

Strategic Monitoring and Remote Terminus (SMART) 24 x 7 for the National Thermal Power Corporation

Technical Requirements

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Project Manager
R. Shankar

SIGNATECH SYSTEMS, INC
PO Box 614, Matthews, NC 28106-0614 USA
704-430-7233 ▪ www.signatechsystems.com

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NTPC	DOE/USAID/EPRI	Global Utilities
C Roy D.K. Agrawal P Bharathiya A Mittal S Prasad S. Ghosh S. Bandopadhyaya T Joseph R Radhakrishnan G Rao A.Pashine Ramagundam Staff R Kamath N Bhatt R.P. Agarwal Dadri Staff	B Fapahunda Dr. Krishnan S Smouse A Padmanabhan D Hengle <u>Colleagues at EPRI</u> B Rasmussen J Stallings R Frank C Taft R James A. Hussey <u>Others</u> C.Carter, Luminant P. Kurchina, Consultant H. Hashemian, AMS O. Glockler, UN IAEA	<u>US Utilities</u> Southern Company TVA Luminant Entergy First Energy Progress Energy Ameren Exelon DTE <u>International Utilities</u> TransAlta, Canada Iberdrola, Spain EdF, France Tokyo Electric Power Itaipu, Brazil China L&P, HK Taiwan Electric, Taipei E.On, UK

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1 EXECUTIVE SUMMARY

SMART Objectives

The vision is to develop technical requirements for the National Thermal Power Corporation for future deployment of advanced monitoring capabilities covering all aspects of power plant systems: instrument monitoring, equipment health monitoring, and system health and performance monitoring. The fleetwide monitoring system: called Strategic Monitoring and Remote Terminus (SMART) 24 x 7 is expected to provide improved reliability and capacity for its growing fleet. These capabilities can be deployed at any level, either on individual components, plant-wide, or fleet-wide. The most aggressive implementations involve fleet-wide monitoring center that will exploit all of these capabilities for electric industry assets that are geographically disparate. Some common capabilities include:

- Early detection of critical equipment incipient problems to forewarn plant engineers
- Maximizing plant efficiencies for various operating conditions: fuel switching, varying load demand, and reduced cost
- Improving operational efficiencies
- Uniform and standardized procedures across the fleet for operations and maintenance problems detection and resolution
- Knowledge capture to improve understanding of little-known equipment failure mechanisms

Results and Findings

The author's experience in working with global utilities in implementation of fleetwide monitoring was utilized. Improvement in safety, improvements in operations and maintenance practices quickly resulted. The principal discussed the needs and objectives with several NTPC technical staff and developed a questionnaire for plant personnel. The principal visited two major NTPC facilities: the Ramagundam plant and the Dadri plant and reviewed needs for fleetwide monitoring. The plant staff apprised the principal of capabilities at the plant including recently installed data historian and trending capabilities. A 2-day workshop was conducted in New Delhi with senior staff and plant managers in attendance where the requirements were spelled out and information was exchanged on the needs across the enterprise. The principal met separately with a number of stakeholders: the Information technology Department, the technical and analysis staff as well as services organizations.

Challenges and Objectives

The objectives of this report are:

- Review current capabilities at NTPC plants to collect, analyze and manage plant data
- Identify needs for fleet-wide monitoring, typical applications and benefits
- Develop technical requirements for implementation of SMART including overall system architecture, staffing and alarm management, and applications
- Discuss typical capabilities and resources requirement for development of fleet-wide equipment monitoring capabilities
- Review fleetwide monitoring activities worldwide and lessons learned

Applications, Values, and Use

Fleet-wide monitoring and equipment condition assessment (ECA) are currently drawing significant interest from the power industry due to the potential benefits of early warning of equipment degradation, cost savings from centralization, and performance and reliability improvements. This report summarizes past efforts and describes technical requirements for implementation of the SMART 24 x 7 for NTPC.

Future

Moving beyond the point at which all of these monitoring capabilities are deployed from a centralized location is the next level which requires:

- Integration of disparate applications into a synergistic diagnostic/prognostic system
- Integration of advanced monitoring systems with Preventative Maintenance programs
- Improved probability of failure and remaining useful life estimations
- Informed Fleet based management for maintenance planning and dispatch

Keywords

SMART 24 x 7

Fleet-Wide Monitoring

Equipment Condition Assessment|

On-Line Monitoring

Thermal Performance Improvement

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2 INTRODUCTION

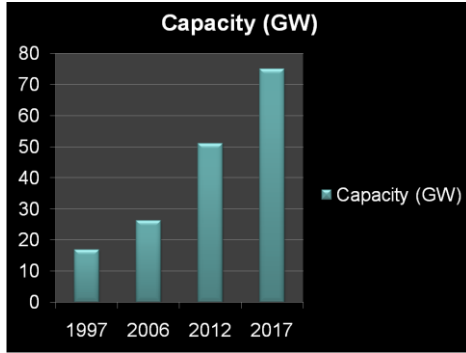
The National Thermal Power Corporation (NTPC)

NTPC, the largest power Company in India, was setup in 1975 to accelerate power development in the country. It is among the world's largest and most efficient power generation companies. In Forbes list of World's 2000 Largest Companies for the year 2007, NTPC occupies 411th place. NTPC has installed capacity of 29,394 MW. It has 15 coal based power stations (23,395 MW), 7 gas based power stations (3,955 MW) and 4 power stations in Joint Ventures (1,794 MW). The company has power generating facilities in all major regions of the country. It plans to be a 75,000 MW company by 2017. NTPC has gone beyond the thermal power generation. It has diversified into hydro power, coal mining, power equipment manufacturing, oil & gas exploration, power trading & distribution. NTPC is now in the entire power value chain and is poised to become an Integrated Power Major.

NTPC has seen a remarkable improvement in asset performance, reduced forced outages, and lower operation and maintenance (O&M) costs over the decade, and has established the vision to be a world-class integrated power major, powering India's growth with increasing global presence. . These advances have surely been due to the dedication of NTPC staff in absorbing best practices, and the infusion of new diagnostic technologies.

Senior NTPC management, with the support of NTPC technical staff, and the encouragement of USAID-India, have embraced a Strategic Monitoring & Assistance Remote Terminus (SMART 24x7) project that would provide asset monitoring capabilities of its disparate generating facilities, provide a virtual center of experts, and assure that the company stays in a leadership role in the electricity sector. Some of the drivers for a SMART (24x7) system are:

- Looming deregulation and global competition
- Need for optimization of plant processes
- Reduction in O&M costs
- Extension of time between inspections and overhauls; transition to a more proactive maintenance organization
- Increased output, reliability, and availability
- Managing with limited resources, such as experts in specific areas
- Rapid growth in capacity
- Stations spread throughout India
- Overall improvement in performance and expected reduction in greenhouse gas emissions



NTPC's share on 31 Mar 2008 in the total installed capacity of the country was 19.1% and it contributed 28.50% of the total power generation of the country during 2007-08. NTPC has set new benchmarks for the power industry both in the area of power plant construction and operations.

Green house gas emission reduction involves focus on efficiency enhancement of the existing power plant(s) through monitoring and tracking of critical performance parameters and timely corrective action(s). The critical success factors to actualize real reduction in green house gas emission revolve around ability to track efficiency trends/deterioration by handling huge volume of real time data emanated from various plants and immediate intervention and corrective actions to ensure sustained efficiency gains preferably on real time basis simultaneously for stations which are spread out geographically.

With the present advancement in IT, it is now possible to develop a model which will enable to achieve the objective with minimum resources. Further, the proposed model would also ensure that the efficiency gains are not only “real” but also sustained throughout the life of the plant and regardless of availability of experts at each plant. Essentially, the proposed model comprises of using IT tools for transfer of high volume data from stations located at different geographical locations to any location. The data so acquired can then be processed through advanced specialized software to identify efficiency levels/ deterioration on real time. There can be second layer of experts from OEMs, academic institutions, system suppliers, and specialist individuals for any specialized analysis and further advice based on real time data.

