

SOUTH CENTRAL RAILWAY RAIL NILAYAM Secunderabad (Telengana)

Zonal Railway Profile

South Central Railway (SCR) formed on 2nd October 1966, is one of the most promising Zonal Railways on Indian Railway network. During the year 2015-16, it carried a total of 367 million passengers and 107.2 million tons of freight, with gross originating earning of ` 13212 Crores. SCR is striving its best to fulfill the passenger's aspirations and demands. The SCR comprise of overall six divisions viz. Secunderabad, Vijayawada, Guntakal, Guntur, Hyderabad and Nanded with route kilometers of 5746.157 on Broad Gauge and 175.93 on Meter Gauge & three workshops i.e. Carriage Repair Shop, Lallaguda & Tirupati and Wagon Workshop, Guntupalli. SCR covers Andhra Pradesh, Telangana and part of Maharashtra, Karnataka, Madhya Pradesh and Tamil Nadu.

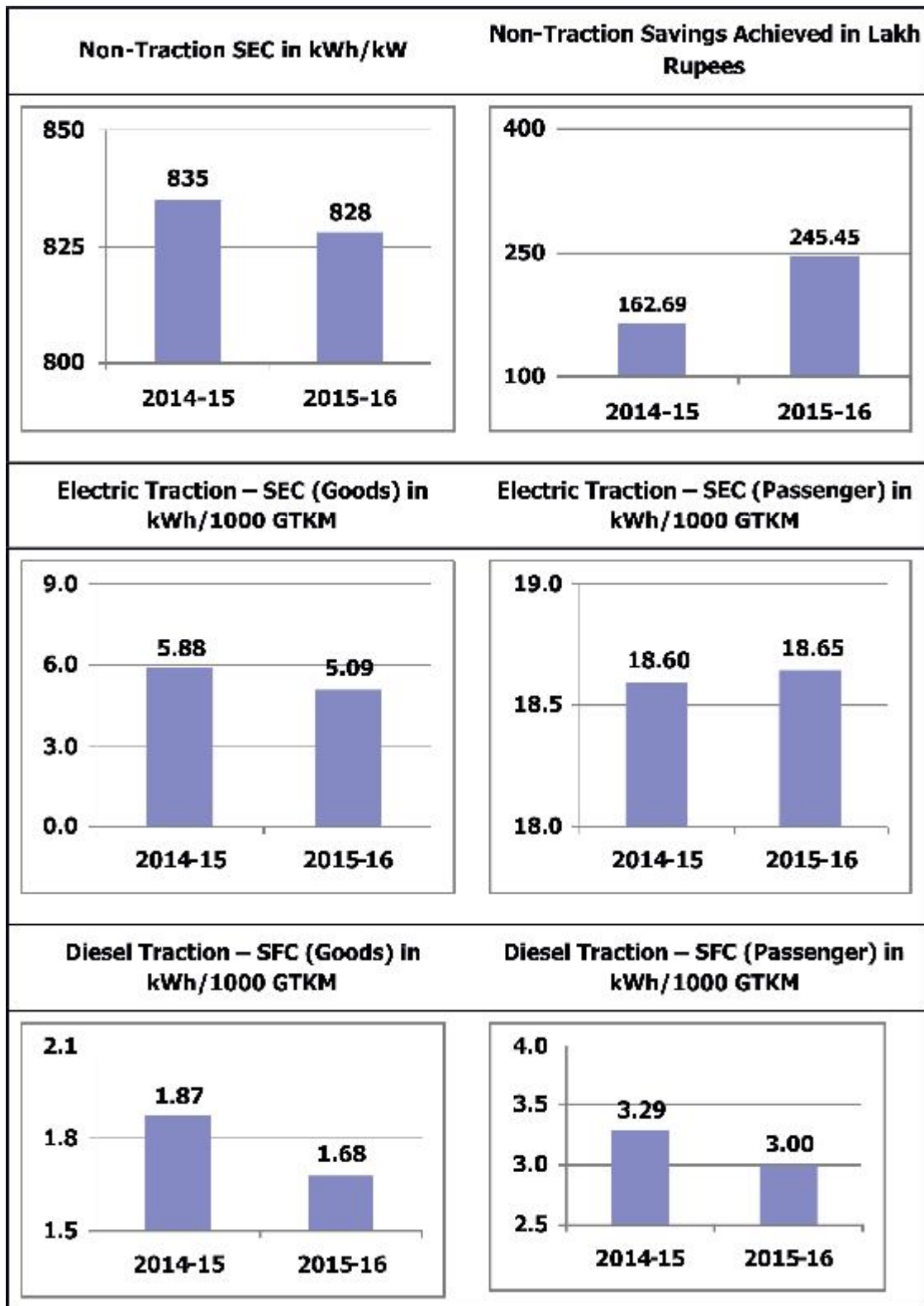


Overview of Infrastructure and other salient Features as on 31.03.2016:

No. of Divisions	: 6
No. of stations	: 748
Route Kilometers	: 5922.087
Track Kilometers	: 8084.701
Electrified Route Kilometers	: 2479
Electrified Track Kilometers	: 6140
No. of Carriage and Wagon Repair Workshops	: 3
No. of Electrical Loco Sheds	: 3
No. of Diesel Loco Sheds	: 5
No. of Traction Sub-stations	: 40
No. of sub-stations (Non-Traction) (incl. receiving sub-stations)	: 218
No. of Electric Locomotives (incl. 115 WAG9 and 54 WAP7 - 3 Ph. Locos)	: 587
No. of Diesel Locomotives	: 602
No. of MEMU coaches (34 motor & 99 trailer)	: 133
No. of EMU coaches (33 motor & 64 trailer)	: 97
No. of AC coaches	: 693
No. of Non-AC coaches	: 3515
No. of Passenger Escalators at Railway Stations	: 39
No. of Passenger Lifts at Railway Stations	: 34
No. of staff quarters	: 34045
No. of Originating Passengers (in millions)	: 366.75
Originating loading (in million tonnes)	: 107.16
Originating earnings (in crores of `)	: 13212.17
No. of passenger trains run daily (Mail/Express – 261, Passenger – 357, MMTS – 118)	: 736

Specific Energy Consumption

Graphic representation of Specific Energy/Fuel Consumption:

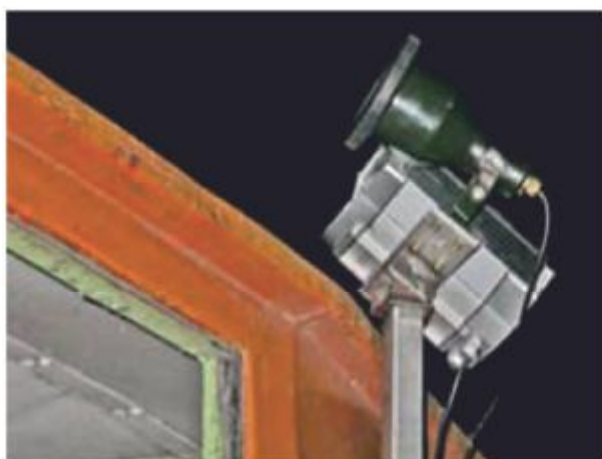


Energy Conservation Measures:

The following energy conservation measures are actively implemented during the year 2015-16.

Traction (Electric):

- South Central Railway is having 40 Traction Sub-Stations consisting of 10 nos. of 12.5/13.5 MVA and 68 nos. of 20/21.6 MVA transformers. By switching off stand by transformers no load losses of 45.47 Lakh kWh are minimized every year. This is 0.29% of annual traction energy consumption of 1553 Million units for the year 2015-16.
- During the year 2015-16 all the TSSs of SC Rly. maintained power factor above 0.97.
- Provision of coasting boards in enroute for trains to regulate power on falling and raising gradient.
- OHE voltage at 27.5 kV maintained by suitable operation of tap position during day & night.
- Switching off yard lights to required minimum at traction sub stations.
- Calibration of Trivector meter is conducting yearly by AP DISCOMs & Railways jointly and the accuracy of meters is 0.5 class.
- Ensured sparkless current collection. OLIVER 'G' regularly used for attending spark location and maintaining spark free current collection.

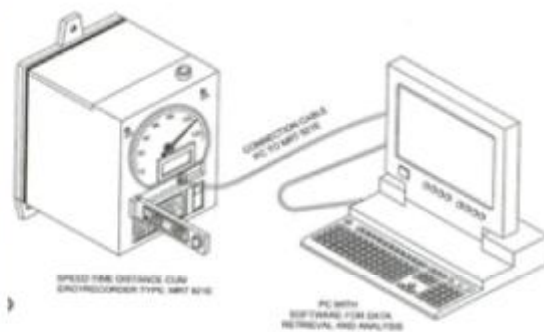


Camera focussing Pantograph



Spark Location

- 5 kVA Auxiliary transformers were provided at L.C. Gates and IB locations instead of 10 kVA Auxiliary transformers to reduce losses.
- The SEC (Specific Energy Consumption) of Goods trains on Electric Traction has been decreased from 5.88 in 2014-15 to 5.09 in 2015-16, showing reduction of 13.44%.
- Shutting down off the locomotives in trip-sheds, freight sheds yards & enroute for more than 30 minutes.
- Switching off blowers whenever the train is stopped for more than 5 minutes.
- Extensive usage of regenerative braking for trains working with three phase locos.
- Lowering of Panto of rear loco of loaded & empty trains working with multiple locos (wherever there is feasibility).
- Counselling ASM's to take OFF signals in time.
- Driving technique of LP improved by intense counseling by Loco Inspectors.



Intensive use of Loco Simulator for training of Loco Pilots and their monitoring by downloading energy data

Traction (Diesel):

Consumption of diesel for traction purposes is being monitored by adopting following conservation measures:

- The yearly cost of HSD oil procured by S.C. Rly. for Diesel train operations is approximately amounting to ₹ 1499 crores. Conscious efforts are continuously made to bring down this fuel bill by undertaking various cost effective and conservation methods at the grass root level.
- A quantity to the tune of 14998 KLs of HSD oil amounting to 76.86 crores was saved by shutting down of diesel locos idling for more than 30 min. in various yards/sidings and the rear loco of MU consist while working light/empty loads. Power controllers are made responsible for prompting the LPs to shut down the diesel locos and keep record of the same.

- RCD staff were sensitized on the value of conserving HSD oil. They were motivated to coordinate with the oil corporations and keep the maintenance of the RCDs without leakages/spillages. Their concerted effort has resulted in handling losses to 0.1% against a target of 0.1%. This has enabled a net saving of 384 KLs amounting to ₹ 1.97 crores.
- Various innovative practices have been introduced by the diesel sheds to enhance the reliability of the locomotives which has substantially reduced their periodical maintenance time and related overheads. This has resulted in a saving of 2892 KLs amounting to ₹ 14.82 crores in HSD oil consumed in the diesel sheds for maintenance purposes.
- The supply of HSD oil was constantly monitored and uninterrupted supplies are ensured even during various agitations/flash strikes by the truck owners. With past experience, the traditional 15 days buffer stock in the RCDs was reduced to 5 days. With the reduced inventory of HSD oil, a saving of ₹ 2.51 crores (approx.) is achieved.
- The fluctuations in traffic and cost of HSD oil at various oil depots of the suppliers are constantly monitored. From time to time, the fuel issuing patterns of the diesel locomotives are modified so that, maximum fueling is taking place from RCDs where the cost of the HSD oil is comparatively cheaper.
- Nominated Loco inspectors constantly monitor the engineman-ship of the Loco pilot with regards to fuel consumption against approved trip rations. Weak Loco pilots were identified and subjected to intensive counseling/simulator training.
- Diesel sheds are doing all out efforts to turn out locomotives in good fettle particularly emphasizing their fuel efficiency which is evident from the improved SFCs achieved. During 2015-16, the SFC for coaching service on S.C. Rly. was 3.00 against that of 3.29 during the year 2014-15 with an improvement of 8.81%. Likewise the SFC for freight service on S.C. Rly. was 1.68 against that of 1.87 during the year 2014-15 with an improvement of 10.16%. The improved SFCs have contributed to a saving of 9183 KLs amounting to 47.06 crores.
- At present 17 locomotives are equipped with auxiliary power unit (APU) on trial basis. The APUs will enable the LPs to keep up the vital pressures with minimum consumption of fuel oil duly shutting off the main engine of locomotive whenever stabled beyond 10 min. This will be introduced in a phased manner on all the locomotives resulting in substantial savings on fuel consumption

Non-Traction:

- **Solar Photovoltaic Modules at stations:** 72 kWp capacity of solar photovoltaic modules have been provided at 7 stations, leading to saving of 1.07 Lakh units amounting to ₹ 8.64 Lakh per annum.



15 kWp ON grid Solar Plant at Anakapalli Station



15 kWp ON grid Solar Plant at Bellampalli Station

- **Solar Photovoltaic Modules at service buildings:** 21 kWp capacity of solar photovoltaic modules have been provided at 3 service buildings, leading to saving of 0.30 Lakh units amounting to ₹ 2.41 Lakh per annum.



10 kWp ON grid Solar Plant at Sanchalan Bhavan Annexe



3 kWp OFF grid Solar Plant at Bidar Running Room

- **Solar Photovoltaic Modules at street lighting:** 53 street lights at service buildings/colonies have been provided with solar photovoltaic modules, leading to saving of 0.13 Lakh units amounting to ₹ 1.03 Lakh per annum.
- **Solar Water Heaters:** 24 Nos. Solar water heaters of 10600 LPD capacity have been provided in place of conventional water heaters, leading to saving of 1.43 Lakh units amounting to ₹ 11.51 Lakh per annum.



1000 LPD Solar Water Heater at IRISSET/SC

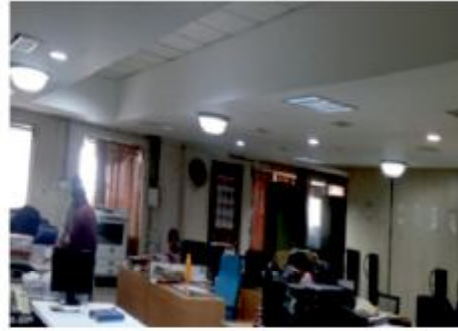


1000 LPD Solar Water Heater at Running Room, Raichur

- **Natural day Light Pipe System:** 112 natural day light pipes have been provided at service buildings to conserving electrical energy during day time and also providing natural ambience and comfort, leading to saving of 0.35 Lakh units amounting to ₹ 2.89 Lakh per annum.



Lallaguda Workshop



CSTE's Office, Rail Nilayam

- **LED Lighting:** 38 stations have been provided with 100% LED lights, leading to saving of 5.82 Lakh units amounting to ₹ 46.85 Lakh per annum. With this a total of 15875 Nos. of LED based lighting of different wattages have been provided at stations and service buildings.



100% LED at Nizamabad Station



100% LED at Bellampalli Station



LED lighting at Sanchalan Bhavan



SOUTH EAST CENTRAL RAILWAYS

Bilaspur (Chhattisgarh)

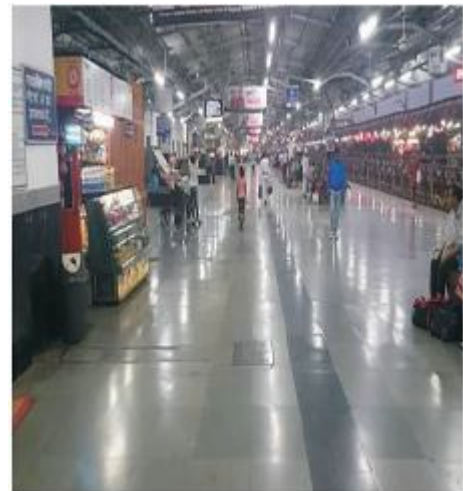
Unit Profile

South East Central Railway always acts & realize towards Energy conservation as an important part of energy planning and its management. It not only saves energy resources for future, avoids wasteful utilisation of energy, provides solution to energy crisis and ensures higher per capita availability/ consumption but controls environmental degradation and pollution.

Since its inception, South East Central Railway has always been a leader in the freight loading sector by providing its services in the states of Chhattisgarh, Madhya Pradesh, Maharashtra and Odisha & contributing immensely in the economic growth of the nation. This Railway is serving as a catalyst of growth and prosperity of not only the South East Central region, but the nation as a whole.



Bilaspur station



Bilaspur Platform



25KWp Solar Power Plant at Bhanwartonk

Energy conservation has always been a major focus area of SEC Railway which is serving the country by carrying among highest freight load. Severely undulating terrain poses its own challenges & requires a very highly skilled driving technique. By not only utilizing the State-of-art Technology in the form of three phase locomotives but also effective training to loco pilots, SECR has achieved the feat of continuous reduction in SEC (Goods) since 2011-12.

Specific Energy Consumption:

Year-wise details of SEC (Goods) vs loading in the SECR is as under:

Year	SEC (Goods)	Decrease in SEC w.r.t. previous year	Goods Loading in Million Tonne	Increase in loading w.r.t. previous year
2010-11	7.72	-	140.62	-
2011-12	7.42	3.89%	150.73	7.19%
2012-13	7.16	3.50%	151.57	0.56%
2013-14	6.11	14.66%	150.52	-0.69%
2014-15	5.80	5.07%	157.19	4.43%
2015-16	5.32	8.27%	170.96	8.76%

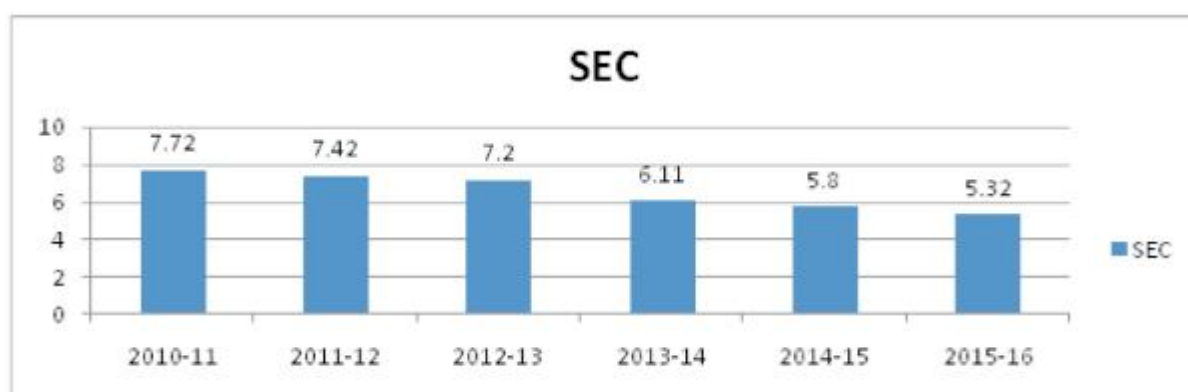
In non-traction field sincere efforts are being made for conservation of Energy, such as use of LED lighting, Solar energy, energy efficient fittings & equipment etc.

Various energy conservation methods adopted in SECR for Traction as well as Non-Traction are as under:

(A)Traction

- On traction side, deployment of new generation energy efficient electric locomotives with 3-Ø Regeneration braking feature has resulted into reduction in Specific Energy Consumption (SEC).

2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	% Imp w.r.t. 10-11	% Imp w.r.t. last year 14-15
7.72	7.42	7.20	6.11	5.80	5.32	(+)31.08%	(+) 8.27



Savings due to regenerative braking:

Year	Average Energy in KWh regenerated by loco per day		% of energy regenerated in term of total energy consumed for each loco	
	WAP-7	WAG-9H	WAP-7	WAG-9H
2010-11	-	1020.00 KWh	-	11.65
2011-12	-	1063.00 KWh	-	11.78
2012-13	855.63 KWh	1365.54 KWh	6.43	13.63
2013-14	936.79 KWh	1385.00 KWh	9.41	13.83
2014-15	931.75KWh	1054.41 KWh	11..33	12.19
2015-16	898.12 KWh	1043.25 KWh	11.52	12.13

- South East Central Railway conducts vigorous training of loco pilots for the purpose of safe and smooth working of trains.
- In this effort the drivers are also trained on the loco Simulator, to work in a controlled environment giving real life situation experience to them.
- Their skill of working of trains is evaluated using the Loco Simulator.

- One important aspect of this evaluation is the energy consumption by drivers during working of train.
- Drivers are counselled to work train in such a manner that they do maximum possible coasting, taking advantage of the down gradients while working a train on a down gradient.
- Ensuring good road learning so as to make best use of different gradients to effect maximum possible saving in Energy consumption.
- For resorting to maximum COASTING by guidance through Coasting Boards provided on line at specific locations.
- Microprocessor based Energy Meters are now provided in all Electric Locomotives to monitor the energy consumption.
- Benchmarking of energy consumption for various sections based on trials & monitoring Loco Pilot-wise energy consumption by downloading data from ESMONS are being done to improve the driver's skills and energy efficiency of locos.
- Switching OFF trailing loco in case of Multiple Units while working light load trains.
- Electric loco idling in sheds and yards are kept shutdown.
- Regular counselling of Loco Pilots is done for Switching 'OFF' blower in case yard detention is more than 15 minute.

(B)Non-traction:

- Segregating of 70/30 lighting circuits at platforms.
- Use of CFL/LED fittings at corridors, staircase, toilets & bathrooms.
- Adoption of T-5 fluorescent tube lights in place of T-12 FTL fittings.
- Use of automatic power factor correction panels in HT/LT substations.
- Replacement of old 90 watt ceiling fans by 60 watt ceiling fans.
- Use of electronic fan regulator in place of conventional fan regulators.
- Provision of LED based station name board in place of neon sign board.
- Timer switch on high mast towers, yard lighting/street lighting.
- Use of electronic ballast in place of conventional ballast in FTL circuits and metal halide circuits.
- Automation of pumps.
- Use of energy efficient pumps in place of old inefficient pumps.
- Efficiency measurement of pumping installation and implementation of action plan.
- Use of energy saver for: (a) Pumps (b) Lighting circuits (c) Air conditioning circuits (d) machines in workshops.
- Use of occupancy sensors for light control in (a) Officer's chambers (b) Conference rooms (c) Waiting halls.
- Use of VVF control for cranes, lifts and escalators.
- Use of 3 star and above labeled electrical products and equipments.

Use Of Renewable Energy

- **SOLAR POWER IN SECR**
- 03 Nos. 10 KWps each capacity each Solar Power Plant (Grid connected) at DRM office building/Bilaspur & Raipur & 01 no. Solar Power Plant Off grid connected at PRS building/Raipur has been provided.

- 08 Nos. Solar power panels have been provided at Railway stations in Raipur and Nagpur division.
- 53 Nos. of different capacity Solar Geysers having total capacity 59200 LPD have been provided at Running Room, Railway Hospital, Officers Rest house , Training school & Dormitory at Railway Station.
- 91 Nos. manned level crossing gates have been electrified by solar power panel.
- 750 KWp Grid connected under PPP model at following five locations in Bilaspur Railway settlement. Tender (RFP) opened on 22.09.2016 & under TC stage.
- Installation of 400 KWp Grid connected under PPP model Solar Plant at New GM Building Bilaspur. Tender (RFQ) opened on 14.09.2016 & under TC stage.
- Installation & commissioning of 2 x 50 KWp Solar Plant at old GM Building rooftop at Bilaspur.
- Installation & Commissioning of 40 KWp Grid connected Solar Plant at Raipur station.
- Installation & Commissioning of 25 KWp Solar Plant at Bhanwartonk Station in Bilaspur division.



■ **USE OF BIO GAS**

Bio-gas plant of 35 cu.m. capacity commissioned in Electric Loco Training Centre / Uslapur resulting in saving of 15 commercial LPG cylinders per month amounting to Rs 3.89 Lakhs per annum (approx.).

■ **DISTRIBUTION OF LED BULBS BY M/S EESL UNDER DELP (DOMESTIC EFFICIENT LIGHTING PROGRAMME) SCHEME**

LED Bulbs sale under DELP Scheme through M/s EESL started in South East Central Railway from Sept'15 and 2,41,122 nos. LED Bulbs of 7 Watt have been distributed during 2015-16.

■ **USE OF BIO-DIESEL IN DIESEL TRACTION AS ALTERNATE FUEL OF HSD OIL**

Construction for 30 TPD Bio Diesel plant based on latest state of the art technology is in progress at Raipur for supply of Bio Diesel to SECR.

Bio-Diesel manufacturing plant is based on algae, which is fast growing, high yielding and has no requirement of arable land. This second generation Bio Diesel plants can also use forest residue and farm residue as raw materials.

CENTRAL RAILWAY
CHHATRAPATI SHIVAJI TERMINIUS
Mumbai (Maharashtra)

Unit Profile

The first Train not only in India but in Asia started in Central Railway from Boribander (CSTM) to Thane over a distance of 30 KM on 16th April 1853. The first Electric Train also started in Central Railway from VT(CSTM) to Kurla via Harbour line on 3rd Feb.1925. Central Railway comprises 5 Divisions i.e. Bhusawal, Nagpur, Mumbai, Pune & Solapur with Total Route KMs(RKM) of 4063.38 KMs (Broad Gauge(1.767m)- 3764.77 KMs, Narrow Gauge (0.762m)- 278.42 KMs & NG(0.610m) - 20.29 KMs) and total Track KM (TKM) 8490.69 KMs. Out of this, 2122.14 KMs (RKM)/ 5887.37 KMs (TKM) are Electrified. Central Railway covers 3 States i.e. Maharashtra, Karnataka and Madhya Pradesh..

The Zonal Headquarters of Central Railway is at Mumbai. It is headed by General Manager who is assisted by Additional General Manager and Principal Head of Dept. of Finance & Accounts, Engineering, Mechanical, Electrical, Signal & Telecommunications, Transport, Commercial, Stores, Medical & Railway Protection Force.

At present C.Rly. serves the entire state of Maharashtra, part of Karnataka and Madhya Pradesh. Mumbai Nava Seva Port Trust of the economical capital of India is served by C.Rly.

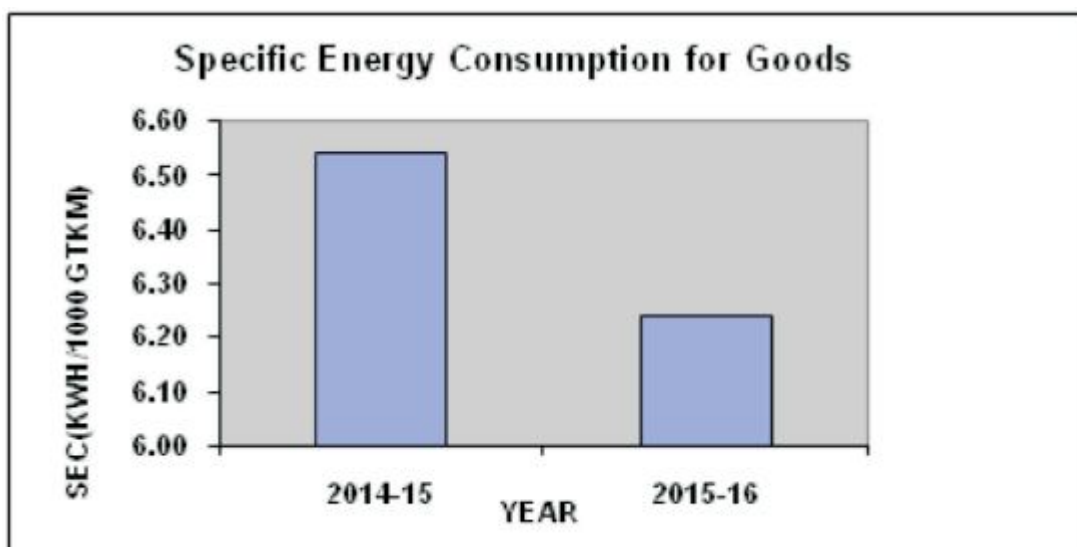
The Sub-urban section of C.Rly. in Mumbai extends from CSTM, the city's business and residential centre, to Kasara in North-East, Karjat/Khopoli in South-East and Panvel in New Mumbai. Also in Pune division, Pune to Lonavla.

Central Railway has a holding of 619 Electric locomotives, 292 Diesel locomotives, 143 EMU rakes in terms of 12 cars, 1 EMU rake in terms of 15 cars, working of 602 motor coaches and 1207 trailer coaches.

Energy Consumption:

Reduction in Specific Energy Consumption (SEC) Electric Traction :

	2014-15	2015-16
Unit consumption (Lakhs KWH/year)	19289	19164
Money value (Rs. Lakhs/year)	161770	143933
GTKM for Goods (in thousand)	74840306	75399120
GTKM for Passenger (in thousand)	41809441	42454299
SEC fo Goods (KWH/1000 GTKM)	6.54	6.24
SEC for Passenger (KWH/1000 GTKM)	18.47	18.35

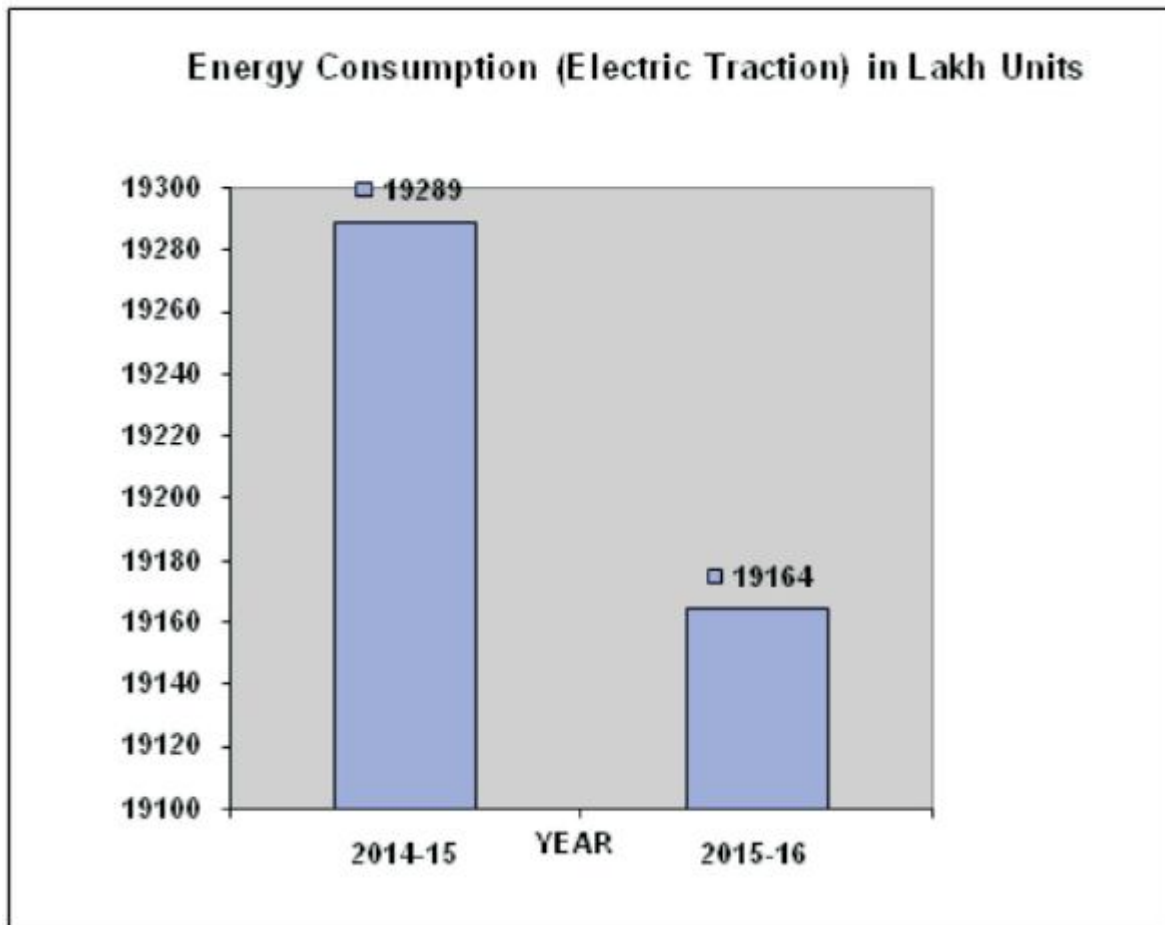


Reduction in SEC (Diesel Traction) :

	2014-15	2015-16
Unit consumption (Lakhs KWH/year)	243351	249776
Money value (Rs. Lakhs/year)	148430	125035
GTKM for Goods (in thousand)	19836158	23666065
GTKM for Passenger (in thousand)	21505884	22933700
SEC fo Goods (KWH/1000 GTKM)	2.37	2.35
SEC for Passenger (KWH/1000 GTKM)	3.96	3.94

Reduction in SEC (Non-Traction)

	2014-15	2015-16
Unit consumption (Lakhs KWH/year)	1348	1352
Money value (Rs. Lakhs/year)	12052	12563
SEC (KWH/KW)	739.23	729.99



Savings in Energy Bills:

	2014-15	2015-16
(i) Annual Electric energy savings achieved (Lakh kWh/ Year)		
(a) Current year GTKM for passenger x (SEC of previous year - SEC of current year in kWh/ 1000 GTKM) x 1000]	100.34	50.95
(b) Current year GTKM for Goods x [(SEC of previous year - SEC of current year in kWh/ 1000 GTKM) x 1000]	-696.01	226.20
(c) Total annual electric energy saving (lakhs kWh/ year) [6 (i)(a) + 6 (i)(b)] / 105	-595.67	277.15
(ii) Diesel saving achieved (Kilo Liters/ Year)		
(a) Current year GTKM for passenger x [(SFC of previous year - SFC of current year in Liters / 1000 GTKM) x 1000]	645	459
(b) Current year GTKM for Goods x [(SFC of previous year - SFC of current year in Liters / 1000 GTKM) x 1000]	397	473
(c) Total annual HSD saving (Kilo Liters / year) [6 (ii)(a) + 6 (ii)(b)] / 103	1042	932

	2014-15	2015-16
(iii) % saving 2014 - 15 & 2015 - 16 for Electric Traction		
(a) For Passenger [(savings in current year/ electricity consumption of previous year)] x 100	1.49	0.76
(b) For Goods [(savings in current year/ electricity consumption of previous year)] x 100	-12.97	4.21
(iv) % saving 2014 - 15 & 2015 - 16 for Diesel		
(a) For Passenger [(savings in current year/ diesel consumption of previous year)] x 100	0.84	0.54
(b) For Goods [(savings in current year/ diesel consumption of previous year)] x 100	0.81	1.01

Energy policy

Guidelines on energy conservation are being received from time to time from the Railway Board. These are advised to the divisions and monitored. Energy Conservation week is celebrated from 14th December to 21st December of every year by conducting seminars, distributing booklets on energy conservation measures.

Objectives:

- To have lowest Specific Energy Consumption.
- To maximize the use of renewable energy resources wherever feasible.
- To identify the areas of excessive energy consumption and avoidable loss of energy and to initiate measures to arrest the same.

Major Projects Implemented during the year 2015-16:

(A) Traction Power:

The following major activities including energy conservation measures have been implemented to reduce energy consumption and achieve economy in energy expenditure during the year 2015-16.

a) Tariff containing measures:

Energy tariff plays a vital role in economic and efficiency of traction system. Dual purpose initiative has been taken to avail the incentive available on power factor as well as reduction in demand and minimization of loss. Now, Central Railway is purchasing power from RGPPL & TATA from NOV-2015 & FEB-2016 respectively through Open Access. During the year (2015-16), due to availing power through

Open Access, Central Railway has saved Rs.178.43 Crores w.r.t. last year (2014-15). Mumbai Suburban, Harbour & Trans-harbour sections has been switched over from DC traction to AC traction.

b) Demand side management to conserve energy:

Central Railway continuously monitors the demand of the sub-stations with the demand approaching/overshooting buzzers to alert the traction power controller to control the maximum demand by the way of extension of feed.

By effective energy management, the demand has been restricted to save the demand charges for Railway and thereby helping the supply authorities in managing the system without extra burden of exceeding demand or losses.

In addition to that, Central Railway by effective switching off the standby transformers, the losses have been restricted.

- (i) The Central Railway has issued instructions to switch off the standby transformers at the traction sub-stations. This has resulted in minimization of losses.
- (ii) The Central Railway has provided capacitor bank in 17 traction sub-stations.
- (iii) Rationalization of demand.

c) Provision of energy saving devices -

Central Railway draws power from 25 KV AC traction sub-stations. Capacitor banks have been provided at 17 traction sub-stations. Since the installation of capacitor banks, the power factor has been improved in the order of 0.90 to 0.99 resulting into handsome saving in restricting the power consumption. The benefits are achieved are as under:-

- i) Saving in restricting the demand.
- ii) Saving on account of avoided losses due to improved power factor ($KWH*(1-(pf1-pf2)^2)$).

d) Improvement in operational efficiency by training the locomotive operation staff resulting in improvement in Specific Energy Consumption (SEC).

Central Railway has taken initiatives on energy efficiency in operation of electric locomotives by -

Regular counselling of operation staff/drivers.

- i) Provision of Coasting Boards.
- ii) Installation of Energy Meters on electric locomotives/EMU's to monitor the energy consumption.

- iii) Comparing the unit wise SECs and take corrective measures.
- V) Switching off of trailing locomotive when empty rake is hauled by MU.
- VI) Switching off of auxiliaries.
- VII) Panto lowering.

e) Introduction of 3-phase technology.

Central Railway has adopted 3-phase technology reducing about 12% to 15% energy consumption due to regeneration on AC and DC EMUs & locomotives.

(B) Non-Traction (General Services)

- 01 Nos. of Solar Panel provided at IRIEEN, NKRD (30kWp, grid connected).
- 01 NOS. of Solar panel provided at DRM building, NGP (10kWp, grid connected).
- 1650 LPD capacity solar heating system have been provided at (500LPD at Lonavala Driver Running Room, 150 LPD at Puntamba SUR division, 500 LPD at BSL Dormitory , 500 LPD at Rest house, Khandesh, BSL division.)
- 5526 LED lights have been provided.
- 2557 Nos. of energy efficient T-5 tube lights of 28 W have been provided at stations and service buildings in place of 40 W tube lights & CFL.
- 1595 nos. of old ceiling fans replaced with energy efficient ceiling fans.
- 46 nos. energy efficient pump sets have been provided.
- At 6 stations 100% LED lights have been provided (NKRD, KNW, SUR, Madha, Mohol, Mallikpet).
- 542 Nos. of staff quarters have been rewired with copper wiring.
- 600 Nos. electronic regulator have been provided in place of resistance type.
- During the year 2015-16 internal Energy audit of 23 location has been carried out major administrative offices at HQ and Divisional level, major stations, Byculla Hospitals.
- Rs. 536.61 lakhs have been saved for better power factor during 2015-16 over C.R.

Significant amount of electrical energy is being saved by adopting the following measures:

- Auto switching on/off 70% platform lights at stations.
- Energy consumption target is fixed for the Zonal Railway by the Railway Board and onwards target is fixed for divisions & workshops.

SOUTHERN RAILWAY

Chennai (Tamil Nadu)

Unit Profile

Southern Railway, having realized the fact that there is an urgent need to take forward energy conservation measures at a much faster pace in the light of the evolving scenario on account of the climate change, has put in place a two pronged approach - short term strategy for energy conservation and long term strategy of substituting conventional energy with renewable energy for reducing the energy consumption and overall energy cost towards sustainable growth. The continuing energy crisis has further bolstered on efforts towards energy conservation and no stone has been left unturned in achieving this by way of implementing various schemes such as introduction of 3 phase loco with regenerative braking, improvement in driving techniques of loco pilots, traction peak load management, power factor improvement, segregation of station lighting load according to the need, reduction of distribution losses, use of energy efficient lamps/ equipments apart from exploiting renewable sources of energy particularly the solar energy.

Energy Conservation Measures during 2015-16:

1) Electric Traction

SEC for Goods has improved from 6.67 in 2014-15 to 6.37 in 2015-16, an improvement of 4.50%. With this improvement, achieved a reduction in energy consumption of 117.5 lakhs units resulting in saving of Rs. 887.2 lakhs.

This is in addition to 12.7% of reduction in 2014-15.

This has been achieved by

- Introduction of 3 phase locomotives which are having unity power factor and regenerative braking of the order of 15.02%
- Encouraging Drivers to resort to coasting on down gradient or before approaching stopping stations/signals.
- Using regenerative braking to the maximum possible extent in Three phase Loco and use of Rheostat Braking to the maximum extent possible in Conventional locos.

- Proper counseling / monitoring of Drivers by loco inspectors regarding energy conservation.
- De energizing rear locomotive in MU operation when running with light load/ empty stock/waiting for signal in station or yards.
- De energizing locos idling in yard/ section for more than 30 min.
- Switching off the auxiliary machines for the locos waiting for path for more than 15min

2.0 Traction Distribution

The following energy conservation measures have been implemented in Traction services in Southern Railway during the year 2015-2016.

RKM Electrified as on 2014-15 : 2534 RKM

RKM Electrified as on 2015-16 : 2706 RKM

1. Increased electrification of 172 RKM in the section Coimbatore - Mettupalayam, Kallayi-Cheravattur

- 1.1 Increase in share of electric traction for freight and Passenger services is as under

	Pass Share in %	Freight Share in %
2014-15	80.53	88.00
2015-16	82.26	90.25

2. At Vridachalalam, Ariyalur, Tiruchchirappalli, Vaiyampatti, Dindigul, Virudunagar, and Kovilpatti TSS improvement in Power Factor has been achieved by running of new and latest three phase locomotives which are inherently having unity power factor and effective load management by feeding the adjacent Traction Substations supply during no load period to avoid no load losses. Amount saved by this innovative method of traction operation has resulted in savings of Rs.187.85 lakhs in Tamilnadu area due to avoidance of low power factor
3. Provision of Low Loss Air cored series reactor at Kannur South TSS.
4. "Switching off" of standby transformers to reduce no load losses.
5. Power factor in Kerala on Traction has been improved by various methods like capacitor bank and running of three phase locos. This has achieved incentive by Electricity Board to the tune of 183.76 Lakhs in 2015-16

3.0 Non Traction Area

3.1 Provision of Energy Efficient Equipment viz

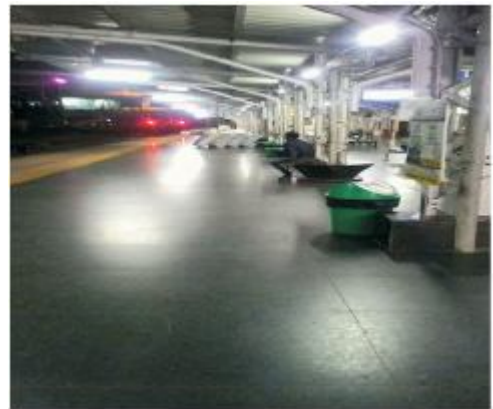
1. T5 lamps - 55, 028 Nos
Energy Savings - 1.973 lakhs units for 2015-16. This is in addition to the energy saving of 1.229 lakhs of units achieved in 2014-15
2. CFL lamps - 78,4365 Nos
Energy Savings - 0.410 lakhs units for 2015-16.
This is in addition to the energy saving of 0.431 lakhs of units achieved in 2014-15
3. Provision of LED lamps in place of Higher Wattage lamps - 1303 Nos.
Energy Savings - 0.845 lakhs units for 2015-16
This is in addition to the energy saving of 0.760 lakhs of units achieved in 2014-15
4. 60 W fans -16,023 Nos.
Energy Savings - 1.672 lakhs units for 2015-16.
This is in addition to the energy saving of 0.257 lakhs of units achieved in 2014-15



5. Electronic Ballast-17,549 Nos
Energy Savings - 0.405 lakhs
units for 2015-16.
This is in addition to the energy saving
of 0.444 lakhs of units achieved in
2014-15



6. LED 18 W Retrofitment lamps in
stations/service buildings-10,250 Nos
Energy Savings - 6.228 lakhs units for
2015-16.



7. Provision of BLDC (35 watts) fans in
place of Conventional Fans - 195 Nos
Energy Savings - 0.356 lakhs
units for 2015-16.



On account of the above, 15.028 lakhs of units have been saved per annum, thereby saving Rs 115.866 lakhs per annum. This is in addition to the energy saving of 6.091 lakhs of units and Rs.48.728 lakhs achieved in 2014-15

3.2 Tapping of renewable energy sources viz

8. Solar Water Heater- 131 Nos.
Energy Savings - 1.775 lakhs
units for 2015-16.
This is in addition to the energy saving
of 0.724 lakhs of units achieved in
2014-15



9. Solar panel for LC gates (41 Nos) and Solar Street lights (55 Nos)
Energy Savings - 0.025 lakhs for 2015-16
This is in addition to the energy saving of 0.0195 lakhs of units achieved in 2014-15



10. Solar PV panel- 5 Nos.
This is in addition to 4 Nos provided during 2014-15.



11. Solar pump- 1 No.
Energy Savings - 0.010 lakhs
Units for 2015-16.
This is in addition to the energy saving of 0.018 lakhs of units achieved in 2014-15



On account of measures on renewable energy, 2.039 lakhs of units have been saved per annum, thereby saving Rs.15.721 lakhs per annum. This is in addition to the energy saving of 0.757 lakhs of units and Rs.6.05 lakhs achieved in 2014-15