

(i) **Unit Profile**

**WESTERN RAILWAY, MUMBAI**



Western Railway in its present form came into existence on 5th November, 1951 by the merger of its forerunner, the erstwhile Bombay, Baroda and Central India Railway (BB&CI), with other State Railways viz, Saurashtra, Rajputana and Jaipur. The BB&CI Railway was itself inaugurated in 1855, starting with the construction of a 29 mile broad gauge track from Ankleshwar to Utran in Gujarat state on the West Coast. In 1864, the railway was extended up to Mumbai.



Subsequently, the project was further extended beyond Baroda in a north easterly direction towards Godhra, Ratlam, Nagda and thereafter northwards towards Mathura to eventually link with the Great India Peninsula Railway, now Central Railway, which had already started operating in Mumbai in 1853. In 1883, a Metre Gauge Railway system, initially linking Delhi with Agra, Jaipur and Ajmer, was established.

The Government of India took over the management of the BB&CI railway from 1.1.1942. In 1949, the Gaikwad Baroda State Railway was merged with the BB&CI Railway. After Western Railway came into being certain further jurisdictional changes were effected. The gauge-wise kilometrage of Western Railways as at present, is as under:

Broad Gauge	4114.01 kms.
Metre Gauge	1588.97 kms.
Narrow Gauge	786.67 kms.
TOTAL	6849.65 kms.



Western Railway serves entire Gujarat, part of Rajasthan and some portion of Madhya Pradesh. Western Railway now comprises of six divisions viz. Mumbai, Vadodara, Ahmedabad, Ratlam, Rajkot and Bhavnagar. Two erstwhile divisions viz. Jaipur and Ajmer were merged into North West Railway on 1st October 2002 and Kota division was made a part of West Central Railway on 1st April 2003. A new division i.e. Ahmedabad was created on 1st April 2003. The Western coast of India served by Western Railway has a number of ports, important among them being Kandla, Mundra, Pipavav, Navlakhi, Bedi, Rozi, Okha and Bhavnagar.

### **Mumbai Suburban Railway Network**



The suburban section of Western Railway in Mumbai extends from Churchgate, the city's business centre to Virar covering a distance of 60 Kms and 28 stations. The line is electrified on 1500 walt DC. The section has been extended to Dahanu Road adding 10 more stations and 60 Kms. The first electric train on this section was introduced in 1928 between Colaba and Andheri.

Historically speaking, the first suburban service in Mumbai with steam traction was introduced wayback in April 1867, with one train each way between Grant Road and Bassien Road. Later it was extended to Churchgate in 1870. By 1900, 44 trains on each way were carrying over one million passengers annually.



Today, of 14 million people travelling per day by the Indian Railways, more than 6 million people travel per day on Mumbai Suburban section alone. Of the 2100 plus services run in Mumbai 1133 services which includes 589 twelve car services are run by Western Railway with a phenomenal frequency of 3 minutes during peak hours. Western Railway carries more than 3 million passengers per day.

Western Railway was first in the world to start an exclusive Ladies Special Train between Churchgate and Virar.



Western Railway is a pioneer in implementing the state of art 'Train Management System' (TMS) over its suburban section till Virar. TMS gives real time information of train movement to commuters. The actual count down of train expected in minutes is displayed at the stations with automatic announcements.



(ii) **Energy Consumption and Energy Conservation Achievements**

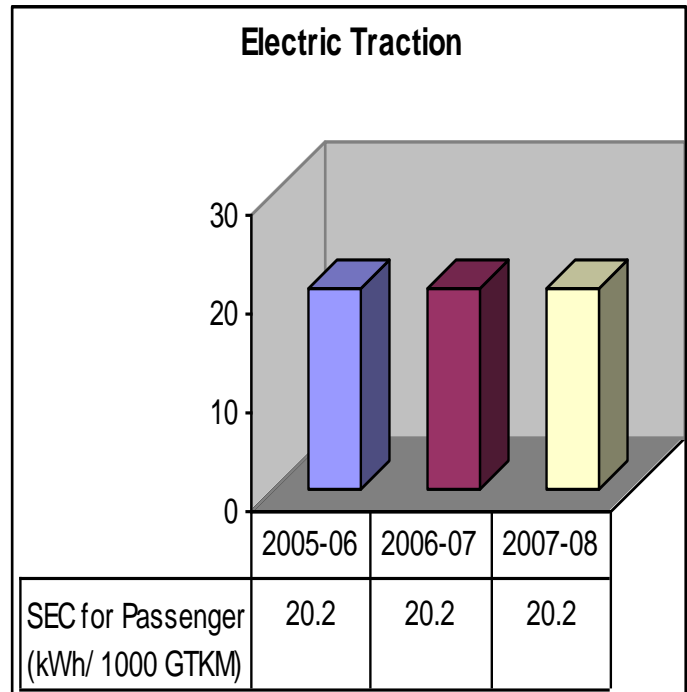
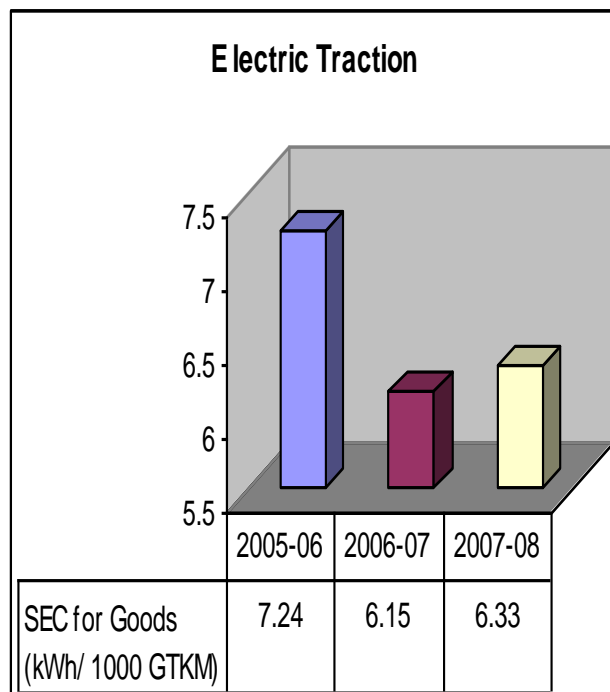
<b>SPECIFIC ENERGY CONSUMPTION REDUCTION</b>			
<b>TRACTION (ELECTRIC)</b>	<b>2005-06</b>	<b>2006-07</b>	<b>2007-08</b>
Unit Consumed ( Laks kWh / year)	8135. 89	8358. 17	9283.33
Money Value (Rs. Lakhs / year)	38123. 92	40782. 61	44670.25
GTKM for GOODSs ( in thousand)	48612437	55333978	58686706
GTKM for Passenger ( in thousand)	20803803	22950380	24441244
SEC for GOODSs (kWH/1000 GTKM)	7. 24	6. 15	6. 33
SEC for Passenger (kWH/1000 GTKM)	20. 2	20. 2	20.2
% SEC reduction (Goods) during the period 2006-07 & 2007-08 w.r.t. preceding year.	-	15.06	-2.93
% SEC reduction (Passenger) during the period 2006-07 & 2007-08 w.r.t. preceding year.	-	0.00	0.00

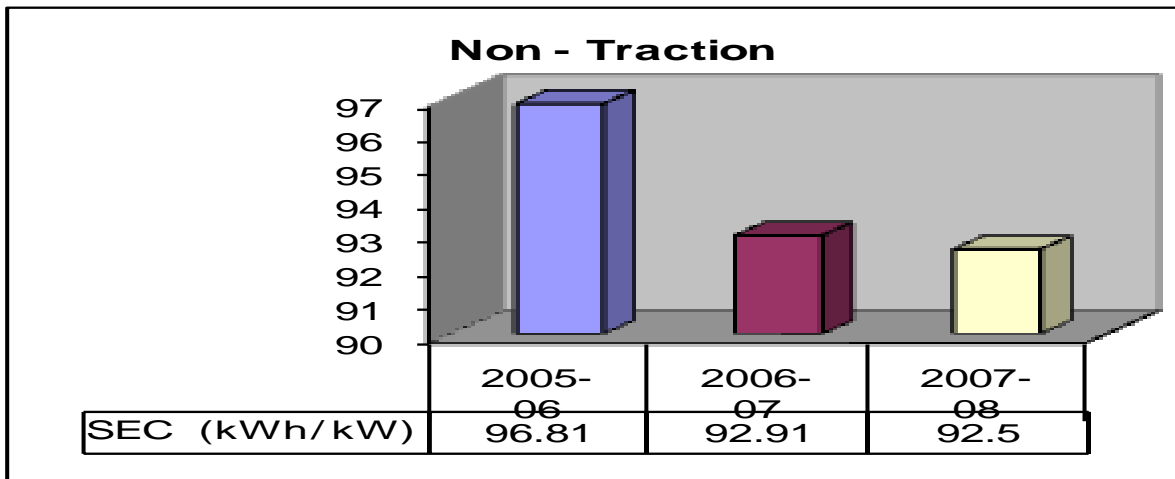
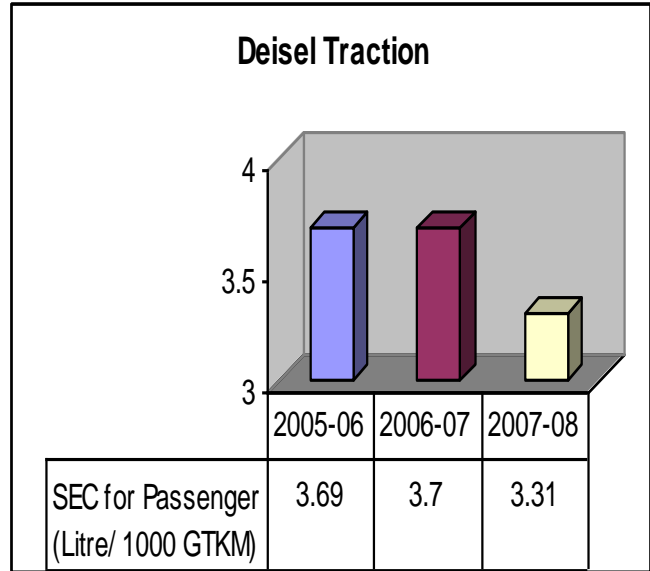
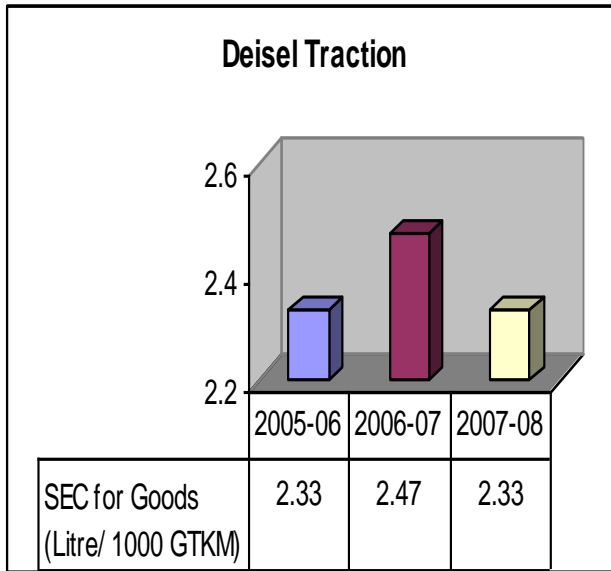
<b>SPECIFIC ENERGY CONSUMPTION REDUCTION</b>			
<b>TRACTION (DIESEL)</b>	<b>2005-06</b>	<b>2006-07</b>	<b>2007-08</b>
Diesel Consumed ( kL / year)	95404	108491	116895
Money Value (Rs. Lakhs / year)	20090	37438	41635
GTKM for GOODSs ( in thousand)	18654238	21490649	22483005
GTKM for Passenger ( in thousand)	8856057	9753814	10223226
SEC for GOODSs (Litres/1000 GTKM)	2. 33	2. 47	2. 33
SEC for Passenger (Litres/1000 GTKM)	3. 69	3. 7	3. 31
% SEC reduction (Goods) during the period 2006-07 & 2007-08 w.r.t. preceding year.	-	-6.01	5.67
% SEC reduction (Passenger) during the period 2006-07 & 2007-08 w.r.t. preceding year.	-	-0.27	10.54

## SPECIFIC ENERGY CONSUMPTION REDUCTION

NON-TRACTION	2005-06	2006-07	2007-08
Electricity consumed in Lakhs kWh	1352.3	1318.3	1364.7
Connected Load in kW	116400	118846	128439
SEC in kWh/kW	96.81	92.91	92.5
% SEC reduction during the period 2006-07 & 2007-08 w.r.t. preceding year. [ (Current year SEC-Previous year SEC)/Previous year SEC]	-	4.03	0.44

### Graphical Representation





### iii. Energy Conservation Commitment, Policy and Organization Set up

#### Commitment

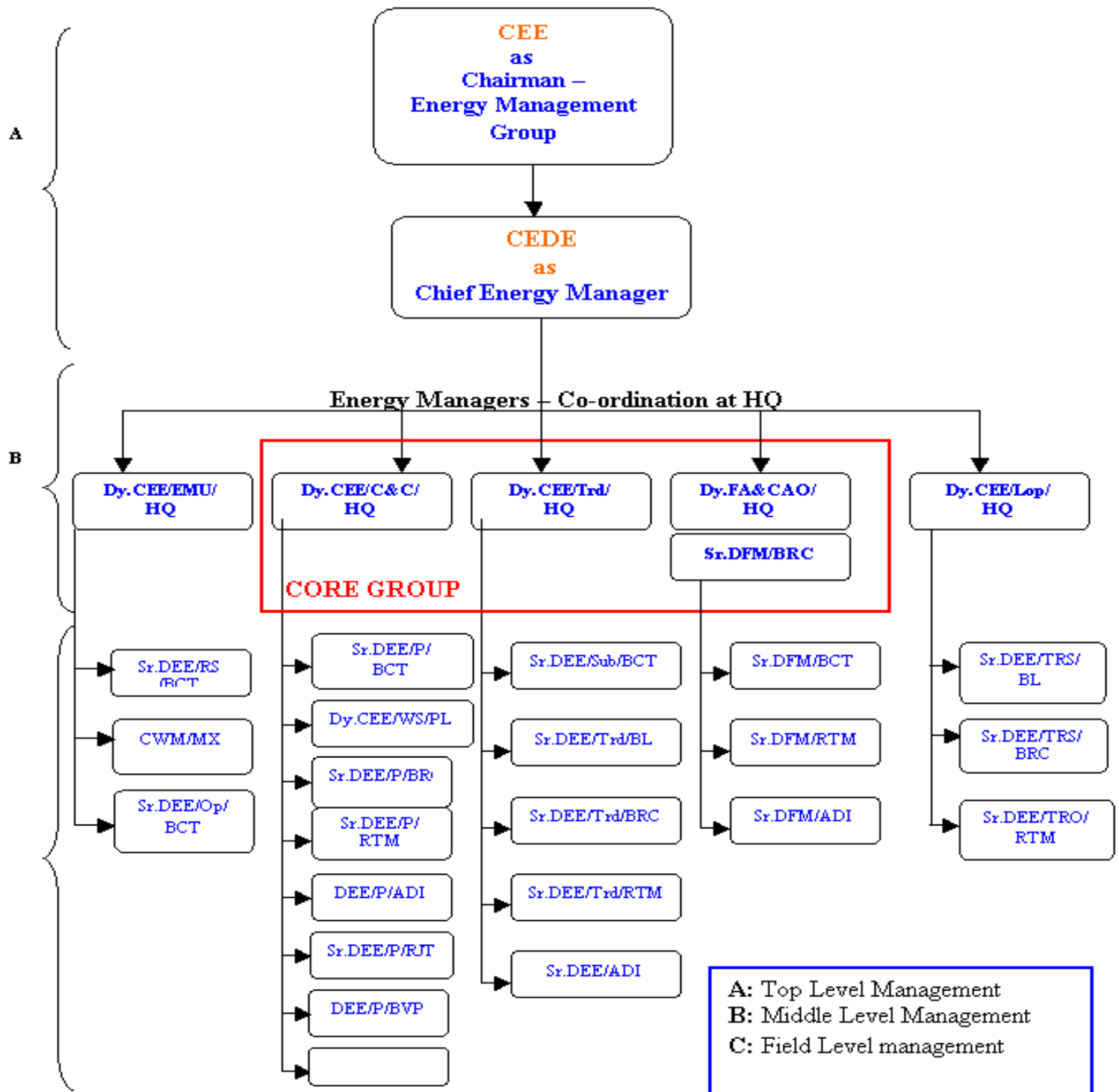
There is a significant potential of energy savings with use of energy efficient applications. Western Railway is committed to conserve energy and Clean Development Mechanism and has already taken a number of measures in this regard.

## Energy Management Policy

Energy Management Policy released by Western Railway is as under -

- a. **Form a team** under the banner of **Energy Management Group (EMG)** to give perpetual impetus to initiatives of energy efficiency and conservations.
- b. Identify Services & Load centers and carryout periodic energy audits to identify the areas of improvement.
- c. Establish a System of **Effective Energy Performance Assurance** to **monitor** Specific Energy Consumption (**SEC**) in potential areas of operations, **fixing** Energy consumption targets (**ECT**) and monitor Energy budget [EB] to reduce **energy intensity**.
- d. **Standardize & Adopt** use of appropriate **energy efficient design / innovative technology**.
- e. **Set up norms** for energy consumption and continuously **compare with the best** in the world and endeavor to reduce the gap and **Bench marking** of energy efficiency for equipments / machinery as per BEE labeling.
- f. **Demand evaluation** to ensure efficient Demand side Management (**DSM**) and approvals on future / new loads after **Cost – Benefit and efficiency** analysis and ensuring **matching surrenders**.
- g. Identification of **surplus machinery** to avoid inefficient use and not permitting its use.
- h. Establish a monitoring & reporting **energy management system** to **monitor, verify & control energy consumption** with periodic reviews and **identify the losses and establish a Loss Arrest System**
- i. Establishing age cum conditions monitoring Asset management System **to** carry out **modifications or replacement** of energy inefficient equipment by efficient one to improve energy efficiency
- j. Adopt **efficient energy sources** for all our operations
- k. **Create awareness & motivate** all employees & their family members for energy efficiency & energy conservation initiatives and **recognize** their **efforts**.

## Organisation Set up



**iv. Major Activities Implemented to reduce energy consumption, Economy in Energy Expenditure and Implementation of Energy Conservation Measures:-**

<b>SECTION</b>	<b>ACTIVITY</b>	<b>ACTION TAKEN</b>
TRD	Use of VAR Compensation Equipment	<ul style="list-style-type: none"> <li>• Dynamic Reactive power compensation system was commissioned at Maksi traction sub-station on RTM division. After its commissioning the power factor has improved to near unity.</li> <li>• Apart from above, shunt capacitor banks provided at BHET traction sub-station (BCT Division), NAD &amp; NKI TSS (RTM division) have further been augmented, which has helped in improving the power factor and thus eliminate the low power factor surcharge.</li> </ul>
	Energy Auditing	<ul style="list-style-type: none"> <li>• Western railway is the first Railway to get its Traction substation (Makarpura TSS at Baroda division) audited in year 2007.</li> <li>• For the year 2008, Bhestan TSS at BCT Division has been audited by In-house team headed by Dy. CEE/Trd/WR.</li> </ul>
	Switching off Stand by Transformer at TSS	<ul style="list-style-type: none"> <li>• Western Railway has issued instructions to <b>switch off the standby transformer</b> at the traction substation.</li> <li>• This has resulted in saving of 1625820 units amounting Rs.75 Lakhs per annum (approx) for the year 2007-08 by <b>loss minimization measures</b>.</li> </ul>
	Review of feeding zone of TSS ( <b>Demand Side Management</b> )	<ul style="list-style-type: none"> <li>• A critical review of feeding zones of traction sub-stations was carried out to avail the benefit of different traction tariffs of distribution companies of the adjoining States.</li> <li>• The feeding zone of Nandurbar TSS, fed by MSEDCL having average tariff rate of <b>Rs. 4.55 p.u</b> was further extended by 33 Kms. In the feed zone of NWU TSS fed by DGVCL having average tariff rate</li> </ul>

		<p>of <b>Rs. 5.18 p.u.</b></p> <p>This shifting of feed zone from Gujarat to Maharashtra has resulted in a recurring <b>saving of Rs. 3.5 Lakhs per month (approx.)</b></p>
LOCO / EMU	Use of Regenerative braking	<ul style="list-style-type: none"> <li>Western Railway has adopted 3-phase technology, reducing about 30% energy consumption due to regeneration on AC locos and AC EMU.</li> <li>Each of the newly introduced AC/DC rake is capable of saving about <b>1 Million units</b> of Energy / annum on account of Regeneration capability equivalent to <b>900-Carbon credit units</b> amounting <b>Rs 3.5 lakhs/rake/annum.</b></li> <li>There are 3 proto-type 12-car rakes have been introduced progressively from 12.11.07 to 13.01.08 and average savings due to regeneration comes to 7 units/km. In addition to that 2082 carbon credits have been earned equivalent to Rs. 1.67 million. <b>Thus, the total saving on account of operation of these three rakes is Rs. 12.08 million</b> so far (Up to 28.09.08)</li> </ul>
	Improvement in Operational efficiency	<ul style="list-style-type: none"> <li>Regular counseling of operation staff like drivers/motormen to be well conversant with road so as to make best use of different gradients to effect maximum possible saving in Energy consumption.</li> <li>Regular counseling/motivation of Loco Pilots is being done for resorting to maximum COASTING by guidance from Coasting Boards provided on line at specific location.</li> <li>Providing of Energy cum speed monitoring system (ESMONS) in all elect. locomotives and 20 EMU rakes to monitor the energy consumption.</li> <li>Benchmarking of energy consumption for various sections based on trials &amp; monitoring Loco Pilotwise energy consumption by downloading data from ESMONS.</li> <li>Comparing the unit wise SEC and take corrective measures</li> <li>Optimization of power consumption of electric</li> </ul>

		<p>Locos/EMUs in auxiliary.</p> <ul style="list-style-type: none"> <li>• Inform crew about train regulation/detention in yards/station so that crew can SWITCH OFF blowers/locomotives as the case may be.</li> <li>• Switch off the blowers in case of halt exceeding 10 minutes.</li> </ul>
Non-Traction	Use of Energy Efficient Luminaries	<ul style="list-style-type: none"> <li>• 4700 nos. of incandescent lamps have been replaced with CFLs during FY 2007-08.</li> <li>• 8630 nos. of T-12 fittings has been replaced with T-5 fittings during 2007-08.</li> </ul>
	Automation of pumps	<ul style="list-style-type: none"> <li>• 1019 nos. of pumps have been automated and provided with soft start till 2007-08.</li> </ul>
	Use of Timer Switches	<ul style="list-style-type: none"> <li>• 223 automatic time switches have been provided for street lights and yard lights.</li> </ul>
	Use of Electronic fan regulator	<ul style="list-style-type: none"> <li>• 17170 conventional regulators have been replaced with electronic fan regulators during 2007-08.</li> </ul>
	Use of Electronic ballast	<ul style="list-style-type: none"> <li>• 28000 Nos. have been provided during 2007-08.</li> </ul>
	Touch & Feel	<ul style="list-style-type: none"> <li>• 56 stations were selected for improvement in illumination level on Platforms, Concourse, Circulating areas etc. as per Railway Board's guideline for Illumination level.</li> <li>• Work at 36 stations has been completed in year 2007-08.</li> </ul>
	Harnessing non conventional sources of energy	<ul style="list-style-type: none"> <li>• <b>Solar water heaters</b> in Railway hospitals, Officers rest house and running rooms- 103 nos. of solar water heaters provided during 2007-08.</li> <li>• <b>Solar light system</b> at LC gate – 120 LC gates have been provided with solar lights in 2007-08.</li> <li>• <b>Solar light system</b> at Station, Colonies &amp; Training Institute – 1130 nos. has been provided till 2007-08.</li> <li>• <b>Solar cooking panel</b> –pilot project to shift cooking</li> </ul>

		on solar panel at ADI running room has been initiated.
	Energy Audit	<ul style="list-style-type: none"> <li>• Energy audit of Mahalaxmi Workshop was carried out in March'08. Short term and long term recommendations are being implemented.</li> </ul>
	Others	<ul style="list-style-type: none"> <li>• Segregation of staff quarters by direct metering from SEBs wherever feasible.</li> <li>• Replacement of overage wiring, window AC and water cooler by new ones.</li> <li>• Substitution of electric illumination by natural illumination in sheds/workshops/offices up to feasible limit.</li> <li>• Switching off streetlights in full moon nights.</li> <li>• Switching off stand by transformers.</li> <li>• Provision of capacitor banks for improvement of power factor.</li> <li>• Use of 3 star and above rated electrical equipments</li> <li>• Use of Energy Saver for (a) Pumps (b)Lighting Circuit (c) Air conditioning &amp; (d) Machines in Workshop</li> </ul>