

Deployment of Energy Management System at Sugar Industry

Given below, is the business case for the deployment of an energy management system (EMS) at a sugar producer with a crushing capacity of 12000 tonne per day. The company wanted to use the information from the system to claim under the renewable energy certificate scheme.

Some facts

The site:

1. 44 distribution feeders at a co-generation power plant
2. 28MW generation capacity
3. in-house consumption is in the range 15-16 MW
4. the remaining power was exported to the grid
5. the Plant Load Factor(PLF) for this industry was 80%
6. the monthly, average plant consumption was approximately 7500 MWh (excluding auxiliary consumption of 10-15% of total load).

Central Electricity Regulatory Commission (CERC) scheme essentials:

7. 1 renewable energy certificate (REC) = 1MWh
8. 1 REC is worth an average of Rs 2000.00

The company adopted an energy management solution (EMS) and the benefit is:

The total monthly income from renewable energy certificates:

Energy generated: 7500MWh

7500 REC * Rs 2000.00 per REC = Rs 15 million per month.

For five months (one season), the total earning from:

Rs 15 mn* 5 month = Rs 75 million in a year

The benefit to the company under the renewable energy certificates is Rs 75 million a year.

REC Regulation

In 2010, CERC issued a letter relating to the terms and conditions for recognition and issuance of renewable energy certificate for renewable energy generation. According to this regulation, CERC will issue certificates to all industries that are producing electricity using a renewable source and are eligible to receive the certificate under these regulations. The certification will be regularly checked and monitored based on an energy injection report duly approved by state load dispatch centre (SLDC). Each 1MWh consumed by these plants will be equivalent to 1REC.

Based on the total export of energy to the Grid, the industry will be paid for every kWh exported. Also as the power is generated using a renewable source, CERC will award some renewable energy certificates to industry for internal usage. These certificates then can be traded in the market giving industry more money.

There are various ways of exporting energy – simple export, wheeling and a banking facility.

- 1) **Exporting Active energy** – The generated power can be transmitted to the grid; based on the total exported energy, industry is paid Rs 2000.00 per MWh of Active energy exported.
- 2) **Wheeling** - The process of generating power at one place and consuming it at some other place is wheeling. In this case, the utility will only charge transmission charges for the units transmitted.

- 3) **Banking** – This facility is for storing/banking the power generated at peak hours i.e. 5 pm to 10 pm. This banked power can be stored as needed by industry. The banked power then can be used at some other time period within a financial year. This banked power can be used by industry during off-peak hours i.e. industry can't use the banked power between 5 pm to 10 pm. A total of 12.5% of power banked is deducted from the total banked power as banking charges. The banking facility is valid for use in a financial year only. If at the close of the financial year some power remains in the bank, the utility will pay a per unit charge on the amount remaining to industry.

Auxiliary consumption (energy derived from diesel generating plants) is not covered under the REC scheme. In an industry, 10-15% of energy consumed is auxiliary consumption.

Generally, a utility buys electricity in KWh (Active Energy) and sell the electricity in KVAh (Apparent Energy). Also the Maximum Demand Indication (MDI) during the seasonal time calculated during the peak hours only (5PM to 10PM) and MDI for non-seasonal time calculated during the whole day. The charge for energy by the utility per KVAh (Apparent Energy) varies from industry to industry based on plant capacity.

Sugar Industry under REC

Introduction to the Sugar Industry

Sugar is one of the oldest commodities in the world and traces its origin to 4th century AD in India and China. In those days sugar was manufactured from sugarcane. But both countries lost their early initiative to the European, American and Oceanic countries, as the eighteenth century witnessed the development of new technology to manufacture sugar from sugar beet. However, India and Brazil are dominant players in the global sugar industry along with Brazil. Given the growing sugar production and the structural changes witnessed in the Indian sugar industry, India is all set continue its domination at a global level.

In comparison with the rest of the world, the Indian sugar industry is in better position regarding raw material availability, crushing period, size of sugar mills, production cost and prices. The major advantage that Indian sugar mills have over others is lower production cost. There are many by-

products in the sugar industry. The major one is bagasse which is used for co-generation of power.

Sugar is one of the industries that comes under the REC scheme. A by-product of sugarcane is bagasse which can be used for power generation. Sugar factories can set up power plants with a specific generation capacity based on the availability of bagasse per day. As sugarcane is a seasonal product, the availability of bagasse, therefore generation, is for the season only, between the months November to March. For rest of the year, the industry is closed and the power is imported from the utility to meet the internal requirement.

With the generation of power from bagasse, the industry gets cheaper power for sugar production, earns by exporting additional power and can earn RECs which can be traded adding to the financial benefit to the sugar industry. Besides this there are options like banking of energy produced which allow the factory to use cheaper energy during the off-season.

The conditions necessary for acquiring a REC certificate are –

- 1) Submit a daily consumption report to SLDC.
- 2) Submission of a daily fuel usage report to SLDC every month.
- 3) Monthly joint meter reading (JMR) through MRI (a hand-held unit) by the utility and industry.
- 4) Energy injection report comprising total monthly generation and consumption (excluding auxiliary consumption). This report too needs to be submitted to SLDC

All the above must be approved and verified by the Nodal Officer (Division, XEn- State Electricity Board); who then sends it to CERC and SLDC.

Apart from that, for monitoring the internal consumption of an industry; the following data is needed –

- 1) Individual feeder reading.
- 2) Daily consumption report to management.
- 3) Consumption data to costing department to derive per KWh generation cost.
- 4) Management information data to pull together other reports.
- 5) Monitoring internal consumption and reducing the auxiliary consumption for efficient use of power
- 6) Individual feeder load monitoring.

What is needed?

To enable the above, an end-to-end solution for load monitoring, consumption monitoring, online data monitoring, automatic meter data acquisition which can be exported to SAP and other applications is required.

The system comprises of –

- 1) 0.2 class HT meters with Modbus port for sub-metering application.
- 2) Energy data monitoring software with a server for online monitoring purposes.

The purpose of the solution is to provide reliable and accurate data to both the utility and the industry.

The industry can monitor the internal consumption at various feeders using HT meters with 0.2 class accuracy and Modbus support. These meters are

looped in a RS485 Modbus network and terminate at a RS485 to RS232 converter which connects with an on-line monitoring software: eWatch 100.

The online data monitoring capability helps industry to monitor instantaneous energy parameters as well as at a polling frequency of 1 min.

The on-line energy monitoring system helps to perform the following functions:

- a) Energy audit
- b) Energy accounting
- c) Energy conservation
- d) System management
- e) Data logging
- f) Trending
- g) Check the consumption / Billing of tariff meter
- h) Reporting and analysis
- i) Alarms
- j) Virtual metering

Advantages of the system for availing benefits under REC scheme

- 1) All data is available at one place.
- 2) No manual data reading.
- 3) Ability to generate a 24 hour consumption report between any time interval for management purpose.
- 4) Generation cost data is available to enable analysis of per KWh cost.
- 5) The data can be exported to any format using SAP or other industry systems.
- 6) Helps in monitoring and reducing internal consumption.
- 7) Shift wise consumption report and production data analysis.
- 8) Continuous load monitoring at each feeder; understand the demand trend at any time or any season.
- 9) Calculation of Plant load factor (PLF).
- 10) Energy audit: to match generation with consumption.