

CASE STUDY : ABT EMS SOLUTION TO NLC TPS – II

END CUSTOMER : Neyveli Lignite Corporation (NLC) TPS-II, Tamil Nadu

PROJECT TITLE : ABT EMS (Availability Based Tariff Energy Management System)

“First Generating plant in India to undergo implementation of ABT”

ABSTRACT

In the wake of opportunities thrown up by liberalization and deregulations, the state machinery started mooting on introducing these effects to the power sector also. ABT was under discussion since 1994, but the final draft was released only in January 2000. ABT along with Electricity Act 2003 is perhaps the most significant and definitive step taken in the Indian power sector, so far to bring more efficiency and focus to this vital infrastructure. NLC is the first power plant in India to adopt ABT mechanism after the mandatory regulation was passed by Ministry of Power, Government of India.

EMS is a system of computer aided tools used by operators of utilities to monitor, control, and optimize the performance of the generation and/or transmission system. The monitoring and control functions are known as SCADA (Supervisory Control And Data Acquisition) and the optimization packages are often referred to as advanced applications.

ABT EMS solution implemented by Kalkitech in NLC TPS-II is a SCADA based EMS for monitoring and analyzing electrical operational parameters and energy in TPS-II of NLC. The system collects data from Special Energy Meters (SEMs), processes and provides functionalities for implementing ABT.

Solution has not only helped NLC TPS-II to earn incentives, but also more importantly helped management to implement ABT mechanism successfully.

IMPLEMENTATION DETAILS

Country	:	India
End Customer	:	Neyveli Lignite Corporation (NLC) TPS-II, Tamil Nadu
OEM Client	:	L&T, India
Solution Provider	:	Kalki Communication Technologies Ltd
Date of implementation	:	January 1, 2003
Date of Commissioning	:	March 15, 2003

CUSTOMER PROFILE

NLC is a central government owned mini-ratna Company whose core activity is lignite excavation and power generation using lignite excavated. Union government has 49% in this PSU and it is administered through Ministry of coal. NLC is having three lignite mines, Mine-I 10.5 MT/A, Mine-II 3 MT/A and Mine-IA 10.5 MT/A. Also, raw lignite is being sold to small scale industries to use it as fuel in their production activities. NLC has power generating capacity of 600 MW in its Thermal power station-I, 1470 MW in Thermal power station-II and 420 MW in Thermal power station-I expansion.

1470 MW capacity TPS-II has 7 units of 210 MW each. The power station was constructed in two stages in 630 MW and 840 MW. The first 210 MW unit was synchronized in 1986 and the last one in 1993. NLC TPS-II is the largest lignite fired thermal power station in Asia. It has the first and tallest tower type boiler in the country. TPS-II has the first software based burner management system and first hydrogen cooled generator of this size. Also, the station has the first boiler to be cleaned by hydrofluoric acid. The power generated by TPS-II is shared with the southern states after meeting the needs of mine-II.

Andhra Pradesh – 19%
Karnataka – 14%
Kerala – 10%
Tamil Nadu – 30%
Pondicherry – 5%
NLC (Aux & internal consumption) – 7%
Unallocated share – 15%

NLC TPS-II has been performing consistently since the implementation of the solution. Current PLF of the station is around 82.5%. The performance of the TPS-II in the last 10 years is the proof for it.

2002-03 – 10504 MUs
2003-04 – 10004 MUs
2004-05 – 9249 MUs
2005-06 – 9170 MUs
2006-07 – 8540 MUs
2007-08 – 10517 MUs
2008-09 – 9064 MUs
2009-10 – 10559 MUs
(Source: Annual Reports)

SOLUTION PROVIDER

Kalki Communication Technologies Ltd is an *ISO 9001:2008* certified Company based in Bangalore, India. Kalkitech has been active in the area of energy efficiency improvement from the past 10 years. Kalkitech is an empanelled consultant for R-APDRP and is currently providing services to the states of Rajasthan, Gujarat, Kerala, Uttarakhand and West Bengal. Kalkitech is a part of BIS metering and SCADA standards committee. Kalkitech has offerings for power plant efficiency calculations and have supplied the same for more than 30 Nos. of NTPC power plants and state utilities like Mahagenco, etc. Our offerings also include energy management and optimization solutions, which can be utilized by ESCOM's. Kalkitech has capability to reduce auxiliary equipment consumptions in power plants. Kalkitech's integrated ABT solution is an indigenously built state of the art solution.

RATIONALE OF THE PROJECT

According to 17th Electric Power Survey (EPS) the demand projections on All India Basis at the end of XII and XIII Plan periods would be in the order of 1392 terra watt hour and 1915 terra watt hour. As per EPS, 3 lakhs MW of installed capacity would be required by the end of XII plan and 4.1 lakhs MW at the end of XIII plan. As a result of this looming demand due to rapid urbanization, over population and unabated industrial growth it has become inevitable to run the existing power plants efficiently. Also, for higher revenue realization, it is indispensable for a power plant to adopt advanced monitoring and control tools.

In the first phase of ABT order, it was recognized that the Union government run power stations had to adopt the ABT mechanism within a stipulated time frame. Being centre run thermal power plant, it was obligatory for NLC to adopt the new tariff mechanism. The new mechanism not only made everyone conscious about penalties but also gave an opportunity to NLC-II to earn UI incentives to the maximum.

Hence, there was an abrupt need of ABT EMS solution for NLC-II thermal power station.

BUSINESS CASE

NLC TPS-II with intent to streamline its generation operations and adopt the ABT mechanism was looking for a complete ABT EMS solution. NLC’s business requirement was not only to comply with ABT regulations but also to look at the creation of possible additional revenue through ABT incentives. NLC wanted to integrate its generation system with greater flexibility and control by monitoring block wise generation. Challenge was to exploit the permissible block wise 4% additional generation revenue through UI without exceeding day wise allowed 1% additional generation.

KEY CHALLENGES

- Communication with legacy meters
- Complex power plant internal system
- Different tariff mechanism
- First ever solution in India

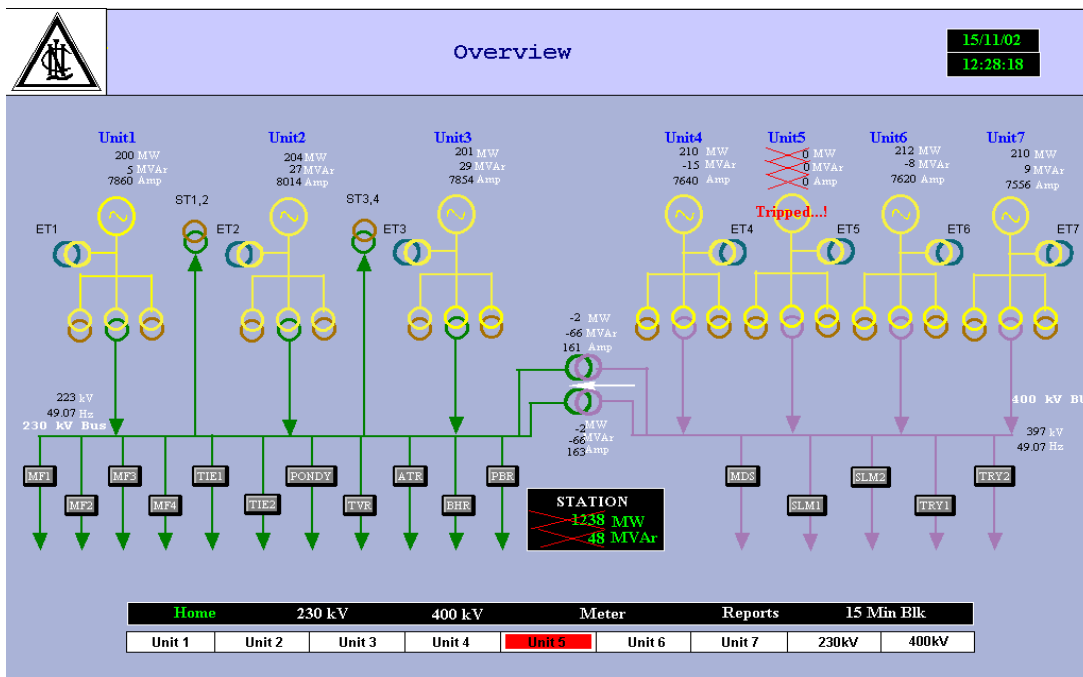


Figure 1: Single Line Diagram of NLC TPS II

SOLUTION PROVIDED

The system consists of two EMS servers in redundant configuration and 5 Nos. of client workstations in and Ethernet TCP/IP LAN. 86 Nos. of energy meters distributed in 10 different groups for RS 485 networks in 2-wire half duplex mode. Each group consists of 8 to 12 meters and is connected to a serial port of both the servers.

The meters communicate with the EMS server in Modbus RTU standard serial communication protocol. The system synchronizes its time with the GPS receiver and synchronizes the meters also.

ABT EMS application is created in National Instruments' Lookout SCADA/HMI software package. Lookout is powerful yet easy-to-use SCADA/HMI software for industrial automation and SCADA applications. Lookout runs under Windows and communicates with field I/O from Programmable Logic Controllers (PLCs), Remote Terminal Units (RTUs), Intelligent Electrical Devices (IEDs) and other devices. Typical Lookout projects include continuous process monitoring and supervisory control, discrete manufacturing, batch applications, and remote telemetry systems. Lookout is object-oriented and event-driven software; you can use Lookout with other programs in the Microsoft Windows multitasking environment.

The ABT EMS software is configured in client-server architecture. The EMS server controls the communication with the meters. The Server application has Modbus driver objects to poll and fetch data from energy meters. The instantaneous parameters, database-generated alarms and events are logged into the citadel database by the server process. The 15-minute block energy data and other data required for report generation are logged into historical data files separately in the server. The EMS Clients are connected to the server through the network. Client applications receive data from Server only.

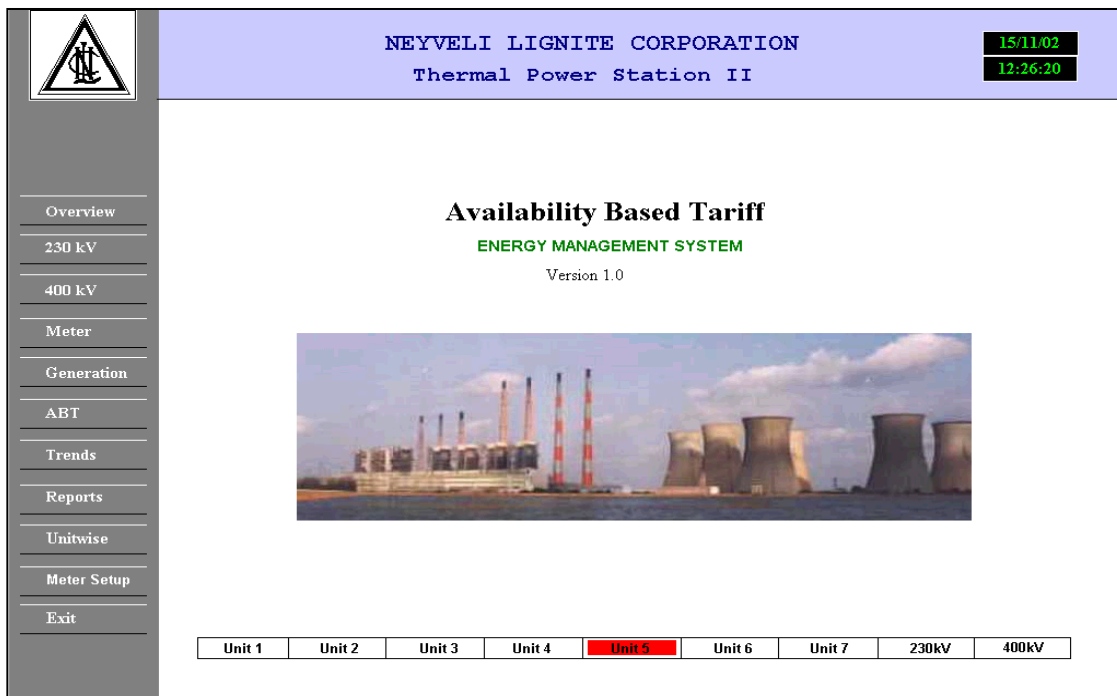


Figure 2: ABT EMS Home Page

The EMS servers are configured for redundancy. Server application will be running in Primary server & Standby server and client systems monitoring the primary server. When the primary fails, Standby loads the server application and starts to function as EMS server. All the clients now get data from standby server. When user starts the server application in the Primary server, Standby unloads the application.

KEY BENEFITS OF THE SOLUTION

- NLC got the breakeven for the project in **22 months and 8 days** (707 days)
- ROI for the project in 5 years has been around **588%** after deduction of tax. (Using NPV method). However, the solution is still active and used rigorously by NLC TPS-II due to which the recently calculated ROI clocked around **846%** after deduction of tax (Using NPV method)
- Out of allowed 1% of additional generation to declared capacity in a day, NLC TPS-II has been able to consistently generate on an average up to **0.8%** as compared to 0.3%-0.4% for majority of the power plants in India. Hence, NLC TPS-II is able to earn high Unscheduled Interchange (UI) incentives.
- Higher UI index for NLC TPS-II. UI index is defined as the product of Declared Capacity percentage to UI rate.
- Avoids mis-declaration penalty and full capacity charges realization
- Minimizes vulnerability of negative UI and increases positive UI within gaming constraints.
- Opportunities for corrective action on generation in next blocks to achieve PLF and positive UI
- Financial performance monitoring with respect to ABT
- Reduced cycle time, monotonous labor and manual error
- Reduction in IT infrastructure for future enhancements
- Rich sets of reports and charts
- Minimal user training required

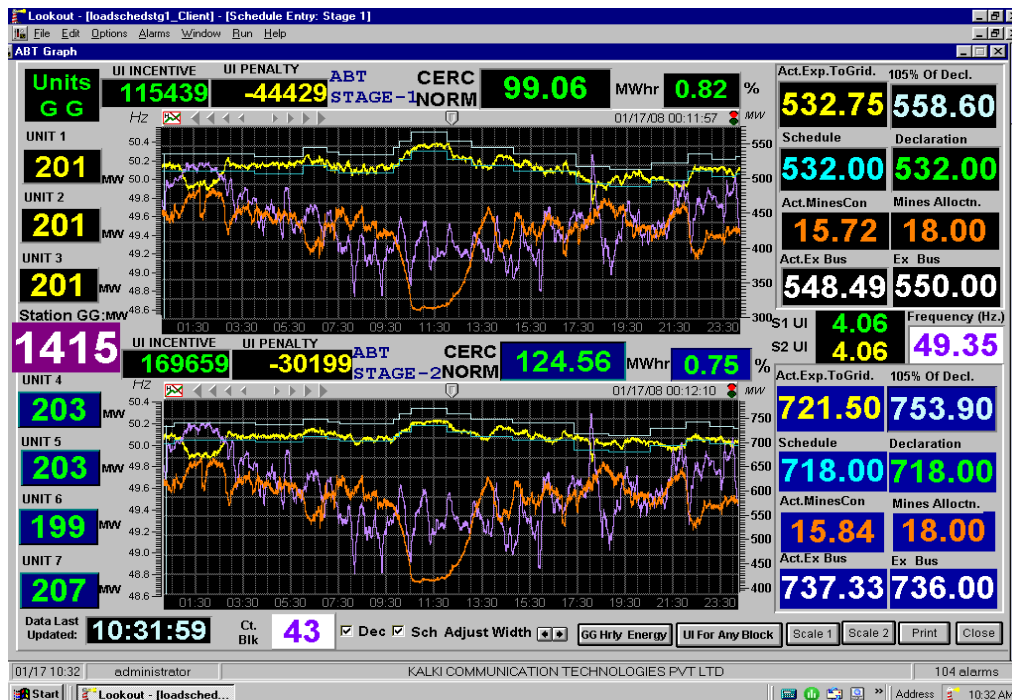


Figure 3 : Dashboard

NOTE

1. *The solution is first of its kind in India and was immediately adopted after the passing of the CERC order. Hence, there is no previous data of UI incentives or UI penalties before the implementation of the solution. UI charges is a function of grid frequency which is beyond solutions control and hence varying UI incentives.*
2. *Data has been collected from the website and hence Kalkitech does not guarantee the accuracy of the data used for calculations. Kalkitech accepts no responsibility for any consequences of use of findings, interpretations and conclusions.*

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