Project Summary

01	**Title:**	Assessment of implementations of various measures for improvements in achievable Performance Parameters at Maharashtra State Power Generating Company Ltd (MSPGCL)Thermal Power Stations.
02	**Work Order No.**	MERC/Appeal-199/case 140-2011/2011-2012/02108
03	**Sponsoring agency:**	Maharashtra Electricity Regulatory Commission 13th Floor, Centre No. 1, World Trade Centre, Cuffe Parade, Colaba, Mumbai-400 005
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10	**Energy audit team :** **(At site)**	M. Siddhartha Bhatt, Additional Director Rajashekar P. Mandi, Engineering Officer N. Rajkumar, Engineering Officer S. Jothibasu, Engineering Officer
11	**Objectives:**	Assessment of implementations of various measures for improvements in achievable Performance Parameters at Maharashtra State Power Generating Company Ltd (MSPGCL)Thermal Power Stations
12	**Scope of work:**	1: Assessment of the overall action plans for implementation of measures occurs for Immediate, Medium and Long term measurements. 2: Reasons for delay, root cause of delay in implementation Assessment of the action plans for implementation of measures and benefits accrued. 3: Avoidable delays in implementation Assessment of the action plans for implementation of measures and resulting in degradation in performance. 4: Revision of performance trajectories. 5: Preparation and submission of report
13	**Report No.:**	ERED/EA/112/2012
14	**Power station:**	MSPGCL – all stations
15	**Date of issue of report:**	April 2012
16	**Signature of Energy Audit Team Leader:**	
17	**Signature of the Division Head:**	

EXECUTIVE SUMMARY

The stations were not geared up for taking up rapid improvements in all units simultaneously because of the legacy. The process of taking up steps towards improvements though slow has began taking shape. The MSPGCL has taken time to re-organize itself to gear up such challenges. The improvements are being taken up one by one and hence the benefits for one unit are getting divided by the overall station performance thereby not indicating large benefits. However, the MSPGCL has made a strong program for implementation of the measures in all stations. It is being done in small steps but there is steady progress. The benefits of these efforts will be reaped in the coming years especially when the units are getting older.

Of the total 2939 schemes recommended for all stations of MSPGCL, 1792 schemes were immediate measure schemes (to be implemented within a year). These 1792 immediate measure schemes were segregated by MSPGCL as Non-Financial (934 schemes) and O&M/ Capex (858 schemes) for taking up the implementation.

Till date 13 Nos of DPR amounting to Rs. 817.05 Cr. DPR's are in-principally approved by MERC, 5 Nos of DPR amounting Rs. 67 Cr are awaiting In-principle approval and 06 Nos of DPRs amounting to Rs 240 Cr are being submitted to MERC very soon. Remaining DPRs are at various stages of approval process.

The time constants for procurement processes have shown some improvement, many of the HRD measures have been implemented, SAP implementation, a great deal of training has been imparted, etc.. On the engineering side, steam path audits and restoration during the capital overhaul itself, change over to LAN compatible primary instrumentation, software for automation of fuel accounting processes, Variable frequency drives, etc., have been implemented and demonstrated in all stations.
Since the exercise began, we have noticed changes in:

- ✓ Sensitivity and greater awareness to KPI especially heat rate
- ✓ Willingness to implement energy efficiency measures and take up challenges in problem solving
- ✓ Bring in energy efficiency practices such as steam path audits

The prime reasons for delay are slow authorization and procurement processes at the station level and the need for a strong central HO level monitoring. Strengthening of the liasoning efforts with regulator regarding approvals for schemes and proactively answering the queries could have reduced the cycle time.

The detailed trajectories of SHR and AP are given in the individual reports. It is concluded that the progress though slow and in small steps is positive and the organization has shown signs of reorientation for the better.

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Abbreviations/Nomenclature

ABT	Availability based tariff
AC	Alternating current
AFB	As fired basis
AHP	Ash handling plant
AOH	Annual overhaul
AP	Auxiliary power (MW or MWh for a time period)
APH	Air pre-heater
ARW	Aerial ropeway
AVF	Availability factor (%)
BDV	Breakdown voltage
BFP	Boiler feed pump
BTL	Boiler tube leakage
C	Capacity of the unit or station (design or operating, MW)
C & I	Control and instrumentation
CA	Chemical Analysis
CC	Carrying capacity
CEP	Condensate extraction pump
CHP	Coal handling plant
COH	Capital overhaul
CT	Current transformers
CW	Cooling water
DA	Deposit analysis
DC	Direct current
DCS	Distributed control system
DIM	Dimensional measurement
DT	Destructive test
ECO	Economizer
ERP	Enterprise resource package
ESP	Electrostatic precipitator
ESV	Emergency stop valve
FDF	Forced draft fan
FO	Furnace oil
F/O	Forced outage
GCR	Generation control room
GCV	Gross calorific value (kcal/kg or MJ/kg)
H	Time period block (hours)
HCV	Higher calorific or heating value (kcal/kg or MJ/kg)=GCV
HGI	Hardgrove Index of coal
HP	High pressure
HPT	High pressure turbine
HT	High tension (6.6 kV and above)
HV	High voltage
HVOF	High velocity oxyfuel flame
IBR	Indian Boiler Regulation
ID	Inside diameter
IDF	Induced draft fan

IED	Intelligent electronic device
IP	Intermediate pressure
IPT	Intermediate pressure turbine
KPI	Key performance indicators
LDO	Light diesel oil
LE	Life extension
LP	Low pressure
LPT	Low pressure turbine
LT	Low tension (415 V)
Max.	Maximum
MCCB	Moulded case circuit breaker
MCR	Maximum continuous rating of the unit
Min.	Minimum
MIS	Management information system
MOD	Merit order dispatch
MS	Main steam
NDT	Non-destructive test
NF	Natural frequency
NRV	Non return valve
O & M	Operation and maintenance
OD	Outer diameter
OEM	Original equipment manufacturer
p	Pressure (kPa or MPa)
P	Power output (MW)
PADO	Performance analysis, diagnostics and optimization
PAF	Primary air fan
PC	Personal computer
PLF	Plant load factor (%)
PT	Potential transformers
R & M	Renovation and modernization
RH	Reheat
RLA	Remaining life assessment
RR	Railway receipt
SAIDI	System average interruption duration index
SAIFI	System average interruption frequency index
SEC	Specific energy consumption (kWh/t)
SFC	Specific coal consumption (kg/kWh = t/MWh)
SH	Superheater
SHR	Station heat rate ((kcal/kWh)
SOC	Secondary specific fuel oil consumption (ml/kWh)
SPM	Suspended particulate matter
SR	Steaming rate (t of steam /t of coal)
SSC	Specific steam consumption (kcal/kWh=t/MWh)
T	Temperature (^{0}C)
TDBFP	Turbine driven boiler feed pump
UHR	Unit heat rate (kcal/kWh)
v	Velocity (m/s)
VI	Visual inspection

WTP	Water treatment plant
Greek letters	
α	Excess air factor (dimensionless: 1.0-3.0)
δ	Leakage rate (dimensionless: 0 to 1.0), deviation in heat rate
Δ	Difference
η	Efficiency (dimensionless or %)
Subscripts	
a	Ambient
av	Average
A	Auxiliary
B	Boiler
BA	Bottom ash
e	Electric
f	Flame
G	Generator
in	Input
m	Mechanical
max	Maximum
min	Minimum
O	Gross overall
ref	Reference
S	Steam
T	Turbine
Units of power inputs/outputs	
MW	Electrical power
MW_m	Mechanical shaft power output rate
MW_t	Rate of energy change in water or steam (heat input/output rate)