MSc Dissertation Summary

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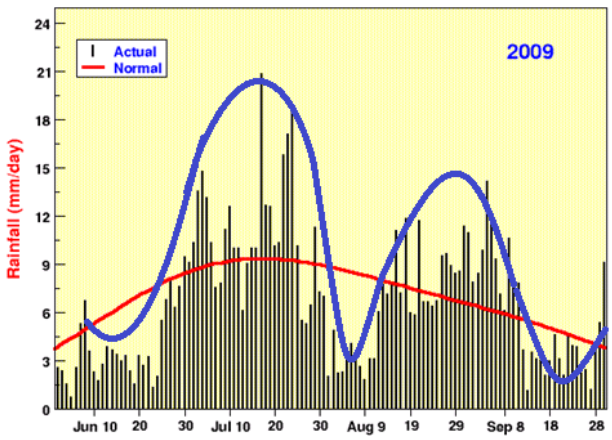
The Impact of Variability within the Indian Monsoon On the Indian Power Sector

The Asian Monsoon has a significant influence on India; the relative strength or weakness of the monsoon season has a sizeable impact on the Indian Stock Market.

The heavy monsoon rainfall is not continuous throughout the entire monsoon season. Figure 1 shows the Daily All India Rainfall for each day during the 2009 monsoon season. The red line indicates the mean rainfall. Periods of very heavy and reduced rainfall are apparent; these are known as the active and break phases of the monsoon.

In recent years, India has developed rapidly. Increasing wealth has resulted in investment in cooling technologies for use in the hot months before and during the monsoon. This has resulted in an increase in summer electricity demand. India is keen to invest in renewable energy to meet this rising energy demand. However, much renewable technology currently available is strongly influenced by the prevailing weather conditions.

In this dissertation the impact of break and active phases within the monsoon on supply and demand in the Indian Power Sector is examined. The method of supply considered is electricity produced by wind turbines.



The Indian Monsoon

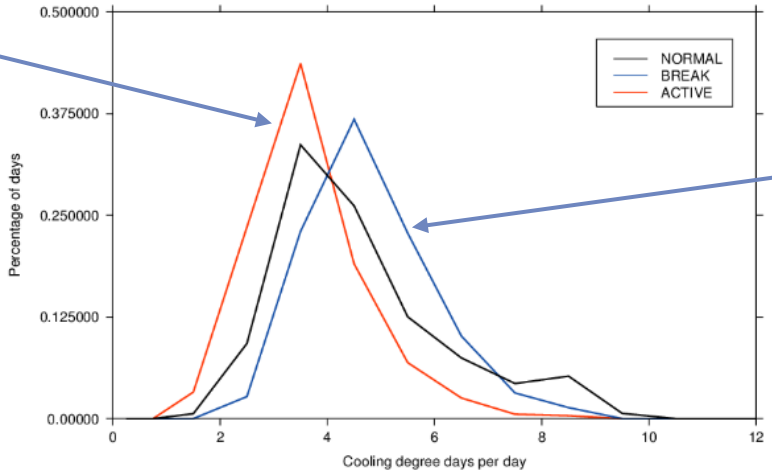
The Indian Monsoon is the seasonal change in winds across India. The most notable feature of the Indian Monsoon is the heavy rainfall that is present throughout India during the monsoon; more than 75% of the annual precipitation occurs in June-September.

Relation between Temperature and Demand

As temperatures rise, the use of air conditioning and air cooling units also increases. Thus in periods of high temperatures the electricity demand is higher. There is also increased need e.g. for refrigeration and changes in the operation of some machinery but this has not been considered here.

DEMAND

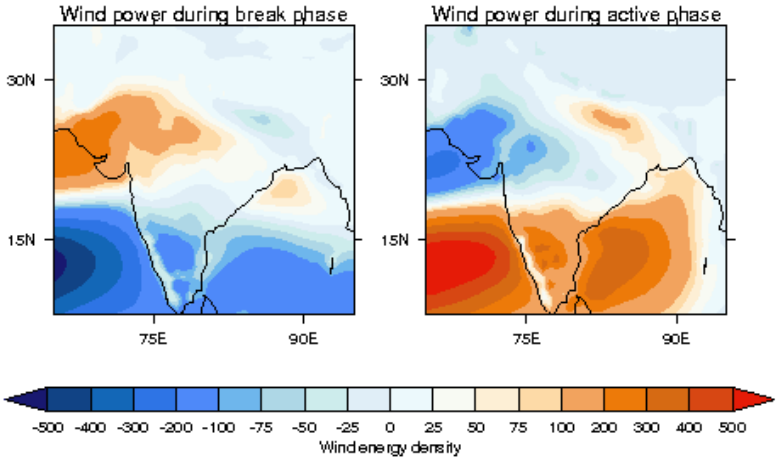
Active phases were associate with lower temperatures and lower cooling energy demand.



Break phases were associated with higher temperatures and thus greater cooling energy demand.

WIND

Break phases were associated with lower wind power in the south and higher wind power in the north.



POWER

Active phases were associated with higher wind power in the south and lower wind power in the north.

RESULTS

Demand is much higher across India during break phases, with the effect most noticeable in the southern part of the country. The effect on wind power output is split between the north and south of India. In the south wind power is higher during active phases and lower during break phases. Thus, in south India and in the region surrounding Bangalore, demand is higher when supply is lower during break phases, which has the potential to create problems within the Indian Power System, especially as this is a region where a large number of turbines are already installed. In north India and around Delhi wind power output is higher during break phases. This is a region where currently only a few turbines are installed. This correlation between high demand and high supply is promising for wind power in this region. The same results are obtained when both monsoon indices are used, suggesting these results are robust.