



NORTH WESTERN RAILWAYS, JAIPUR

Zonal Railway Profile

The zone of North Western Railway is one of the 7 new zones announced in the year 1996 and it was formally created and became functional w.e.f. Oct.1, 2002 with its HQ at Jaipur. The zone has been created incorporating 2 Divisions of Bikaner and Jodhpur of Northern Railway and Jaipur and Ajmer Divisions of Western Railway. This zone primarily serves the State of Rajasthan and also includes small portion of state of Haryana and Gujarat. Though the major gauge conversion work was undertaken by Indian Railways in the decade of 80s, still there is an appreciable amount of route kilometer on Meter Gauge over this railway and the breakup for the same is given as below.

<u>Gauge</u>	<u>Route Kms.</u>	<u>Track Kms.</u>
BG	3488.80	4380.82
MG	<u>2131.08</u>	<u>2487.89</u>
Total	5619.88	6868.71

Though the major traffic on the zones is of passenger services substantial amount of freight services are also run due to the recent incentives and initiatives introduced by the Railway Administration. The zone is also meeting the defence requirement as the zonal boundary spreads along the entire length of border in the state of Rajasthan with our neighbour country of Pakistan. There are no. of long distances trains serving to all major cities in all the parts of the country i.e. Eastern, Southern, Central & Northern etc. A Rail link between Khokharapar (in Pakistan) and Munabao (in India), a land mark Indo-Pak peace effort, is also served by this railway.

The premier luxury tourist train services – Palace on Wheels (POW) in BG network and Heritage on Wheels (HOW) in MG network are being run by this Railway

There are 4 divisions with their HQ at 4 major cities in the state of Rajasthan as Ajmer, Bikaner, Jaipur and Jodhpur. There are 3 major Workshops at Ajmer, Jodhpur and Bikaner. So far as rake maintenance of passenger coaches is concerned there are 3 major coach depots at Jaipur, Jodhpur and Lalgargh in Bikaner.

Electrical Department of this railway apart from being the nodal agency for monitoring the energy consumption etc. is mainly responsible for operation and

maintenance of all assets connected with electrical power supply arrangements over its entire length and breadth of the zone, water supply pumping installations, diesel generating sets for emergency power supply, air conditioning systems and other activities of train operation like maintenance of illumination and air conditioning systems on passenger coaches, maintenance of electrical power supply track crossings and liaison with various electrical power supply authorities including realization of energy bills, fixation of tariff etc. Chief Electrical Engineer of this railway is also designated as Electrical Inspector to the Govt. so far as railway premises are concerned. Major electrical installations over the zone are given as below.

i)	Total connected load	- 83.666 MW
ii)	Total no. of electrical sub-station	- 145
iii)	Total no. of pumping sets	- 785
iv)	Total no. of central air conditioning plant	- 32
v)	Total no. of room air conditioners	- 954
vi)	Total no. of Water coolers	- 482 + 15 Master water cooler.
vii)	Total no. of electrified stations	- 515 out of a total of 589
viii)	Total no. of DG sets	- 123
ix)	Total no. of electrified quarter	- 32480

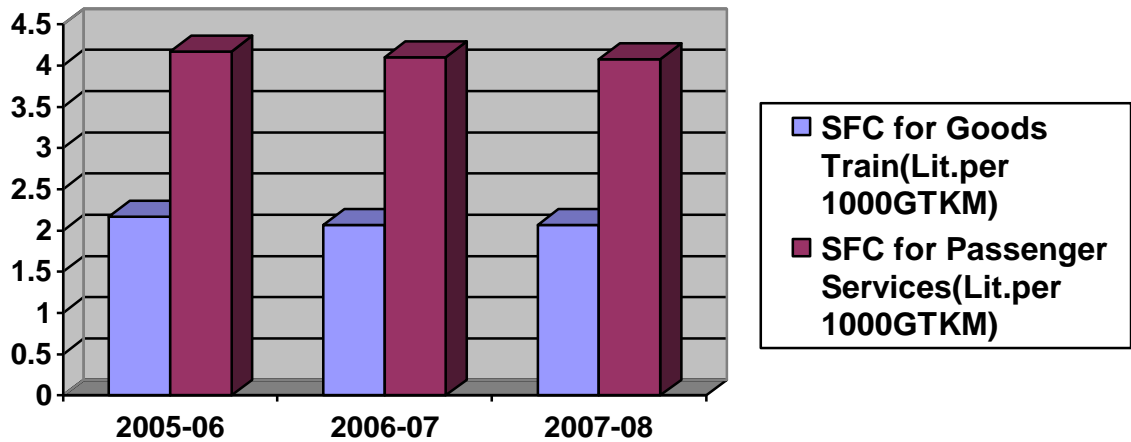
Energy consumption

Since there is no electrified track available on North Western Railway territory, HSD oil is the main source of energy for traction purposes and electricity is used for all purposes other than traction.

Traction

As a result of the number of measures undertaken by this Railway in the field of traction, specific fuel consumption have been improved as shown below:-

S. No.	Specific fuel consumption	2005-06	2006-07	2007-08
1.	For goods train (litre per 1000 GTKM)	2.17	2.07	2.07
2.	For passenger services (litre per 1000 GTKM)	4.17	4.10	4.08



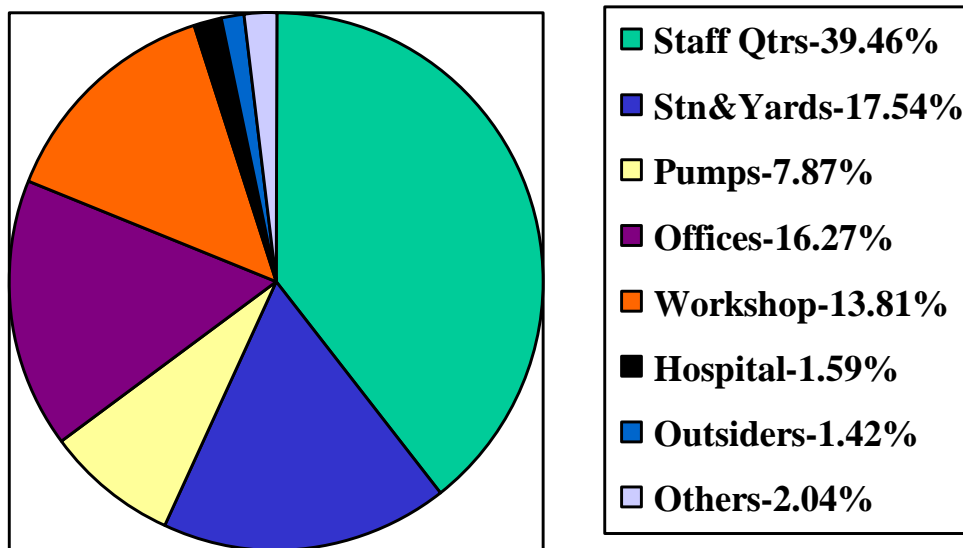
Non traction

For all purposes other than traction, viz. illumination, water supply, ventilation, air-conditioning, manufacturing etc. electricity is the main source of energy in this Railway. As such there is total connected load of 83.666 MW for all service buildings, residential quarters etc. over this Railway.

The total energy consumption along with cost is given below:-

Year	2005-06	2006-07	2007-08
1. Electrical energy purchased (Thousands kwh/year)	72812	75490	79271
2. Cost of electrical energy (Lacs of Rs.)	3005.75	3106.53	3276.54
3. Connected load in KW	76903	78995	83666
4. Specific energy consumption in KWH/KW	79.86	80.85	79.93
5. HSD oil consumed (KL/year)	153266	171342	188408
6. Cost of HSD oil (Lacs of Rs.)	40641.47	48761.32	54476.32

It has been further analyzed that the major electricity consumption to the tune of 39.46% is in staff quarters as shown in the chart enclosed and hence policy is mainly directed towards increasing awareness for use of efficient luminaries and other equipments etc. In this regard brochures were also issued for better awareness amongst the consumers, a copy of which is also enclosed as annexure.



Energy Conservation Commitment, Policy and Set up:-

Energy conservation is the main thrust area of the top management of this railway and hence finds important place in the action plan targets even for assessing annual performance of the persons assigned this role. As the major scope for energy conservation over this railway is in the field of use of electrical power for general services and HSD oil is the main source of energy for traction purposes, Electrical Department of this railway has been assigned the role of Energy Manager for monitoring and control the energy efficiency. As such, an officer at the level of Sr. Administrative Grade i.e. Chief Electrical General Engineer has been nominated to be the Energy Manager at the HQ level reporting through Chief Electrical Engineer to the General Manager. He is mainly responsible for not only monitoring the energy consumption measures on almost daily / weekly basis but also plans the investment proposals and follows up the execution of these projects in time. At the divisional level an officer of the same rank as Additional Divisional Railway Manager is entrusted with this job as Energy Manager.

As such a well designed and designated administrative system with the following agenda is set up at HQ level to reduce specific energy consumption on continual basis:-

- i) To monitor the quantum of energy saving on account of energy conservation initiatives.
- ii) To identify the potential areas for energy savings in consultation with other department
- iii) To suggest measures for better energy efficiency and ensure the implementation.
- iv) To take care of latest technology development in the field of energy conservation.
- v) Arrange energy awareness programme through conferences, seminars, poster campaign, issue of brochures identifying Dos & Don'ts, training programme etc.
- vi) Plans the investment / proposal and arrange sanctions for necessary fund.

At the divisional field level, these programmes and policies are being implemented and executed by the field officers which are being reviewed periodically by divisional Energy Manager i.e. Additional Divisional Railway Manager.

The other policy initiatives are follows:-

- Fixing the target of obtaining ISO certificate by major sub-station & coach maintenance depots as a point for annual performance assessment through ACR.
- Replacement of all geysers in rest houses, train crew rest rooms, retiring rooms, hospitals etc. with Solar Water Heaters.
- Banning on use of heaters and incandescent bulb in offices/ service buildings
- Technical audit of sub-stations in order to enhance safety and energy conservation.
- Daily monitoring of Power Factor at all HT connections.

Further, in line with Energy Conservation Act 2001, officers/ engineers of this railway have been persuaded and sent for training to become certified Energy Manager / Auditor and accordingly three (3) senior officers of this railway have been awarded the certificate by BEE.

Use of Non-Conventional Sources of Energy - There is a strong commitment of this railway administration for use of alternate energy resources like solar, which is in abundance in this area and as such maximum use of solar lighting has been made for electrification of roads on both sides of the Level Crossing gates in this railway and rather bench marking is being proposed for the same. Other uses of solar energy on this railway are for solar water heater and solar distilled water plants.

A work for setting up Wind Power Mill of capacity 10.5 MW has been proposed by this Railway.

Energy Conservation Achievements

There are two sources of energy being utilized in this railway i.e. one HSD oil mainly for traction purposes and secondly electricity for all purposes other than traction.

HSD Oil

As regards the use of HSD oil, a source of energy for traction purposes, following measures have been taken in this railway due to which it has been possible to achieve a significant saving of 1511.69 KL oil during 2007-08.

Measures :

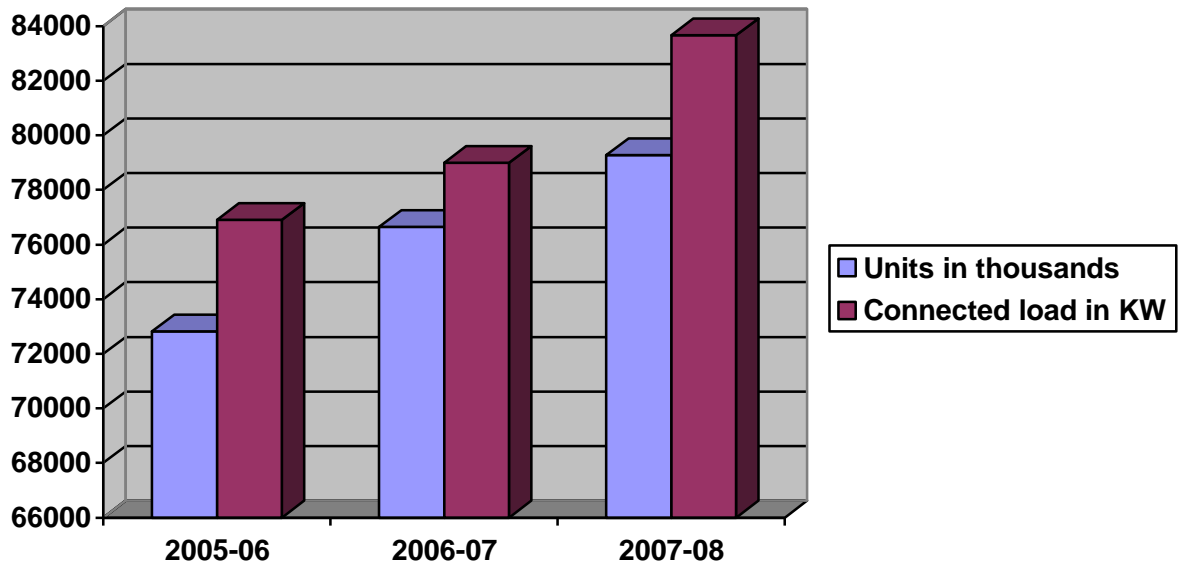
- The sequence of ignition in diesel loco motive has been improved using latest technology.
- Leakage of pipe of the diesel loco motive have been connected back to the fuel tank instead of draining out thus saving costly HSD oil.
- Constant and intensive training to driver of locomotive for improving their driving, technique including the maximum use of dynamic breaking to optimise fuel consumption.
- Bench marking of the fuel consumption in different sections during the trip for comparison of various driving techniques has also resulted into the fuel saving.
- Use of microprocessor based techniques for governor control mechanism of diesel engine of the loco motive has resulted in fuel saving.
- Instructions for shutting down of the diesel engine of the locomotive in case of any out of course stoppages for more than 30 minutes.

As a result of above, saving achieved is given as below.

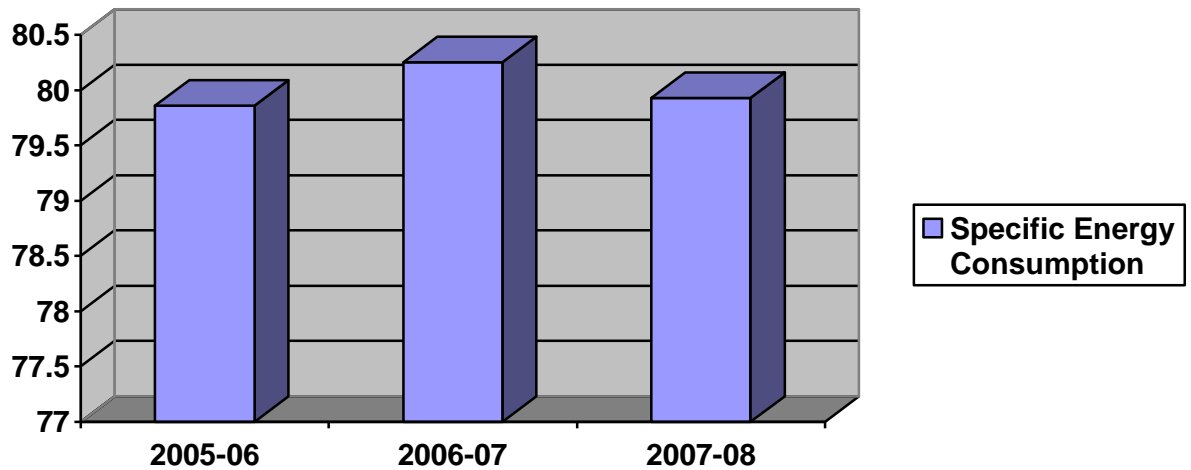
	<u>2005-06</u>	<u>2006-07</u>	<u>2007-08</u>
Saving achieved in KL/year due to implementation of EC measures/projects	1417.89	1622.17	1511.69

ELECTRICAL ENERGY:

ENERGY PURCHASED v/s CONNECTED LOAD



Specific Energy Consumption



The specific electrical energy consumption was maintained at 79.93 kwh/kw in year 2007-08 which is 0.4% less as compared to last year i.e. 2006-07.

However, following are the Energy Conservation measures and the achievements thereof in use of electrical energy over this railway for purposes other than traction.

Sub-stations Standby transformers are kept switched off and are being used in rotation so as to save no-load losses.

- Technical auditing is carried out on all sub-stations.
- APFC panels are installed at all HT and LT supply points so as to maintain the power factor above 0.97. Beside saving in energy it also yields rebate from DISCOM authorities as given below:

Year 2005-06	Rs. 41.06 lac.
Year 2006-07	Rs. 59.54 lac.
Year 2007-08	Rs. 60.82 lac.

Lighting

- i) At all the railway platforms of this railway, lighting circuits have been divided such that only 30% lights are being switched ON at all times and remaining 70% lights are switched ON before 15 to 30 minutes to arrival of the train and these lights are again switched off 10 minutes after the departure of the train.
- ii) In order to have better illumination of circulating areas in front of station buildings, high mast towers are being used instead of individual pole lighting. This has not only resulted into less connected load but with the use of electric timers for switching off the 70% of the lighting during non peak hours, it has been possible to achieve a saving of 23725 units i.e. an amount of Rs. 97747 per annum at each location.
- iii) Similarly streetlights in the residential colony and other service areas are also controlled by timer switches.
- iv) Extensive use of electronic ballast in place of conventional ballast resulted a saving of approximately 16 lakh unit i.e. an amount of Rs. 66 lakhs per annum approximately.
- v) Use of T-5 tube light fittings as a retrofit on replacement accounts as well as compulsorily for all additional new points resulted a saving of approximately 20 lakh unit i.e. an amount of Rs. 82 lakhs per annum approximately.
- vi) Mandatory use of 9/11/13W CFL tubes in all corridors, varandah, toilets, staircase etc.
- vii) Use of 4x14W tube light luminaire for illumination of streetlights in place of 75W/110W etc. HPSV luminaire in phased manner.

Air-conditioning & Cooling.

- i) Use of blowers and switching off compressors during non peak hours in central air-cooling plant.
- ii) Regular cleaning of AHU filters and use of de-scaling agent in water cooling circuits.
- iii) Use of master water coolers in place of distributed water cooling units on railway platforms.

Pumping installations.

Mandatory use of time switches in all the water supply pumping installations to control the working as per requirement. Pipeline leakages are also not allowed and being plugged in to reduce water and energy losses. Shunt capacitors are being provided necessarily for maintaining the desired power factor.

Diesel Generating Set

Provision of AMF panel to control the working period and regular maintenance is being done for achieving an optimum specific oil consumption of all standby DG sets.

In Workshops

- i) Old inefficient equipments are being replaced by energy efficient machines in phased manner.
- ii) Air leakages in compressed air pipeline are being attended to on regular basis.

Train Services

Passenger coaches are being provided with CFL fittings of lesser wattage which resulted in not only the better illumination but reduce the electrical load on its alternator which has further resulted into less tractive load on the locomotive and hence in direct saving in fuel consumption. It is also having bearing on the less use of electrical energy required for charging of the batteries at periodical interval as the frequency has reduced and hence resulted into saving of electrical energy.

ISO Certification.

By fixing the target of achieving ISO certification for the sub-station and major electrical coaching depot on this railway, it has been possible to establish the procedure and working instructions which has got direct bearing on energy conservation, though no quantification has been made in this regard.

Awareness Programme for consumers

- i) Leaflets/pamphlets indicating various energy saving tips have been distributed to domestic consumers (copy enclosed).
- ii) In house training program for staff and workmen for energy conservation at their work place as well as in their practices.
- iii) Arranged awareness program viz –essay writing quiz, slogan, painting competition for children and staff.
- iv) Extensive use of electronic energy meters have been made replacing the old electro-mechanical energy meters in all staff quarters.

It has been observed that this single step has created great awareness in the occupants to switch off lights and other gadgets when not required as it records even the miniscule of wattage being used by mosquito repellent, sleep mode of TV etc.

Use of non conventional sources of energy

- i) 46 nos. Solar Hot Water Plants of 35500 LPD total capacity are provided at running rooms, rest houses, training schools, hospitals etc. with a cumulative of 129 nos. resulting in net saving of 355500 kWh amounting to Rs. 14.65 lacs.
- ii) 30 nos. Solar Distilled Water Plants of 50 LPD capacity are provided at coaching depots, workshops, diesel sheds etc. resulting in net saving of 648000 kWh amounting to Rs. 26.70 lacs.
- iii) Solar Lighting arrangement is provided at stations, level crossing gates etc. where provision of electrical supply is not economical resulting in net saving of 40920 kWh amounting to Rs. 1.68 lacs.
- iv) Solar Lanterns have been provided to Station Masters of stations where provision of electrical supply is not economical.

Saving achieved in kwh/year due to implementation of EC measures	<u>2005-06</u>	<u>2006-07</u>	<u>2007-08</u>
	14.04 lac.	26.45 lac.	47.99 lac.

Environment and Safety

The administration of this railway is well aware of and fully respect its obligations to the society and is committed to ensure a pollution free healthy environment not only to its employees but to the community at large as well. In this regard sound environmental management practices are being adopted and all endeavor is made to strive for continual improvement in this direction. It is hereby mentioned that the following actions have been undertaken.

- i) Affluent treatment plants have been installed at diesel loco sheds and major workshops to ensure pollution free waste water to be discharged.
- ii) Sewerage treatment plants are installed for treating the sewerage water.
- iii) Incinerators have been installed to burn the medical waste in large divisional hospitals of this railway.
- iv) All the emergency power supply diesel generating sets have been provided with acoustic panel to reduce noise pollution.

In this regard, it is mentioned that 2 nos. of mobile power cars attached in the most prestigious train rake of "Palace on Wheels" being maintained by this railway have been provided recently with the acoustic panel which has resulted into an appreciable reduction of noise pollution from earlier levels of 100DB to 85DB.

- v) All the diesel generating sets are being maintained as per the schedule recommended by the manufacturer in order to reduce and control the pollution from exhaust emission of these sets.
- vi) It is also mentioned that plans are afoot for replacement of the overhead electrical power lines by underground cable as a safety measure to avoid accidents.