

# Global Energy Management System Implementation: Case Study

India

## L&T MHPS Turbine Generators Pvt.Ltd (LMTG)

*1<sup>st</sup> Organization in Heavy Engineering Sector in India to Implement and get certified for ISO 50001.*



L&T-MHPS Turbine Generators-Aerial view

Unique Manufacturing Facility in World to manufacture

### Business Case for Energy Management

L&T-MHPS Turbine Generators is a joint venture between India's Engineering Conglomerate Larsen & Toubro, Japan's Mitsubishi Hitachi Power systems & Mitsubishi Electric Corporation to manufacture Super Critical & Ultra Super Critical Turbines & Generators in India. The Turbine & Generator Shops are part of one of the world's largest and most advanced hubs for manufacturing the complete range of equipment for supercritical power plants.

LMTG's mission "To emerge as a Market Leader in the field of Design, Manufacturing and Supply of Steam Turbines & Generators through Continual Improvement, Employee Involvement, **Energy Performance, Safety** and **respect for Environment**".

#### Case Study Snapshot

<b>Industry</b>	Heavy Engineering
<b>Product/Service</b>	Manufacturing of Supercritical Turbines & Generators
<b>Location</b>	Hazira, Surat, Gujarat
<b>Energy Management System</b>	ISO 50001
<b>Energy Performance Improvement Period</b>	4 Years
<b>Energy Performance Improvement (%) over improvement period</b>	<b>Electricity- 31.3 %</b> <b>NG- 48.4%</b>
<b>Total energy cost savings over improvement period</b>	US\$ 1.93 Million
<b>Cost to implement EnMS</b>	US\$ 0.84 Million
<b>Payback period (years) on EnMS implementation</b>	06 Months
<b>Total Energy Savings over improvement period</b>	29680 GJ
<b>Total CO<sub>2</sub>-e emission reduction over improvement period</b>	9706 T CO <sub>2</sub> -e (Metric tons)

LMTG Energy Management (performance) is an integral part of decision making process and change management. L&T-MHPS Turbine Generators journey towards Excellence in energy Management has started

right from inception and it is integral part of Facility layout which does not require any diesel operated vehicles for internal movement of the jobs. The Purpose of setting up LMTG is to introduce super critical & Ultra super critical technology based power plant equipment in India, efficiency is 6 % higher than conventional sub critical power plant equipment's. At LMTG we strive for excellence and in the journey we were certified for ISO-50001 Energy Management System and we are the First in heavy engineering sector in India.

*“Through implementation of ISO 50001 we understood basic Energy cycle from cradle to grave and we believe a unit saved is equal to four units generated.”*

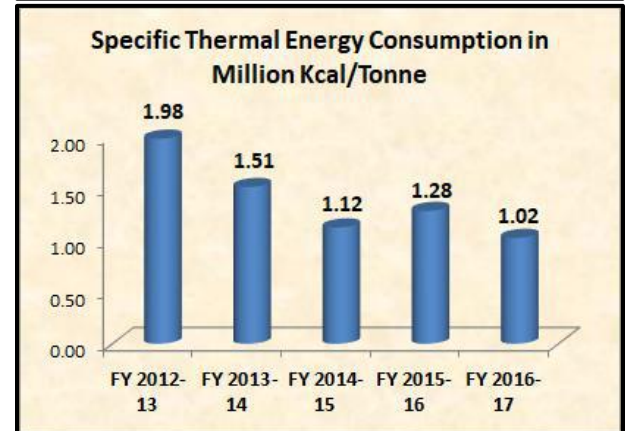
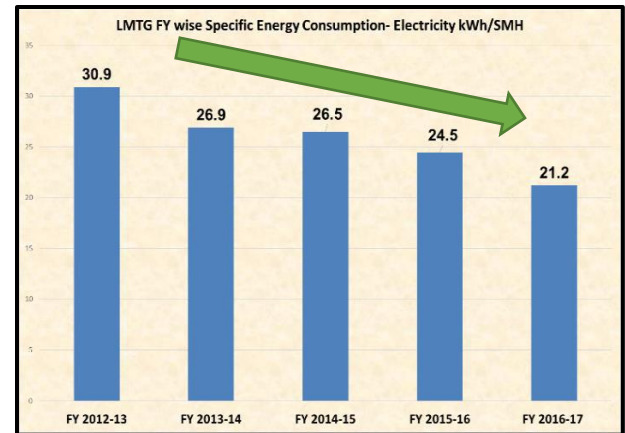
—Aloke Sarkar, Vice President & Head Operations

## Business Benefits Achieved

L&T MHPS Turbine Generators Pvt.Ltd, though we are not an Energy Intensive Industry we have focused on Implementing ISO 50001 – EnMS to be on the path of sustainable development & Green Manufacturing. We were certified with ISO 50001 on 18<sup>th</sup> September 2012 and following were the benefits achieved:

1. Implementation of EnMS has led us to shift focus from Energy Conservation Programme to Energy Performance including Energy efficiency, use and consumption in structured manner.
2. EnMS enabled us to establish systems and Procedures at organizational and process level for systematic management of Energy.
3. Systematic Measurement and Monitoring plan at all process levels and monthly review by process owners.
4. Improvement in Energy performance by all process.
5. Implementation of EnMS has reduced our manufacturing costs and thereby improving the bottom line.

6. Organizational Specific energy Consumption – Electricity (kWh/SMH) reduced by 31.3% and Thermal (Million K.cal/ Tonne) by 48.4% resulting in Total savings of 2,08,946 USD



7. Monthly Management reviews
8. Increased Awareness to Staff and Workmen due to periodic EnMS-Training Programme.
9. Through our initiatives we could reduce our Carbon Foot Print by 9706 T CO<sub>2</sub>-e.
10. **EnMS enabled us to get recognize our efforts at National & State Level competitions on Energy efficiency and awarded 4 times in a row.**

## EnMS Development and Implementation

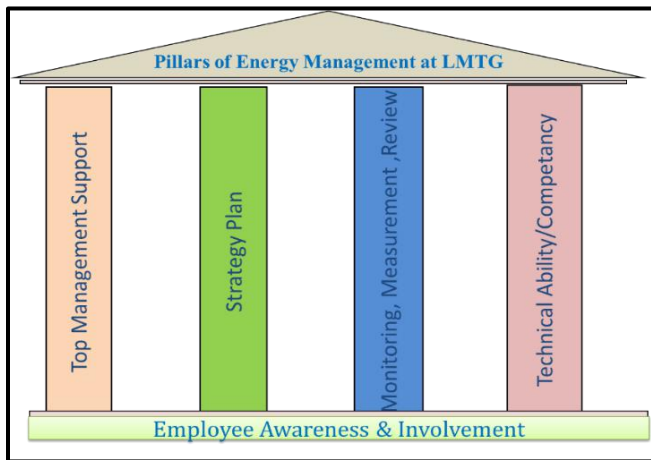
At LMTG we believe in TEAM (Together Every one achieves More) rather than individual excellence in Silos. To Develop and implement EnMS Top Management Support and commitment were vital.

LMTG has started their EnMS preparations at the end of FY 2011-12 and geared up in FY 2012-13 by setting organizational Objectives to get certification by Sep 2013 and improve Organizational energy performance.

Macro and Micro plan is chalked/derived out and two teams: 1. Apex committee (senior management chaired by CEO/VP)

2. Core team- cross functional team with participation from all the departments, were formed to focus & dedicatedly work on the mission.

LMTG EnMS is developed and implemented based on four pillars on the strong foundation of Employee Awareness & Involvement, as depicted in the figure:



Top Management has appointed Management representative to lead the core team and report the progress of EnMS implementation to Apex committee. Energy Policy, mission and vision statements were formed and deployed by Top management. Roles and responsibility matrix of individual team members were defined and document guidance sheet is also prepared to clarify the team members about quantum of the work.

**Energy Planning & review**

LMTG has detailed Energy Planning process procedure (DOP-16-15-03) which is revised time to time to incorporate the ISO guidelines released (example- ISO 50006, ISO 50047, ISO 50015 etc.). The purpose of the Energy Planning & review is to determine the organization’s energy performance & study of energy

profile based on data and other information. This leads to identification of significant use & Identification, Prioritization of energy performance. This information is to assist the personnel responsible for the implementation of the Energy Management System to gather the base-line energy information of LMTG.

- Identify current energy sources
- Evaluate past and present energy use and consumption
- Methodology for determination of significant energy usage is as per below matrix :

Proportion of Energy consumption (A)	Energy Saving Potential (B)	Potential for usage of renewable energy sources (C)	Cost of investment (D)	Legal / Other requirements (E)
1 – Low, <8% of Energy	1 – Low	1 – Not possible	1 – High	1 – No such requirements
2 – Medium, 8% to 15% of Energy	2 – Medium	2 – Not mandatory but if implemented, will be better	2 – Medium	2 – Not mandatory but in future applicable
3 – High, 15% to 100% of Total consumption	3 – High	3 – Yes. Its mandatory	3 – Low	3 – Yes. Its mandatory
Note: If Rating (A*B*C*D*E) is 6 and above then process is consider as Significant else Non - Significant				

Refer Format F-13-01-001-XX

- Energy Base Line- Quantitative reference providing a basis for comparison of energy performance- process of setting baseline was in-depth described in our Procedure

- Energy performance Indicator were set at Organization level and departmental/process level.
- Energy Objectives, Target and Energy Management Action Plans
- Normalization of Energy data to compare performance under equivalent conditions.
- Static factors needs to be identified process wise
- Future Estimation of Energy to be done at Organizational level and departmental/Process Levels

**Finance** is an important aspect for any system implementation, considering the Top management commitment through organizational objectives initial budget approval has been granted for development and system implementation. However at advanced stage finance for Energy Efficiency Projects were approved after detailed analysis considering technological, operational, business and financial options.

**Cost- Benefit – Analysis**

ISO -50001 EnMS Implementation has benefited LMTG in many Tangible and Intangible benefits as below:

- It’s a game changer, Energy performance has become integral part of production reviews & Improved Energy awareness down the line.
- Total Cost Savings Accrued S -US\$1.93 Million
- Cost of Investment for EnMS – US\$0.84 Million
- Payback Period – 6 Months

**Approach for Verification of Energy Performance:** LMTG Implemented methodology for verification of Energy performance based on ISO 50006 and ISO 50015. We follow a two stage approach:

**Project –Based Approach:**

This is applicable for all projects taken at organization level or departmental/Process Level to improve the Energy performance of the Significant Energy equipment.

At LMTG Projects are classified as below:

Description of Energy Efficiency/ Conservation Projects	SPP/ROR	Implementation Guidelines*
Projects with High Investment (> Rs 15 Lakhs)	More than 5 years	During Project stage
Project with medium investment( Rs 5-15 Lakhs)	Up to 3 years	With Approval
Projects with Low/ No investment( Rs 0-5 Lakhs)	Up to 1 year	Immediate Implementation

\*However projects concerning Energy performance & environment will be given first priority for evaluation and approval even though the payback period is not attractive.

Respective Core team member will collect the Energy data of the department/Process/equipment before and after implementing the Project to assess the Improvements and benefits as per Energy management Programme.

**Organization – Based Approach:** This method calculates the organization wide total Energy consumption and all departments Output for particular period. It is monitored periodically to check the overall Energy performance of the Organization.

In above both the approach the below steps are followed as per system Guidelines:

- Determine the Project Boundaries/battery limits
- Determine measurement & verification plan
- Normalize the data considering the variables and static factors



- Analyze the energy data to determine the performance improvement
- Report the Energy performance

**Approach to validate the results of Energy Performance:** Validation of the Energy performance results is done in two stages:

**Organization level,** Management representative appoints a Cross functional team headed by Certified Energy Auditor to validate the Energy performance after project completion.

At departmental Level – the Projects are validated through the Internal Audits planned twice in a year.

**Operational Control Procedures and sustain Energy performance Improvements:** Operational Control procedures/Standard operating procedures with respect to Energy were developed during EnMS implementation stage for all departments and significant energy usage equipment’s. These Procedures include the Energy efficient operation, Do’s and Don’ts for the particular equipment/process.

Employee awareness and training is a structured process and every year all Top management, Core team members are trained by external faculty and Core team members will conduct internal training in their respective departments for staff and workmen. To sustain the energy performance improvements: the best practices

- vendor evaluation based on energy performance while procuring the products and services and
- Vendor performance evaluation based on EnMS post ordering were integrated in to the organizational procurement processes.
- Sharing of best practices across L&T group companies through structured meeting every month.

*“Sustainability is all about preserving our natural Environment which is the source of our survival and well-being.”*

—S.N Roy, CEO & MD L&T Power,  
Whole Time Director L&T.

**Development of Expertise:**

LMTG believes people are our real assets and Structured Training of people/employees is a vital part to implement the EnMS, one day training Programme for Apex team and two day training Programme for Core team is arranged and conducted by external consultant. Later Core team has given responsibility to give awareness to their respective departments and Implement EnMS in departments under guidance of Apex committee and Consultant.



Apex team Training

LMTG also encourages and Sponsors employees to participate and get certified as Energy Manager/Energy Auditor organized by Bureau of Energy Efficiency (Government of India), EnMS Lead Auditor course and to participate in various national and International Events, seminars on Energy efficiency. The above steps has helped our organization to acquire competency and skills required for implementing the EnMS at all organizational levels. Refresher Training on ISO 50001 EnMS is arranged every year for Core team members to understand the latest developments and share their case studies/ experiences

**Tools & Resources:**

LMTG has already implemented ISO9001, 14001 & OHSAS 18001 before ISO 50001 and staff were aware about the methodology used , training & review mechanism were in place. Unlike other Management systems ISO5001- EnMS was analytical based and

training of cross functional teams and bottom line workmen was a challenge and we have converted training course material in to local language for better understanding it payed off. Training was also arranged through our JV partners to inculcate Japanese techniques like Pointing and calling, GOF (Grasp of fact) and makigami analysis for detailed.

## Lessons Learned

Key challenges faced during EnMS development and implementation were:

We should have a reliable metering system in place before EnMS implementation.

Training cross functional teams on various analytical tools used during EnMS implementation like Linear Regression, Multiple regression, CUSUM analysis, financial pay back calculations, estimation of Energy savings etc. Training team on analyzing the energy performance deviations w.r.t baseline.

## Keys to Success

- Leadership-Top management commitment, Clear Goals & Directions, Energy Focus
- System Approach to Management
- Involvement of People- Cross functional Involvement at all levels.
- Dedicated, trained & committed team to drive the project.
- Integrate with Overall business plans.

- Training awareness and Education.
- Start with projects with little or no investment
- Sharing Best practices
- Factual approach to decision making
- Mutual Beneficial Supplier relationship
- Establish & Usage of Performance metrics

## Accolades received

We have received many accolades and some of the key are mentioned below:

**FY 2014-15-** Energy Efficient Unit Award by CII.

**FY 2015-16** Energy Efficient Unit Award by CII.

**FY 2015-16** Outstanding Contribution in Energy conservation by SGCCI

**FY 2016-17-** Certificate of Merit from Ministry of Power for National Energy Conservation Award -2016



**FY2015-16 Energy Efficient Unit Award By CII**

Through the Energy Management Working Group (EMWG), government officials worldwide share best practices and leverage their collective knowledge and experience to create high-impact national programs that accelerate the use of energy management systems in industry and commercial buildings. The EMWG was launched in 2010 by the Clean Energy Ministerial (CEM) and International Partnership for Energy Efficiency Cooperation (IPEEC).

For more information, please visit [www.cleanenergyministerial.org/energymanagement](http://www.cleanenergyministerial.org/energymanagement).

