

## Case Study EA-102

### Power & Energy Audit in Commercial Buildings and Corporate Offices

#### About The Installation:

Power & Energy Audit in buildings like Banks, Hospitals are becoming increasingly popular as these are 24 X 7 and critical in nature, thus uninterruptible power supply and its reliability are the top priority issues. This detailed study is carried out to study power quality and energy conservation potential of the entire facility at Corporate Office and main building of one of the leading public sector bank in India.

Electricity is received at 11 KV from the sub station of the state electricity board. The sanctioned contract demand for the facility is 1450 KVA, but in April 2007, the demand has exceeded to 1478 KVA. Present power factor is varying between 0.94 and 0.95.

#### About The Assignment:

Power & Energy Audit has been carried out considering BEE & ECBC guidelines, IS guidelines and IE rules. In this audit, main objective has been to study:

1. HT/LT substations with DG sets and its adequacy
2. Installed UPS systems and its performance, Adequacy of the back-up/redundancy
3. Energy conservation in: Air-conditioning, lighting, Pumping and any other area
4. Power quality and associated problems & thoroughly evaluating earthing system



#### How did we Approach?

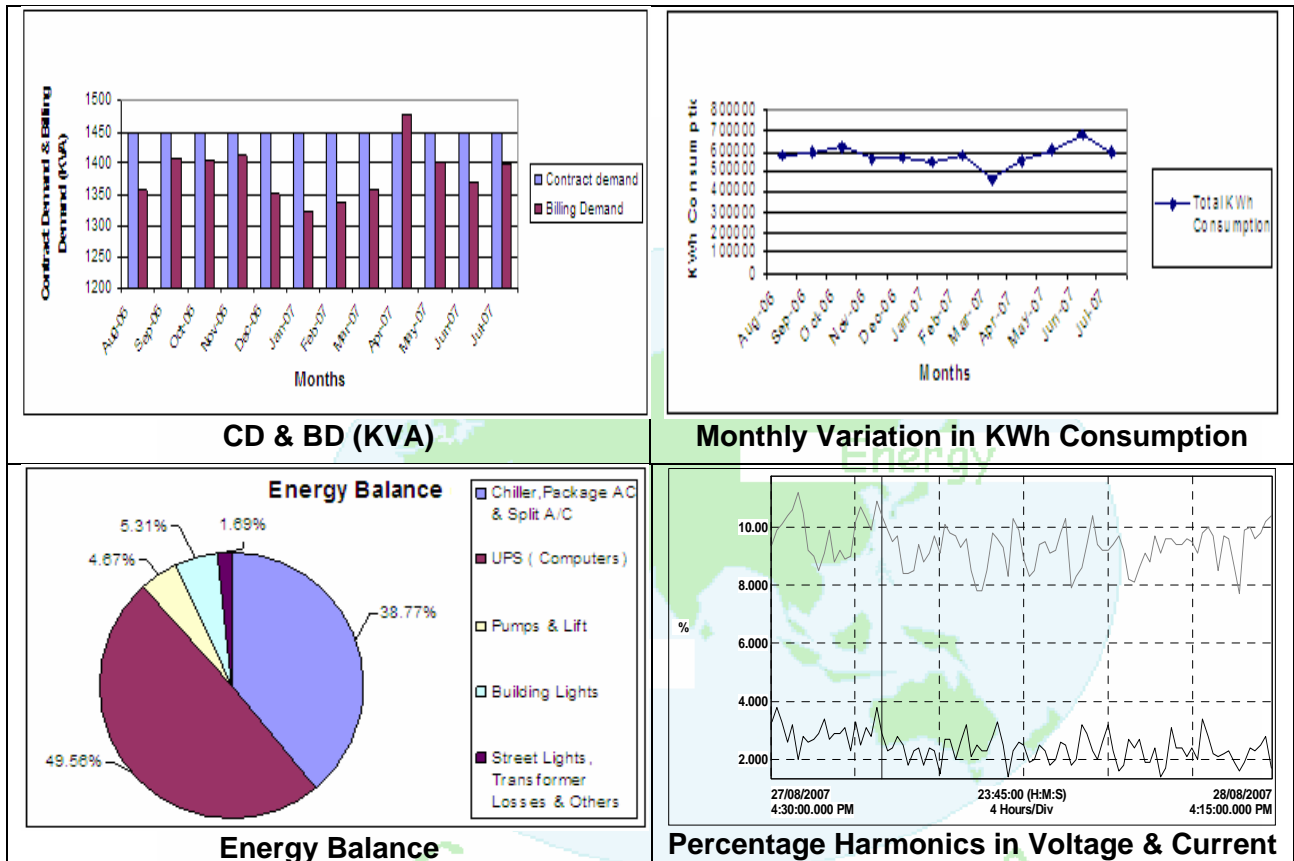
Power & Energy Audit in buildings is comparatively more recent than industrial Energy Audits. Approach followed in this study has been as follows:

1. Figure out complete distribution system including the hardware and operating parameters
2. Measurements for Energy Consumption, Efficiency & Losses Evaluation
3. Identification of Energy Conservation Opportunities
4. Quantification of Energy Conservation Opportunities
5. Recommendations for Energy Saving Measures
6. Effects of harmonics on the UPS & main transformer
7. Studied for safety measures at Sub Stations & Transformer locations
8. Earth pit resistance measurement

Overall focus has been on measurements, quantification and analysis of energy transmission & usage, identification and quantification of losses in distribution system, Air-conditioning system, pumping system etc and finally to evolve solutions to improve energy efficiency. Harmonic study has been carried out for the main transformer & Uninterruptible Power Supply.

### Observations:

Overall Balance in terms of Energy, KWH and Cost has been carried out. Variation in KWH consumption, voltage, current and harmonics has been studied.



### Findings & Recommendations:

1. Average billed power factor is 0.94 to 0.95. Significant saving will be achieved by increasing the PF from 0.94 to unity (1) at the distribution side by installing additional capacitors. This will result in 7 to 8% savings in the electricity bill with payback in few months.
2. Sometimes it is observed that maximum demand is exceeding the contract demand, therefore it is recommended to install Maximum Demand (MD) controller to reduce the MD and hence penalty is avoided and demand charges are reduced.
3. The motors having % loading less than 50 % are recommended to make changeover of connections from delta to star and replace FTL copper chokes with electronic chokes.
4. Numbers of Window Air Conditioners & Split A/C units have been installed as per the requirement. It is recommended to transfer this air conditioning load to centralized air conditioning system as the KW/TR of Window Air Conditioners or Split A/Cs is high as compared to water cooled condenser systems (1.5 to 2 versus 0.7 to 1 KW/TR). This is possible by installation of additional AHUs. This will result in 5 to 6% saving in total electricity bill with a payback of less than year.
5. The recorded value of percentage THD voltage of about 5 % and percentage THD current of about 38 % for transformer-1 and 5.2 % and percentage THD current of about 18.2 % for transformer-2, which were recorded under full load conditions are not within the IEEE-519 guidelines for Harmonics permits the  $V_{thd}$  upto 3 % and  $I_{thd}$  upto 15 % as reasonable limit, when measurements are carried out with the capacitors switched ON.



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