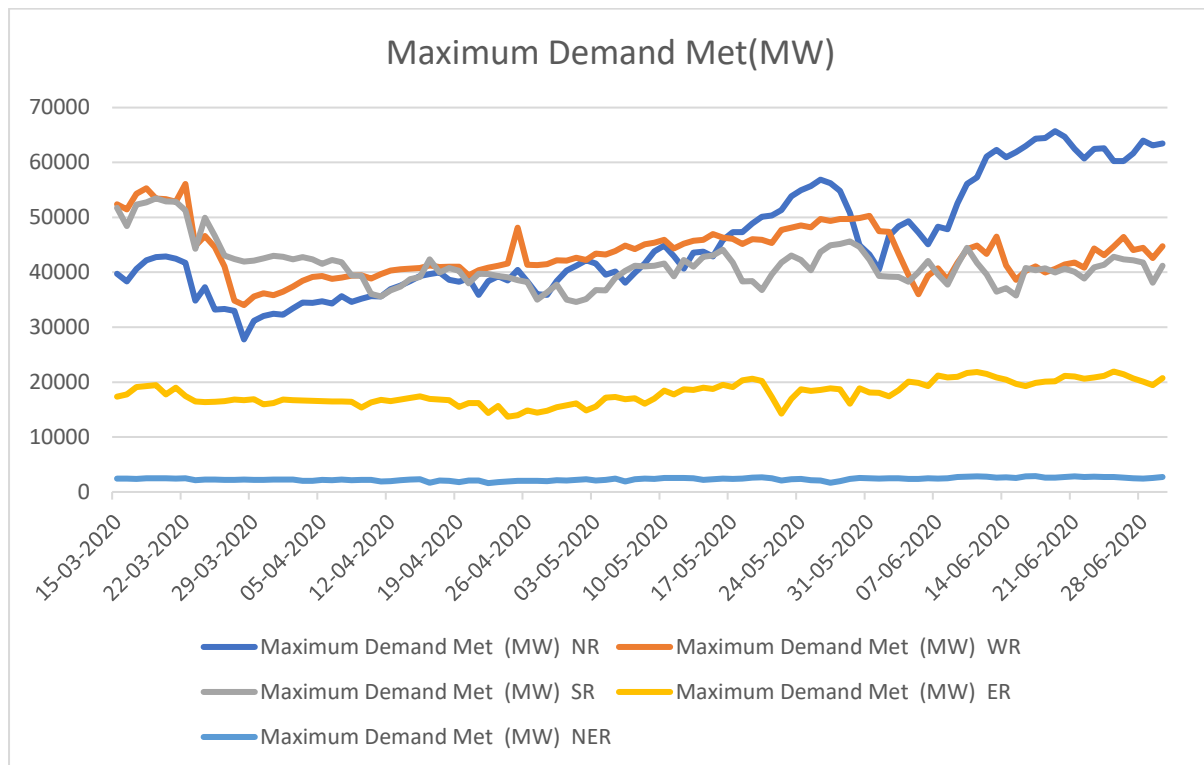
### Energy Met (MU) and Peak Demand Met (MW)

The trend of daily electricity consumption and peak demand met for each Region for the period 15<sup>th</sup> March to 30<sup>th</sup> June is shown in Figures 1 and 2 respectively, as given below:



**Fig 1. Energy Met(MU) from 15<sup>th</sup> March 2020 to 30<sup>th</sup> June 2020**

Source: Daily Reports , POSOCO

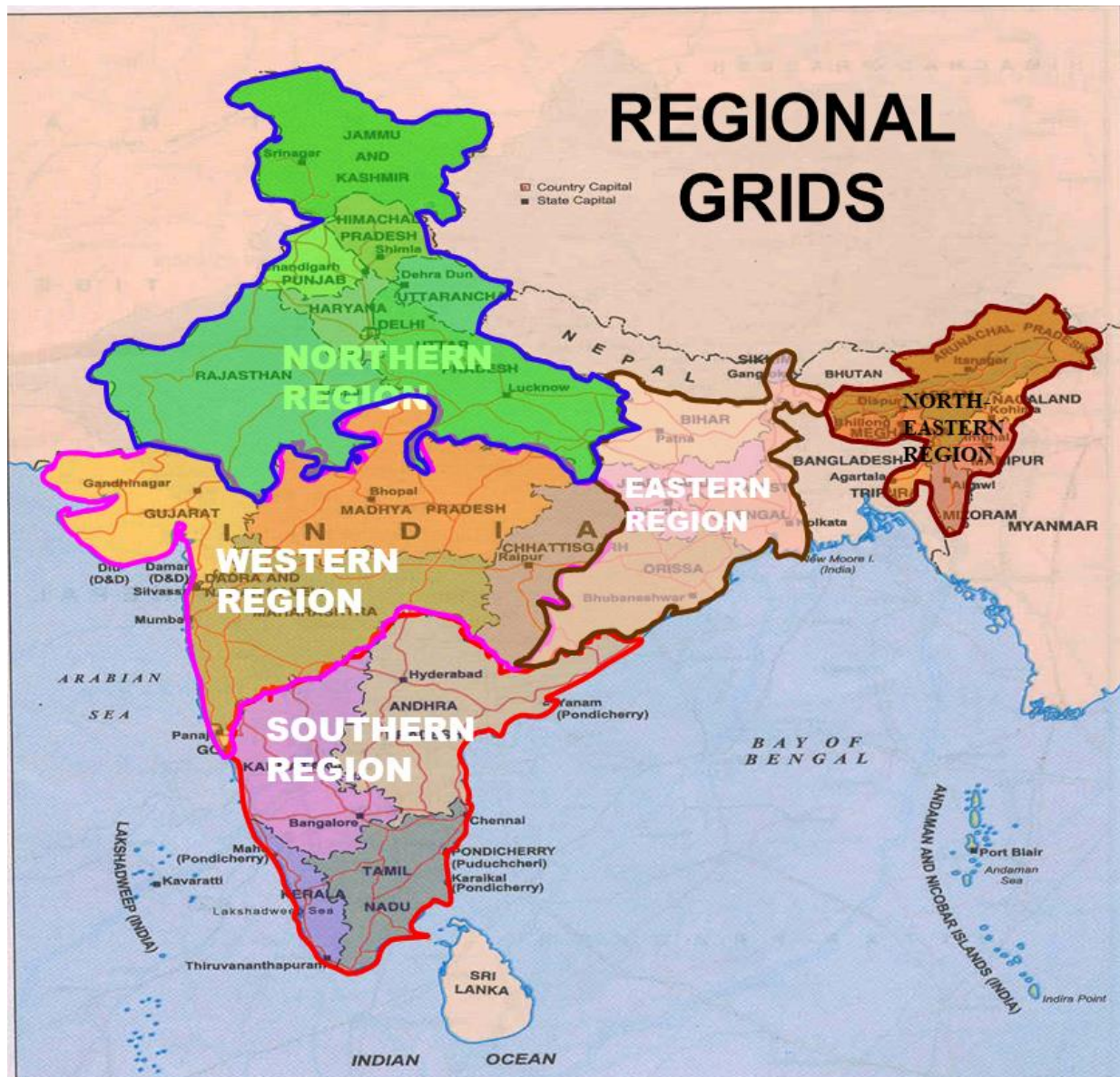


**Fig 2. Maximum Demand Met(MW) from 15<sup>th</sup> March 2020 to 30<sup>th</sup> April 2020**

Source: Daily Reports, POSOCO

The first lockdown was declared for the country by the Hon'ble Prime Minister, w.e.f. 24<sup>th</sup> of March 2020. The essential services in terms of supply of food, electricity, water, etc., were kept in operation. As can be seen from the graphs, the electricity consumption fell most steeply after lockdown, in the Western Region, and least steeply in the Eastern Region. The Western and Southern Regions are the highest electricity consuming regions during this time of the year. Northern Region, though the highest electricity consuming region over the year, consumes less during March, as it is neither cold nor very hot, and so the weather beating loads do not come into operation.

Among the high electricity consuming Regions, Western Region has the largest percentage of industrial (about 35%) and commercial load (about 7%), i.e. a total of 42%, as compared to about 37% in Northern Region, and 41% in Southern Region. Eastern Region, though with a high percentage of industrial and commercial load, i.e. about 51%, is a low electricity consuming region. From the regional map depicted below, it can be seen that the Eastern Region is a relatively smaller geographical area, comprising the states of Bihar, Jharkhand, West Bengal, Orissa and Sikkim. The North Eastern Region has the lowest consumption in all the Regions, and has an industrial and commercial load of about 34%.



The Western Region's peak demand fell from a high of 55000 MW on 23<sup>rd</sup> March to about 35000 MW on 29<sup>th</sup> March, a drop of 36%. The Northern Region peak demand fell from 42000 MW on 19<sup>th</sup> March to 29000 MW on 29<sup>th</sup> March, a drop of 31%. The Southern Region peak demand fell from 54000 MW on 19<sup>th</sup> March to about 41000 MW on 29<sup>th</sup> March, a drop of 24%. Peak demand for the Eastern Region fell from 20000 MW on 19<sup>th</sup> March to 17000 MW on 23<sup>rd</sup> March, a drop of 15%. The effect of drop in industrial and commercial load due to COVID-19 in the Eastern Region was not in consonance with the comparatively high percentage share of industrial and commercial demand. It could be that the industries in Eastern Region did not observe the lockdown very strictly, possibly due to livelihood issues. Most of the migrant labour comes to Gujarat and Maharashtra in the Western Region. Most of the source of migrant labour is from UP and Bihar, the latter being in the Eastern Region.

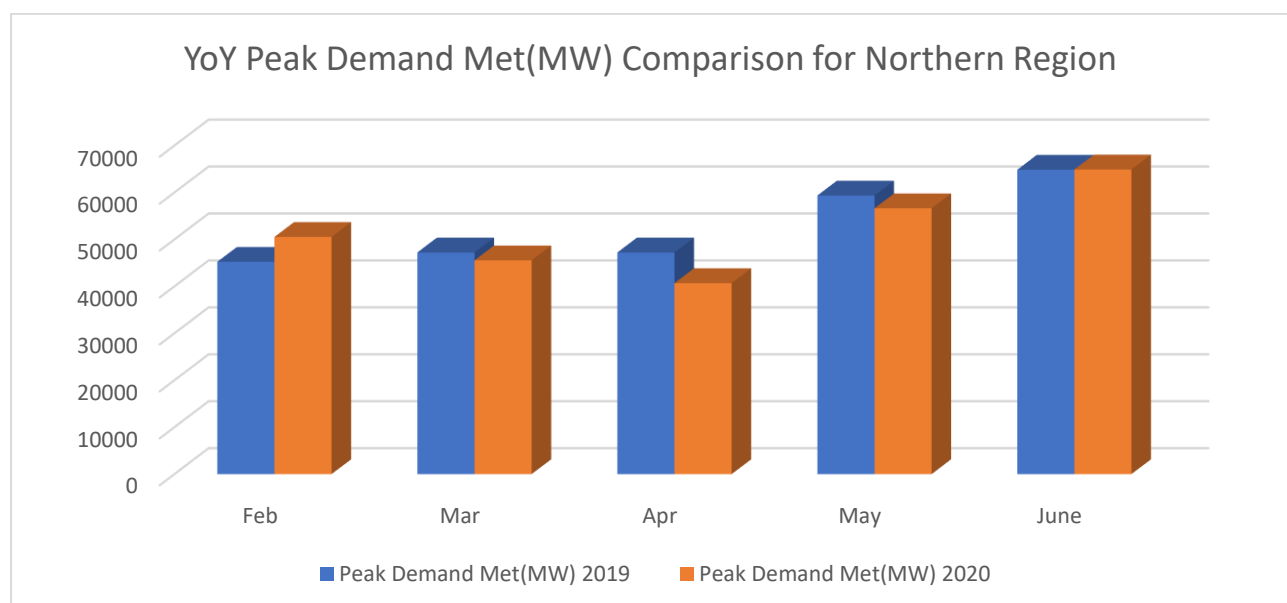
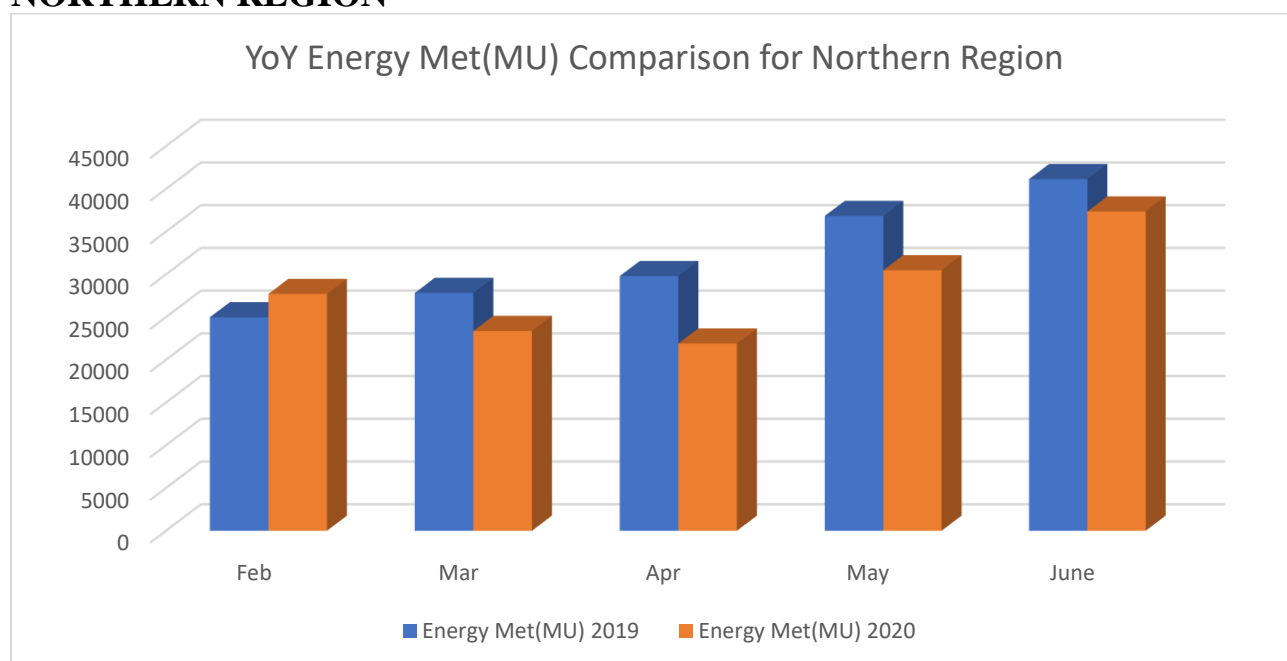
In Maharashtra and Gujarat, when the migrant labour went back, there were very less workers to work; whereas in the Eastern Region, the workers returned and the industrial manpower was possibly not affected. The North-Eastern Region being the lowest electricity consuming Region, with an industrial and commercial load comprising 35% of the total load, also experienced a small drop in the peak demand of about 200 MW after lockdown, out of a total demand of about 2400 MW, i.e. a drop of just about 8.5%. Similar drop in electricity consumption (in Million units) was seen in the respective Regions.

The demand subsequently started picking up, with the oncoming summer heat, requiring weather beating loads like air conditioners to come on. The demand in the Northern Region picked up the fastest, since rains started in the Southern Region and Western Region in June, whereas they started in Northern Region in July, peppered with pre-monsoon showers.

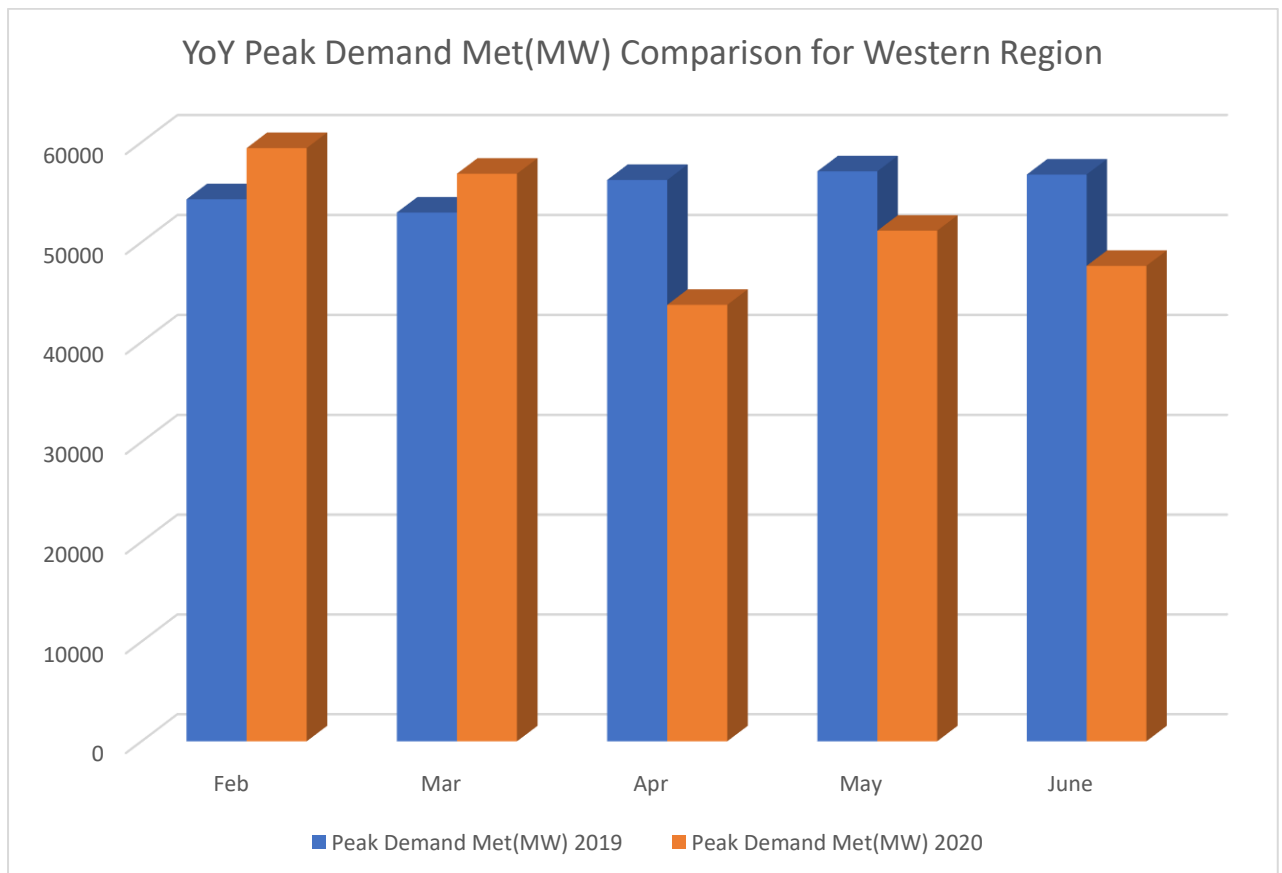
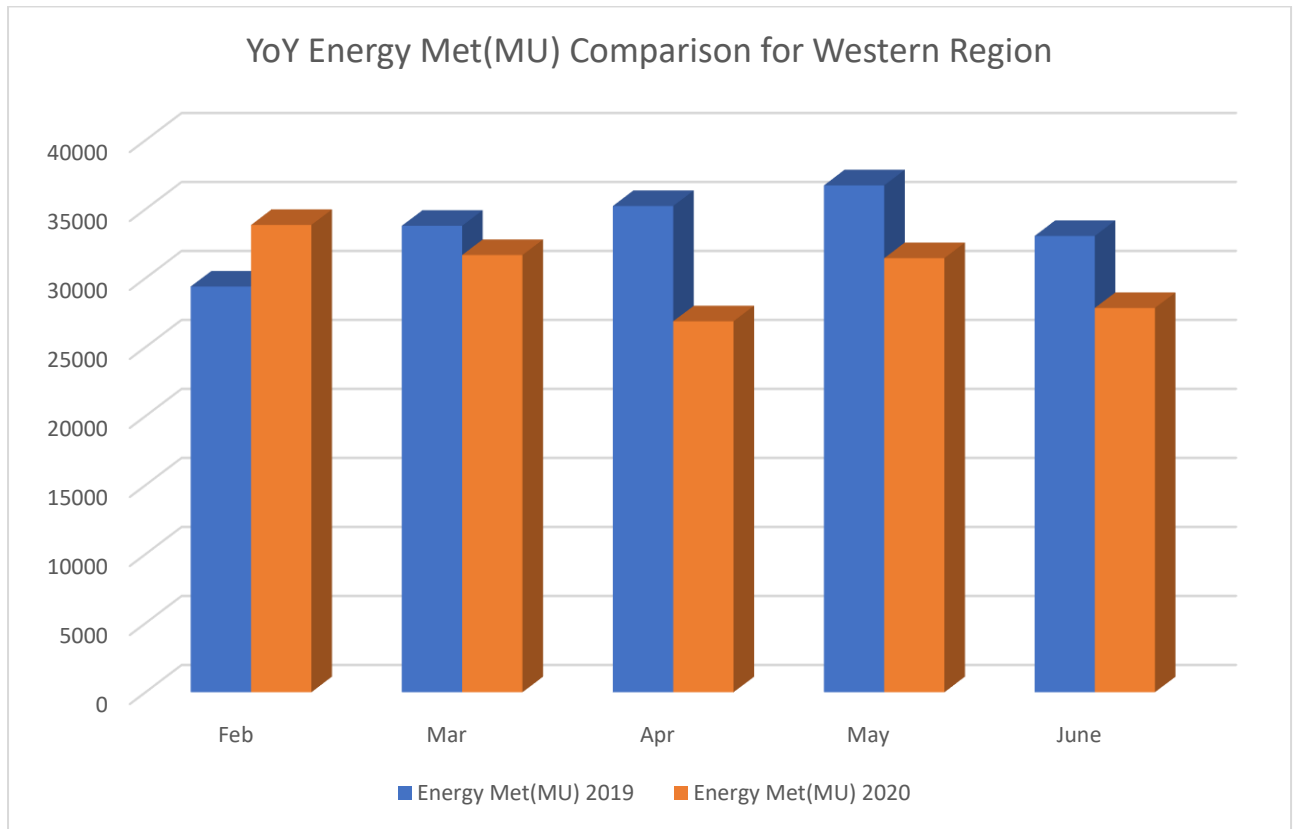
### Year-on-year comparison of electricity consumption and peak demand: Before and after COVID 19

The electricity consumption and peak demand of the country, and so also of the Regions, varies over the year. So, it would be better to compare these figures for the current year vs the same period last year, to see, if the electricity consumption and peak demand has come back to normal, or is still lower as compared to the same month last year, after opening of the lockdown, to get an accurate picture. The figures of electricity consumption and peak demand for each of the Regions are shown below.

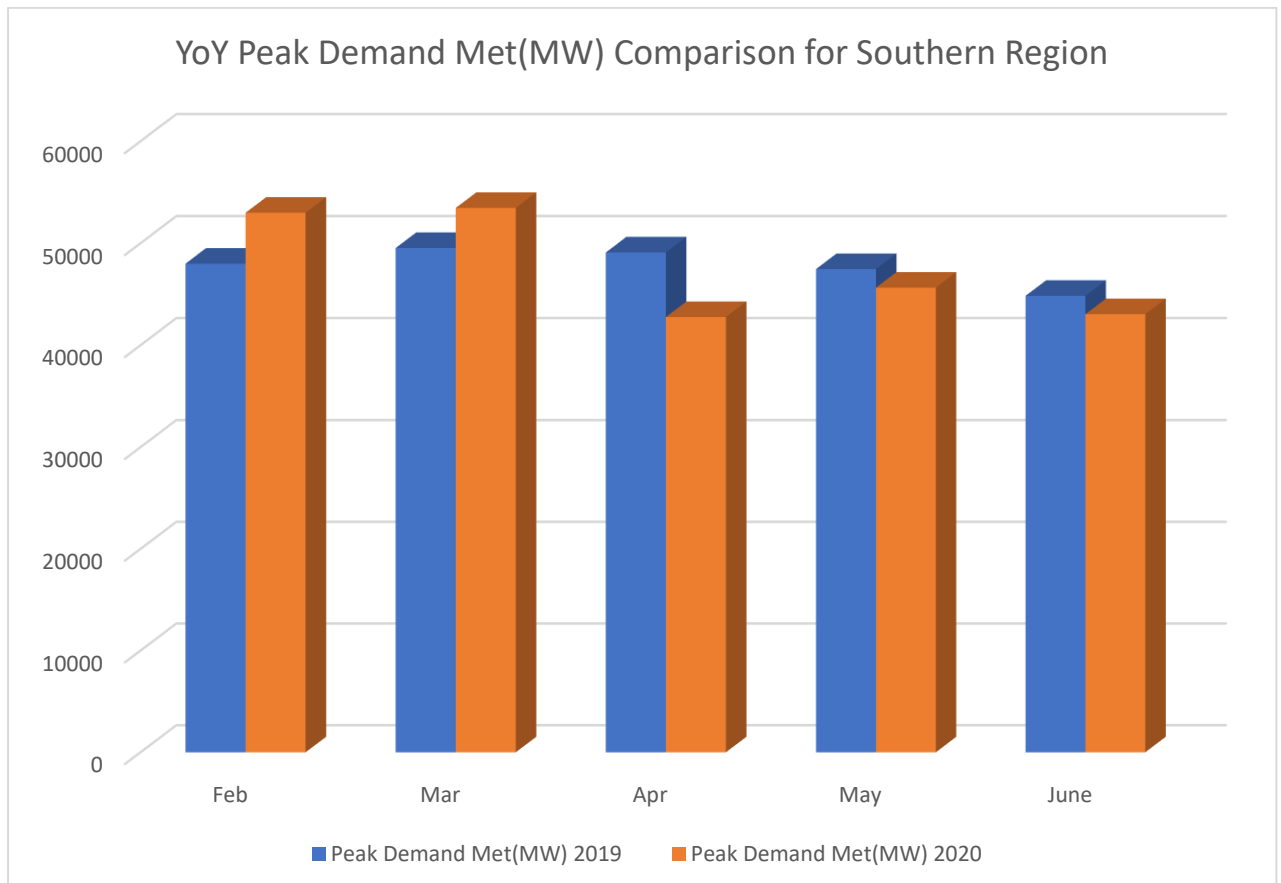
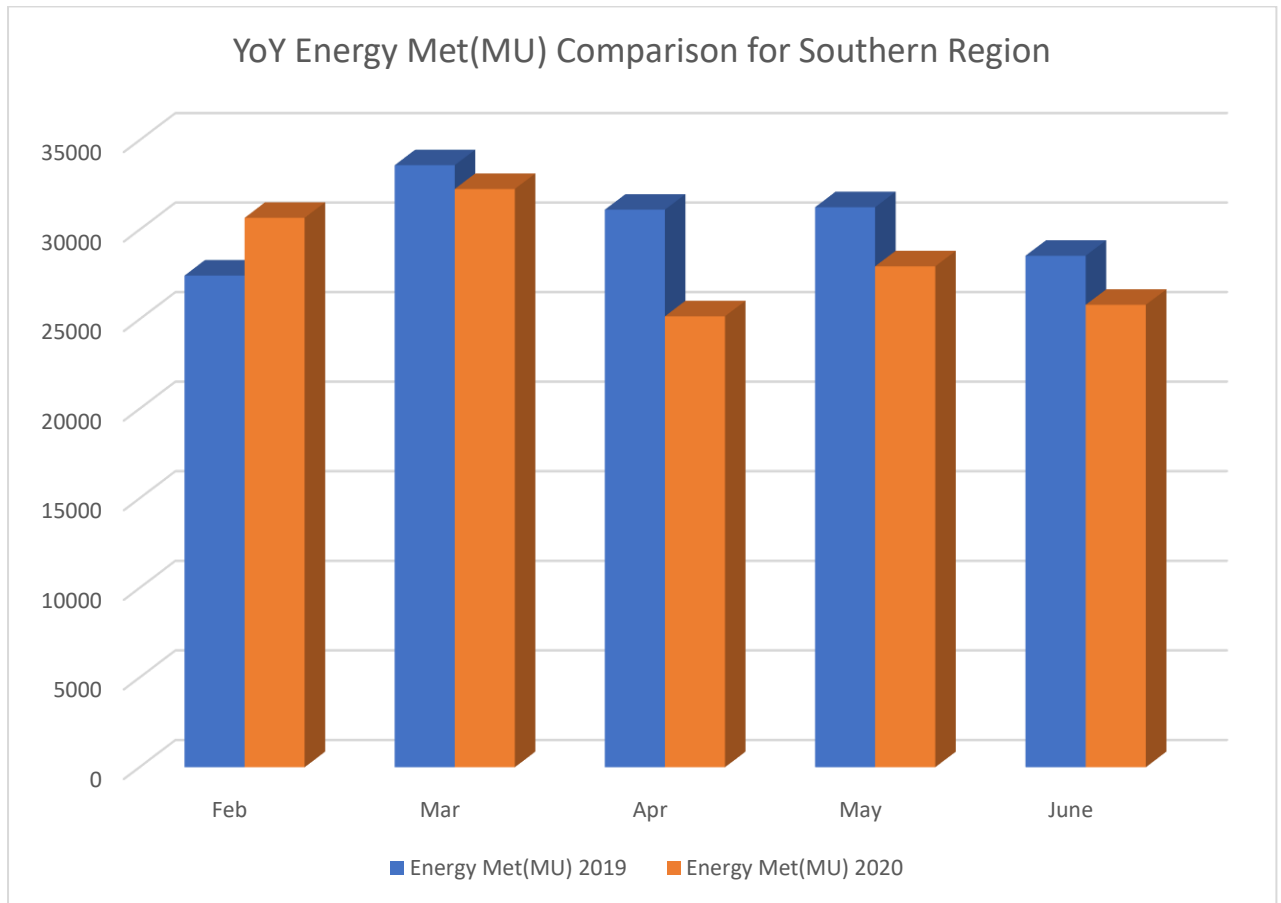
#### NORTHERN REGION



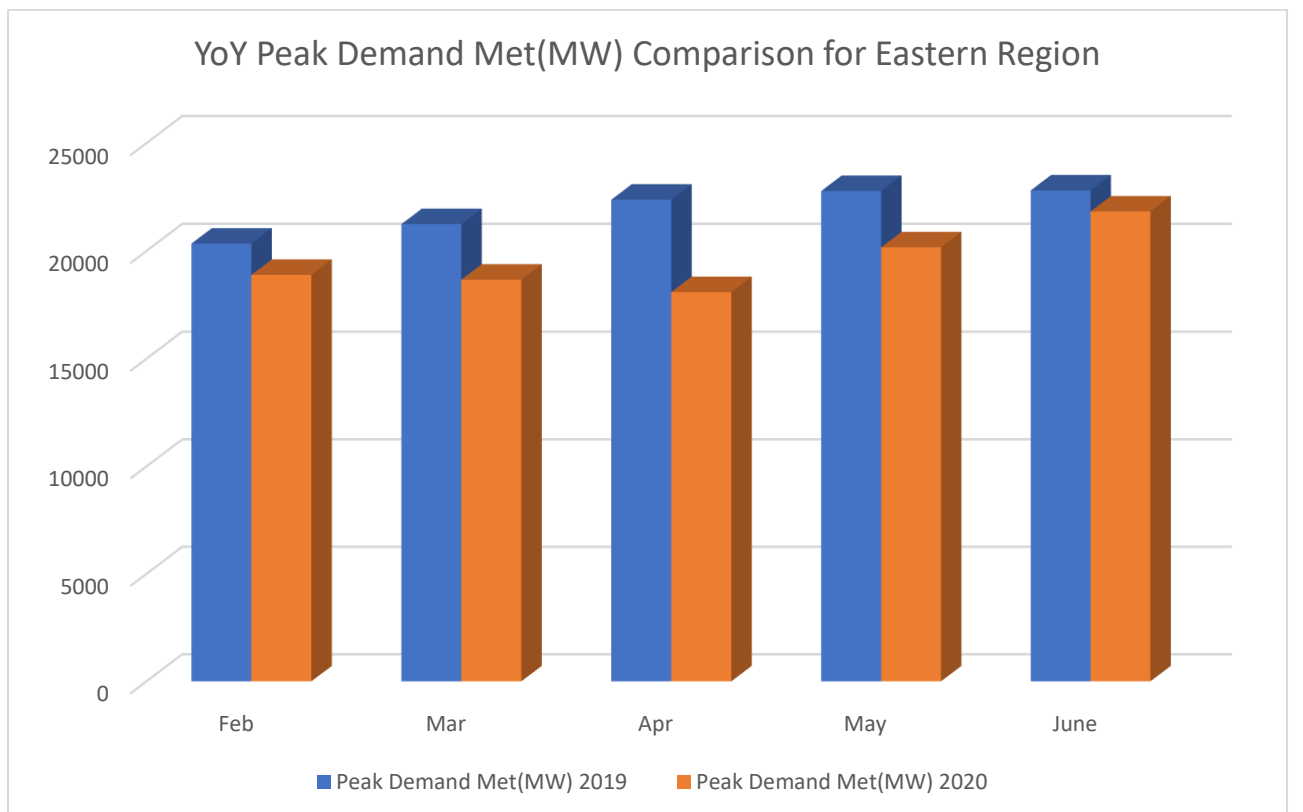
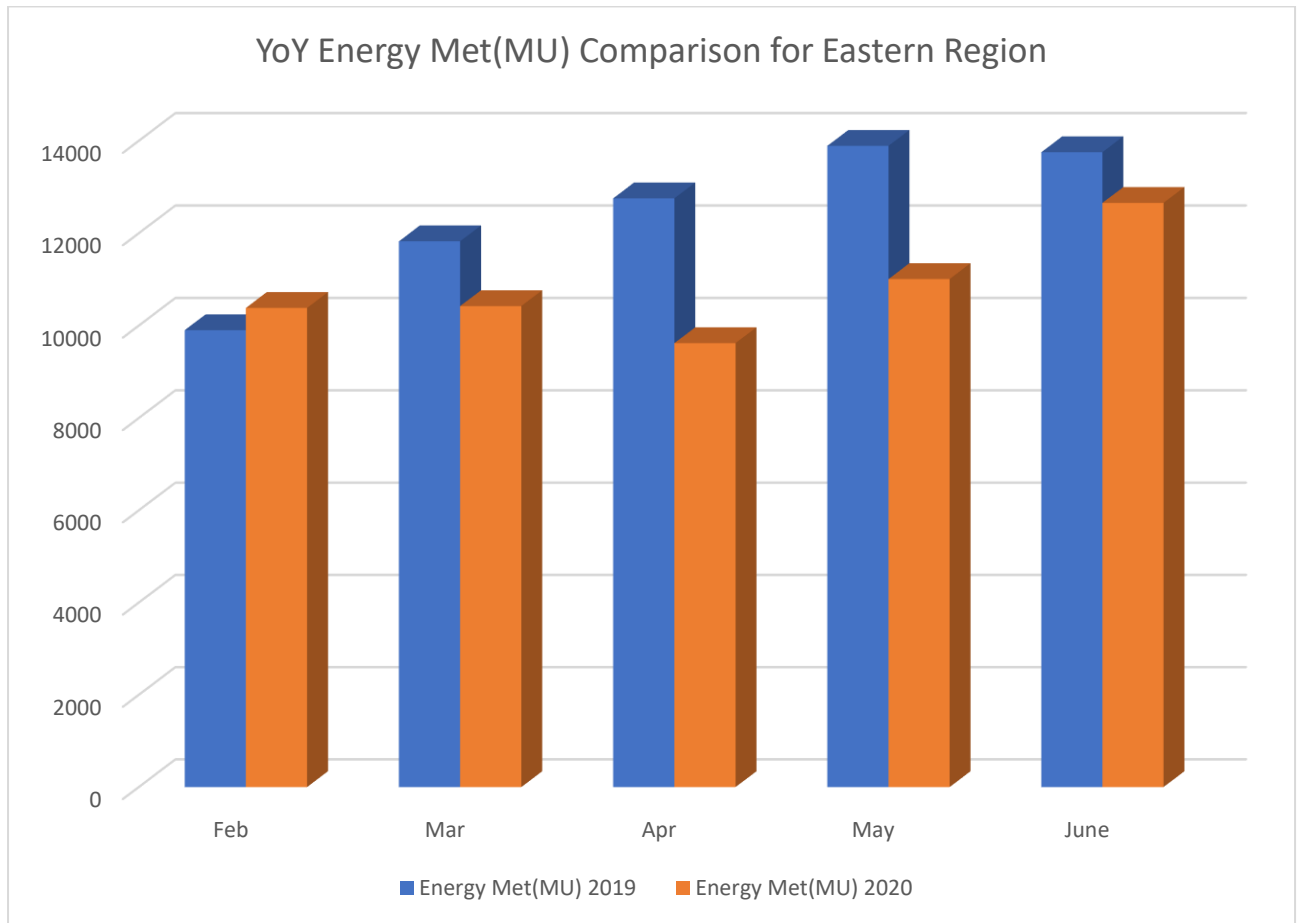
## WESTERN REGION



## SOUTHERN REGION

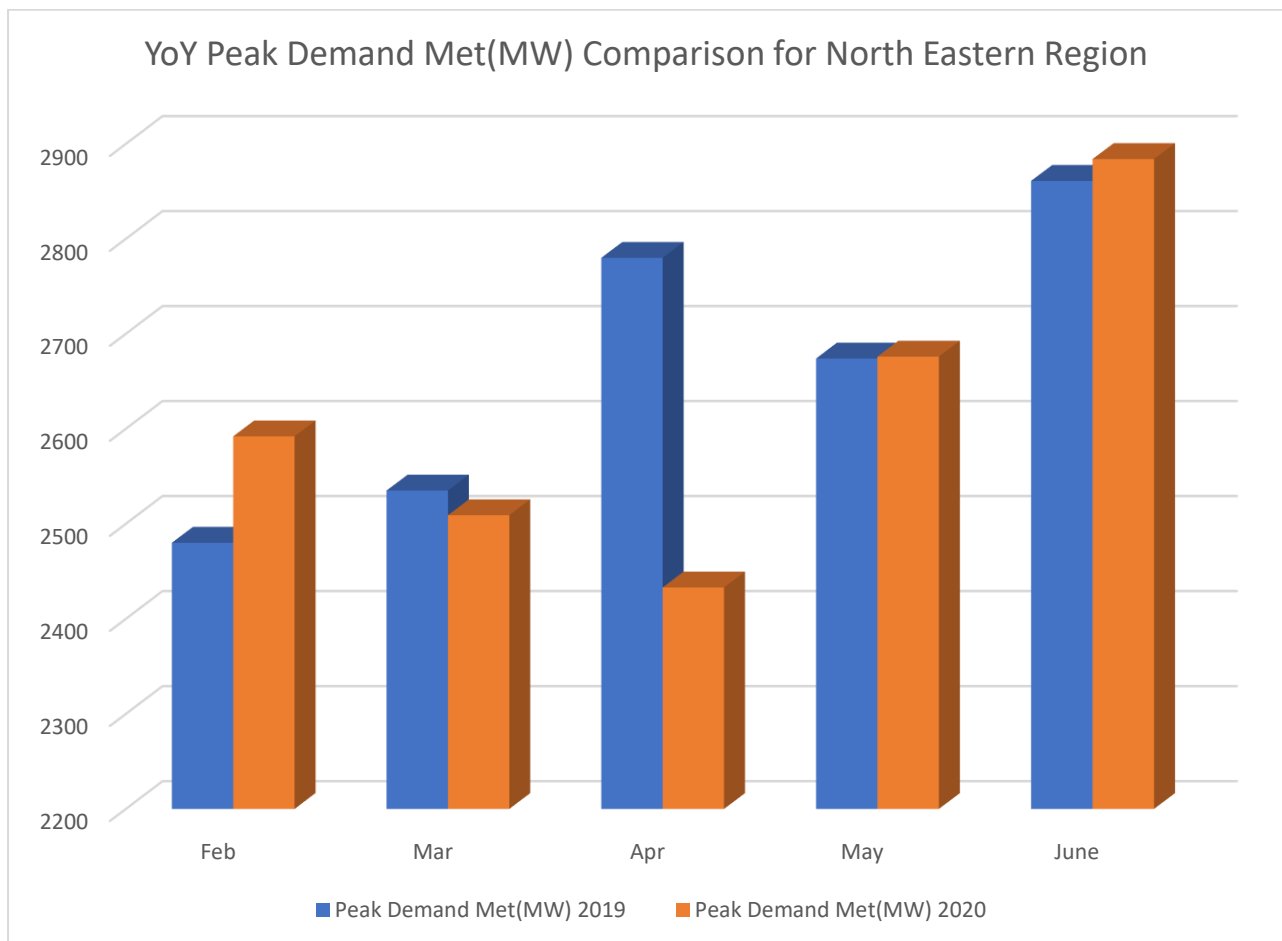
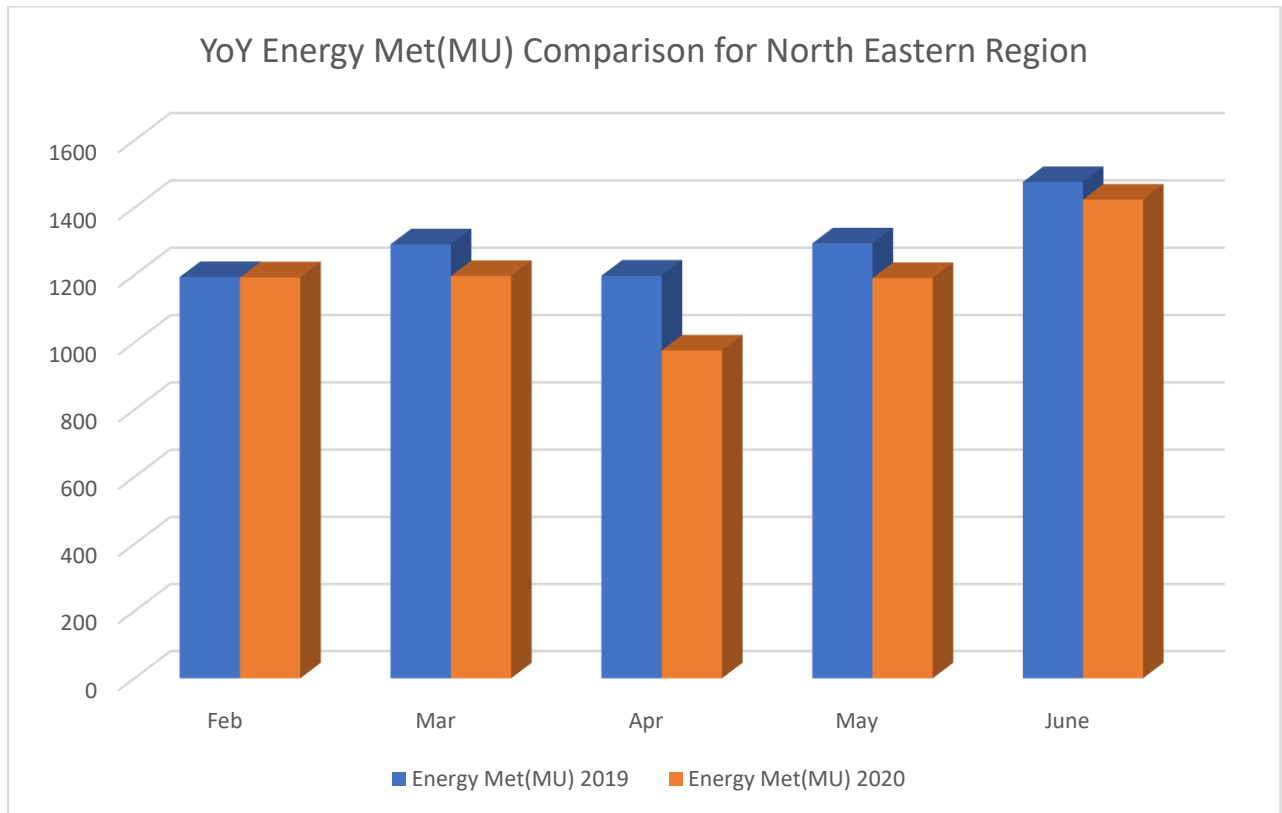


## EASTERN REGION





## NORTH EASTERN REGION



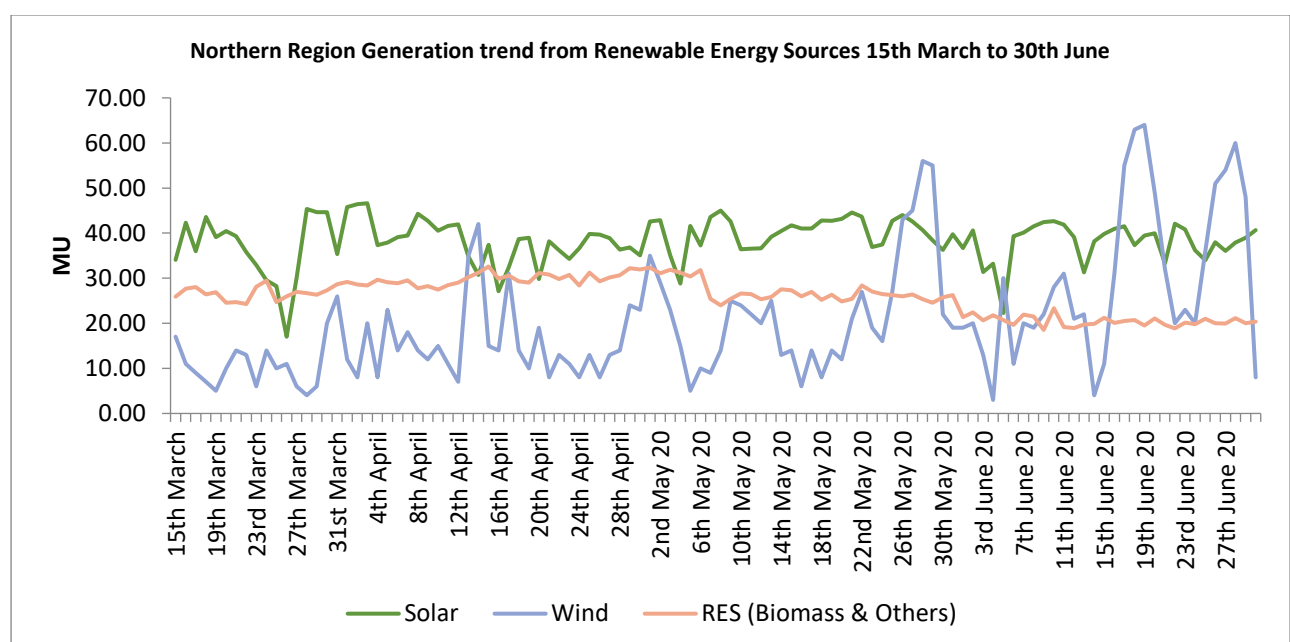
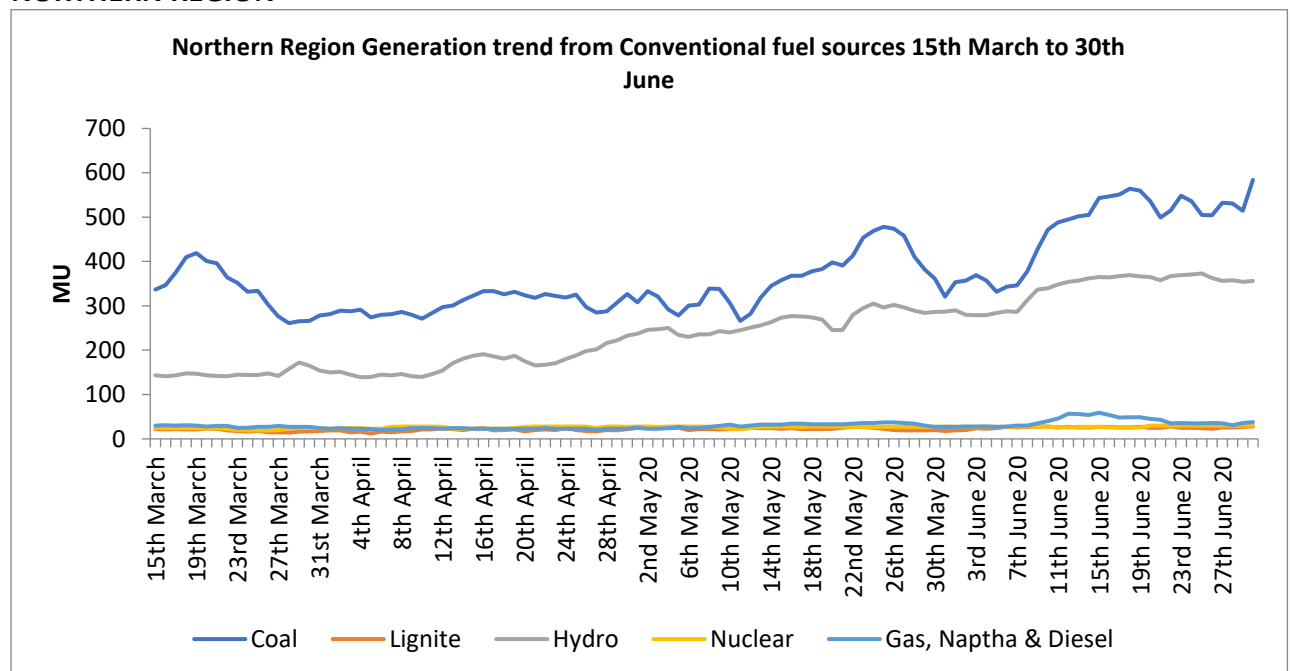
An analysis of the graphs of electricity consumption and peak demand met shows that in almost all Regions, the figures for both, which were higher in February 2020, as compared to last year, have become much lower in April 2020, as compared to April 2019. After that, the

gap started reducing, as more and more unlocks happened and industries and commercial places opened. But till June, it is still less than the same month last year.

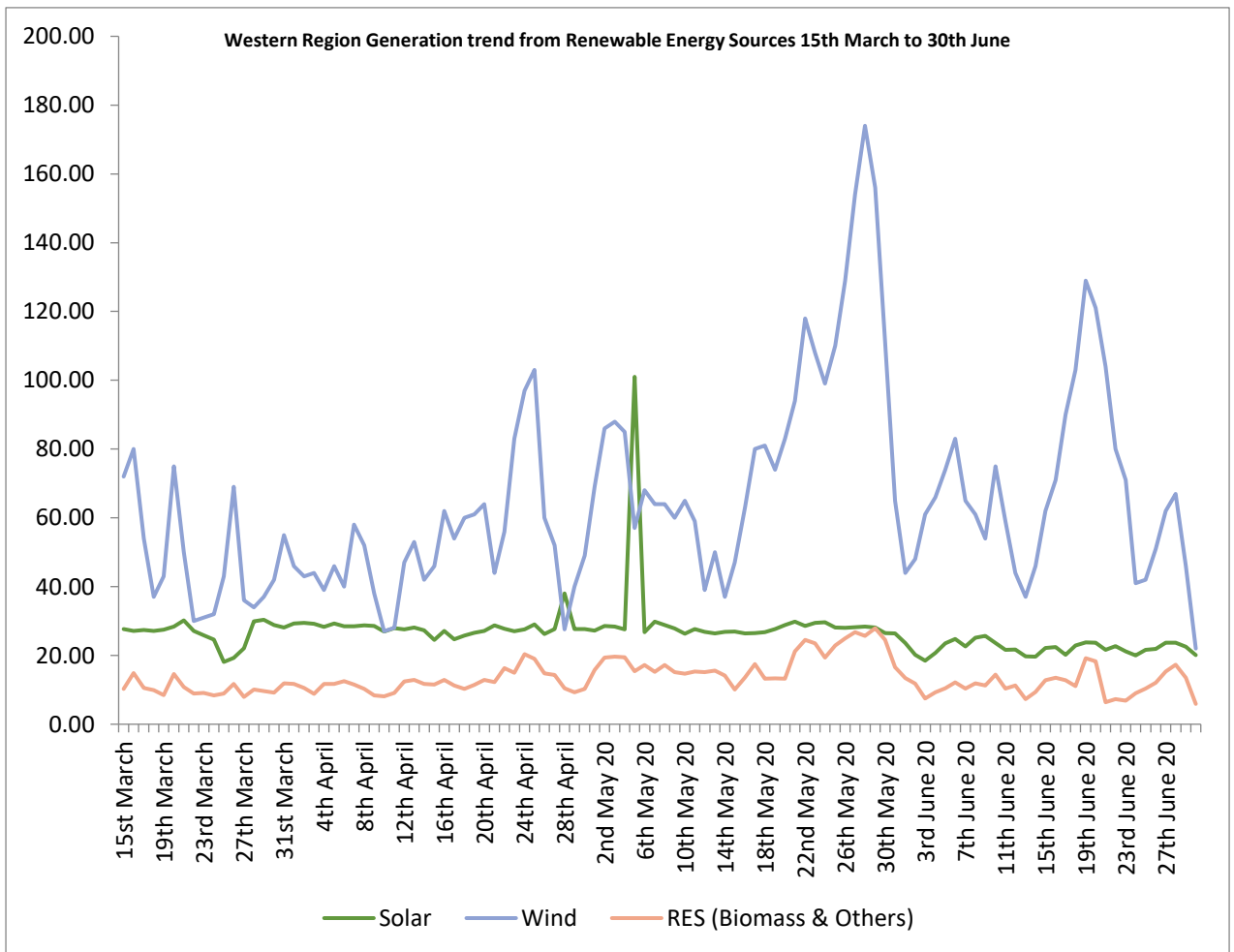
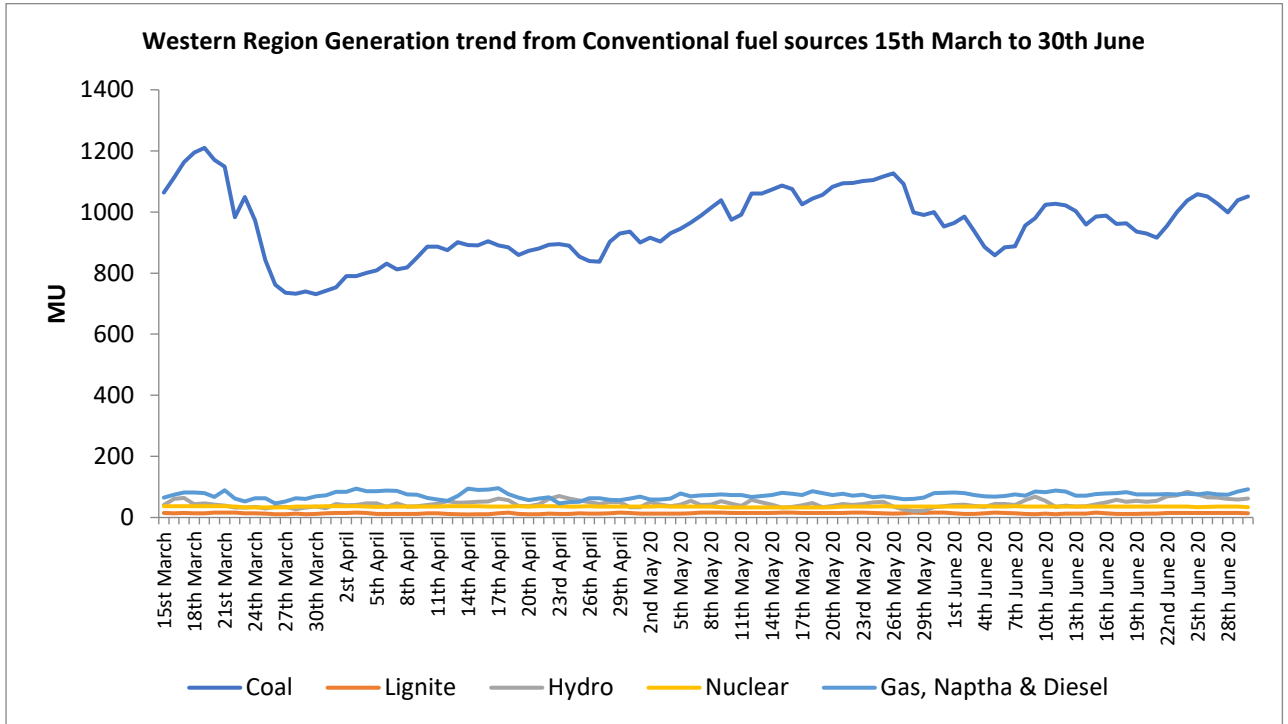
### Source-wise behavior of generation for each Region

Since generation and load have to be exactly equal at each point of time, the generation would have been reduced in each Region to match the reduced load. Let us examine which source of generation has been reduced. Logically, it would be economical to reduce the coal/lignite based generation first, since there is a fuel charge which has to be paid by the State Distribution companies, depending on number of units consumed, whereas in hydro power plants, any water not being used to generate and spilled, is zero cost energy going waste, so also renewable energy like solar and wind energy. The trend of generation over the period 15<sup>th</sup> March to 30<sup>th</sup> June, region-wise, is shown in the graphs below. The renewable generation is shown in a separate graph, with a different scale, since, being small, it would look insignificant in the combined graph of other sources of generation.

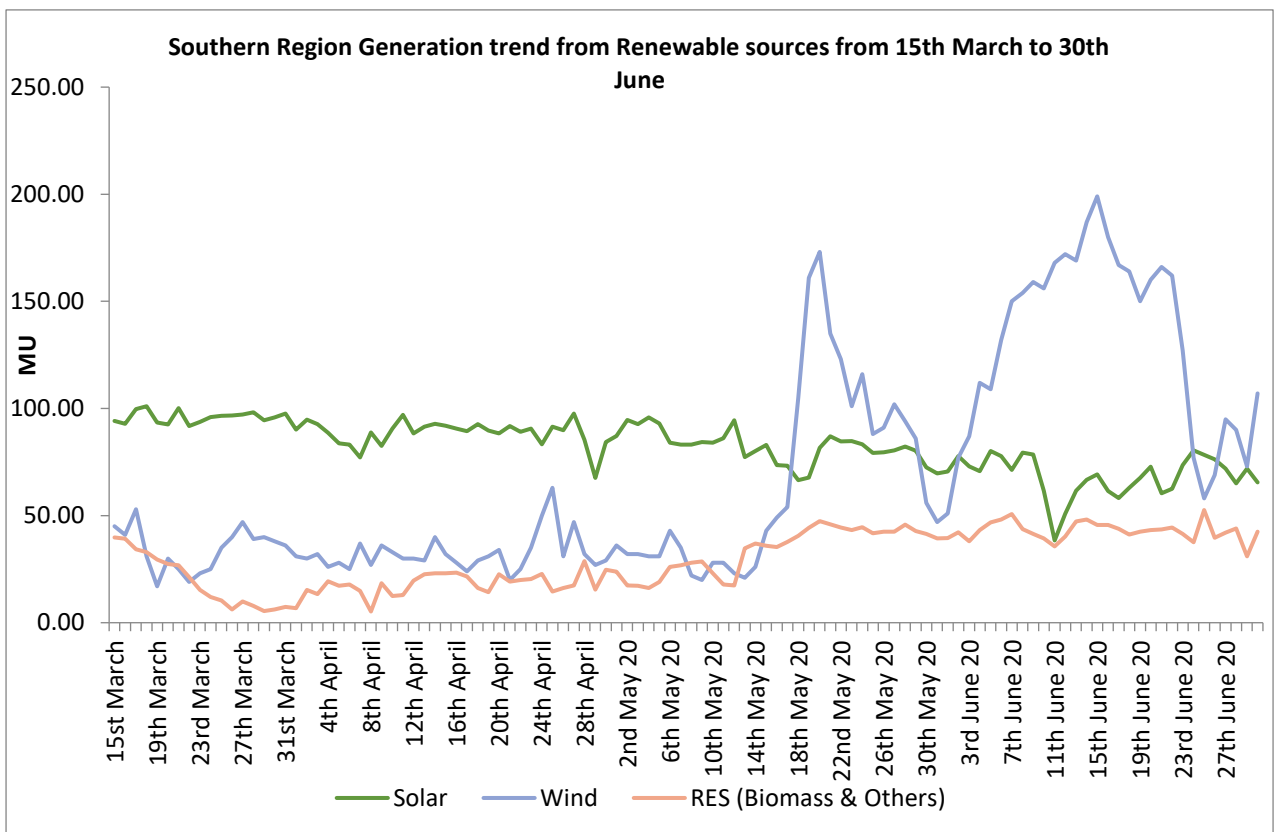
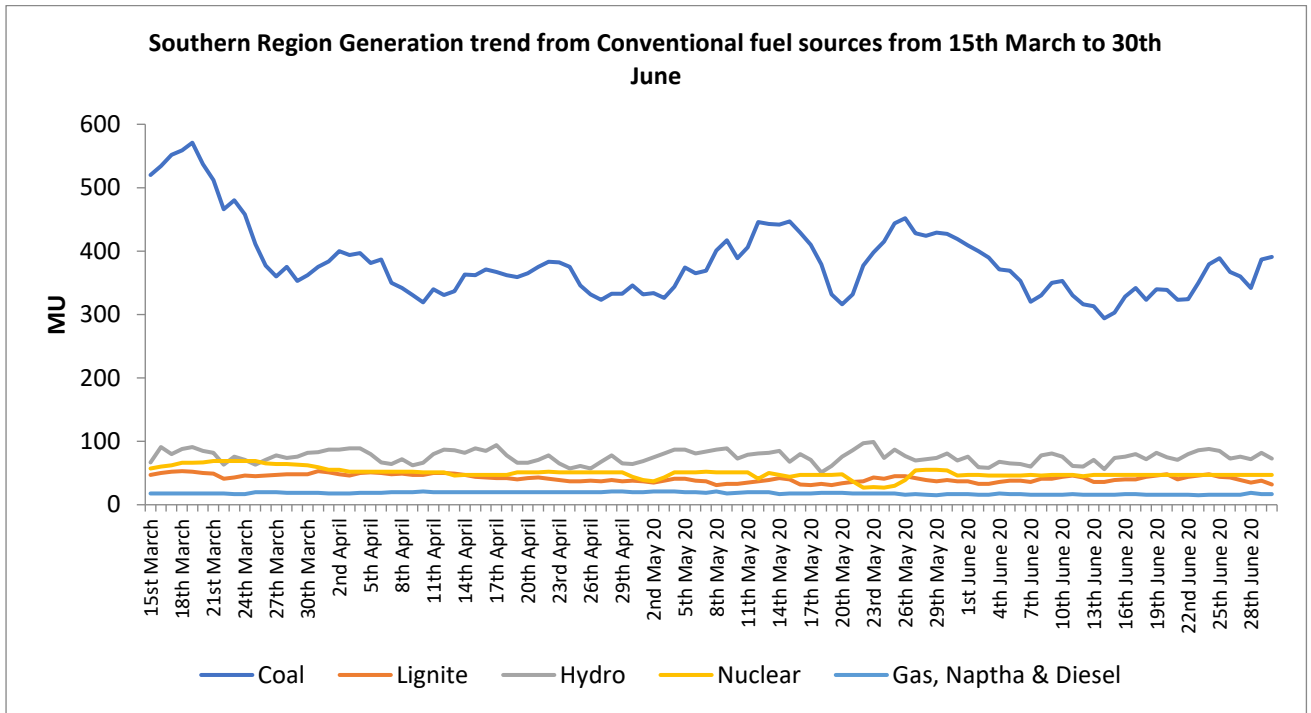
### NORTHERN REGION



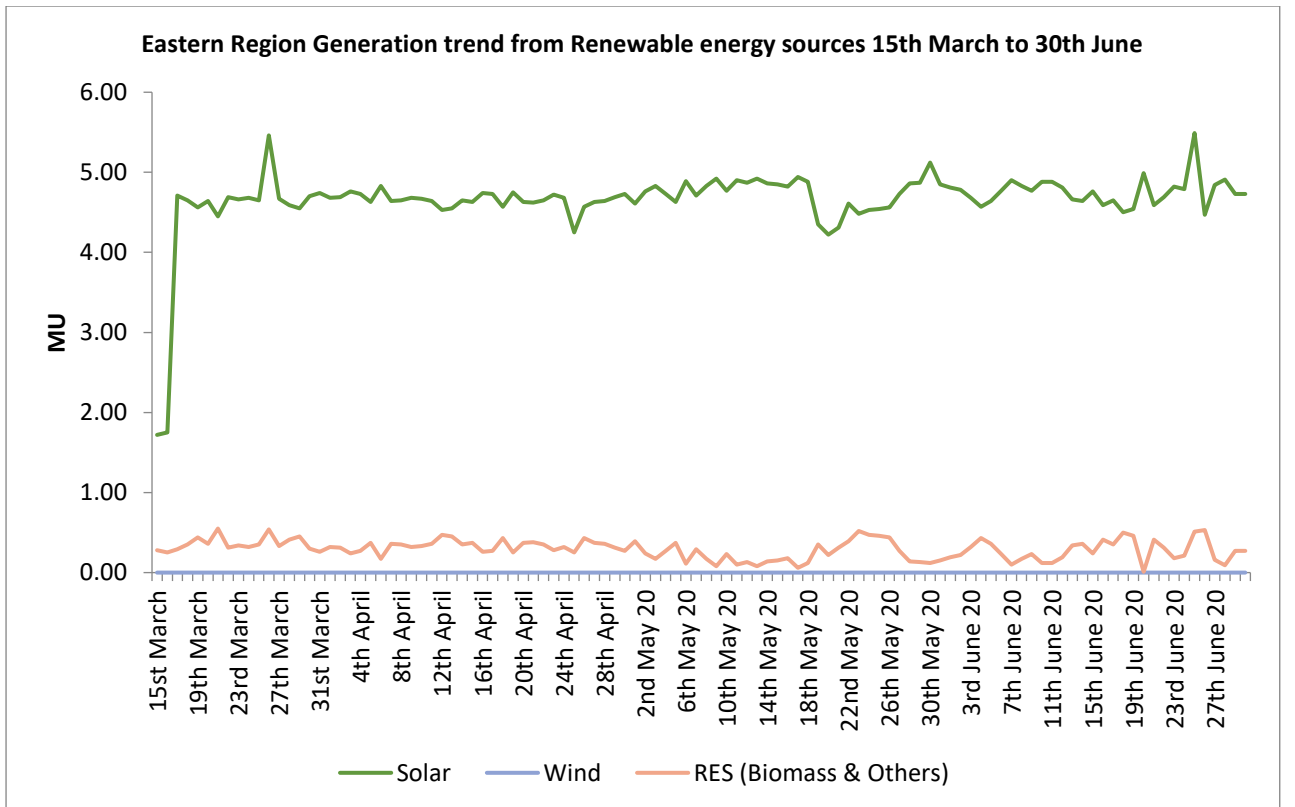
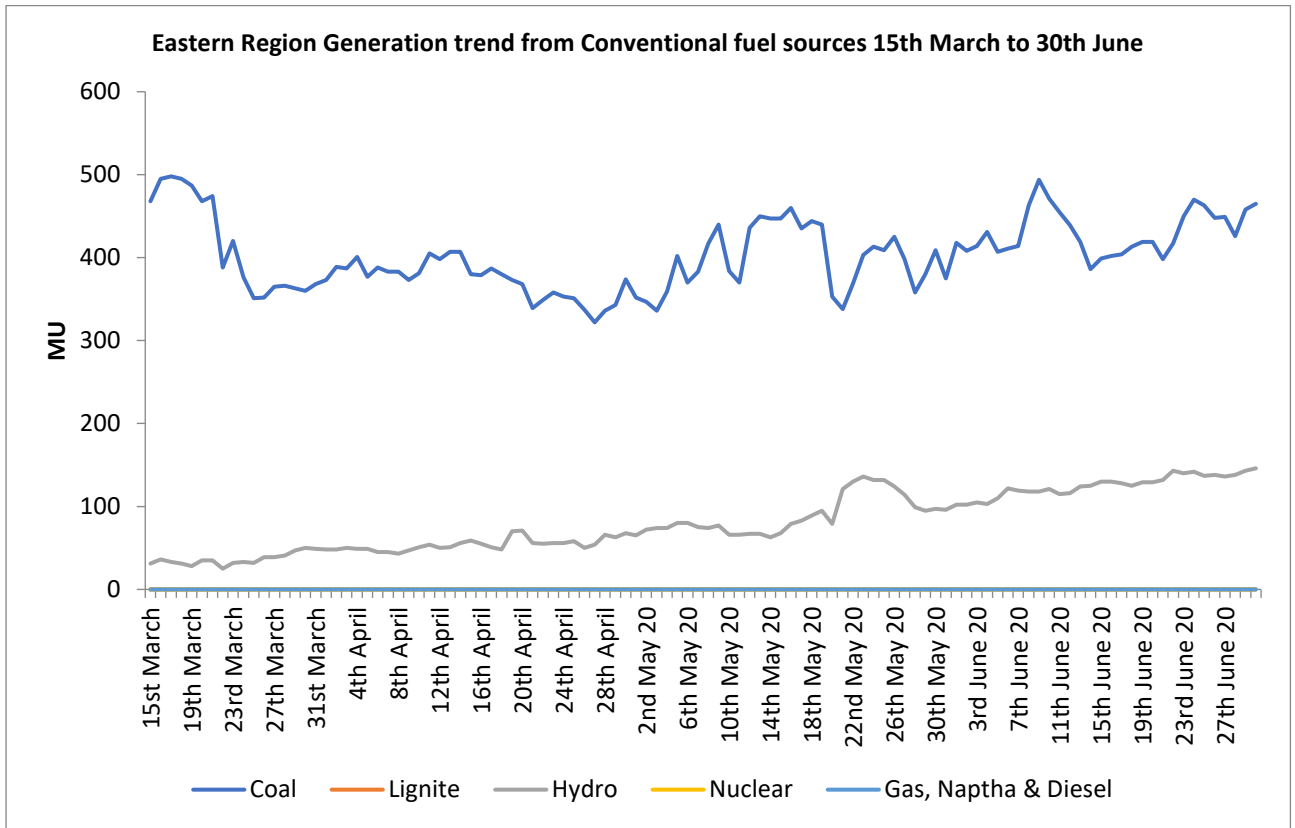
## WESTERN REGION



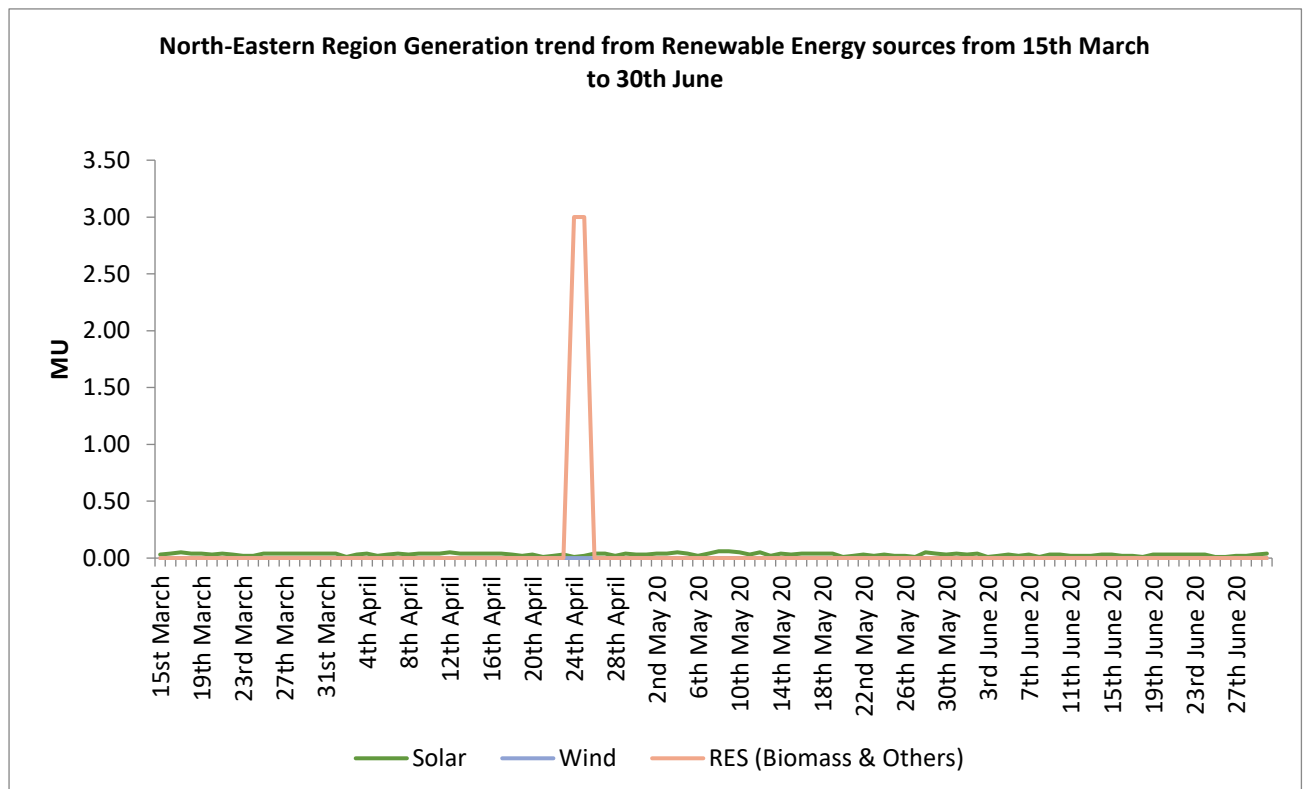
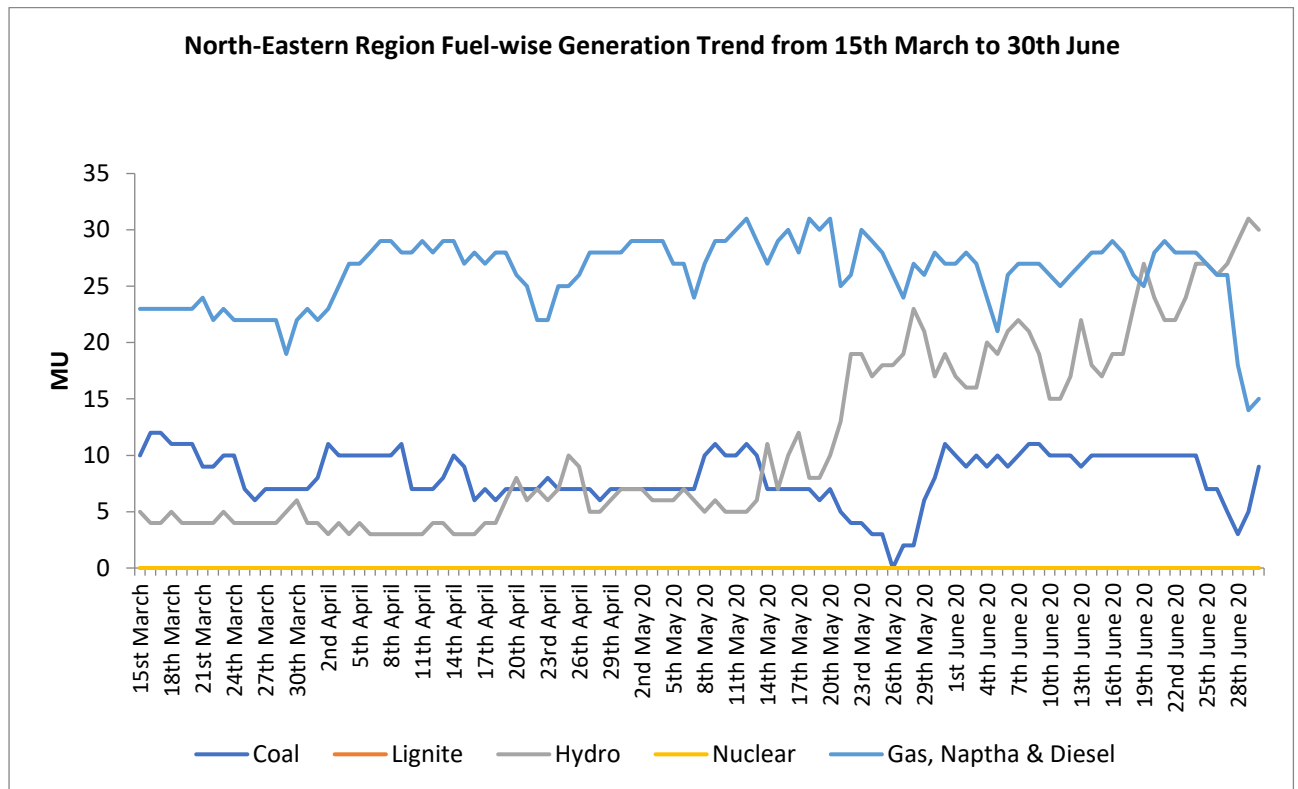
## SOUTHERN REGION



## EASTERN REGION



## NORTH EASTERN REGION



The above graphs show that, as expected, coal generation declined after the lockdown was initiated and stayed low, before picking up in the Northern, Western and Eastern Regions to meet the increased demand due to opening up of industries, as well as to meet the weather beating loads. On the other hand, it stayed at the same level in the Southern Region, which was bolstered by the vast increase of hydro and wind generation, of which they have a substantial capacity, as the inflows increased in the reservoirs due to the arrival of the

monsoons and onset of the wind season. Wind generation also increased in the Western and Northern Regions, whereas solar generation stayed the same or declined slightly, due to cloudy weather. Hydro generation also increased in the Northern Region due to melting snows and some rain in the catchment areas, as well as in the Eastern Region due to rains in the catchment areas.

## Conclusion

COVID-19 has caused a substantial drop in the electricity consumption and peak power demand in all the regions of India, due to closing down of industries and commercial establishment. The Regions where the demand dropped the maximum were the Western Region and the Northern Region. The peak demand dropped 36% in Western Region, 31% in the Northern Region, 24% in the Southern Region 15% in the Eastern Region and 8.5% in the North-Eastern Region. The effect of drop in industrial and commercial load due to COVID-19 in the Eastern Region was not in consonance with the comparatively high percentage share of industrial and commercial demand in that Region. It could be that the industries in Eastern Region did not observe the lockdown very strictly, possibly due to livelihood issues.

In order to meet the reduced demand, and reduced exports to Bangladesh and Nepal and increased import from Bhutan, the generation that was reduced most in India was the coal based generation.

The generation from coal based stations then picked up in the Northern, Western and Eastern Regions due to easing of lockdown restrictions, with more and more industries opening up, and increased weather beating loads. Hydro generation picked up due to the melting of snows in the Northern Region, and monsoons in the Western, Southern and Eastern Regions. The wind season also picked up in the Southern, Western and Northern Regions, whereas the solar generation stayed the same or declined due to clouds.

However, a comparison of the electricity consumption and peak power demand during the months after the lockdown, i.e. April, May and June, showed that in all the Regions, these were substantially lesser than the same period last year initially, but picked up due to weather beating loads, and opening of industries and some commercial establishments, but are still less than the same period last year. This shows that the effect of the pandemic on the Regional electricity consumption and peak demand still continues. This is obvious, since the Railways have not yet started their regular service, many malls are still closed and certain industries have not yet achieved their full production. It is uncertain when the demand would get restored. This would possibly happen when there is a vaccine ready for the pandemic.