

Executive Summary

Indian Railways (IR) runs 9,212 freight and 13,313 passenger trains over its vast network of 66,687 Route Kilometers (RKM) and carries more than 1,000 million tonnes of freight traffic per year and about 22 million passengers every day. These trains are hauled either by diesel locomotives or electric locomotives. The total expenditure on energy/fuel (on BG routes) during 2015-16 was ₹ 23,699 crore, of which expenditure on cost of diesel was 56 *per cent* and the cost of electricity was 44 *per cent* in 2015-16. As on 31 March 2016, 27,999 (42.40 *per cent*) out of 66,687 Route Kilometers (RKMs) have been electrified across IR. During the last five years, 1165 to 1730 RKMs have been electrified, and ₹ 678 crore to ₹ 1668 crore spent on RE projects annually.

Ministry of Railways has taken new initiatives for accelerating the pace of Railway Electrification (RE). The present capacity of IR to carry out the electrification projects is proposed to be enhanced and it has recently drawn up (August 2016) an Action Plan for railway electrification of 24,400 RKMs of BG network in the next five years i.e. 2016-17 to 2020-21. In addition to Central Organisation for Railway Electrification (CORE), a specialized agency which was set up for railway electrification, IR had also been entrusting RE projects to Rail Vikas Nigam Limited (RVNL). In a recent development, in order to achieve the target of 24400 RKM by 31 March 2021, IR has decided to assign RE projects to Indian Railway Construction Organization (IRCON), Rail India Technical and Economic Services Limited (RITES) (Railways' PSUs) and Power Grid Corporation of India Limited (PGCIL) (a PSU under the Ministry of Power) having expertise in laying the transmission lines in India and abroad.

Audit reviewed the various stages of project management including approval process, identification of implementing agency, project planning, project execution by various implementing agencies and post project utilisation of the completed RE Projects.

It was noticed that the pace of electrification in terms of RKMs improved and against 1165 RKMs electrified in during 2011-12, 1730 RKMs were electrified during 2015-16. However, audit noticed delays in every stage of project planning to project execution in the 36 selected RE projects reviewed, which indicated that there is scope to further improve the pace of electrification.

No prioritization was done by the Railway Board amongst projects approved by it, taking into account their intended financial and operational benefits.

Substantial delays in completion of the projects, led to increase in the capital cost of the projects and in the loss of opportunity of cost of money of the capital invested.

Delay in completion of projects led to substantial time and cost overrun in the selected projects reviewed by Audit. Delays in completion also led to non-achievement of projected savings. Significant delays were noticed in completion of balance activities of RE projects for which sanction of Commissioner of Railway Safety (CRS) had been received. These delays had adversely impacted effective utilization of the RE projects.

Important Audit Findings

- The time taken for sending the abstract estimate by the concerned Zonal Railway to the Railway Board and its approval by Railway Board ranged up to 59 months in 24 projects. The objective of saving time for deciding whether or not to take up a section for railway electrification is not being fulfilled due to delays in processing the proposals and preparation of abstract estimates. Variations of six *per cent* to 62 *per cent* between the abstract and detailed estimates indicated that the system of abstract estimates was hardly adding value to the process. The percentage variation was more than 40 *per cent* in respect of Karepalli-Bhadrachalam, Shakurbasti-Rohtak, Jhansi-Kanpur, Barauni-Katihaar-Guwahati and Guntakal-Kallur projects. **(Para 3.1)**
- Time taken by Railway Board after inclusion of the RE project in the Annual Works Programme for assigning CORE as agency was up to 337 days in 17 projects, whereas for RVNL, it was up to 202 days in six projects. While CORE took up to 229 days for assigning project to Chief Project Directors, RVNL took up to 40 days in assigning project to their Chief Project Managers. **(Para 3.3)**
- For the projects assigned to CORE, the time taken after the project appeared in the Annual Works Programme, to the approval of the detailed estimates was up to 35 months in 27 projects. For projects assigned to RVNL, the time taken was up to 18 months in seven projects. **(Para 3.4)**
- Practices such as e-tendering which help in reducing tender processing period significantly were yet to be adopted in CORE or RVNL. The time taken for the issue of NIT after sanction of detailed estimates was up to 3177 days in 24 projects assigned to CORE and up to 915 days in 12 tenders in seven projects assigned to RVNL. The time taken was 3177 days in Barabanki-Gorakhpur-Barauni project, 2905 days in Barauni-Katihar-Guwahati project, 2179 days in Ujjain-Indore and Dewas-Maksi project, 2135 days in Tiruchirappalli-Madurai

project, 2100 days in Varanasi-Lohta-Janghai project and 2003 days in Shakurbasti-Rohtak project. Thus, the tenders were processed without giving due regard to the objective of completion of project in time. To execute a project, up to 116 tenders were issued by CORE. 116 contracts were awarded in Barabanki-Gorakhpur-Barauni project, 53 in Itarsi-Katni-Manikpur-Chheoki project, 46 in Barauni-Katihar-Guwahati project, 30 in Khana-Sainthia-Pakur project, and 29 in Ujjain-Indore and Dewas-Maksi project. Over the years, the number of contracts awarded per project continued to be very high.

(Para 4.2.1, 4.2.2)

- While accepting tender, position of work experience and turnover of the firm were assessed in most of the tenders by CORE and RVNL. But, assessment of solvency/financial soundness of the firm were not done by CORE. Further, assessment of likely impact of the workload of the firm on its ability to complete the work was not made by the tender committees of CORE, whereas it was considered during assessment by RVNL. The past performance of the bidders was not assessed in both CORE and RVNL while evaluating the bids.

(Para 4.3)

- The agreements in CORE were executed up to 798 days after issue of Letter of Acceptance. The time taken was 798 days in Ujjain-Indore and Dewas-Maksi project, 661 days in Barabanki-Gorkhpur-Barauni project, 387 in Krishnanager-Lalgola project, 376 in Barauni-Katihar Guwahati project and 374 days in Shakurbasti-Rohtak project. Similarly in RVNL, agreements were signed beyond the prescribed period of 28 days in nine out of ten contracts in seven projects up to 204 days subsequent to the issue of Letter of Acceptance. The time taken was 204 days in Amla-Chindwara-Kalumna project and 175 days in Chappra-Balia-Varanasi project. The delays had a consequential impact on the execution and completion of the work.

(Para 4.4)

- There were substantial time and cost overruns due to delays in completion, which also led to non-achievement of projected savings. On an average, 16 completed projects got delayed by 35.12 months. In 14 projects out of these, there was a cost overrun of 2.02 *per cent* to 76.62 *per cent*. In 12 out of these projects, there were balance activities yet to be completed. In 10 ongoing projects, the targeted date of completion was over 21 months to 57 months back. In respect of 21 projects, projected savings of ₹ 3006 crore could not be achieved due to delay in completion of the projects.

(Para 4.5.1)

- For 21 projects executed by CORE, the original period of completion was 3954 months. Total 2026 extensions for 8190 months were granted by CORE in these projects, which increased the time of execution of the contracts by more than two times. Similarly, for six projects executed by RVNL, the original period of completion was 281 months. Total 30 extensions for 208 months were granted by RVNL, which increased the period of execution of the contracts by almost 74.02 *per cent* in these projects. **(Para 4.5.2.1)**

- Extensions were granted to the contractors in a routine manner. Of the 481 contracts reviewed in audit, in 419 contracts, extensions were granted. Overall 2086 extensions were granted to various contractors by CORE and RVNL. Out of 2086, 1446 extensions (69 *per cent*) were granted without mentioning the clause under which these were allowed. The reasons for extensions included non-availability of material for foundation, delay in receipt of material, non-completion of Traction sub-station (TSS), non-deployment of sufficient manpower etc. on contractor account and delay in handing over of land for depot/TSS, yard-remodeling of section, delay of work by Engineering Department, change in scope of work, non-approval of drawing, non-completion of transmission line, non-supply of material etc. on Railway account. The mechanism available to the Railway administration to ensure timely completion of projects was through levy of liquidated damages (LD), levy of penalty and termination, which was not being used effectively. LD was not imposed in most of the cases of extensions and only token penalty was recovered from the defaulting contractors. As assessed by Audit, against leviable LD of ₹ 250.28 crore, only ₹ 0.93 crore was recovered by CORE and as against ₹ 29 crore, only ₹ 4.66 crore was recovered by RVNL in form of LD and token penalty.

(Para 4.5.2.1 and 4.5.3)

- To undertake works on sections, a 'block' (part of the section) is provided by Operating Department to the implementing agency, which is to be utilized for execution of work. During this time, the traffic on the section is suspended partly/completely as per requirement. Availability of blocks and utilization by the implementing agency and the contractors is one of the critical areas for completion of the RE projects within the prescribed cost and time. It was seen that no benchmark for utilization of block has been prescribed by the Railway administration for RE Projects. **(Para 4.8)**

- Though instructions of Railway Board existed for fixing time for processing of the bills for payment right from the stage of measurement in various offices, no such time limits were prescribed by CORE. **(Para 4.9)**
- A number of balance activities such as completion of work of transmission lines, completion of work of TSS, electrification of sidings, activities in yard attributable to implementing agencies for Railway electrification were yet to be completed in 16 out of 17 completed RE projects despite CRS sanction. Many of these balance activities were critical for effective project utilisation of the electrified sections. **(Para 5.1)**
- There were instances of sub-optimal utilization of the electrified sections. In 12 electrified sections, only up to 59 *per cent* trains were being run with electric traction. The shortfall in achievement of projected savings with respect to present utilisation was ₹ 404.05 crore in 14 projects. **(Para 5.2)**
- In 66 electrified sections (15286 RKM), of 15 Divisions of eight Zonal Railways, 345 trains were being run through Diesel Traction on electrified sections due to reasons such as missing links, balance activities yet to be completed, coordination issues between Zonal Railways, terminal constraints, shortage of electrical locomotives for passenger and goods trains and MEMU rakes etc. **(Para 5.3)**

Recommendations

1. ***The viability of RE project will depend on (i) the anticipated saving by use of electric traction as compared to diesel traction and (ii) capital cost of electrification. Electric traction being more economical than diesel traction, the saving will be directly related to the Gross Tonne Kilometers (GTKM) transported using the electric traction. Since electrification involves significant capital cost, an RE project would be viable only if certain threshold level of GTKM is achieved. If the prices of diesel fall, for an RE project to become viable, higher GTKM will need to be transported. Similarly fall in electricity rates or increase in diesel prices would make RE projects viable at lower level of GTKM expected to be transported. Therefore broadly higher the expected traffic in terms of GTKM to be hauled, higher will be desirability of the RE. The process of preparation of Abstract Estimate may be simplified by replacing it with a 'Go Ahead Sanction' based on simple essential parameters like potential Gross Tonne Kilometers (GTKM) to be transported on the electrified track/section.***

The other detailed aspects being covered under Abstract Estimate should be incorporated in Detailed Project Report (DPR).

- 2. All new line projects should be assessed simultaneously with and without electrified routes instead of current practice where new lines are assessed without electrification and electrification is added as a supplementary and subsequent activity. This way if viable, the line project can be taken up with electrification from the beginning.*
- 3. The identification of executing agency and its field formations should be expedited.*
- 4. For preparation of DPR the designated agency should be given a fixed timeline say three months for completing the work.*
- 5. Since inputs from the Divisional Railways, Zonal Railways and Railway Board are crucial for DPR, involvement of Railway Board officials would be a significant positive in preparation of DPR in time and of desired quality. The preparation of DPR should be done by agencies other than RVNL/other executing PSU, as remuneration to RVNL/other executing PSU in the form of management fees has a positive linear relationship with the cost of the project.*
- 6. The projects should be prioritized on the basis of the expected financial and operational benefits and project execution methodology such as Engineering, procurement and commissioning (EPC), or turnkey may be used as far as feasible as this would enhance accountability of the contractor, minimize co-ordination issues and make monitoring of the projects easier.*
- 7. Monitoring of projects should be given due importance. Project scheduling tools and time and resource optimization techniques such as CPM/PERT should be provided for in the DPRs.*
- 8. E-tendering should be implemented and various activities of tender evaluation should be done in parallel.*
- 9. Large number of tenders require closer monitoring and handling of coordination issues on account of multiplicity of tenders. Therefore, a project should be executed in a way that the number of tenders are minimized.*
- 10. Timelines for various activities in tender processing may be prescribed so as to complete tender evaluation process within a reasonable time. Last Accepted Rates (LAR) should be up dated by maintaining appropriate database.*
- 11. Assessment of contractors includes evaluation of technical resources (personnel/machine), work experience, past performance, turnover, financial*

resources (solvency) etc. The working capital commitment should be reflected in the agreement with the contractor including mode of ensuring availability of working capital. It will be a good idea to integrate instructions issued by Railway Board for assessing the eligibility of the contractors from time to time and issue a set of comprehensive instructions so that gaps or overlaps if any in the existing instructions issued from time to time can be addressed.

- 12. General Conditions of Contract/Special Conditions of Contract terms should be practical and balanced and their strict implementation should be ensured. Conflicting Provisions in GCC for execution of binding agreement should be reconciled. Delays in execution of agreement with the contractors should be minimized and agreements should be executed within the prescribed period.*
- 13. The mechanism of LD available to the Railway Administration should be effectively enforced so as to ensure timely execution of the project. An expeditious execution of a project may entail higher cost due to mobilization of larger resources of the contractor but this higher cost may be more than offset by early utilization of block and expected savings from use of electric traction. Incentives in the tender process for early completion of project should be provided so as to expeditiously derive financial and operational benefits.*
- 14. MoU between Railway Board and RVNL should provide for timelines with incentives/penalties for completion of project before time/ with delays.*
- 15. The execution of the project requires significant involvement of the contractor, the implementing agency for Railway Electrification and the concerned Zonal Railways. Thus, a tripartite agreement should be considered between the three to delineate responsibilities and streamline coordination issues between the three parties.*
- 16. Delays in execution of works may be controlled through better project monitoring. To eliminate delays, project teams should be adequately empowered for various activities during project implementation like approval of variations, approval of layout, drawing, etc. Reasonable time limits may be prescribed for higher hierarchical formations for taking decisions.*
- 17. Technological up gradation is a part of the mission statement for Railway electrification. Accordingly, technological upgradation such as mechanization of work of foundation, stringing of wire from both ends, undertaking of signaling work (fit for all operations) etc. should be identified and implemented.*

- 18. The productivity of human resources of CORE/RVNL deployed can be improved by upgrading skill set of the officials in areas of time scheduling techniques like PERT/CPM) and procurement methodologies.**
- 19. Making available a block for any project involves foregoing of potential earning from block utilization. Therefore, Railway Board should prescribe suitable benchmark for block utilization and use it for incentivizing/penalizing the contractors.**
- 20. Timelines for various activities from measurement of work executed to passing of bills may be prescribed and liabilities of personnel responsible for delays should be assigned.**
- 21. Missing links should be identified and accorded highest priority as missing links adversely impact the utilization of electric traction on electrified routes.**
- 22. Completion of balance activities after CRS sanction and its impact on post CRS sanction utilization of the project should be a part of monitoring mechanism by the Railway Board.**
- 23. Critical activities/issues having an impact on project utilisation such as commissioning of Traction sub-station, shifting of traction change point, work related to SCADA, availability of terminal infrastructure, electrification of sidings, availability of electric locos, crew and MEMU rakes and missing links, should be identified and monitored separately. Monitoring of RE projects should include monitoring activities of the project implementing agency as well as open line so that RE projects are effectively utilized.**
- 24. The utilization of the electrified section for using electric traction is the real objective of RE projects and should be monitored by the Railway Board to ensure that diesel traction on the electrified sections is not used except for unavoidable reasons.**