Chapter 3 – Electrical – Signalling and Telecommunication units

The Electrical department is responsible for safe train operations and maximizing the utilization of fixed and moving assets such as train rakes, locos and tracks etc. At Railway Board level, the Electrical Department is headed by Member (Electrical) who is assisted by three Additional Members for Electrical, Telecommunication and Signalling.

At Zonal level, the Electrical Department is headed by Chief Electrical Engineer who is responsible for operation and maintenance of Electric Locos, EMU, MEMU, Overhead Electrical Equipment (OHE), its maintenance and operation, planning, electrical coaching stock, operation and maintenance and electrical general power supply, air conditioning, diesel generating set operation and maintenance and water supply. The Signalling and Telecommunication department is headed by Chief Signal & Telecommunication Engineer (CSTE) who is responsible for maintenance of signaling assets.

The total expenditure of the Electrical Department during the year 2013-14 was ₹60,003.81 crore. During the year, apart from regular audit of vouchers and tenders, 605 offices of Electrical and Signalling & Telecommunication department of Railways were inspected by Audit.

This chapter includes three individual paragraphs regarding purchase of electricity at higher rate by ECR Administration; under-utilization of electric traction by SR Administration leading to non-achievement of projected saving; and defective planning of CR Administration in replacing traction system.

Paragraphs related to Electric department of Indian Railways

3.1 East Central Railway (ECR): Purchase of electricity at higher rate

Avoidable expenditure of ₹27.13 crore on account of purchase of electricity at higher rate from Jharkhand State Electricity Board (JSEB) instead of purchase from Damodar Valley Corporation which provided a more reliable power supply at lower rates

Dhanbad Division of East Central Railway (ECR) was purchasing electricity for Dhanbad and Gomoh Railway Complexes from the Jharkhand State Electricity Board (JSEB) since April 2001 (earlier from Bihar Electricity Board) for non-traction[132] purposes.

During review of records of Dhanbad Division, Audit noticed that ECR Administration approached (1999 to 2001) Damodar Valley Corporation (DVC) for procuring power supply directly through their source at Dhanbad and Gomoh Railway complexes for non-traction purposes. The decision was taken on account of erratic electric supply[133] position of JSEB at these complexes and on the basis of cost-benefit analysis (March 2000) that showed annual saving of ₹1.20 crore (based on tariff rate between April 1998 and March 1999) in case of taking power supply directly from DVC.

Audit reviewed the records of power supply of Dhanbad and Gomoh Railway complexes for the period from September 2004 to December 2014. Audit noticed that though proposal for direct power supply from DVC, based on cost benefit analysis and reliable source of power supply, was made for both Dhanbad and Gomoh Railway complexes, it was implemented (August 2004) only for Gomoh Railway complex. The Dhanbad Railway complex is still receiving power supply from JSEB.

Thus, Dhanbad Railway Complex continued to procure power from JSEB despite the availability of electricity at cheaper rate from DVC and erratic supply of electricity by JSEB (Average supply failure during 2010-13 increased to 116 hours per month in comparison to the 103 hours per month during 2000-04). This resulted in avoidable extra payment of ₹27.13 crore[134] on account of electricity charges during September 2004 to December 2014.

When the matter was taken up with ECR Administration in April 2014, they stated (August 2014) that

(i) Non-implementation of any proposal due to financial constraints should not be treated as failure. Proposal for supply of power from DVC was initiated for both stations (Dhanbad and Gomoh) but

[132] Running auxiliary and support services such as electricity towards station, offices, residential quarters and colonies, yards, workshops, water supply air conditioning etc.
[133] Average supply failure during 2002 was 103 hours per month at Dhanbad and 167 hour per month at Gomoh
[134] The loss was calculated on basis of difference of rate of power supply from DVC at Gomoh Railway Complex and from JSEB at Dhanbad Railway Complex.

approved and implemented only for Gomoh Railway station based on the lower initial investment (₹9 lakh in comparison to ₹35.45 lakh for Dhanbad) required by DVC for survey/ supervision charges for taking direct power supply and more erratic power supply (power failure of 167 hours per month in comparison to 103 hours per month at Dhanbad during the period 2000-04). Audit has not taken into consideration the above initial investment

(ii) Dhanbad Railway complex is being supplied electricity from three separated sources of JSEB which enable more reliable power supply even if one source is not available. If DVC supply is taken at one point and JSEB connection is surrendered, the reliability of the power supply will be compromised. Moreover, integration of existing network to enable power supply from single source to all locations will incur extra investment which was also not taken into consideration by Audit.

The above replies are not acceptable to Audit in view of the facts that-

(i) DVC demanded (February 2002) ₹35.45 lakh from ECR Administration as estimated service charge for direct supply at Dhanbad Railway complex. However, Divisional authorities did not approach higher authority for fund provision in this regard. The reason for the same was not on record of ECR Administration. Moreover, initial investment (₹35.45 lakh) required by DVC as survey/ supervision charges and expenses to be incurred for laying of transmission line (integration of network) are one-time expenses and the pay-back period would be very small considering the huge monetary saving as energy charges are lower than that of JSEB. Further, ECR Administration did not have data on record in respect of expenditure to be incurred in laying of transmission line, as such, the same has not been taken into consideration while analyzing avoidable expenditure.

(ii) ECR Administration approached (2000) DVC for direct power supply to overcome the erratic and unstable power supply of JSEB. They also proposed for obtaining power supply through a separate dedicated feeder line of DVC keeping in view the quality of power as well as reliability. As such, Railways' contention that surrendering JSEB connection will compromise the reliability of power supply is not sustainable.

The matter was brought to the notice of Railway Board in February 2015; their reply has not been received (May 2015).

3.2 Southern Railway (SR): Under-utilization of electric traction and consequent non-realization of projected savings

Under-utilization of electric traction even four years after commissioning in the Tiruchchirappali – Dindigula (TPJ-DJ) section deprived SR Administration of projected savings of ₹9.23 crore. Further, under-utilization of electric energy supplied in the Section led to payment of maximum demand charges and low power factor charges to State Electricity Board (TNEB) amounting to ₹4.49 crore.

The electrification of Tiruchchirappali – Madurai (TPJ-MDU) section was sanctioned (2007-08) by Railway Board at a cost of ₹96.85 crore.

Review of records of detailed sanctioned estimates of electrification project revealed that SR Administration estimated an annual savings of ₹12.88 crore per annum after commissioning of the electric traction in the section between Tiruchchirappali- Dindigul (TPJ-DG). This saving would be on account of savings in operating cost of running trains in electric traction instead of existing diesel traction. Besides, SR Administration projected that 3 goods trains, 20 mail/express trains and 3 passenger trains would run on electric traction after the commissioning.

To feed energy to TPJ-DG section, two traction substations (TSS) at Vaiyampatti (VPJ) and at Dindigul (DG) were energized during December 2010 and March 2011 respectively. Electrification of the TPG-DJ section was completed and commissioned (March 2011).

A. Records of train operation on the above section after commissioning (March 2011) revealed the following:

(i) Goods train services with electric locomotives were introduced from March 2011. However, due to shortage of trained crew staff (Loco pilots) for electric traction, running of goods trains was not regular on this section. The number of running of goods trains was reduced from 10 to 4 during September 2011 to January 2012;

(ii) Regular Mail/express train services with electric locomotives were introduced from September 2011. Three pairs of mail/express trains and one pair of passenger train were operated (September 2011) with electric locomotives which was reduced to two pairs of mail/express trains (October 2011) and further reduced to one pair of mail/express train from February 2013.

(iii) Traction distribution (TrD) branch of Madurai Division requested its Traffic Branch from time to time (April 2011 and January 2012) to operate more trains with electric locomotives to avoid idling of assets created and to achieve the projected savings.

Madurai Division (SR) attributed (April 2011 and January 2012) the reason for less operation of Goods and Mail/ Express trains to shortage of trained crew staff.

Further review of records of trained crew staff during the period from May 2011 to March 2014 revealed that even after four years of commissioning of electric traction in the section, only 36 per cent of crew staff could be trained for electric traction. Audit also observed that the availability of crew and loco link suitable for AC traction route[135] was not analyzed by Railway Administration at the time of electrification of the project. Moreover, despite improvement in the position of trained crew (27 per cent in May 2011 to 36 per cent in March 2014), operating department of the Division could not plan for operation of more trains on electric traction.

From the above findings, it is evident that despite the electrification of TPG-DJ section, SR Administration could not fully operate mail/ express trains with electric locos instead of diesel locos as planned in the detailed estimates. This deprived SR Administration of the projected savings. Audit assessed the non-saving due to under-utilization of electric traction in the section at ₹9.23 crore.

B. Audit further noticed that in terms of TNEB rules, in case of high tension consumers, maximum demand charges would be levied on demand actually recorded or 90 per cent of sanctioned demand whichever was higher and in case average power factor was less than the stipulated limit of 90 per cent, low power factor charges would be levied. In case of this section (TPJ-DG), maximum demand charges (₹2.03 crore) had to be paid as no power was drawn from December 2011 to June 2013 (except during August 2012) after commissioning of traction sub-station (September 2011). Also, as power factor could not be maintained on the section due to non-drawal of power, low power factor charges (₹2.46 crore) had to be paid.

As such, SR Administration had to make payment of ₹4.49 crore (₹2.03 crore + ₹2.46 crore) on account of Maximum demand and low power factor charges to State Electricity Board due to under utilization of electric energy supplied in the Section.

The matter was brought to the notice of SR Railway Administration in August 2014. In reply they stated (December 2014) the savings and running of Goods/ Mail/ Express trains were projected for entire electrification of TPJ-MDU section and not only for TPJ-DJ section. It was also stated that availability of trained loco pilot is not the only criterion for running more trains with electric loco and crew, but operational feasibility/ flexibility are more important to ensure efficient and smooth operation of trains. Reduction in train services on electric traction was due to the combined reason of sub-optimal utilization of crew occasioned by the partial extension of electric traction only upto Dindigul, exacerbated by severe crew shortage which came in the way of the administration being able to send diesel crews for conversion training.

The above replies confirm that, before investments in the electrification project, SR Administration had not taken into consideration issues regarding operational feasibility such as adequate trained crew manpower for smooth operation of trains over electric traction. Audit noticed that as per detailed

[135] The route where trains are running with electricity and electric loco used for the purpose instead of diesel loco

sanctioned estimate, separate projections were made for projected savings (₹12.88 crore for TPG-DJ section and ₹10.41 crore for DJ-MDU section) and running of trains for TPJ-DG and DH-MDU sections. Moreover, shortage of trained staff to operate electric locomotives could not be accepted as reason for allowing the investment to remain idle resulting in non-achievement of the stated objectives. Further, additional expenditure was also incurred due to payment of maximum demand charges and low power factor charges to State Electricity Board.

The matter was brought to the notice of Railway Board in March 2015; their reply has not been received (May 2015).

3.3 Central Railway (CR): Avoidable expenditure of ₹5.89 crore due to defective planning of works

Inadequate planning for replacing 22KV/2.2 KV DC traction system in Mumbai suburban sections of Central Railway for providing power supply to stations and the belated decision to retain it three years after works were commenced resulted in avoidable expenditure of ₹ 5.89 crore

The traction system in Mumbai suburban section was on Direct Current (DC). The work of converting this into Alternate Current (AC) system has been ongoing since 1998-99 in Central Railway and is still in progress. In DC traction system, the power supply to signalling equipments, stations and service buildings is provided by traction supply feeders by stepping down from 22 KV to 2.2 KV. However, in AC traction system (25KV/230V) being provided in Mumbai Suburban section, the power supply to signalling system etc. is supposed to be provided by 2 Auto Transformers(AT) provided at each station along with local supply. In addition 1 AT is to be installed at each station to work as main supply to feed supply to indicators, announcing system, UTS, clocks, CCTV and also platform power supply(30 per cent) and local supply was to act as standby, for above and 70 per cent of lighting load in normal course.

As a part of DC- AC conversion**,** based on the proposals of Central Railway, Railway Board sanctioned two works for off loading 2.2 KV traction feeders used for general services by providing State Electricity Board (SEB) supply in the normal course and Diesel Generator (DG) sets as standby source of supply for important stations, cabins and other service buildings of Mumbai division in 2006-07 and 2007-08 at a total cost of ₹ 2.88 crore and ₹ 4.55 crore respectively.

Against the above two sanctioned works, Dy. Chief Electrical Engineer (Construction), Central Railway, Dadar awarded contracts for the work "provision of Diesel Generator (DG) sets of various capacities, construction of DG set rooms with provision of power supply arrangement" to M/s. New Adarsh Electrical Works, Thane for 19 suburban stations, and to M/s. R D Electricals, Mumbai for 30 stations on suburban sections of Mumbai division in November 2007 and April 2008 at a total cost of ₹2.58 crore and ₹4.45 crore respectively. The completion period of the work was 12 months from the

date of issue of letter of acceptance. Against the sanctioned work of 2006-07, another contract for 'augmentation of power supply arrangement from MSEDCL for the stations on suburban section of Mumbai division' was awarded to M/s. Laxmi Electrical works in October 2008 at a total cost of ₹0.87 crore with completion period of six months.

While the above works were nearing completion, in December 2010, Chief Electrical Engineer (CEE), Central Railway submitted a detailed note to General Manager (GM), Central Railway for retention of 2.2 KV system for feeding general services power supply specifying various reasons such as unreliability of DG sets, high cost of its operation, demand for land by the power supply authorities for setting up sub-stations at many stations, passengers safety, security and maintaining law and order in the event of power supply interruption at suburban stations. Further it was stated in the note that the 22 KV/2.2 KV system was also being retained on Western Railway as it is an old proven system with feasibility of capacity augmentation. GM, Central Railway accorded his administrative approval to retain 2.2 KV DC power supply system for suburban area in December 2010.

It was observed in Audit that by December 2010, 45 DG sets were supplied by the contractors and 43 cabins were constructed to house the DG sets. The total expenditure incurred on the above works during 2006-07 to 2014 -15 was ₹ 8.83 crore.

Out of the above, only 13 DG Sets were retained for use in stations of sections beyond the Chhatrapati Shivaji Terminal, Mumbai (CSTM) – Kalyan section and the remaining 32 DG sets and related works together costing ₹ 5.89 crore became redundant.

The failure in planning and extra ordinary delay in setting it right leading to financial loss was taken up with Central Railway Administration in July 2014. In reply (December 2014) they justified the decision on following grounds:

i) Central Railways decision to feed power supply to indicators, announcing systems etc .and also platform power supply of 30 per cent by providing AT was not technically feasible.

ii) 2.2 KV system of power supply in Mumbai has been an independent system with proven record of high reliability.

iii) Providing land to State Electricity Board for making necessary infrastructure to provide additional load etc. would be difficult at many stations.

iv) Feeding 70 per cent General Services load from local supply was not advisable due to unreliability of uninterrupted supply and taking into account passenger safety, security, maintaining law and order in Mumbai suburban services with heavy traffic.

v) Railway Board's stipulation (December 2010) that exclusive supply for general services load such as indicators, announcing system, CCTV and platform supply is not permissible as per existing guidelines of Railway

Board and therefore, Railway should plan for independent power supply arrangement for general service application as was existing earlier in the past.

vi) There was an approximate saving of ₹ 12 crore by retaining 22KV/2.2 KV system.

Central Railway Administration further stated that all DG sets procured are in good condition and are being handed over to other units as per their requirement 22 DG sets have already handed over and ₹ 1.22 crore was realized and another 10 sets were planned to be used in running rooms at various stations etc.

The reply furnished is not acceptable since:

i. The factors now brought out by Railway Administration such as the lack of technical feasibility of the works sanctioned and the annual saving of ₹12 crore anticipated by retaining the 22KV/2.2 KV system should have been considered before sanctioning and commencing the works. But this was not done. Thus the sanction and commencement of work was without due process of consideration as prescribed in Indian Railways Financial Code and Indian Railways Engineering Code[136] for planning and sanctioning works/ investment decision.

ii. Further, it was three years after the contract was awarded and an expenditure of ₹ ₹8.83 crore incurred on the work, that Chief Electrical Engineer, Central Railway in December 2010 had proposed for dropping the works and opting for 22KV/2.2 KV system. This points to inordinate delay in setting right the mistakes in planning.

iii. The transfer of DG sets and realization of credit for it from other Railway units would not wipe out all losses involved as 50 per cent of the codal life of DG Sets (10 years) has already expired. Audit observed that out of 43 cabins created for housing the DG Sets, 14 were being used for other purposes such as CCTV control room by RPF etc. and 29 still remained to be allotted and used

Thus inadequate planning for replacing 22KV/2.2 KV DC traction system in Mumbai suburban sections of Central Railway for providing power supply to stations and the belated decision to retain it three years after works were commenced and an expenditure of ₹ 8.83 crore had been incurred, resulted in avoidable expenditure of ₹ 5.89 crore after taking into account the savings on transfer of surplus DG sets elsewhere.

The matter was brought to the notice of Railway Board in February 2015; their reply has not been received (May 2015).

[136] Chapter II of Indian Railway Finance Code and Chapter of II of Engineering Cod