“Integrated Availability Based Tariff”
Maximization of Revenue for Generating Utilities in India by Integrating Availability Based Tariff with Plant Performance Calculations and Merit Order Dispatch

A White Paper

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Abstract:

The objective of Indian Electricity Act 2003 in the context of a Thermal Power Plant are Availability, Affordability & Discipline. The mechanism devised by CERC to ensure that the objectives are met is ABT mechanism. Till now, ABT is seen as a norm which one has to follow and not has a tool to maximize revenue. And that’s what Web based Integrated ABT Solution of KALKITECH do precisely…it enables the Power Plants to maximize the revenue. The problem of Realization of revenue while complying ABT regulations is experienced by Thermal Generating Stations in India. The integration of ABT with Plant Performance Calculations and Merit Order Dispatch will enable the Generating Station to maximize their revenue and excel in complying ABT norms. The web based Integrated ABT solution for a Thermal Generating Station comprising of Declaration of Capacity based on Plant Performance Calculations (based on PTC codes of ASME), Generation of Power based on Merit Order Dispatch of the Schedule received from Load Dispatch Centre and UI Analysis, will optimize the Overall Plant Operation and maximize the revenue. The solution ensures that there is Optimization of Generation of Power, increasing UI benefits in comparison with production cost and no Mis-Declaration by the Thermal Generating Station, and hence resulting in the maximization of revenue.

Introduction

Availability Based Tariff regulation in a nutshell with reference to Thermal Generating Stations:
Availability Based Tariff comprises of three components:
(a) Capacity charge, towards reimbursement of the fixed cost of the plant, linked to the plant’s declared capacity to supply MWs,
(b) Energy charge, to reimburse the fuel cost for scheduled generation, and
(c) Unscheduled Interchange - a payment for deviations from schedule, at a rate dependent on system conditions.
The last component would be negative (indicating a payment by the generator for the deviation) in case the power plant is delivering less power than scheduled and positive in case the power plant is delivering more power than scheduled when frequency is low.

In addition to this, penalty (in geometric progression) will be levied for Mis-Declaration; Incentive will be given for achieving PLF greater than the target at a rate notified by the regulatory commission.

Functionality of ABT & Integrated ABT

At present - Functionalities of Availability Based Tariff Solutions existing across Generating Stations in India:
- No integration with PPC and MOD
- Manual Preparation of Declared Capacity (DC) by the Shift Operator
- Sending of DC to Load Dispatch Centre (LDC)
- Receiving of Dispatch Schedule (DS) sent by LDC
• Generation of power as per DS
• Monitor frequency. When Frequency is low increase the generation within regulatory limits (normally without having a clear picture of overall benefit from the activity i.e., analysis of UI benefit in comparison to cost of generation)

Functionalities of the Integrated Availability Based Tariff Solution for Thermal Generating Stations in India of KalkiTech:

• Web based solution with modular architecture for scalability and flexibility
• Calculation of Declared Capacity based on the inputs from Plant Performance Calculation Module
• Automation of Communication between LDC through email for sending DC and receiving DS
• LDC prepares Dispatch Schedule for the Plant. Forwarding this DS as Input to Merit Order Dispatch module for optimization of generation cost by allocating load on the multiple units of the Plant based on Merit Order among the Units.
• Real Time Monitoring: Real Time monitoring of the essential ABT meter parameters. For all UI and billing purposes, the frequency notified by LDC is taken as the reference. Due to some reason like non synchronization of Time between LDC meter and Plant meter, there will be always difference in frequency. Hence for over generation with respect to UI, the datum should be LDC frequency and not Plant meter frequency. Another option is to enable GPS clock in the Plant meter and ensure that LDC measures frequency on a GPS clock enabled meter. It is recommended that Auxiliary Consumption is also measured in ABT meter, enabling 15 minute block wise Energy Accounting for Management Information and monitoring Auxiliary consumption with respect to the limit set by the regulatory Commission/ Management.

Types of Modules

(a) UI simulation module:
For the given system frequency, the solution should be able to simulate the UI implication and the generation cost and provide a comparison between the two for the Engineer to decide on over or under generation at a given point of time.

(b) Plant Performance Module:
Performance Monitoring enables the Plant personnel to track the status of each individual equipment and process parameters to maintain the performance levels as close to the design performance. The formulae / procedure used for Performance calculation is based on PTC codes of ASME.

(c) Merit Order Dispatch Module:
MOD Engine takes up the responsibility to enable generating stations to minimize their production cost. Given the station dispatch commitments from the load dispatch centre as well as from the Generation Control Room in the form of day-ahead / day of operation
schedule, and cost of generation curves for each unit, it performs computations based on standardized solutions/algorithms, thereby arriving at the optimal load distribution across different units within the plant such that overall fuel cost and hence the cost of generation is minimized, subject to the constraints specified.

(d) Energy Accounting Module:

The Energy Accounting Engine calculates all the charges viz Capacity charges, Energy Charges, UI charges, Mis-Declaration Penalty, Incentive for PLF, etc from the perspective of the plant (for eg. Actual Rate of Energy Charges incurred instead of the rate notified in the MYT/ Tariff Order. Note: LDC or RPC/SPC prepares bills based on MYT/ Tariff order). On receipt of Accounts from LDC or RPC/SPC, the module will compare the results and if any discrepancy found, the authentic reports generated will be useful during arbitration/representation before the commission/statutory body.

(e) Reporting Module:

A web based reporting engine/tool shall enable the user to generate custom made reports in addition to the pre-defined reports. The reports can be exported to pdf, xls and xml formats. Xml format historic reports will enable integration of other software (for example, Website launching or SAP/ERP integration) easily.
Abbreviations

ABT     – Availability Based Tariff
PPC    - Plant Performance Calculations
MOD   - Merit Order Dispatch
CERC – Central Electricity Regulatory Authority
UI      – Unscheduled Interchange
Mis    - Declaration
PLF   – Plant Load Factor
LDC   – Load Dispatch Centre
RPC   – Regional Power Committee
SPC   – State Power Committee
MYT   – Multi Year Tariff Order issued by regulatory commission
PTC codes of ASME – Performance Test Codes of ASME standards

References

✓ www.cercind.gov.in - Terms and Conditions of Tariff by CERC (ABT regulations)
  - KalkiTech White Paper on Merit Order Dispatch