

Key Results And Analysis

Data was primarily analysed for the Bharti building and a number of striking inferences were achieved.

Data from the Bharti building was used for a span of 53 days to study the effect of three key factors - Temperature, the number of classes being held, and the effect of holidays on the energy consumption of building.

To study for the variations in temperature, daily energy consumption was normalised using the mean absolute temperature of the day. It was observed that energy consumption spiked whenever temperature crossed 28°C, by a factor of 1.2. This can be explained by the fact that people tend to start using Air Conditioning - one of the primary sources of building energy consumption, above the empirically observed temperature of 28°C. After normalising for AC usage using the AC normalisation factor (1.2), data between the classes being held and the increase in energy demand was studied.

Classes are a short term phenomenon as opposed to the more gradual trends obtained from variations in temperature. To understand its effects daily power consumption data for each day was studied. Classes are period of time when there is a greater concentration of people in the building resulting in an increased instantaneous power demand for a phase. It is observed, on an average, when classes are being held, power demand rises by a factor of 1.25 - The class normalisation factor.

Daily energy consumption data, was mapped to the IIT Delhi Holiday Calendar to see if on given day it was a holiday or not, including weekends. If it was a holiday, none of the normalisation factors were applied apart from temperature normalisation.

The normalised energy value were then clustered into 3 different sets, using k-means clustering, indicating low, regular and high demand. In absolute terms, the mean low energy demand for the Bharti building was 3962 kWh, the mean regular energy demand was 5157 kWh and the mean high energy demand for the given period of time was 6536 kWh. In relative terms, these values translate to 1.1, 1.34 and 1.7 times the baseline for low, regular and high energy demand. The baseline energy consumption value for a given day is obtained by extrapolating the minimum energy demand of the building to a span of 24 hours. This value indicates the minimum energy demand of the building for a given a day. Minimum energy demand for Bharti building was observed between 6:15 AM to 7:00 AM, daily, though this timeframe can vary for different buildings.

This model can be used to accurately study energy demands in variety buildings. The study undertaken can be further expanded, as more data accumulates to incorporate a variety of other factors such as seasonal variations in demand.

KEY INFERENCES

Average Values

Regular Demand | 5157 kWh

1.34 X Baseline

High Demand | 6536 kWh

1.7 X Baseline

Low Demand | 3962 kWh

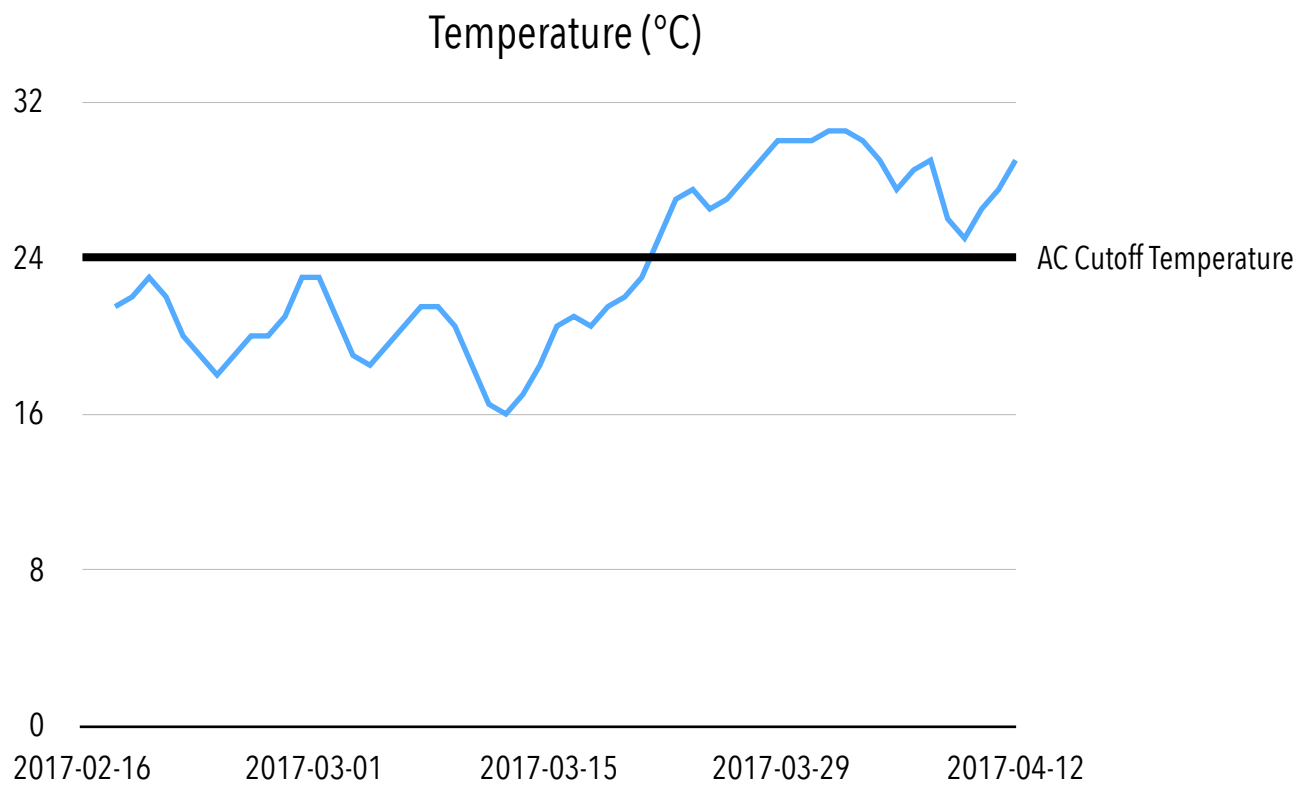
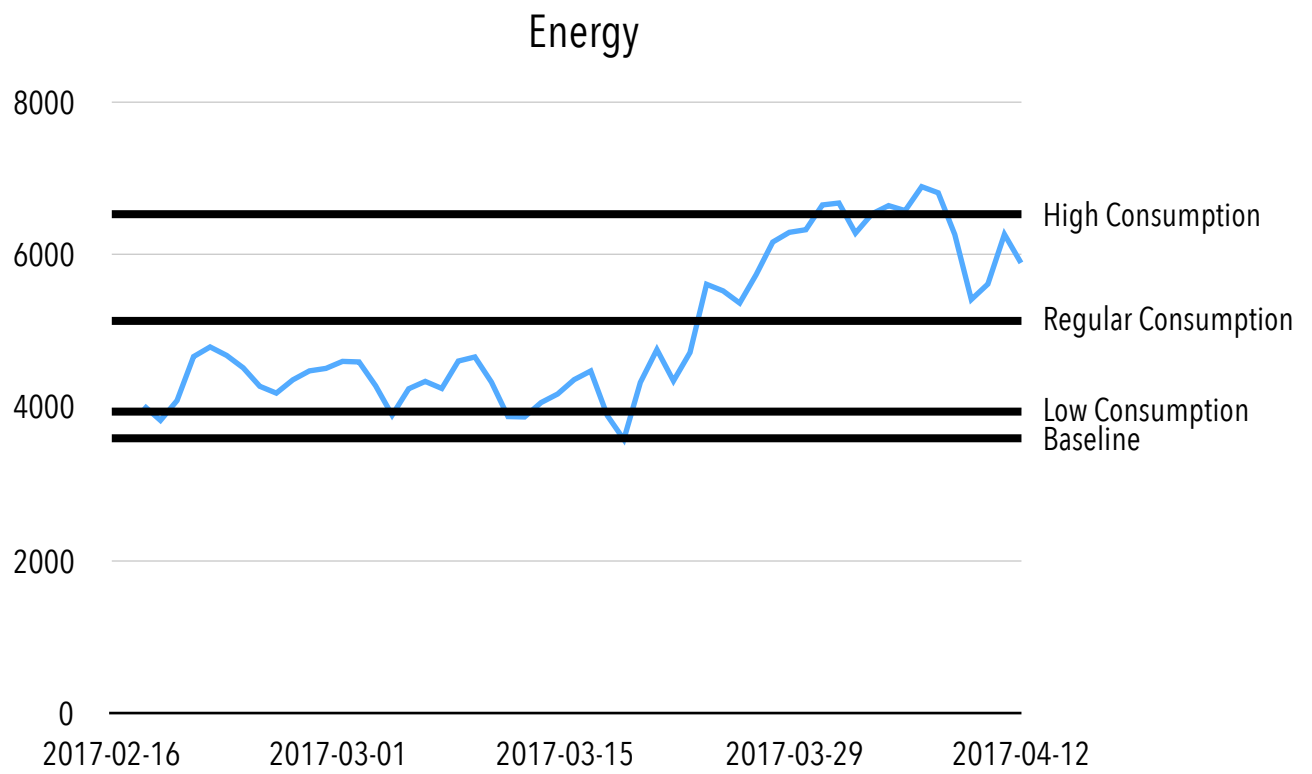
1.1 X Baseline

KEY INFERENCES

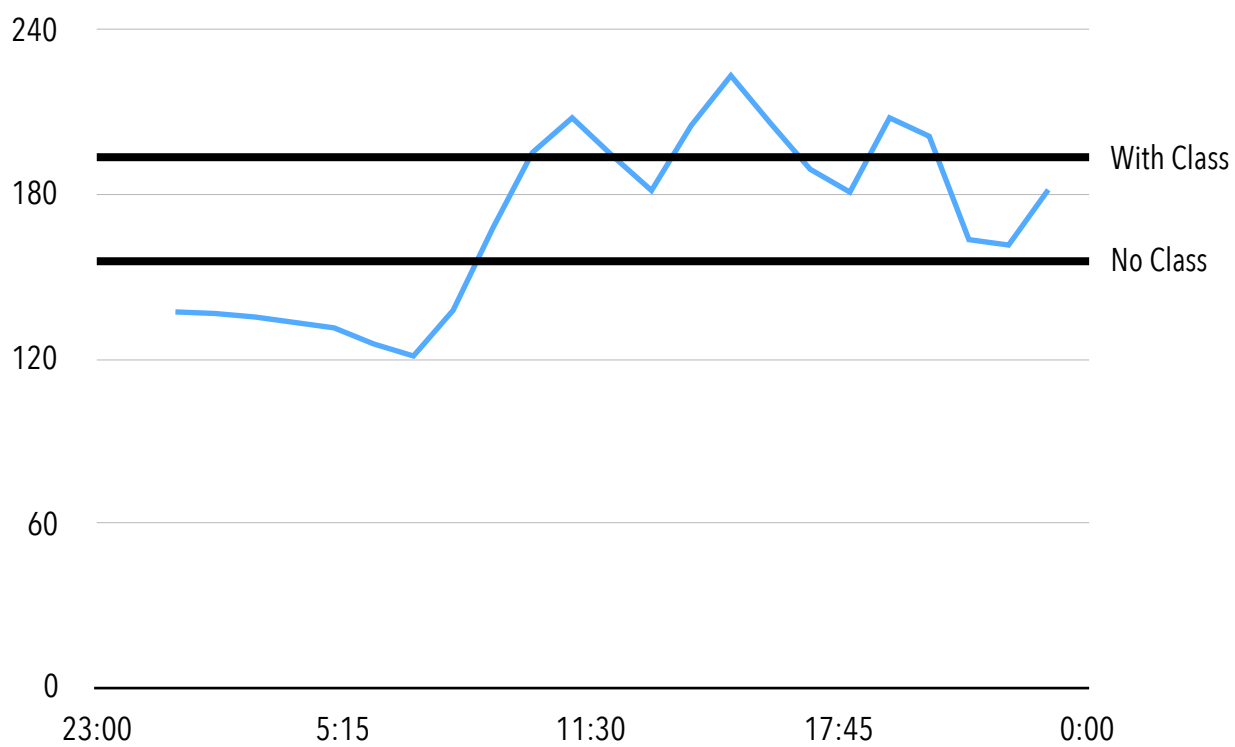
AC Cutoff Temperature - 28°C

AC Normalisation Factor - 1.2

Number Of Classes and Power Demand - 1.25



Hourly Power Demand - 14/03/17



No. Of Classes - 14/03/17

