

GMR ENERGY LIMITED
220MW BARGE MOUNTED POWER PLANT
MANGALORE

(i) Unit Profile

GMR group, an Rs 3,600 Crore business house, is one of the fastest growing private sector organizations in the country with interests in infrastructure and manufacturing. The group has completed 26 years of corporate excellence and contribution to national economy. The Chairman of GMR Group Mr. Grandhi Mallikarjun Rao was awarded the “*ET Entrepreneur of the year*”. Starting from a single jute mill, GMR group has grown literally into a 'Infra-major' of Indian industry today. We believe that this burgeoning growth is the direct result of the core values that we strictly adhere to in every aspect of our work: professionalism, integrity and total commitment to world-class quality. We have recorded several firsts for India's private sector including the world's largest 2-stroke power plant of 200MW capacity under one roof and the world's largest barge mounted 220MW combined cycle power plant at Mangalore. The Group is also developing three more power projects which are currently under development; GMR Badrinath Hydro Power Generation Pvt. Ltd. in Alaknanda, Uttarakhand, Kamalanga Power Project in Orissa and the Talong Power Project in Arunachal Pradesh. We have already set up a 388 MW combined cycle gas based power plant at Vemagiri in Andhra Pradesh. GMR Group is developing a world-class Greenfield international airport in Shamshabad, Hyderabad and modernizing and restructuring the Indira Gandhi International Airport in New Delhi. GMR recently entered in the International arena by bagging the Sabiha Gokcen Airport Istanbul, Turkey.

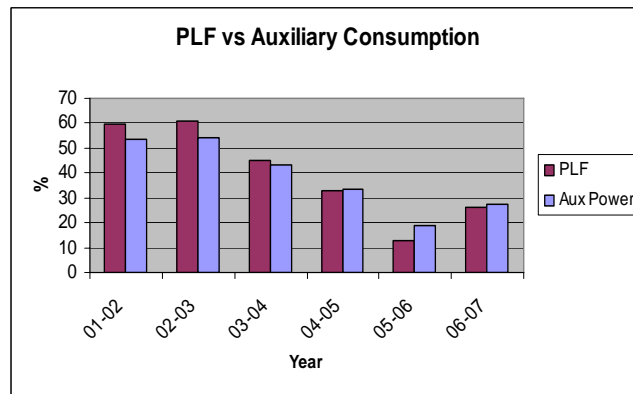
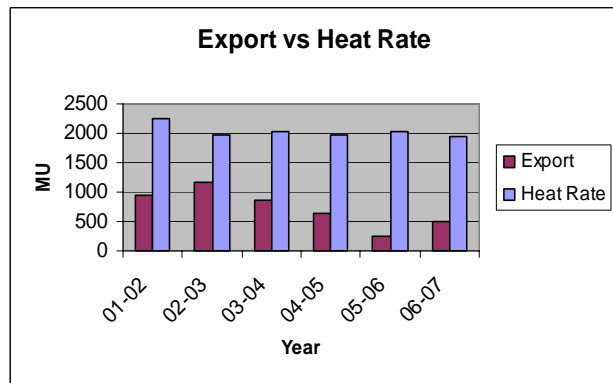
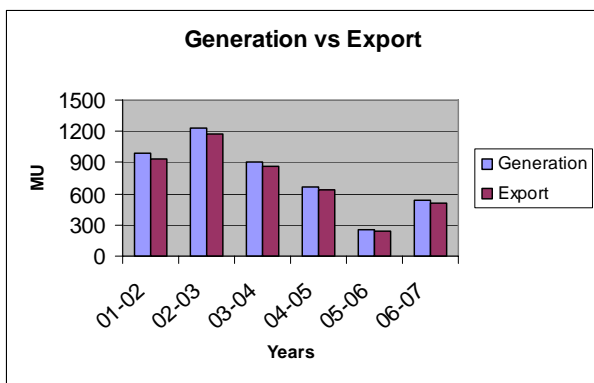
The Barge mounted combined cycle power plant at Mangalore has a net power export capability of 220MW and supplied power to Karnataka grid. The plant comprises of 4 X 46.48MW LM6000 PC GE make gas turbines using naphtha as fuel and 1 X 53.58MW ABB make steam turbine.



Plant is certified for OHSAS 18001: 1999, ISO 14001: 2004 and ISO 9001: 2000 by DNV. It is the world largest power plant on barge and first of its kind in India. The major milestones achieved are:

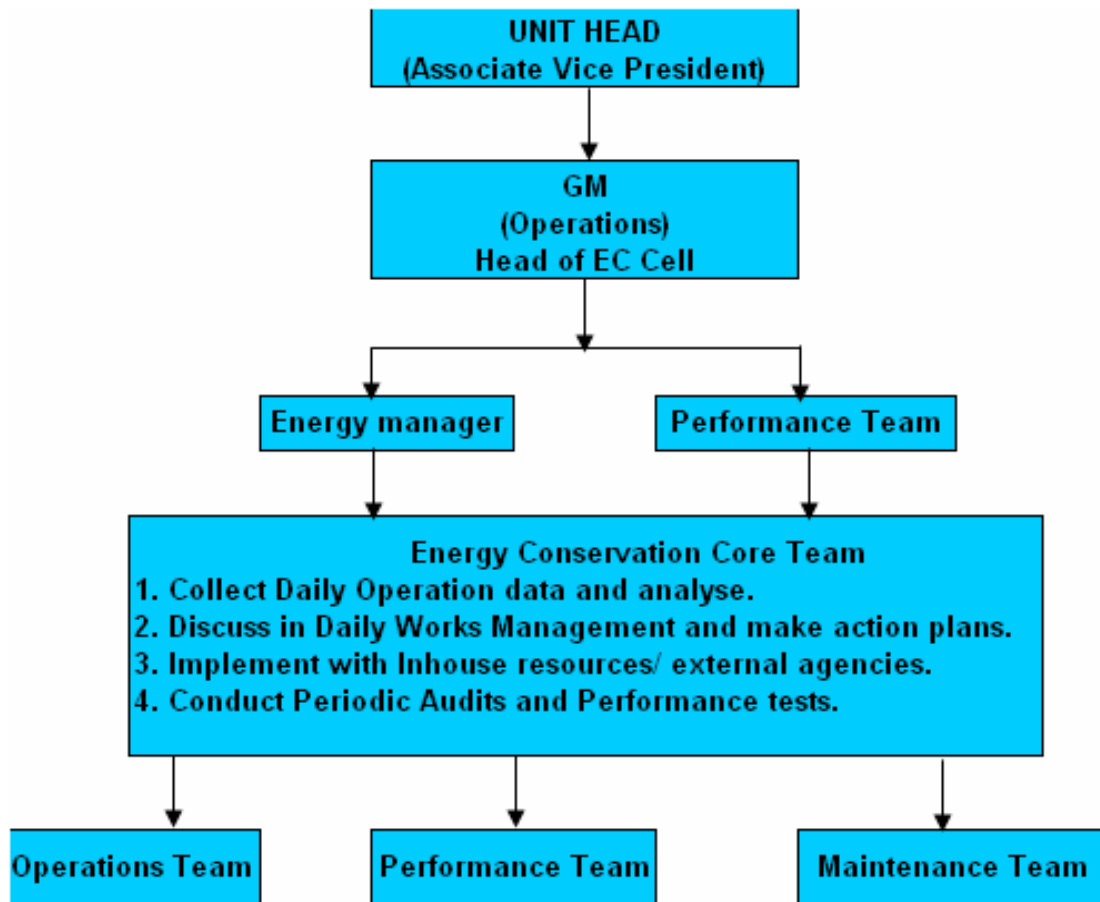
- Barge Reached at Mooring Basin 12/02/01
- First Gas turbine synchronized 03/05/01
- Simple cycle commercial operations 08/06/01
- Steam turbine synchronized 17/11/01
- Combined cycle commercial operation 21/11/01

(ii) Energy Consumption



Specific energy consumption in Kcal/ KWh		
Year	Kcal / KWh (LHV)	KWh / Tonne (of fuel)
2004 - 2005	1840.0	6.02
2005 - 2006	1884.7	5.96
2006 - 2007	1816.3	6.12

(iii) Energy Conservation Drive



As per the BEE guidelines, two staff members were nominated by the company for Energy Auditor and Energy Manager Examination. They have appeared for the examination and cleared the written papers:

1. Neelesh Nema – EA 2074
2. Ramesh Bhagat – EM 2229



**GMR Energy Limited
Mangalore**

ENERGY POLICY

We, GMR Energy Limited, a 220MW Barge Mounted Power Plant, are committed to optimally utilize energy, so as to make it environmentally sustainable for further generations.

We plan to achieve this by:

- Managing efficiently the utilization of energy resources (like Naphtha, HSD) and the operational practices.
- Adopting energy efficient technologies/equipment for all future acquisitions.
- Making energy conservation a mass movement with the involvement of all employees.
- Going beyond standards, wherever economically viable.
- Enrich our experience in energy conservation through exchange of ideas with other organizations.
- Closely monitoring and controlling the energy consumption utilizing effective energy management systems.

Date: 28-07-2004

G.MALLIKARJUNA RAO

MANAGING DIRECTOR

Energy Conservation Commitment

Our group adopts the following methodology:

Corporate Office Role

Top Management –

- o Sets Energy Policy
- o Approves objectives
- o Sanction resources
- o Review progress
- o Provide course correction

Site Management Role

Top Management –

- o Sets and Review objectives
- o Approve reports for financial resources
- o Review periodically progress achieved
- o Provide course corrections

Middle Management –

- o Identify possible areas of improvement
- o Collect improvement data
- o Request for resources
- o Manage energy improvement planning
- o Audit / Review / Report

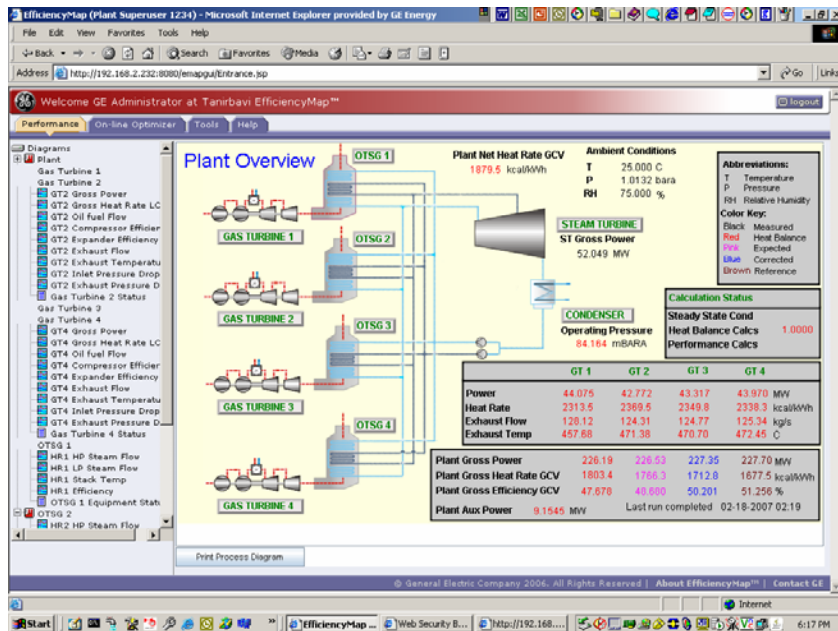
Line Management –

- o Collect data on consumption
- o Suggest improvements
- o Implement / manage plans and projects
- o Submit periodic reports
- o Report shortcomings, if any

(iv) Energy Conservation Achievements 2006-07:

1. Online Plant Performance monitoring in DCS and Efficiency mapping module for Gas Turbine. (*Trend setter technology*)

“Off- line Optimizer” and “On-line Optimizer” helps us in determining which GT to be run at varying dispatch conditions. **E-Map software installation in GEL is first in India.** It indicates “best combination” of equipment and optimum set point of operation to achieve an optimized heat rate.



2. Plant Cycle Time reduction and its heat rate optimization by Cycle Time- Charts supported by Software.

This helped in optimizing the Plant start up and SD effectively and soft records for in-depth analysis at each cycle interval with specific energy consumption, units etc are available for.

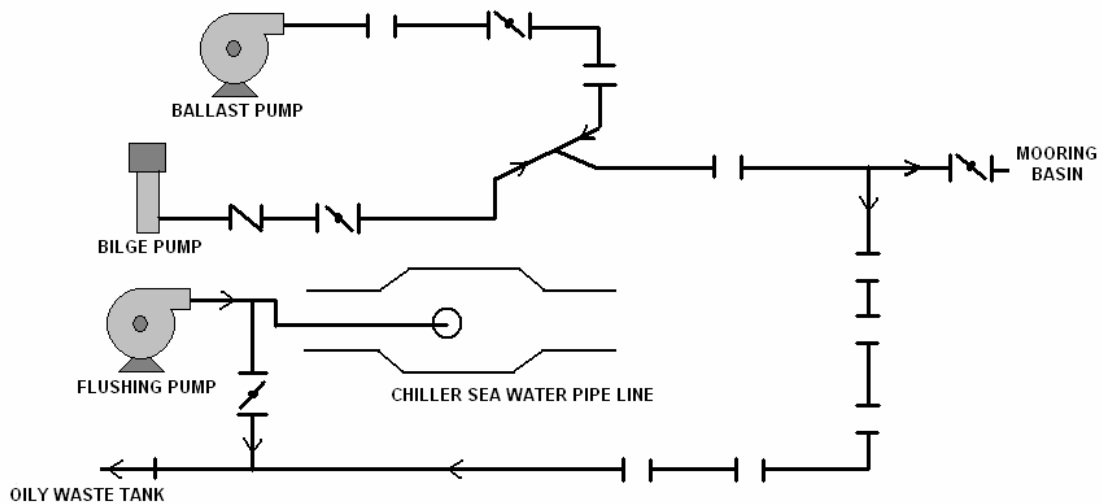
Investment 0.5 lac
Savings 686 lacs

StartUp Time Chart Report was Started on Date 22-May-2007 at Time 16:39:51 Hrs

Event ID	Activity	Tagname	Units	Value/Time
1	Contingency Pump A	XI-CCP-A	Hrs	16:39:58
2	First Cooling Water pump Startup	XI-9000	Hrs	16:45:48
3	Type of Start(HOT/WARM/COLD)			WARM
4	STG Flange center temp before startup	MAN_TT3F05	DegC	277.00
5	MS temp TT4018 reqd for ESV opening as per SLD	MAN_TT4018	DegC	314.00
6	Main steam header temp before start up at First GT Start	TI-4018	DegC	157.65
7	HSD integrator Reading before start up at First GT Start	FODI-6003	Tons	1,338.69
8	Naphtha integrator Reading before start up at First GT Start	FODI-6001	Tons	208,690.20
9	GTG # 1 energy meter reading before startup at first GT start	JOI-1091P-1	MWH	26,239.20
10	GTG # 2 energy meter reading before startup at first GT start	JOI-1091P-2	MWH	151,552.40
11	GTG # 3 energy meter reading before startup at first GT start	JOI-1091P-3	MWH	35,158.23
12	GTG # 4 energy meter reading before startup at first GT start	JOI-1091P-4	MWH	24,490.98
13	STG energy meter reading before startup at first GT start	JOI-3941	MWH	26,745.76
14	UAT #1 energy meter reading before startup at first GT start	JO-8611	MWH	11,255.59
15	UAT #2 energy meter reading before startup at first GT start	JO-8624	MWH	8,880.00
16	First GT Start	HS-1000-3	Hrs	16:46:55
17	First OTSG Inlet temp	TI-2014-3	Deg C	33.35
18	First OTSG outlet temp	TI-2017-3	Deg C	35.06
19	CPU B Taken on Line	XI-4686B	Hrs	16:49:58

3. Connecting Bilge/ Ballast Pump Discharge to Chiller Debris Filter Line

Chiller debris filter flushing is done by town water through flushing pump discharge. During monsoon season lots of debris is coming and choking the screen and flushing becomes ineffective. This modification helped in effective flushing of debris filter because Bilge/Ballast pump is taking clear sea water.



Energy Savings in terms of Electricity and fuel:

Description	Electricity Savings (in Lakhs Kwh)	Savings (in Rs. Lakhs)	Investment (Rs. in Lakhs)
Chiller Condenser periodic mechanical and chemical cleaning	18.4	31.4	1.0
Condenser bullet and high pressure cleaning	22.9	39.3	1.2
Demand controller on air comp	4.1	5.2	5.1
Zero trips of plant		204.0	4.7
STG output tuned better than designed value	11.5	66.8	20.5
Bilge System conversion to sea water		0.3	1.0
Onshore comp Interconnection	0.9	4.0	1.7
Plant Performance System			
E-Map Performance Management System	5.1	900.0	1.4
Online HMBD			
Preservation techniques during shut down time	45.9	78.6	0.2

Water Conservation Management Program		3.0	0.4
Rain Water Harvesting		0.2	0.3
Total	108.6	1332.5	37.2

Description	Fuel Savings (in MT)	Savings (In Rs. Lakhs)	Investment (Rs. in Lakhs)
Reduction in Start up Time	2505	490	0
Stabilization time for Cooling water flow reduction	1331.1	143.5	0
Fuel Nozzles purge system	1234.8	359.9	5
Reduction in Start up Time	3363.8	981.2	1.5
Time Charts	1856	686	0.5
Reduction in Start up Time			
HP LP Interconnection			
Hogging Ejector installation			
Rota meter for STG			
Online Water Balance			
Total	10290.7	2660.6	2.5

Others Achievements

- “Suraksha Puraskar-2005” Award for OHS performance 2002 -2004 by National Safety Council of India.
- Received 5S Excellence Award – 2006 (3rd Prize) from CII.
- Received Best Safety Management & Performance - 2006 certificate from NSCI – Karnataka Chapter.
- All the three Quality systems are integrated as ESHQ management system and complete documentation is in soft form.
- Legal register developed for the ESHQ management system can be bench marked as quoted by certifying agency (DNV).
- Received 5S Excellence Award AOTS – CUMI, 5S annual award for excelling implementing 5S practices, 2006-07.
- Received 1st prize (jointly) AOTS – CUMI, 5S annual award for implementing 5S practices, 2005-06.

(v) Energy Conservation Plan & Targets

Main Targets planned for 2007-2008 is as follows:

- Installation of VFD drives on all important drives like CEP, Naphtha transfer and booster pump, DM transfer pump and DeNOx booster pump.

- Optimise auxiliary consumption based on despatch pattern
- Increase efficiency of prime movers like BFP.
- Reduce Plant start up time by 10 minutes

(vi) **Environment and Safety**

Plant is certified for OHSAS 18001: 1999, ISO 14001: 2004 and ISO 9001: 2000 by DNV. Major Environment improvement made during 2004-2007.

Environment

DISPOSAL OF MARINE DEBRIS:

We are using about 18000 M3 per hour of seawater for cooling the Steam Turbine and Chiller condensers. The water carries lot of organic debris which are trapped in our Travelling water screens before the pump suction. The debris, when disposed as a land fill, created bad smell and attracted lot of flies causing nuisance to the work force. A compost pit has been made to convert the marine debris to organic manure which is used in the development of green belt

WASTE PAPER RECYCLING

The waste paper generated in our plant was disposed by incineration. With the aim to minimize pollution and conserve natural resource, the incineration was stopped. An environment management program was developed for recycling of the waste paper. The waste paper is shredded and the shredded waste is disposed to paper vendors for recycling

DEVELOPMENT OF RENEWABLE ENERGY SOURCE (Jetropa)

A management program is made to study the possibilities of cultivation and yield of Jetropa in GMR plants. Around 2000 square feet of land from the green belt is taken up for Jetropa plantation with out disturbing the existing plant species. This pilot project will give valuable information about the nurturing of Jetropa plant and the ways in which the yield of seeds can be maximized. Once the outcome is positive it can be extended to other GMR Plants in Chennai and Vemagiri in Andhra Pradesh. The second phase of the Jetropa plantation will be based on the outputs from the pilot project and will be developed in a commercially viable manner.

Safety & Health

We achieved **zero** accident record for the last three years and we plan to maintain the zero accident record for the entire PPA period of Seven years. We are certified for OSHAS 18001.