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Report of the Comptroller and Auditor General of India

on

Electrification Projects in Indian Railways

Union Government (Railways)
No. 22 of 2017

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for the year ended March 2016

Laid in Lok Sabha/Rajya Sabha on _____

Union Government (Railways)

No.22 of 2017

Preface

This Report has been prepared for submission to the President of India under Article 151 of the Constitution of India.

This Report of the Comptroller and Auditor General of India contains the results of performance audit of Railway Electrification Projects in Indian Railways. The instances mentioned in this Report are those which came to the notice in the course of test audit for the period 2013-14 to 2015-16 as well as those which came to the notice in earlier years, but could not be reported in the previous Audit Reports.

The audit has been conducted in conformity with the Auditing Standards issued by the Comptroller and Auditor General of India.

Contents

Abbreviations

Abbreviation	Full form
CORE	Central Organisation for Railway Electrification
CR	Central Railway
CR	Completion Report
CRS	Commissioner of Railway Safety
D&G	Direction and General
DPR	Detailed Project Report
ECOR	East Coast Railway
ECR	East Central Railway
ER	Eastern Railway
GTKM	Gross Tonnage per Kilometre
IR	Indian Railways
IRCON	Indian Railway Construction Organisation
IRPSM	Indian Railways Projects Sanctions & Management
IRR	Internal Rate of Return
NCR	North Central Railway
NEFR	Northeast Frontier Railway
NER	North Eastern Railway
NR	Northern Railway
NWR	North Western Railway
OHE	Overhead Electric Traction
RE	Railway Electrification
RITES	Rail India Technical and Economic Services Limited
RKM	Route Kilometre
ROR	Rate of Return
RVNL	Rail Vikas Nigam Limited
SCADA	Supervisory Control and Data Acquisition
SCR	South Central Railway
SP	Sectioning and Paralleling Post
SR	Southern Railway
SSP	Sub Sectioning and Paralleling Post
SWR	South Western Railway
TKM	Track Kilometre
TSS	Traction Sub Station
WCR	West Central Railway
WR	Western Railway

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 Tiruchirapalli-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-Katihaar-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 un-avoidable reasons.***

Chapter 1 - Introduction

1.1 Introduction

Indian Railways (IR) run 9,212 freight and 13,313 passenger trains over its vast network of 66,687[1] Route Kilometers (RKM) and carries more than 1,000 million tonnes of freight traffic per year and about 22 million passengers per day every day[2]. These trains are hauled either by diesel locomotives or electric locomotives. As on 31 March 2016, 27,999 (47 *per cent*) out of 58,825 Broad Gauge Route Kilometers (RKMs) have been electrified across IR. With 5,869 diesel and 5,214 electric locomotives as on 31 March 2016, 64.80 *per cent* of the freight traffic and 51.3 *per cent* of the passenger traffic is hauled by electric traction.

In comparison, electric traction is a more environment friendly option. By using electric traction over diesel traction, the nation reduces the use of fossil fuel, reduces import of petroleum and reduces its carbon footprints. For IR, electricity is a cheaper source of energy and electric rolling stock is also capable of regeneration process. Thus, increase in speed, ease of operation and better economic viability of the operations are the main positive aspects of using electric traction. Over the years, IR has undertaken the work of electrification of various routes/sections.

During 2015-16, the electricity consumption of IR for traction and other than traction purposes (excluding manufacturing units) was 18,226 million KWH units for which it spent around ₹ 10,425 crore. During the same period, diesel consumption of IR was 2,918 million litres for which it spent around ₹ 13,274 crore. The total expenditure on energy/fuel (on Broad Gauge routes) during 2015-16 was ₹ 23,699 crore which was about 22 *per cent* of the Ordinary Working Expenses. This expenditure was 19 *percent* in 2009-10. Further, of the total expenditure on fuel, expenditure on cost of diesel was 56 *per cent*, while the cost of electricity was 44 *per cent* in 2015-16.

The Vision 2020 document stated that 33,000 RKMs would be electrified by March 2020. By 31 March 2016, 27,999 RKMs out of 58,825 RKMs have been electrified, 12,710 RKMs have been included in the Works Programme and the remaining 18,116 RKMs were yet to be sanctioned. In August 2016, the target has been revised by Railway Board to cover 24,427 RKMs under electrified routes by 31 March 2021, including 12,710 RKMs in progress and 11,717 RKMs (out of 18,116 RKMs) of missing links between already electrified sections.

[1] 66,687 RKM include 58,825 RKM in Broad Gauge, 4,908 RKM in Meter Gauge and 2,297 RKM in narrow Gauge
[2] Source: Indian Railways Year Book 2015-16

1.2 Organisational Structure

Member (Traction) has the responsibility to oversee and monitor RE projects. The Railway Electrification Directorate in Railway Board assists him in policy decision making.

The responsibility to carry out Railway Electrification (RE) was entrusted to a specialized agency of the Indian Railways, viz. Central Organisation for Railway Electrification (CORE), which was set up in 1979 at Allahabad. Projects are also entrusted to Rail Vikas Nigam Limited (RVNL), a Railway Public Sector Undertaking on nomination basis. Railway Board has also allocated some projects to Zonal Railways (Central Railway, Western Railway and East Coast Railway). Railway Board has also decided (August 2016) 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) (PSU under the Ministry of Power).

Till 2015-16, CORE and RVNL were the two main executing agencies for railway electrification (RE) projects. CORE is headed by a General Manager, who is assisted by officials from Electrical, Engineering, Signalling and Telecom (S&T), Finance, Stores, Personnel and Security Departments at headquarters in Allahabad. At present there are eleven project units to execute the works. These are headed by Chief Project Directors (CPDS). These units are located at Ambala, Lucknow, Jaipur, Secunderabad, Chennai, Bhubaneswar, Ahmedabad, New Jalpaigudi, Jabalpur, Kolkata and Danapur. CORE implements projects for electrification of important railway routes through these project implementing units for harnessing maximum benefits from their traffic potential. The Mission Statement of CORE envisages introduction of electric traction for 33,000 RKM by 2020, in steps of up to 1500 RKM per annum. The Mission Statement also envisages simplification of procedures and timely finalisation of tenders, timely execution of projects, improve the supply chain for ensuring timely supply of material to the projects and promote technological improvements in Railway Electrification works.

RVNL is headed by the Chairman and Managing Director (CMD) who is assisted by Directors in Personnel, Operations, Projects and Finance. The work of RE projects are supervised by Executive Director, RVNL and its field formations are headed by Chief Project Managers (CPMs) at various locations.

Further, respective Zonal Railways are responsible for providing inputs such as blocks for undertaking works, approvals of drawings and design etc. to the

executing agencies during implementation of RE projects and for post completion utilisation of electrified sections. This requires revision in existing loco link and crew link.

Ministry of Railways has taken new initiatives for accelerating the pace of Railway Electrification. While stating that the present capacity of IR to carry out the electrification projects is 2,000 RKMs annually, they have drawn up (August 2016) an Action Plan for railway electrification of 24,400 RKMs of BG network during 2016-17 to 2020-21. Ministry of Railways has decided to engage Public Sector Undertakings viz. Indian Railway Construction Organization (IRCON), Rail India Technical and Economic Services Limited (RITES) (Railways' PSUs) and Power Grid Corporation of India Limited (PGCIL) (PSU under the Ministry of Power) having expertise in laying the transmission lines in India and abroad.

1.3 Audit Scope and Objectives

The review on Railway Electrification projects covered a period of five years, i.e., 2011-12 to 2015-16 and was undertaken with a view to assess

1. Whether approval process for taking up Railway Electrification Projects, identification of implementing agency and project planning were aimed at ensuring timely commencement of the projects?
2. Whether execution of the Railway Electrification Projects by various implementing agencies was done following best practices of project management and whether procedures followed ensured timely finalisation of tenders, timely execution of projects and promoted technological improvements in Railway Electrification Projects?
3. Whether optimal post project utilisation of the completed Railway Electrification Projects was ensured?

1.4 Audit Criteria

Provisions contained in Chapter XII of Indian Railways Code for Engineering Department and Chapter VI of Indian Railways Finance Codes and Railway Board instruction/ orders issued from time to time on contract management have been adopted as criteria for conducting the review.

The criteria for Railway Electrification Project implementation with respect to economy, efficiency and effectiveness has been taken as cost, time and quality respectively. Comparison of cost, time and quality issues for similar project execution methodologies between CORE and RVNL was made by Audit.

Specific circulars issued by Government of India, Railway Board and subordinate authorities relating to Electrification Projects, creation of posts, provision of Direction & General (D&G) charges, utilization thereof, etc. were also used as audit criteria.

1.5 Audit Methodology and Sample

The methodology adopted included review/ examination of records maintained at various levels by Railway Administration/ Railway Board. Review of records available at various level, i.e. CPD offices, Zonal Railways, CORE, RVNL and Railway Board, was conducted by audit officials of Principal Directors of Audit/ Director General Audit of various Zonal Railways. Project execution methodologies viz. multiple tenders and supply orders based on item rate, turnkey projects and EPC projects were reviewed for selected CORE and RVNL projects.

An Entry Conference was conducted at the Railway Board on 13 July 2016 where representatives of Railway Board, RVNL and CORE interacted with Audit. Subsequently, mid-term engagement between the same stakeholders was held on 09 September 2016 at Allahabad. Exit Conference was held with CORE, Allahabad and RVNL on 19 Dec 2016 and 2 March 2017 respectively for discussion of audit findings and recommendations. Audit findings and recommendations were finally discussed with Member (Traction), Financial Commissioner and Additional Member (Traffic) and Additional Member (Budget), Director (Finance), RVNL, General Manager, CORE and other officials of Railway Board on 17 March 2017.

RVNL furnished reply to the specific audit issues raised in respect of the projects executed by them. Railway Board also furnished a reply, responding specifically to Audit Recommendations. Response of the Railway Board, CORE, RVNL and Zonal Railways at every stage have been considered and suitably incorporated in the Audit Report.

The criteria for sample selection and the sample selected is as follows:

Table 1.1- Sample of projects

S. no.	Executing Agency/ Criteria	Total number of projects	Sample selected	Criteria for selection
1.	CORE (Completed projects)	24	12	50 *per cent*
2.	RVNL (Completed projects)	3	2	
3.	CORE (Ongoing projects)	22	11	50 *per cent*
4.	RVNL (Ongoing projects)	7	4	
5.	CORE (New projects)	24	6	25 *per cent*
6.	RVNL (New projects)	4	1	
Total		**84**	**36**	

Audit selected 14 completed projects, 15 ongoing projects and seven new projects for detailed review. For selection of the sample, projects where CRS sanction had been received for all sections as on March 2016 were treated as completed. Three projects were completed during June to November 2016, when audit was undertaken. As such, of the 36 projects reviewed there were 17 completed projects, 12 ongoing projects and 7 new projects. The list of projects reviewed in audit along with their status during the field audit is given below:

Table 1.2 – List of projects reviewed in audit

S. no	Name of the RE Project	RKM	Status at the time of audit
1.	Bhubaneswar – Kottavalasa	414	Completed
2.	Krishnanagar – Lalgola	127.67	Completed
3.	Karepalli-Bhadrachalam Road-Manuguru	88.22	Completed
4.	Andal-Ukhra-Pandabeswar	20.34	Completed
5.	Ujjain-Indore and Dewas-Maksi	115	Completed
6.	Tiruchirapalli-Madurai	154	Completed
7.	Barabanki-Gorakhpur-Barauni	709.14	Completed
8.	Shakurbasti- Rohtak	60	Completed
9.	Jhansi - Kanpur including Ait Jn.- Konch Branch line of NCR and Kanpur Anwarganj- Kalyanpur	240.57	Completed
10.	Madurai-Tuticorin-VanchiManiyachchi-Nagercoil	262	Completed
11.	Varanasi-Lohta-Janghai-Unchahar including Phaphamau-Allahabad	207	Completed
12.	Barauni-Katihar-Guwahati	836	In progress
13.	Daund – Manmad including Puntamba Shirdi	255	Completed
14.	Shoranur – Kannur – Mangalore - Panambur	328	In progress
15.	Mathura-Alwar	123	Completed
16.	Ghaziabad -Moradabad	140	Completed
17.	Gooty - Dharmavaram - Yelahanka - including Dharmavaram - Sri Satya Sai Prashanthi Nilayam - Penukonda	306	Completed
18.	Gondia – Ballarshah	250	In progress
19	Khana-Sainthia-Pakur including Pandabeswar-Sainthia	205	In progress
20.	Roza - Sitapur - Burhwal	181	Completed
21.	Alwar-Rewari	82	Completed
22.	Garhwa Road-Chopan-Singrauli	257	In progress
23.	Andal - Sitarampur	57	In progress
24.	Guntkal-Bellary-Hospet including Torangallu-Ranjitpura	138	In progress
25.	Amla-Chindwara-Kalumna	257	In progress
26.	Itarsi-Katni-Manikpur-Chheoki including Satna-Rewa	653	In progress

Table 1.2 – List of projects reviewed in audit			
S. no	**Name of the RE Project**	**RKM**	**Status at the time of audit**
27.	Titlagarh –Sambalpur- Jharsuguda	238	In progress
28.	Jakhal-Dhuri-Ludhiana	123	In progress
29.	Chhapra-Ballia-Varanasi-Allahabad	330	In progress
30.	Rohtak-Bhiwani	48	New work
31.	Jhansi-Manikpur including Khairar-Bhimsen	408	New work
32.	Erode-Karur-Tiruchirapalli	300	New work
33.	New Katni-Singrauli	248	New work
34.	Kiul-Tilaiya	87	New work
35.	Guntakal-Kallur	40.26	New work
36.	Ghazipur-Aunrihar-Manduadih	78.61	New work
	Total RKMs of selected projects	**8367**	

1.6 Acknowledgement

The report includes the responses of CORE, Zonal Railways and Railway Board gathered during various discussions/Exit Conferences held at Zonal/Railway Board level. The Audit team wishes to acknowledge the cooperation extended during this audit by the management and staff of the Railway Administration at CORE, Allahabad, its various CPD Offices, RVNL and its CPM offices, Zonal Railways and Railway Board.

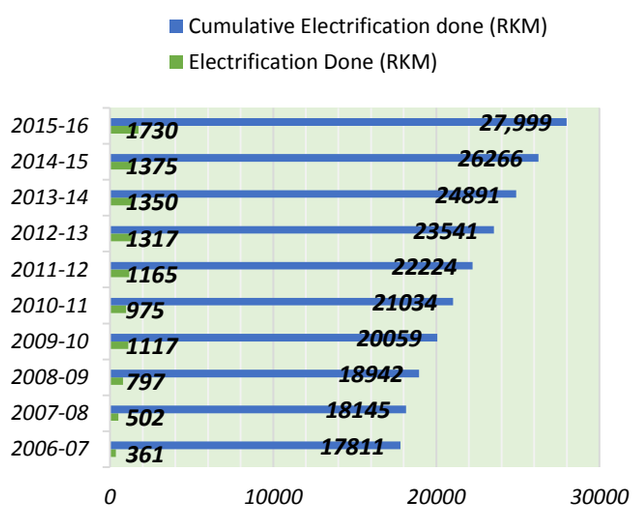
Chapter 2 - Progress of Electrification in Indian Railways

2.1 Progress of RE projects in IR

2.1.1 Electrification so far

With 388 RKM electrified pre-independence, IR have come a long way and has completed electrification of 27,999 RKM up to 31 March 2016. During the past decade the pace of railway electrification has gathered momentum and around 10,000[3] RKMs have been electrified. Status of year-wise RKMs electrified during the past ten years and total cumulative RKMs electrified is depicted in the ***Graph 1***.

Graph 1: Electrification done in terms of RKMs
(Source: IR Yearbook)



2.1.2 Expenditure on Electrification Projects in IR

The budget estimates, final allocations and expenditure on Railway Electrification projects during the past six years are given in the table below:

Table 2.1 – Expenditure incurred for implementation of RE projects (₹*in crore*)

Year	*Budget Estimate*	*Final Allocation*	*Actual Expenditure*
CORE			
2010-11	598.05	644.58	643.21
2011-12	757.00	680.03	678.15
2012-13	691.32	792.66	798.42
2013-14	862.90	1073.90	1077.46
2014-15	978.19	1143.43	1136.70
2015-16	1718.87	1670.99	1667.77
RVNL			
2010-11	37.00	6.09	6.09
2011-12	221.00	162.00	153.95
2012-13	141.57	85.30	171.57
2013-14	128.09	178.09	178.09
2014-15	204.00	247.00	242.50

[3] From 17,786 RKMs in 2006-07 to 27,999 RKMs in 2015-16

Table 2.1 – Expenditure incurred for implementation of RE projects (₹ *in crore*)			
Year	***Budget Estimate***	***Final Allocation***	***Actual Expenditure***
2015-16	309.77	412.42	412.42
DEP - RVNL			
2015-16	5.00	15.87	2.32
Zonal Railway-ECoR*			
2015-16	55.00	72.35	0
Zonal Railway-CR*			
2015-16	0.02	0	0
Zonal Railway-WR*			
2015-16	0.01	0	72.35

**Three Zonal Railways have been allotted RE works 2015-16 onwards*

2.1.3 RKMs electrified, energized and CRS sanction obtained during the past seven years

Since 2009-10, CORE and RVNL have completed electrification of 6,709 kms and 1,623 kms respectively. Against this, 4855 kms and 1,095 kms only have been energised[4] till March 2016. As per rules[5], sanction of Commissioner of Railway Safety (CRS) is required for the execution of any work on the open line, which will affect the running of trains carrying passengers and any temporary arrangement necessary for carrying it out, except in cases of emergency. Final inspection by CRS for the introduction of commercial services involves permission (sanction) by CRS for commercial operations based on results of trial run. This is a safety assurance issue. CRS works under Ministry of Civil Aviation and is independent of the Railway Administration. Year-wise status of electrification completed, energized and CRS sanction obtained from 2009-10 to 2015-16 is given in the table below:

Table 2.2 – Details of RKMs electrified, energized and CRS sanction obtained						
Year	***CORE***			***RVNL***		
	Electrification (RKMs)	***2.2 to 25 KV Energization (RKMs)***	***CRS sanction (RKMs)***	***Electrification (RKMs)***	***2.2 to 25 KV Energization (RKMs)***	***CRS sanction (RKMs)***
2009-10	916	0	420	92	92	92
2010-11	740	956	74	177	159	159
2011-12	804	694	451	214	114	114
2012-13	937	609	1158	301	198	198
2013-14	1033	595	374	240	185	185
2014-15	1089	974	1097	264	81	81
2015-16	1190	1027	1174	335	266	266
Total	**6709**	**4855**	**4748**	**1623**	**1095**	**1095**

Source: Records of CORE/Allahabad and RVNL

[4] Energisation is the process of connecting the Over Head Equipment (OHE) with suitable Power Supply, i.e., Electric Current of desired strength starts flowing after energisation of the line.

[5] Para 1302 of Indian Railways Permanent Way Manual 1986, Under Section 23 of Railways Act, 1989 (24 of 1989) and Chapter VII of the Railways (Opening for Public Carriage of Passengers) Rules, 2000

As can be seen, the RKMs energised were less than the RKMs electrified and RKMs which were cleared by CRS for running of trains were less than the RKMs energised. However, the figures of RKMs electrified as mentioned above did not match with the figures of RKMs electrified as mentioned in the Indian Railway Year Book of the respective years. The reasons for the mismatch could not be ascertained in Audit.

2.2 Status of RE Projects as on 31 December 2016

As on 31 December 2016, 102 Railway Electrification projects covering 24,241 RKMs were appearing in the project monitoring database of Indian Railways Project Sanction and Management (IRPSM) **(Appendix I)**. Year-wise breakup of these projects, RKMs covered, their physical progress, expenditure incurred on them so far and their throw forward for 2017-18 are detailed below:

Table 2.3- Status of 102 Ongoing RE Projects as on October/November/December 2016 as reflected in IRPSM

Year of sanction	*Number of ongoing RE projects*	*Total RKM*	*Physical progress ranging between (in %)*	*Latest sanctioned cost (₹ in crore)*	*Up to date expenditure (₹ in crore)*	*Throw forward 2017-18 (₹ in crore)*	*Remarks*
1991-92	1	434	100	282.39	266.61	15.77	Completion Report (CR) under preparation.
1992-93	3	780	98 to 100	828.81	828.72	19.06	MM of one RE project still in progress, one RE project completed and in one RE project residual work is in progress. CR in one project was under preparation.
1995-96	1	540	99	445.84	430.17	15.71	Work completed. Revised estimate along with Completion Estimate sanctioned by Railway Board.
1996-97	1	254	96	236.44	253.45	5.78	Residual work in progress.
1997-98	2	763	98 to 99	470.92	383.78	85.90	In one project, one TSS is yet to be commissioned and CR yet to be drawn. Another project completed.
1999-00	2	519	95 to 100	308.26	297.29	11.42	One project completed and CR drawn. One project in progress.
2003-04	1	562	100	386.18	386.18	0	Completed and CR drawn.
2005-06	2	426	90 to 98	324.80	519.59	7.39	One section commissioned, though progress is 90 *per cent*. The second project is completed and trains being run on electric traction.

Table 2.3- Status of 102 Ongoing RE Projects as on October/November/December 2016 as reflected in IRPSM

Year of sanction	*Number of ongoing RE projects*	*Total RKM*	*Physical progress ranging between (in %)*	*Latest sanctioned cost (₹in crore)*	*Up to date expenditure (₹in crore)*	*Throw forward 2017-18 (₹in crore)*	*Remarks*
2006-07	5	890	90 to 100	702.50	1010.60	6.65	Though all five projects are almost completed, balance activities are yet to be done in three projects, which included electrification of Yard, work of patch doubling, augmentation of TSS and construction of railway quarters.
2007-08	4	1246	75 to 99	1117.37	1538.19	69.12	In two projects, though almost completed, balance works such as work of SP, Tower erection/ overhead Line work in progress. CR in one project was under preparation.
2008-09	4	1545	65 to 98	1408.03	1359.52	232.71	In three projects, works such as TSS yet to be commissioned or commissioned late, wagon shed, siding work yet to be completed. Traction change points not planned in two projects.
2009-10	1	140	85	151.91	156.48	8.21	Work in progress
2010-11	9	2363	2 to 99	2656.80	2386.33	667.53	In four projects, though physical progress of work was more than 90 *per cent*, balance activities such as commissioning of TSS, were yet to be completed.
2011-12	1	82	95	118.48	126.23	13.30	One TSS yet to be commissioned.
2012-13	11	2442	12 to 95	2916.79	1671.12	770.41	In six projects the progress of work was less than 50 *per cent*.
2013-14	6	1592	5 to 24	1920.99	273.97	945.10	All works in progress.
2014-15	2	462	10 to 24	555.15	252.21	262.20	All works in progress.
Total	**56**	**15040**		**14831.66**	**12140.44**	**3136.26**	
2015-16	28	6632	just started/ yet to start	3413.80	26.58	6442.60	In 12 projects detailed estimates were yet to be approved.
2016-17	18	2569	just started/ yet to	402.32	0	2957.78	In 15 projects detailed estimates are yet to be sanctioned. No expenditure

Table 2.3- Status of 102 Ongoing RE Projects as on October/November/December 2016 as reflected in IRPSM

Year of sanction	*Number of ongoing RE projects*	*Total RKM*	*Physical progress ranging between (in %)*	*Latest sanctioned cost (₹ in crore)*	*Up to date expenditure (₹ in crore)*	*Throw forward 2017-18 (₹ in crore)*	*Remarks*
			start				incurred on any of the projects.
Grand total	**102**	**24241**		**18556.79**	**12167.02**	**12536.64**	

It was observed that

- As many as 56 projects covering 15,040 RKMs, which were included in the Works Programme 1991-92 to 2014-15 were still appearing in the list of projects in IRPSM. Of these,
  - Only in four projects (1313 RKMs), completion reports had been drawn and in two projects (740 RKMs), the same was in process. However, a throw forward of ₹ 0.70 crore is still reflected in respect of these four projects.
  - In 20 projects (4047 RKMs), the physical progress was more than 90 *per cent* and these projects were in the advanced stages of completion. However, in most of these projects balance activities remained to be completed/were going on. The oldest project related to year 1991-92 and latest related to 2012-13. In these projects, against the latest anticipated cost of ₹ 3782 crore, an amount of ₹ 3972 crore has already been incurred. In ten projects, the excess expenditure ranged between seven per cent and 74 *per cent* of the last sanctioned cost.
  - In seven projects, the physical progress was between 76 *per ce*nt and 90 *per cent*.
  - In another seven projects, the physical progress was between 51 *per cent* and 75 *per cent*.
  - In three projects, the physical progress was between 26 *per cent* and 50 *per cent*.
  - In 11 projects, the physical progress was less than or equal to 25 *per cent*, and in seven out of these, less than 11 *per cent* physical progress was reported.
  - In respect of two projects, physical progress was not reported by the concerned railway.
- The latest anticipated cost of the 56 projects was ₹ 14,740 crore. Against this, an expenditure amounting to ₹ 12,140 crore has already been incurred. A

throw forward of ₹ 3136 crore during 2017-18 is required for completion of these projects, as of now.

- In 45 projects, detailed estimates have been revised/under revision, indicating that the initial estimates were not accurately prepared by the Zonal Railways. Further, due to reasons such as Material Modification and delays in completion of projects, the cost of the projects had to be revised.
- Further, in the last two years (2015-16 and 2016-17), 46 projects covering 9,201 RKMs were added to the shelf of RE projects.
- Out of these 46 projects, in 26 projects, detailed estimates were under preparation, under vetting in one project and sanctioned in 18 projects. Information in respect of one project was not available.

Thus, a large number of projects taken up in earlier years, were yet to be completed in all respects, in order to derive full benefits of electrification. 16 out of 17 completed RE projects reviewed in audit, are still appearing in the list of IRPSM, where, though the work of electrification has been completed, in majority of cases, balance activities are pending as a result of which railways have not been able to derive full benefits of electrification.

Chapter 3 – Planning of Railway Electrification Projects

Audit selected 36 Railway Electrification (RE) Projects for detailed review. This included 17 completed projects, 12 work in progress and 7 new projects. The main objective of Project Management is to ensure timely completion of works for meeting operational needs, getting returns on investments and to avoid time and cost over runs. The following elements of Project Management including project proposal, execution and post project utilisation were reviewed in detail in audit:

i. Justification
ii. Techno-economic feasibility assessment
iii. Administrative approval
iv. Detailed Project Report (DPR)
v. Sanction
vi. Preparatory work for project implementation
vii. Identification of implementing agency
viii. Contracting
ix. Implementation of contract
x. Completion of project
xi. Utilization of the electrified section
xii. Closure of project
xiii. Post Project Assessment with respect of estimations in Techno-economic feasibility assessment
xiv. Post contractual activities viz. arbitration and judicial proceedings

The above includes identification of work/project, preparation and approval of abstract estimates, authorization by the Union Parliament, inclusion of the project in Annual Works Programme, allotment of work to Executing Agency – CORE, RVNL, Zonal Railways, preparation and sanction of detailed estimates, invitation of bids and awarding of contracts, approval of layout plan, coordination with utility providers for power supply and transmission lines (land and Right of Way issues), Over Head Equipment (OHE) Wiring, Service Building, Traction Sub Stations (Power Supply Installation), Switching Posts (SP), Signaling modifications and post completion of physical work, inspection by Commissioner of Railway Safety (CRS) and final commissioning.

The Project approval process at Zonal Railway and Railway Board include consultation with various Departments at Zonal Railways and Railway Board level, finance vetting, financial appraisal by Economic Directorate of Railway Board, 'in-principle' approval by NITI Aayog and inclusion of the project in the Annual Works

Programme of the Indian Railways. The complete process is diagrammatically explained in **Appendix II.** The pictorial representation of sequence of activities for different activities viz. overhead equipment (OHE), Traction sub-station (TSS), Supervisory Control and Data Acquisition (SCADA), Civil Engineering, Signaling & Telecom and Zonal Railways is enclosed in **Appendix III**.

3.1 Process of approval of projects including sanction of Abstract Estimate at concerned Zonal Railways and Railway Board

For an RE project, the cost estimation, consultation with stakeholders and stakeholder identification is done through the process of preparation of abstract estimate. The procedure for preparation of abstract estimate and its sanction is governed as per laid down instructions[6]**.** It involves processing at Zonal Railways and Railway Board wherein the consultation process with multiple stakeholders (departments and hierarchical formations of Indian Railways) takes place. Preparation of abstract estimate includes assessment of Internal Rate of Return (IRR) for the project, termed as Rate of Return (RoR) in Indian Railways, RoR requires assessment of cash flows for elements identified by Indian Railways through methodology, process/data prescribed[7] by the Railway Board. Abstract estimate also contains an estimate of the project cost and the expected/estimated date of operationalization of the electrified link/section.

Review of the process of approval of Abstract Estimates in respect of 36 projects selected in Audit showed that

- The basis adopted in respect of cash flow elements for calculation of ROR in various selected projects was not as per norms[8] prescribed by the Railway Board. Some of the elements of cash flow including loco utilization, repair and maintenance cost of locos, Capital at charge on account of OHE, depreciation /internal charges of OHE/locos, expenditure on electric loco and OHE, Statistical data on Specific Fuel Consumption (SFC) & Specific Energy Consumption (SEC), lube oil consumption, cost of electrification of sidings, capital cost of OHE Car etc. were not incorporated for calculation of ROR. The estimated ROR was not calculated as per the prescribed methodology in 31 out of 33 projects reviewed by audit. The consultation process was also deficient in 28 out of 31 projects, where all departments were not consulted as required. Information was not made available in respect of remaining five projects. **Annexure 3.1**

[6] Railway Board Circular/letter no. 2000/PL/29/150 Pt. dated 12.02.2002
[7] Railway Board Circular/letter No. F (X) II – 2008/RE/1 dated 12.06.2008
[8] Final report of the Committee on Methodology and Evaluation of Railway Electrification Projects issued in April 2007

- All the four elements considered in sanctioning of abstract estimate, viz., process of preparation of abstract estimate and consultation with stakeholders, elements of cash flow, estimated cost and scheduled date of operationalization take a long time for preparation and have no bearing on the actual execution/ implementation of the project. It is seen in Audit that the total processing time for an RE project (time period taken for sending the abstract estimate by the concerned Zonal Railway to the Railway Board and its approval by Railway Board) ranged from 1.17 months to 59 months in 24 projects for which information was available. On average the time taken was 29 months per project with a median value of 30 months. The total time taken for processing of the RE project was more than 36 months in Ujjain-Indore and Dewas-Maksi, Jhansi-Kanpur, Daund-Manmad, Roza-Sitapur-Burhwal, Alwar-Rewari, Itarsi-Katni-Manikpur-Chheoki, Jhansi-Manikpur, Erode-Tiruchirapalli and New Katni-Singrauli projects. **Annexure 3.2**

- In respect of 31 RE projects, the detailed estimates were six *per cent* to 62 *per cent* more than the respective abstract estimates. On an average this difference was 26.39 *per cent* with a median value of 22.59 *per cent*. In respect of three RE projects viz. Jharsuguda-Sambalpur-Titlagarh, Itarsi-Katni-Manikpur-Cheoki-including Satna-Rewa and Khana-Sainthia Pakur including Pandeshwar-Sainthia, the abstract estimates were less by four, seven and 12 *per cent* respectively. For the remaining one project the information was not available. The percentage variation was more than 40 *per cent* in respect of Karepalli-Bhadrachalam, Shakurbasti-Rohtak, Jhansi-Kanpur, Barauni-Katihar-Guwahati and Guntakal-Kallur projects. **Annexure 3.3**

- The main objective of preparation of an abstract estimate[9] is to enable the authority competent to give administrative approval to the expenditure of the nature and the magnitude contemplated, to form a reasonably accurate idea of the probable expenditure and such other data sufficient to enable that authority to gauge adequately the financial prospects of the proposal and also to avoid the expense and delay of preparing estimates for works in detail at a stage when the necessity or the general desirability of the works proposed has not been decided upon by competent authority. In 23 selected projects, it was seen that the time taken for preparation and approval of abstract estimates was up to 59 months, and therefore the objective of saving time was not fulfilled. Further, as far as the general desirability of taking up the project is

[9] Para 702 of the Indian Railways Code for the Engineering Department

concerned, electrification has been considered a more cost-effective and environment friendly option for traction and abstract estimate are therefore not required to aid the decision of whether or not to take up the project.

Thus, the objective of saving time as well as aiding the decision of 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 between the abstract and detailed estimates indicated that the system of abstract estimates was hardly adding value to the process and was thus not fulfilling the objective of the process.

As the items and processes for an RE project are more or less consistent, the costing per track kilometer (TKM) can be standardized with specific desirable inputs and the benefits of electrification can be standardized in terms of Gross Tonnage per Kilometer (GTKM). The GTKM and track length at which railway electrification is likely to be beneficial can be determined on a simplified basis of assessment like potential GTKM to be handled on the electrification project. A standardized procedure may be considered to be applied to a proposal. An illustrative example is discussed below:

Illustrative example for granting go-ahead sanction for a project based on benchmark

The analysis of the process of sanction of abstract estimate in ***Mathura- Alwar Project (Group 163)*** was carried out in audit.

The abstract cost was of this RE project was calculated differently thrice during a six-month period April 2008 and October 2008 (₹ 80.00 crore, ₹ 77.42 crore and ₹ 163.81 crore in April 2008, September 2008 and October 2008 respectively). Finally, the abstract estimate of ₹ 99.71 crore was approved by the Railway Board in October 2010. As such, the assessed cost of abstract estimate varied between ₹ 77.42 crore and ₹ 163.81 crore and was approved at ₹ 99.71 crore. The projected Rate of return (ROR) in the abstract estimate was assessed at 17.74 *per cent*. The detailed estimate of ₹ 119.83 crore was sanctioned in May 2011. The sanction was given by Commissioner of Railway Safety (CRS) in March 2015. As of October 2016, the expenditure incurred was ₹ 82.08 crore and the physical and financial progress of the project was 99 *per cent* and 68.5 *per cent* respectively.

The calculation of financial appraisal was based on projected traffic, estimated saving in energy consumption, saving in lubricant consumption, etc. (on saving side) and locomotive capital cost, cost of project, repair and maintenance cost of locomotives etc. (on expenditure side). The savings were based on present traffic and projected traffic in terms of Million Gross Tonne Kilometer per annum (MGTKM per annum) and difference in Specific Fuel Consumption (SFC) for diesel

locomotives and Specific Electrical Consumption (SEC) for electrical locomotives as per latest statistical data that would be available.

In this RE project, a benchmark value of cost of the project per TKM could have been assessed at ₹ 0.49 crore per TKM (*the cost per TKM taken from the detailed estimate for Jhansi-Kanpur Project (Group 148) of CORE approved in December 2008 was ₹0.49 crore*). For 160 TKM for Mathura- Alwar RE Project the estimated cost on this yardstick would be ₹ 75.4 crore.

The ROR for the project was to be greater than 14 *per cent* (as per the prescribed benchmark) and accordingly the minimum annual saving @ 14 *per cent* would by 0.14 x 75.40 = ₹ 10.56 crore.

Adding 50 *per cent* enhancement in the savings for compensating other costs (loco cost, shed cost, project cost etc.) for assessing the viability of project for the purpose of go ahead sanction, the benchmark saving for the project would be ₹ 15.84 crore.

The saving as per projected traffic on account of saving of fuel and lubricant and repair and maintenance (of locomotives) was assessed at ₹ 17.84 crore.

Since the saving in ₹ 17.84 crore is above the benchmark saving of ₹ 15.84 crore, go ahead sanction could have been given.

It is recommended that

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).***

During Exit Conference (Dec 2016 and March 2017), Zonal Railways, CORE and RVNL agreed that the process was time consuming and needed to be simplified.

Member (Traction) during Exit Conference (March 2017), stated that GTKM alone could not be a good criteria for taking up an RE Project due to existing requirements of railway procedures and many other factors such as traction change, construction of RUB/ROB etc. would not be covered under the proposed GTKM criteria. Audit stated that the objective of electrification is change of traction and estimated cost and savings can be incorporated in deriving parameters for GTKM for the electrified section as demonstrated in the illustration above. Where the RE project requires shifting/lifting of existing ROB/RUB, the number, length and height of the existing ROB (already available with railway administration) can be collected in a template and estimated cost for this activity incorporated in the decision making for such projects in addition to GTKM. It was also suggested by audit that present process of preparation of abstract estimate involves a large number of field formations and the process is complex, leading to very large time being taken for preparation of the abstract estimates. Replacing the current procedure and simplifying the process would save time without any adverse consequences, as project implementation would still be on the basis of detailed project report (DPR).

Railway Board in their reply stated (March 2017) that as per the instructions of Railway Board, GTKM to be transported on electric traction is one of the factors considered for inclusion of the RE Project in Annual Works Programme. However, they stated that, the matter 'Go ahead Sanction' would be examined and put up for consideration of the Board.

3.2 Electrification of New Line Projects

In a New Line project on Udi-Bhandai section in Agra Division of NCR, it was seen that the project was included in the Works Programme 1999-2000 and the detailed estimate of ₹ 214.09 crore (Oct 2002) for the same was prepared without including electrification in its scope. In August 2008, Railway Board advised GM, NCR to include the electrification of the section as Material Modification to the New Work after eight years of staring the project. However, this was not agreed to by Chief Administrative Officer (CAO)/Construction, NCR. As on August 2016, an expenditure of ₹ 450.67 crore has already been incurred on the project. Though CRS sanction was given on October 2015 and operation of single pair of passenger train was started in December 2015, due to non-electrification of the section, the utilization of the new line remains meagre. This also indicated that planning for the project was not comprehensive. The abstract estimate of ₹ 105.77 crore for the electrification project for this line has been submitted by NCR Administration to the

Railway Board in 2015-16 and remains to be sanctioned by Railway Board, despite identification of its need in August 2008.

It is recommended that

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.***

Railway Board in their reply stated (March 2017) that instructions (June 2015) already exist for provision of TRD estimate in proposal for doubling/3rd line in electrified/undergoing electrification sections. They stated that for electrification of new line, the matter will be examined with Civil and Traffic Directorates and separate instructions will be issued.

3.3 Identification of executing agencies

Subsequent to sanction of abstract estimate, the RE Project is incorporated into the budgetary process for approval by the Union Parliament. After approval by the Union Parliament, the project gets reflected in the Annual Works Programme[10]. The Railway Board then allocates the execution of the project to Central Organization of Railway Electrification (CORE) or any other implementing agency such as Zonal Railways. In a few cases, projects are assigned to RVNL on nomination basis. RVNL is provided management consultancy fee of 8.5 *per cent* of the cost of the project and 0.25 *per cent* as Direction and General (D&G) charges payable to concerned Zonal Railways as prescribed by Railway Board[11]. The management fee is linked to the cost of the project and increases, if the cost of the project increases.

It was observed that

- The work was assigned to RVNL on the basis of operational needs of the Zonal Railways in cases where RVNL was also the executing agency for associated New Line/Doubling Projects/Gauge Conversion. Railways also stated that as the existing workload of CORE was in excess of their capacity, RVNL was assigned these projects.

[10] Also known as the Pink Book
[11] Letter no. 2004/W-1/RVNL/15 dated 04.11.2012

- There are no milestones fixed between Railway Board and RVNL regarding delivery of the project. There are no penalties on RVNL for not delivering a project in time or for any deficiency in the quality of work.
- Time period taken by Railway Board after inclusion of the RE project in the Annual Works Programme to assign CORE as executing agency was up to 337 days in 17 projects (13 days before in case of RE project of Alwar-Rewari), whereas for RVNL, it was up to 202 days in six projects (29 days and 12 days in case of RE projects of Daund-Manmad and Jakhal-Dhuri-Ludhiana respectively). The average time taken for allotment of project to CORE was three months with a median value of one month. This time was on an average three months for RVNL with a median value of two months.
- Subsequent to assigning agency by Railway Board, CORE/RVNL assigned projects to their respective Chief Project Director/CORE or Chief Project Manager (CPM)/RVNL for execution. It was seen that
    - While CORE took up to 229 days for assigning project to CPDs, RVNL took up to 40 days in assigning project to their CPMs.
    - The time taken for assignment of work to CPD's by CORE was up to 605 days after inclusion of RE project in the Annual Works Programme in 24 projects, with a mean value of six months and median value of six months (In case of two projects, the time period of assignment by Railway Board to CORE has been adopted as the time period of subsequent assignment of work by CORE to CPD was not made available). Corresponding figures for range, mean and median for RVNL were up to 202 days, three months and three months in six projects. (The time period of assignment by RVNL to CPM was not made available in four projects, accordingly the time period of assignment by Railway Board to RVNL has been adopted).

Annexure 3.4 and 3.5

Thus, substantial time was taken for assigning the work to the respective field formations of the implementing agencies.

It is recommended that

3. The identification of executing agency and its field formations should be expedited.

Railway Board in their reply stated (March 2017) that the process of identification of executing agencies (CORE, RVNL, other PSUs and Zonal Railways) for further

entrusting of RE work has been expedited as RE works are entrusted to them immediately after sanction of Budget so that these agencies can start preparing DPRs immediately based on realistic assessment of site. They further stated that identification of executing agencies depends upon other factors such as strength of the organization in area of project execution etc.

3.4 Preparation of Detailed Project Report and sanction of detailed estimates

Subsequent to allotment of the work to CORE/RVNL, the work is assigned by CORE/RVNL to their field formations viz. Chief Project Director (CPD)/CORE or Chief Project Manager (CPM)/RVNL for preparation of Detailed Project Report (DPR). The Detailed Project Report (DPR) includes detailed estimate. Detailed estimates are prepared by officials of CORE and approved by appropriate authorities at CORE and Railway Board as per delegation of power contained in Schedule of Powers (SoP), for projects assigned to CORE. For projects assigned to RVNL, the detailed estimates are prepared through consultants and approved by RVNL.

3.4.1 Elements included in DPR and timeliness of their preparation

'Manual on Policies and Procedure for Procurement of Works' issued by Ministry of Finance lays[12] down in detail, various components of Detailed Project Report.

1. Background of the work/project justifying the need for the work.
2. Details of scope of the project.
3. Exclusions (if any) – This will cover part of the work, which is not included in this particular project estimate.
4. Availability of land – There should be a clear indication about the availability of land required for completion of whole project. The land shall be made available free of all encumbrances.
5. Reference to Concept Drawings and their acceptance – This shall indicate the details of concept drawings prepared and their approval by the prescribed authority.
6. Cost benefit analysis of the project including projected Internal Rate of Return and projected traffic of electric traction on the electrified route.
7. Time of the completion – This will consist of two parts, one for pre-construction activity till award of the work and the other one for the execution using time scheduling activities like CPM, PERT etc.[13]

[12] Para 2.3.2 and Para 2.5.1

[13] The components of a DPR include use of time scheduling activities such as PERT and CPM. In project management, CPM is the sequence of project network activities that add up to the longest overall duration and determines the shortest time possible to complete the project. It is a commonly used project management tool and any project with interdependent activities can apply this method of mathematical analysis. Another similar technique is PERT used to schedule, organize and

8. Environmental Impact Assessment (EIA) of the project and approval thereof, wherever applicable.
9. Source and availability of funds – The manner of transferring the fund to the executing agency to be spelt out.
10. Approval of Statutory Bodies for Site Plan, Architectural Drawings etc. as required.
11. Detailed soil investigation.
12. Detailed architectural drawings.
13. Detailed structural drawings.
14. Detailed Cost Estimates based on specifications and schedule of rates.
15. Annual plans and consequential projected allocations and cash flows.
16. Systems to be adopted for project monitoring.
17. Work accounting system.
18. Quality assurance system/mechanism.
19. Bidding systems – Single part, two parts, pre-qualification, etc.

To be comprehensive, a DPR should include the above mentioned elements. In addition, the DPR should also include project execution methodology to be adopted viz. EPC, Turnkey, quasi-turnkey, conventional with/without material supply and identification of the Implementing Agency and its field formations.

The DPR prepared for RE projects comprises of survey report of the section to be electrified, technical requirements under different activities viz. Operating, Electrical, Civil Engineering, Signal and Telecommunication and Construction Department, basis of estimate and detailed estimate. Detailed estimates comprises of item wise estimate of cost containing head of account and department wise (Civil, Electrical, Signal and Telecom) element of cost in each item. The source of financing (Depreciation Reserve Fund, Development Fund, Extra Budgetary Resource, etc.) for each item is also a part of the detailed estimate. The cost is estimated on the basis of applicable Schedule of Rules (SOR) and pattern indicated through Latest/Last Accepted Rates (LAR). The detailed estimate is not supported by any time or resource data.

At present, DPRs for RE Projects are being prepared after identification of agencies responsible for execution of the project, which is given the responsibility of preparation of DPR. Due to adoption of different elements, the cost per TKM vary for various implementing agencies preparing DPRs. The project execution

co-ordinate tasks within a project and also helps in determining the shortest time required for completion of a project with interdependent activities.

methodology is not identified in the DPRs prepared for RE Projects. Identification of agency for preparation of DPRs (irrespective of the implementing agency) will facilitate specialization and also completeness and comprehensiveness of DPRs prepared, which will assist in project planning, implementation and monitoring.

The DPRs prepared by CORE or RVNL also do not contain use of scheduling or monitoring tools over time or resources such as Critical Path Method (CPM), Program Evaluation and Review Techniques (PERT), Gantt. Chart etc. in any of the projects. Elements such as exclusions, time to be taken pre-construction and during execution, Environment Impact Assessment, approvals of statutory bodies, system of project monitoring, quality assurance, bidding systems etc. are also not part of the DPRs being prepared at present.

During the Exit Conference with CORE and RVNL (December 2016), Railway Administration admitted that completion targets of Railway Projects are not supported by any reasonable and scientific basis and time scheduling of activities is not done. It was also agreed that Date of Completion (DOC) of activities in a tender are not determined on any scientific basis.

Analysis of the time taken in preparation of DPRs including detailed estimates was done for 36 selected projects in Audit. It was observed that

- For the projects assigned to CORE, the time taken from 1st April of the year when the project appeared in the Annual Works Programme, to the approval of the detailed estimates was one month to 35 months with a mean value of 11 months and median value of 10 months in 27 projects.
- For projects assigned to RVNL, the time taken was 2 months to 18 months with a mean value of 11 months and median value of 11 months in seven projects.
- In case of CORE seven months to 69 months were taken from preparation of abstract estimate to approval of detailed estimates with a mean value of 39 months and median value of 39 months. The corresponding range for RVNL was 30 to 50 months, with a mean of 27 months and median of 26 months. The time taken was more than three years in respect of 11 Projects assigned to CORE and two projects assigned to RVNL.

Annexure 3.4 and 3.5

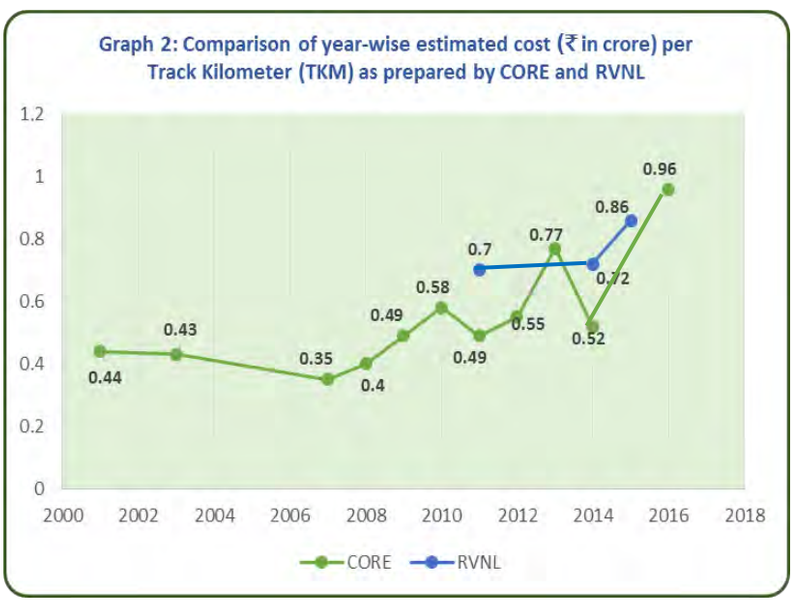
- Detailed estimate was yet to be prepared in one project assigned to RVNL. Part of one project, viz., Barauni-Katihar-Guwahati, approved by Railway Board and assigned to CORE in August 2008 was assigned to RVNL in July 2015. One

project, viz., New-Katni-Singrauli was assigned to CORE in Annual Works Programme for 2015-16 and has been subsequently transferred to Indian Railway Construction Company Limited (IRCON) in January 2017.

It was also observed that there were wide variations between the cost of the abstract estimate and approved detailed estimate. The differences in cost ranged between 6 *per cent* to 62 *per cent* (4, 7 and 12 *per cent* below in respect of RE projects of Jharsuguda-Sambalpur-Titlagarh, Itarsi-Katni-Manikpur-Cheoki-including Satna-Rewa and Khana-Sainthia-Raipur including Pandabeswar-Sainthia respectively) with mean value of 23 *per cent* and median value of 21 *per cent* in case of CORE in 27 projects. Similarly, it ranged between 15 to 62 *per cent* with mean value of 28 *per cent* and median value of 20 per cent in seven projects of RVNL. The overall variation for both CORE and RVNL projects was 6 to 62 *per cent* with mean value of 23.38 *per cent* and median value of 21.5 *per cent*. The percentage variation was more than 40 *per cent* in respect of Karepalli-Bhadrachalam, Shakurbasti-Rohtak, Jhansi-Kanpur, Barauni-Katihar-Guwahati and Guntakal-Kallur projects. **Annexure 3.3, 3.6 and 3.7**

The above positions reflect that considerable time was taken from the preparation of abstract estimate to approval of detailed estimate and the variation between these two costs are also large.

3.4.2 Comparison of detailed estimates prepared by CORE and RVNL



Year wise (Financial year) comparison of cost of detailed estimate per Track Kilometer showed that the detailed estimates prepared by RVNL were higher than detailed estimates prepared by CORE by 36 *per cent* to 37 *per cent* during the period 2010-11 to 2014-15[14] as can be seen in ***Graph 2***. Besides, a variation in costs as per

[14] Comparable data for both the organization was available only in 2010-11 and 2014-15

detailed estimates and abstract estimates was higher for RVNL in comparison to CORE. This is despite the fact that, a significant part of work in RVNL projects including the work of sanction with CRS, is executed by Zonal Railway in terms of Memorandum of Understanding (MoU) between Ministry of Railways and RVNL.

Annexure 3.8

It is recommended that

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.***

In their reply, Railway Board stated (March 2017) that the Audit Recommendation for timeline of three months for preparation of DPR by designated agency is acceptable and they would be communicating the same to the executing agencies in due course. Railway Board, however did not agree with the Audit Recommendation regarding preparation of DPR by agencies other than RVNL, as it is a PSU of Ministry of Railways and is governed by GFR and CVC guidelines. RVNL in this regard stated that the differences in the cost of detailed estimates between those of RVNL and CORE arose due to difference in scope of work (including signaling works, wiring trains, utility vehicles etc.) CORE officials agreed with the need for consistency in the elements and the relative costs during preparation of the detailed estimates, development of a specialized agency for preparation of DPRs of RE projects and suggested elements and process for preparation of DPR. Audit emphasized that preparation of DPR by an entity other than RVNL, would benefit railways in form of realistic cost and documented plan enabling execution of RE projects in time and of desired quality. Audit stated that realistic and reasonable estimation of cost in Detailed Estimates should be done, keeping in view the project execution methodology, time period of completion (which impacts resource requirement of men and machine for the contractor) and tendered terms and conditions. During Exit Conference (March 2017) CORE stated that this could result in significant increase in the estimated cost of the project. Audit opined that

it would be a financially prudent decision to look at a higher cost estimate, keeping in view the loss of projected savings due to delays, low productivity of deployed manpower and time cost of idle investment holistically and incorporate the same in decision making.

Chapter 4 - Execution and monitoring of Railway Electrification Projects

4.1 Project execution methodology

RE projects in Indian Railways are executed through the following project execution methodologies:

a. **Conventional methodology with/without Stores Contracts** – In this methodology, Department-wise contracts are awarded for execution of separate activities of the project like Overhead Electrification (OHE), Traction Substation (TSS), Supervisory Control and Data Acquisition (SCADA), Electrical General, Signal, Telecom, Civil Engineering contracts for construction of service buildings, residential quarters etc. The important stores are processed, indented and supplied by Indian Railways to the contractor. A variation to this is Department-wise award of contracts with stores procurement also included. This methodology involves multiple contracts within a project as well as within departments of CORE.

b. **Turnkey/Quasi Turnkey Contracts** – In this methodology, a single contract is awarded for all works including stores. This is a commonly used methodology in RVNL. The engineering part involving preparation of Detailed Estimate is prepared by officials of CORE and through consultants for RVNL. A variation of turnkey used in CORE in some projects is to award a composite contract with stores for OHE, TSS, SCADA with or without General Electrical works. The remaining activities like Signal, Telecom, General Electric works (where it is not a part of the Composite Contract), Civil Engineering contracts for construction of buildings, residential buildings etc. are awarded through separate multiple contracts. This is termed as quasi turnkey methodology in this report.

c. **EPC Contracts** – Engineering, Procurement and Construction (EPC) projects wherein all activities of a project are awarded to a single contractor.

Project execution methodologies are determined by the implementing agencies. RVNL prepared detailed estimates by engaging consultants and adopted turnkey methodology for project execution, whereas CORE prepared the detailed estimate through its officials and used conventional without stores, conventional with stores and quasi-turnkey methodologies for project execution.

The conventional contracts without stores require skill set with an organisation for engineering, contracting, store procurement, inventory management, monitoring of

contracts etc. towards the common project activities. This requirement is reduced in conventional contracts without stores and further reduced in quasi-turnkey contracts. There is a further reduction in requirement of skill sets in turnkey. EPC contracts require minimum in-house skills.

It was seen that RVNL used turnkey project execution methodology consistently. However, CORE followed different project execution methodologies for different projects without carrying out any cost benefit analysis.

Out of 28 selected projects for CORE, the project execution methodologies used were conventional without stores in 11 projects, conventional with stores in four projects, quasi-turnkey in 10 projects and turnkey in two projects. RE project Barauni-Katihar-Guwahati was divided into four groups which were executed through different project execution methodologies, one through conventional without stores, one through quasi-turnkey and two through turnkey. Two groups in this project were executed by CORE and one each were through conventional without stores and quasi turnkey, while the other two were executed by RVNL through turnkey methodology.

In six out of eight projects, RVNL used turnkey as project execution methodology whereas one project was on quasi-turnkey basis. The project execution methodology of one project of RVNL was yet to be decided, as the detailed estimate was not approved so far.

Annexure 4.1

It was observed that

- No analysis of benefit of in-house procurement of stores with cost implication of manpower, inventory management, optimal utilisation of material, scrap management, stock piling etc. was carried out by CORE.
- The time cost of money involved in supply of stores procured and paid by railway was not assessed as a cost by CORE.
- There were multiple contracts in all projects and time taken in deciding contractors varied and was not synchronized for completion of projects in time.
- The D&G establishment component provision remained at 8.37 *per cent* irrespective of the project execution methodology adopted by CORE. Similar provision for D&G (non-establishment components) remained at 1.35 *per cent* of estimated cost.
- There was absence of project scheduling and monitoring mechanism which is the minimum requirement where multiple contracts are entered into. The time

scheduling processes like CPM/PERT for the project were not used at CORE as well as RVNL at the project level.

- Various requirements for the contractors for execution through various methodologies in terms of manpower, machines, financial resources and monitoring mechanisms were not framed. The estimated benefit of different methodologies in terms of time, manpower requirement for CORE, time cost of money involved, quality issues and corresponding implication on cost (in terms of financial bid) were not carried out at CORE.
- No prioritization was done by the Railway Board amongst projects approved by it, taking into account their financial and operational benefits.

In their reply, Railway Board stated (March 2017) that they have prepared an 'Action Plan' for Electrification wherein is has been decided to electrify 90 *per cent* of BG routes of IR i.e. 24,400 RKM by 2020-21. They further stated that RE projects are generally financially remunerative and as per the approved Action Plan the execution of these projects will be carried out on fast track basis without any prioritizing them on operational & financial basis. They further stated that presently executing agencies decide the methodology of project execution of RE projects. EPC contract methodology has only recently been adopted by CORE in two tenders. As such after gaining adequate experience the EPC mode of contracting system will be used in majority of future RE projects.

RVNL, in their reply stated (March 2017) that Clause 8.3 of GCC clearly provide for submission of detailed time programme by the contractor adopting project management tools. However, audit has pointed out the requirement for use of programme monitoring software and tools by project executing agencies viz. CORE and RVNL.

It is recommended that

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.***

4.2 Processing of tenders

Once the project execution methodology is finalized, various tenders are processed and accepted by the accepting authority. This involves preparation of a tender document comprising of General Conditions of Contract (GCC) and Special Conditions of Contract (SCC). The estimated cost of the project is a part of the tender document. A notice inviting tender (NIT) is issued which prescribes the earnest money deposit (EMD) requirement, eligibility conditions for the contractor, scope and time of work, bidding process in particular single envelope bid or double envelope bid, date of opening of tender, conditions of GCC/ SCC, etc.

The tenders are opened on the prescribed date and subjected to examination by executing department of the implementing agency, vetting by finance department of implementing agency, tender evaluation by the prescribed tender committee (including representative of the finance department) and acceptance by the competent authority. A letter of acceptance (LoA) is issued containing the terms for execution of a binding agreement. This is followed by execution of a binding agreement. The objective of tender process is to assess the capability (Turnover/resources), work experience (previous work), financial solvency (soundness involving review of turnover, balance sheet, work load, etc.) and performance assessment of past works of the bidder. The objective is also to assess his capability to execute the contract in time and obtaining a competitive bid for the execution of the tender. The reasonability of price in a bid is determined on basis of Last Accepted Rates (LAR) of similar previous tenders. These LAR are periodically updated. The activities in tender evaluation where significant time is taken are verification of eligibility requirements of the bidders and determination of applicable rates of Last Accepted Rates (LAR). The former is used to assure Railways of the capability of the bidders and latter to be used for assessing the reasonability of rates offered by the bidders. The cost estimates for EPC mode cannot be compared to LAR's of other methodologies of project execution in view of difference in responsibilities of Railway Administration and its contractors in various project execution methodologies.

4.2.1 Time taken in various stages of tender processing

The details of time taken from issue of NIT after sanction of detailed estimates, acceptance of tenders, issue of letter of acceptance and execution of binding agreement by CORE as well as RVNL was assessed in audit for 36 selected projects. It was observed that

- The time taken for the issue of NIT after sanction of detailed estimates was up to 3177 days in 24 projects (it was issued up to 233 days before finalization of detailed estimate in nine projects) in respect of tender issued by CORE and up to 915 days in 12 tenders in 7 projects in respect of 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 Tiruchirapalli-Madurai project, 2100 days in Varanasi-Lohta-Janghai project and 2003 days in Shakurbasti-Rohtak project. This shows that, NIT was issued before approval of the detailed estimate by CORE authority in nine projects. It was seen that time being the essence of project was compromised and tenders were not processed against objective of completion of project in time.
- Time taken for issuance of Letter of the Acceptance (LOA) from sanction of detailed estimate was in the range of three to 3255 days at CORE, whereas RVNL took 96 days to 1141 days from the sanction of detailed estimate. Agreement of the contracts was executed by CORE and RVNL authorities with successful bidders up to 798 days and 204 days respectively from the date of issue of LOA.

Annexure 4.2 to 4.5

It was further seen that practices such as e-tendering which help in reducing tender processing period significantly[15] were yet to be adopted in CORE or RVNL. The activities involving assessment of contractors' capabilities at various levels (executing department, finance vetting, and evaluation by Tender Committee (TC)) and verification of claims of the bidders is done in sequence and no procedure to carry out these activities in parallel was prescribed/followed. As a result, a lot of time was being taken to complete the assessment.

4.2.2 Number of contracts awarded per project

The number of contracts awarded in the 36 selected RE Projects were seen. It was observed that

- 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-Katihaar-Guwahati project, 30 in Khana-Sainthia-Pakur project, and 29 in Ujjain-Indore and Dewas-Maksi project. On an average 20 and 24 tenders were issued for the two categories of projects, viz. 8 work in

[15] Railway Board letter no. 2004/CE I/Misc./MR's Instructions dated 21.06.2004

progress and 14 completed projects respectively. This indicates that over the years the number of contracts awarded per project continued to be very high.

- While, CORE awarded a large number of contracts to execute a project, RVNL issued only up to four tenders to execute a project. The time taken was 3255 days in Barabanki-Gorakhpur-Barauni project, 2978 days in Barauni-Katihar-Guwahati project, 2667 days in Tiruchirapalli-Madurai project, 2295 days in Ujjain-Indore and Dewas-Maksi project, 2190 days in Varanasi-Lohta-Janghai project and 2108 days in Shakurbasti-Rohtak project.
- Total 506 and 11 contracts were awarded for total 27 and 7 projects by CORE & RVNL respectively for execution of projects. For 27 projects executed by CORE, there were up to 116 tenders for implementation of a single project, for seven projects executed by RVNL, up to four contracts were awarded. In the absence of use of time scheduling processes like CPM/PERT, keeping track of execution of such large number of contracts was also difficult and delays in one or more contracts affected execution of work in other contracts.
- In 19 RE Projects, out of 29 ongoing and completed RE Projects test checked, where the number of tenders issued were more than five; the minimum contract values ranged between ₹ one lakh to ₹ 1.2 crore with a mean of ₹ 24 lakh and maximum value ranged between ₹ 3.16 crore to ₹ 165 crore with a mean of ₹ 45.14 crore.

A large number of small contracts create challenges in regard to monitoring and synchronization of works of different contracts. It also impacts the ease of monitoring, accountability of contractors and coordination issues.

Annexure 4.4 to 4.6

It is recommended that

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.***

Railway in their reply stated (March 2017) that the recommendation of Audit for fast track process of tenders is acceptable and separate set of instructions will be issued to executing agencies after examining the issue in consultation with Civil Engineering (General) Directorate of Railway Board. They further stated that e-tendering has been implemented for tenders of CORE after 24 March 2017.

4.3 Assessment of capability of contractor to execute the project work

Railway Board have laid down the following instructions for assessing the capability of the contractor to execute a work:

- Assessment of turnover and work experience[16],
- Assessment of past performance of the contractor[17]
- List of personnel, organization, plant & machinery available and proposed to be used for the work[18]; and
- Financial soundness (solvency) involving assessment of turnover, volume of workload, balance sheet, etc.[19]

Thus, assessment of capability of a contractor's entails assessing his turnover, resources, work experience, past performance and financial soundness (solvency through examination of balance sheet, work load, turnover, etc.). The practice being followed in CORE and RVNL was reviewed in audit. It is observed that

- In CORE assessment of resources, turnover and work experience as part of eligibility requirement was carried out in tenders above ₹ 50 lakh. However, no assessment of past performance and financial soundness was done in tenders irrespective of money value. Out of 508 contracts awarded in respect of 28 RE Projects, in 474 contracts information was made available to audit. Of these 149 contracts (31 *per cent*) were below ₹ 50 lakh, where no assessment of resources, turnover, work experience, performance and financial soundness was done in absence of any prescribed eligibility conditions.
- In RVNL, the resources, turnover, work experience and financial soundness in term of net positive cash flow from works and liquidity was seen while finalizing the contractor. However, the past performance of the contractor was not incorporated in the assessment process for contractors.

[16]Railway Board letter no.94/CE-I/CT/4 dated 17.10.2002 and letter no. 90/CE-I/CT/27dated 17.08.95
[17]Railway Board letter no.85/WI/CT/23-GCC dated 31.01.86
[18]Railway Board letter no.94/CE-I/CT dated 22.10.2001 and Railway Board letter no. 90/CE-I/CT/27 dated 17.08.95
[19]Railway Board letter no. 2007/CE.I/CT/18 dated 28.09.2007, letter no. 90/CE-I/CT/27 dated 17.08.95, letter number 68-B (C)-PAC/IV/23/20 dated 25.10.1968 and letter no.94/CE.I/CT/4 (Pt. II) dated 19.11.2003

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 seen to have been made by CORE. It is also seen that assessment of the workload of the firm on the 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 also not assessed in both CORE and RVNL while evaluating the bids.

In the absence of comprehensive assessment of the capability of the contractors, in a large number of works contracts, the work got delayed.

It is recommended that

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.***

During the Exit Conference, RVNL stated (March 2017) capability/bid capacity of the contractor is done in RVNL. They stated that if a firm has existing commitment beyond its capacity based on its peak output in last five years, the firm is bypassed. CORE stated that the Tender Committee did not evaluate the performance of the contractor due to lack of process for the same. However, audit stated that the same has been prescribed by the Railway Board and should be followed.

Railway Board in their reply stated (March 2017) that the recommendation on Audit regarding assessment of capability of contractor to execute the project work will be examined in Board's office in consultation with Civil & Finance Directorate and in light of the existing provisions and accordingly, if need be, suitable instructions will be issued. They further stated that the recommendation of Audit regarding work experience and turnover assessment practice to be made compliant to the prescribed directives of Railway Board will be examined separately in consultation with Civil and Finance Directorate of Railway Board.

4.4 Finalization of contract document

Clause 8 of the GCC provides for execution of agreement within seven days after issue of Letter of Agreement and prescribes forfeiture of EMD, if agreement is not executed within the prescribed seven days. GCC Clause 16 (4) (a) provides for execution of agreement after submission of Performance Guarantee, which can be submitted up to 60 days after issue of LOA. The provisions of GCC applicable to CORE, thus have conflicting provisions. The provision at RVNL involved execution of agreement within 28 days after issue of Letter of Acceptance.

Contract was yet to be awarded in respect of one new project being executed by RVNL and information for one project executed by CORE was not available. Review of 517 contracts in the remaining 34 projects revealed that

- The condition of execution of agreement within seven days after issue of Letter of Agreement was not being followed in CORE. Review of 470 contracts (out of 506 contracts in 27 projects) revealed that agreements were executed beyond the prescribed period in 457 contracts. EMD of ₹ 17.55 crore required to be forfeited in these contracts was not forfeited.
- 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. The delays in execution of agreements had a consequential impact on the execution and completion of the work.
- Similarly in RVNL, agreements were signed beyond the prescribed period of 28 days in 9 out of ten contracts in seven projects. Agreements were signed up to 204 days subsequent to the issue of Letter of Acceptance and approximately ₹ 10.61 crore of Earnest Money Deposit was not forfeited. The time taken was 204 days in Amla-Chindwara-Kalumna project and 175 days in Chappra-Balia-Varanasi project.

Annexure 4.7 to 4.10

It is recommended that

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.

Railway Board in their reply stated (March 2017) that the issue will be examined separately in consultation with Civil and Finance Directorate in Railway Board.

4.5 Project Implementation

4.5.1 Time and cost overrun

It was seen in Audit that there are delays in finalisation of tenders and awarding contracts to contractors. There are also numerous extensions granted to the contractors on various accounts. This leads to delays in completion of the projects as well as increase in the estimated cost of the projects. The time and cost overrun in respect of the 29 selected projects reviewed in audit were as follows:

Table 4.1 - Time and cost overrun in respect of completed projects and projects where work is in progress

S. no	*Project*	*Status*	*Original date of completion*	*Actual date of completion*	*Time over run (months)*	*Original detailed estimate cost (₹ in crore)*	*Actual expenditure up to March 2016 (₹ in crore)*	*Cost overrun (₹ in crore)*	*Whether Balance activity pending*	*Physical progress (%)*	*% of cost over run*	*Loss of projected savings (₹ in crore)*
1	*Bhubaneswar-Kottavalasa*	Completed	Mar-01	Dec-04	45	315.65	322.03	6.38	Yes	98	2.02	NAV
2	*Krishnanagar-Lalgola*	Completed	Mar-07	Nov-07	8	63.84	99.93	36.65	No	100	57.41	56.34
3	*Karepalli-Bhadrachalam-Manuguru*	Completed	Sep-07	Nov-09	26	57.54	88.11	30.57	NAV	98	53.13	15.2
4	*Andal – Ukhra Pandabeswar*	Completed	Mar-07	Nov-10	44	40.47	71.48	31.01	No	95	76.62	23.28
5	*Ujjain-Indore and Dewas-Maksi*	Completed	Feb-10	Jan-13	35	67.62	72.21	4.59	Yes	95	7.53	38.03
6	*Tiruchchirappalli-Madurai*	Completed	May-09	Feb-14	57	92.38	155.51	63.13	Yes	95	68.34	165.35
7	*Barabanki-Gonda-Gorakhpur-Chhapra-Barauni*	Completed	Mar-10	Nov-16	80	679.96	934.91	255	Yes	75	37.50	875.22
8	*Shakurbasti-Rohtak*	Completed	Mar-13	Jan-13	-2	69.83	78.55	8.72	Yes	99	12.49	0
9	*Jhansi-Kanpur including Ait Jn.- Konch Branch line of NCR and Kanpur*	Completed	Mar-11	Sep-12	18	155.73	151.65	-4.67	Yes	70	-3.00	64.40

Table 4.1 - Time and cost overrun in respect of completed projects and projects where work is in progress												
S. no	*Project*	*Status*	*Original date of completion*	*Actual date of completion*	*Time over run (months)*	*Original detailed estimate cost (₹ in crore)*	*Actual expenditure up to March 2016 (₹ in crore)*	*Cost overrun (₹ in crore)*	*Whether Balance activity pending*	*Physical progress (%)*	*% of cost over run*	*Loss of projected savings (₹ in crore)*
	Anwarganj - Kalyanpur											
10	*Madurai-Tuticorin-Vanchimaniyachi-Nagercoil*	Completed	Dec-11	Dec-14	36	175.45	249.35	73.9	Yes	92	42.12	376.55
11	*Varanasi-Lohta-Janghai-Unchahar incl. Phaphamau-Allahabad*	Completed	Mar-13	Dec-15	33	151.49	197.86	46.37	Yes	95	30.61	175.02
12	*Mathura-Alwar*	Completed	Mar-13	Mar-15	24	119.83	79.63	-40.2	Yes	99	-33.55	27.61
13	*Ghaziabad-Moradabad*	Completed	Mar-14	Jan-16	22	151.9	143.67	-8.23	Yes	100	-5.42	26.47
14	*Daund - Manmad*	Completed	Mar-12	Jan-16	46	216.18	267.1	50.92	No	96	23.55	17.79
15	*Gooty - Dharmavaram-Yelhenka – including Dharmavaram – Sri Satya Sai PrashanthiNilayam Penukonda*	Completed	Aug-13	July 16	35	228.37	285.15	56.78	Yes	90	24.86	28.10
16	*Roza-Sitapur-Burhwal*	Completed	Mar-14	Nov-16	32	131.98	153.67	21.69	Yes	80	16.43	80.14
17	*Alwar-Rewari*	Completed	Mar-14	Mar-16	24	118.48	123.62	5.14	Yes	95	4.34	14.19
18	*Barauni-Katihar-Guwahati*	In progress	Mar-12	NAV	NAP	821.53	697.37	-124	Yes	20	-15.09	496.06
19	*Shoranur – Kannur-Mangalore-Panambur*	In progress	Jun-14	--	NAP	371.52	394.38	22.86	Yes	80	6.15	94.09
20	*Gondia-Ballarshah*	In progress	Oct-14	--	NAP	203.88	140.47	-63.4	Yes	50	-31.10	57.92
21	*Khana-SainthiaPakur including Pandabeswar-Sainthia*	In progress	Mar-14	NAP	NAP	299.5	304	-4.50	Yes	79	-1.50	169.45
22	*Garhwa Road-Chopan-Singrauli*	In progress	Dec-14	--	NAP	252.75	146.3	106.45	Yes	40	42.11	38.9
23	*Andal-Sitarampur*	In progress	Mar-15	--	NAP	78.98	59.07	-19.9	Yes	50	-25.21	6.722

Table 4.1 - Time and cost overrun in respect of completed projects and projects where work is in progress												
S. no	***Project***	***Status***	***Original date of completion***	***Actual date of completion***	***Time over run (months)***	***Original detailed estimate cost (₹ in crore)***	***Actual expenditure up to March 2016 (₹ in crore)***	***Cost overrun (₹ in crore)***	***Whether Balance activity pending***	***Physical progress (%)***	***% of cost over run***	***Loss of projected savings (₹ in crore)***
24	*Guntkal-Bellary-Hospet*	In progress	Sep-14	NAP	NAP	226.68	7.49	-219	Yes	10	-96.61	159.18
25	*Amla-Chindwara-Kalumna*	In progress	Mar-15	NAP	NAP	255.04	234.79	-20.3	Yes	90	-7.95	NAV
26	*Itarsi-Katni-Manikpur-Cheoki-including Satna-Rewa*	In progress	Mar-15	NAV	NAP	861.34	508.59	-353	Yes	55	-40.98	NAV
27	*Titlagarh – Sambalpur - Jharsuguda*	In progress	Mar-17	NAP	NAP	280.81	96.73	-184	Yes	20	-65.52	NAV
28	*Jakhal -dhuri-Ludhiana*	In progress	Feb-18	NAP	NAP	149.53	0.77	-149	Yes	1	-99.64	NAP
29	*Chhapra-Ballia-Varanasi-Allahabad*	In progress	Mar-18	NAP	NAP	415.15	129.79	-285	Yes	30	-68.64	NAP
				Total	**562**							**3006**

As can be seen from the data above,

- In respect of 17 completed projects,
  - Except one project, which was completed within the targeted time period, in 16 projects, there was a time overrun of 8 months to 77 months in completing the project. On an average, these 16 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 respect of 12 projects where works were still in progress (as on Dec 2016),
  - In 10 projects, the targeted date of completion was over 21 months to 57 months back and the physical progress of work was below 90 *per cent*. (one *per cent* in a project and 90 *per cent in another project*)
  - In three projects, the physical progress was between 79 *per cent* and 90 *per cent and* cost overrun of 6.1 *per cent* has already been incurred in one of these three projects.

Delay in completion of projects led to substantial time and cost overrun as seen by audit in the selected projects. Delays in completion also led to non-achievement of

projected savings. The date of completion has elapsed in 26 projects. In respect of 21[20] projects, projected savings of ₹ 3006 crore could not be achieved due to delay in completion of the projects. There would also be financial cost in terms of interest on investment during the period of delay.

In their reply, RVNL stated (March 2017) that reasons for delays are due to associated doubling/gauge conversion projects, non-availability of blocks, delays in clearances in approvals, frequent changes in specifications and other reasons, most of them being beyond the control of RVNL.

4.5.2 Extensions granted for execution of projects

Implementation of work under the tender for the project starts after the execution of the binding agreement. Period of completion is provided in the contract. Clause 17A and 17B of GCC provides for extension of period of completion on various grounds.

- Clause 17A (i) relates to extension on grounds of any modification which materially increases the magnitude of work. Payment of price variation is involved under this clause.
- Clause 17A (ii) relates to extension on grounds of act or neglect of Railway employees or by other contractor employed by the Railway
- Clause 17A (iii) relates to extension on grounds of delay by the Railway to hand over the contractor possession of lands or to give necessary notice to commence the work or to provide necessary drawings or instruction or any other delay caused by Railway
- Clause 17 B relates to extensions for reasons attributable to the contractor. As per the clause, the time for the execution of the work or part of the works specified in the contract documents shall be deemed to be the essence of the contract and the works must be completed not later than the date(s) as specified in the contract. Under this clause, liquidated damages (LD) and token penalty may be levied for extensions due to default on part of contractor to fulfill his obligation under the contract. On such extension the Railway will be entitled without prejudice to any other right and remedy available on that behalf, to recover from the contractor as agreed damages and not by way of penalty a sum equivalent to ½ of 1 *per cent* of the contract value of the works for each works or part of the work. For the purpose of this Clause, the contract value of the works shall be taken as value of work as per contract agreement including any

[20]Information about loss of projected saving in one completed project and three works in progress where projected date of completion had elapsed was not available. One project was completed within schedule date of completion

supplementary work order/contract agreement issued. Provided also, that the total amount of liquidated damages under this condition, shall not exceed the under noted percentage value or of the total value of the item or groups of items of work for which a separate distinct completion period is specified in the contract.

(i) For contract value up to ₹ 2 lakh – 10 *per cent* of total value of the contract

(ii) For contracts valued above ₹ 2 lakh - 10 *per cent* of first ₹ 2 lakh and 5 *per cent* of balance.

4.5.2.1 517 contracts were awarded by CORE/RVNL in 36 selected projects. Audit reviewed 481 contracts and observed that

- Extensions were granted to the contractors in a routine manner. Of the 481 contracts reviewed in audit, in 419 contracts, extensions were granted.

Annexure 4.9 and 4.10

- For 21 projects executed by CORE, the original period of completion was 3954 months. Total 2026 extensions for 8190 months were granted by CORE. The information was not available in one of these 21 projects. More than 100 extensions were granted in four projects which included Barabanki-Gorakhpur-Barauni project (581 extensions in 113 contracts), Barauni-Katihar-Guwahati (216 extensions in 46 contracts), Khana-Sainthia-Pakur (184 extensions in 22 contracts) and Ujjain-Indore and Dewas-Maksi (171 extensions in 29 contracts). The extensions granted increased the time of execution of the contracts by more than two times. Out of total 506 contracts of CORE, the information was not available in case of 132 contracts. Of 374 contracts, 210 contracts were completed and 164 contracts were in progress. Of these, only 16 contracts were completed within the original date of completion, 22 contracts were terminated by CORE, seven contracts were under arbitration and 14 contracts were under enquiry of Vigilance Department of CORE.

Annexure 4.11 and 4.12

- For six projects executed by RVNL, the original period of completion was 281 months. Total 30 extensions for 208 months were granted by RVNL in three projects. The extensions granted increased the period of execution of the contracts by almost 74 *per cent.* One contract was completed out of total 11 contracts of RVNL and that too after extensions. The remaining 10 contracts were in progress.

Annexure 4.13 and 4.14

4.5.2.2 It was observed that the clauses under which extensions were granted were either not mentioned while granting them or where mentioned on account of the contractor, provisions of levy of liquidated damages were not used to exercise control over execution of the project as discussed below:

- Clause 17 B states that 'competent authority while granting extension to the currency of contract may also consider levy of token penalty, as deemed fit based on the merit of the case. Provided further, that if the Railway is not satisfied that the works can be completed by the contractor and in the event of failure on the part of the contractor to complete the work within further extension of time allowed as aforesaid, the Railway shall be entitled without prejudice to any other right or remedy available in that behalf, to appropriate the contractor's Security Deposit and rescind the contract under Clause 62 of these Conditions, whether or not actual damage is caused by such default.'

  A review of extensions granted by the railways to the contractors in selected 36 projects showed that Railway Administration was using the provision of levy of token penalty under Clause 17 B of GCC *in lieu* of levy of LD, and not in addition to levy of LD as the rules provide. The levy of LD is mandatory under Clause 17(B), as the rule clearly states that 'Further, competent authority while granting extension to the currency of contract under Clause 17 (B) of GCC may also consider levy of token penalty, as deemed fit based on the merit of the case'. From the language used it is evident that the levy of token penalty is in addition to LD and not an alternative to levy of LD on the contractor. The matter was discussed during the Exit Conference (Dec 2016) and GM, CORE agreed to get the matter examined legally.

- Further, while granting extension to the contractors it is mandatory to mention the clause under which the extension is being granted. The periods of such extensions are also required to be monitored. During the review of 517 contracts of 36 projects, it was seen that GCC clause was mentioned only in 612 out of 2056 extensions granted by CORE and 14 out of 30[21] extensions granted by RVNL. Of these, only in 107 cases of CORE and two cases of RVNL, extensions were granted on contractors' account.

[21] Information was not made available for six extensions in Gooty-Dharmavaram-Yelhenka including Sri Stay Si Prashanthi Nilayam-Penukonda Project

- Out of 2086 extensions granted to various contractors by CORE and RVNL, 1446 extensions (69 *per cent*) were granted without mentioning the clause under which these were allowed.
- It was also seen that maximum LD that can be levied under Clause 17B have been prescribed. Thus, any extension beyond this maximum period for levy of LD should be reviewed carefully by the Railway administration, before granting further extensions as it points to repeated failure on part of contractor to adhere to his/her obligations. Such cases should be considered for termination under Clause 17B and Clause 62 of GCC. During Exit conference (December 2016) Railway officials stated that if LD were to be imposed, the capacity and motivation of contractors would be compromised and it would be difficult to get the work completed. Termination of contracts was also stated to be an impractical solution in view of limited availability of bidders and time taken to process fresh tenders. It was also stated that certain activities particularly of civil contracts relating to construction of residential buildings and other activities of Civil Engineering Department do not affect the target which for Railway Electrification is sanction by CRS. It was further stated by Railway administration that extension in date of completion does not impact cost as Price Variation Clause (PVC) is not applied to the extensions and Price Variation is not given to the contractors in most cases.

Annexure 4.9, 4.15 and 4.17

Audit is of the view that clauses of GCC should be used to control the execution of project. The clauses are aimed to ensure that extensions are granted for valid reasons, the reasons for extensions are analysed and that 'time being the essence of the contract' is strictly followed for monitoring of the works. However, review of 517 contracts of 36 projects by audit showed that granting of extensions is being done in a routine manner. The details of extensions, non-imposition of LD's/penalties, non-termination, impact on timeliness of projects implementation, impact on cost etc. are detailed below:

4.5.3 Non-levy of liquidated damages for delay in execution of work

For completion of railway electrification projects, 8302 months of extensions were granted in the contracts for 21 projects executed by CORE and out of this only 421 months (five *per cent*) of extensions were assessed by Railway Administration to be attributable to contractor, where LD was leviable. Railway administration either did not properly assess the entity responsible for extension or largely assessed it on

railway account for balance 7881 months extension (95 *per cent*). However, LD of ₹ 37.66 lakh only was levied by CORE in four projects. This includes a sum of ₹ 10 lakh LD levied and recovered in Mathura-Alwar project where GCC clause was not mentioned. CORE levied token penalty for those extensions (which were attributable to the contractor and where GCC clause was mentioned) and levied an amount of ₹ 109.44 lakh and ₹ 38.96 lakh in respect of nine completed works and five works in progress respectively.

Annexure 4.15 and 4.16

Similarly, in RVNL, 208 months of extensions were granted for three projects and only 16 months of extensions (7.7 *per cent*) were assessed where LD was leviable. However, LD of ₹ 4.65 crore in two projects and token penalty amounting to ₹ 1.53 crore and ₹ 0.16 crore in respect of one completed work and one work in progress respectively was levied.

Annexure 4.17 and 4.18

Audit reviewed the reasons for extensions granted by the Railways and observed that

- In respect of 13 completed works of CORE, for total period of extensions of 2092.8 months granted on account of the contractor, an amount of ₹ 194.23 crore of LD was leviable on the contractor. The periods of extensions in these projects attributable to contractor ranged between seven and 986 months and on an average extension of 156.28 months were given in these 13 completed projects. As assessed by audit, on an average, LD of ₹ 15.00 crore was leviable on the contractors in these 13 completed projects (ranging from ₹ 0.51 crore and ₹ 123.18 crore).
- Similarly, in respect of seven projects where work was in progress, it was seen that 554.17 months of extensions were granted on account of the contractor with leviable LD assessed by audit as ₹ 56.05 crore. On an average, extension granted per work was 79.17 months and leviable LD was ₹ 8.00 crore in respect of these projects.

Annexure 4.19

- For two completed projects executed by RVNL, 114 months of extensions and LD of ₹ 29.01 crore was attributable to the contractor.

Annexure 4.20

- The reasons for extensions included non-availability of material for foundation, delay in receipt of material, non-completion of 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 TR line, non-supply of material etc. on Railway account.

Thus, extensions were granted to the contractors in a routine manner. In a large number of cases, the clause of the GCC under which the extensions were granted were also not mentioned. Where extensions were granted due to reasons attributable to the contractors, levy of LD was not being resorted to in most of the cases and only token penalty were imposed and recovered. Therefore, tender processing delays and extensions in a contract are impacting progress of work in various contracts. Time as essence of contract is not appreciated by the Railway administration itself and consequently not communicated to the contractor. The only mechanism available to the Railway administration to emphasize the importance of 'time being the essence of the contract' is through levy of LD, penalty and termination, which are not being used effectively.

4.5.4 Time cost of idle investments due to extensions

Delay in implementation of electrification projects leads to greater time lag in productivity of capital invested. Capital invested without completion has a time cost. Railway finances their projects from the Government of India (Capital account) as well as through borrowings through Indian Railway Finance Corporation. Financial Project Appraisal and monitoring does not include time cost of money on investment during the construction phase and loss of projected savings during execution of the project. Time cost of idle investment has been worked out by audit at 5 *per cent* per annum[22]. Impact of delays is reflected in time cost of idle investment due to extensions for contracts has been reviewed and assessed in respect of 26 (23 of CORE and three of RVNL) out of 36 selected projects. Audit assessed that

i. For the 23 projects (15 completed and 8 work in progress) executed by CORE, an amount of ₹ 923.27 crore of time cost of money during the execution of the projects was involved. The information was not available in two completed projects and one work in progress.

ii. Due to delay in completion of projects, an amount of ₹ 2798.94 crore of the expected projected savings could not be achieved in 19 projects of CORE as detailed below:

[22]Average of the rate of dividend declared by Railway Convention Committee

- In respect of 13 completed projects of CORE, an amount of ₹ 1561.25 crore of projected saving could not be achieved. These projected savings ranged between ₹ 14.19 crore (Alwar-Rewari project) to ₹ 875.22 crore (Barabanki-Gorakhpur-Barauni project), with an average of ₹ 120.09 crore per project. The information was not available in one completed project. One project was completed within prescribed date of completion.
- Similarly, in respect of four works in progress of CORE, an amount of ₹ 272.99 crore of projected savings could not be achieved. The projected savings ranged between ₹ 6.72 crore (Andal-Sitarampur project) to ₹ 169.45 crore (Khana-Sainthia-Pakur project), with an average of ₹ 68.24 crore per project. These projects are still not completed and their loss of projected savings would increase with delay in completion of project. The information was not applicable in one project and not available in one project.

Annexure 4.21

iii. Similarly, for the three electrification projects (two completed – Daund-Manmad and Gooty-Dharmavaram-Yelhenka project and one work in progress – amla-Chindwara-Kalumna project) executed by RVNL, an amount of ₹ 42.59 crore of time cost of money was involved during the execution of the project. An amount of ₹ 176.97 crore of projected savings could not be achieved due to delay in completion of two electrification project executed by RVNL (one completed and one work in progress). The information was not applicable to three projects and not available for one projects.

Annexure 4.22

Substantial delays in completion of the projects, lead to increase in the capital cost of the projects and till the time the project is completed and assets put to use effectively, there is a time cost of money on the capital invested, which is not considered while planning and implementing the project. The delay in completion also leads to loss in projected savings. This loss is not given any consideration while planning a project, determining project execution methodology, selection of contractor and execution of the project by the Railway administration.

It is recommended that

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.***

During Exit Conference (March 2017), CORE assured that clause of GCC under which extensions for date of completion are granted will be mentioned by CORE and necessary instructions would be issued to CPDs for compliance. However, in most of the cases of delays the reasons are attributable to railways as well as contractors. CORE assured that only token penalty will generally not be concurred henceforth and liquidated damages would be imposed under clause 17B of GCC.

During Exit Conference (March 2017), RVNL stated that most of the delays were on account of Railways and beyond the control of RVNL. They further stated that RVNL is a special purpose vehicle for execution of important projects and hence issue of penalty on RVNL should not arise. Audit is of the view that non provision of penalty on RVNL was not consistent with objective of ensuring accountability of executing agencies in implementation of RE Projects. CORE and RVNL however, agreed that a tripartite agreement would assist in timely completion of projects.

Railway Board in their reply stated (March 2017) that Audit recommendation regarding providing incentives in the tender process for early completion of project so as to derive financial and operational benefits optimally will be examined separately in consultation with Civil and Finance Directorates in Railway Board. Railway Board accepted the Audit recommendations for incorporation of timelines in MOU between Railway Board and RVNL for giving incentives for timely completion of projects and imposing penalty for delay in execution of RE projects and stated that the same would be examined in consultation with RVNL and Civil Engineering Directorates. The Audit recommendation regarding 'tripartite agreement between the Zonal Railway, implementing agency and the contractor and to delineate responsibilities and streamline coordination issues between the three parties', was accepted by the Railway Board and they stated that the modalities for its implementation will be decided in due course.

4.6 Project monitoring mechanism

As we have seen, there have been substantial delays in completion of the RE projects. Many of the delays have been due to delays in decision making at various levels of planning, tendering, award of contracts, execution of works and co-ordination between entities within railways (Zonal Railways in particular) and with other government and quasi government entities (mostly state government entities). Railway Board has issued orders/instructions from time to time for strengthening the monitoring mechanism of these projects.

Project Management Consultancies (PMCs) for supervision of projects being executed by Railways is permitted as per Railway Board orders[23] (October 2006) subject to the condition that the cost of PMC contract and actual departmental manpower taken together should not exceed the stipulated D&G charges in the estimates i.e. outsourcing should be expenditure neutral. PMC document of RVNL has been permitted to be used. Railway Board also issued instructions[24]for preparation of databases for list of approved and working contractors in various categories with details regarding status of standing earnest money, performance on completed/ongoing works and other relevant credentials. Database of last accepted rate of all works awarded during last 3-4 years (with special features, if any) and information is also required to be kept of firms with experience in specialized areas of work.

It was seen that these were not being followed at CORE. One of the constraining factors for delay was non-availability of supervisor and other staff. CORE did not resort to use of PMCs for overcoming these constraints. This resulted in delays during project planning and execution.

It is recommended that

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***

[23] Letter no.2006/W-I/General/D.P. Pt. I dated 10.10.2006
[24] Letter no. 2002/CE/I/CT/5 dated 16.01.2003

signaling work (fit for all operations) etc. should be identified and implemented.

During Exit Conference CORE stated that large number of delays occur in procurement of tower wagons, multi utility vehicles like crane mounted on self-propelled rail which are part of rolling stock programme. They opined that these activities should also be assigned to them like RVNL. Audit agreed that these activities need to be considered to a part of detailed estimate of CORE. CORE further stated that non-availability of LAR for EPC contracts would make assessment of offered rate difficult. They stated that at present technical bid is received, evaluated and quantum of work finalized and subsequently financial bid is called from eligible bidders. This reduces competition and railways loses its capacity to achieve completion of projects in schedule time at reasonable price.

Audit stated that preparation of DPR should enable obtaining a price bid along with a technical bid. Further, the changes in the scope of work on account of new technology, fresh specifications/fresh requirement is not entirely an unexpected event. The bid document should provide for mechanism to discover price for these changes in scope of work through identification of changes and discover a time and cost through process similar to an arbitration process involving representatives of bidders, Railway and a mutually acceptable independent and credible entity. Where the changes are large enough to make the original bid redundant before issue of Letter of Acceptance, the price discovery in such cases could be based on Swiss Challenge Methodology where the revised price given by the bidder can be challenged by any other entity with equivalent technical competence and a percentage of tolerance for the challenges (say five per cent) could be prescribed. Alternately, the original bidder could be given on opportunity to match the competitive bid. The technological practices should be considered for upgradation. It could include mechanization of work of foundation, fit for all signalling works, stringing from both sides, use of CCTV, uploading of Videos in measurement and monitoring of work of contractors etc.

Railway Board in their reply stated (March 2017) that from time to time, Railway Board has delegated the power to sanction of detailed estimate and award of works contracts to Zonal Railways. As regard approval of variations of quantities are concerned Board's instructions already exists for empowerment of Zonal Railways. The layout and drawings etc. are being approved at CPD's level.

Railway Board further stated that Audit recommendations on prescribing time period for higher hierarchical formations for decisions, will be examined separately in Railway Board. They added that e-tendering has been implemented by CORE for tenders opening beyond 24 March 2017 and Audit recommendation regarding changing business practices, minimising multiplicity of contracts and using EPC mode of contracting and technological upgradation were acceptable and would be implemented in phases.

4.7 Productivity of deployed human resources

The human resources deployment at CORE involves sanction of work charged posts based on Budget allotment for CORE. A provision in the estimate is made for establishment expenses under Direction & General Charges (D&G) for each electrification project. The D&G charges comprise of establishment component (8.37 *per cent* of estimated cost) and other than establishment component (1.35 *per cent* of the estimated cost). The establishment component is further split in to percentages allocated for each department. The prescribed D & G charges are the maximum permitted for each project and number of posts to be sanctioned (Gazetted and non-Gazetted) are required to be within the permitted percentage charges. Instructions including yardsticks for gazetted posts (based on budgetary allocation) for officials above senior scale have been prescribed by the Railway Board. Audit had highlighted issues relating to D & G Charges in the Audit Report[25]on "Provision and utilization of Direction and General Charges provided in works estimates of construction organization in Indian Railways.

The details of D&G charges on establishment matters were reviewed in respect of 28 selected projects executed by CORE and it was observed that

- In 14 projects the details such as provision and/or expenditure on D&G charges were not maintained/made available to Audit.
- In remaining 14 projects, against the total provision of ₹ 247.93 crore for D&G charges, an expenditure of ₹ 415.61 crore was incurred. Total excess expenditure on D&G charges for 11 projects (comprising of 9 completed and two work in progress) was ₹ 202.75 crore. The expenditure on D&G charges was less than the provision in three projects viz. Gondia-Balharshah, Garhwa Road-Chopan-Singrauli and Jharsuguda-Sambalpur-Titlagarh RE projects.

[25]Chapter 3 of Report no 24 of 2015 (Railways) Volume II of Comptroller & Auditor General of India

- Railway Administration had rectified the process of sanction of D&G charges with effect from 2016-17 based on internal audit carried out in CORE. It was seen that 82 numbers of posts against RE estimates were being operated in other Zonal Railways and Railway Board which cannot be operated and hence has led to classification of revenue expenditure as capital expenditure besides unauthorized operation of posts against RE estimates.
- In RVNL, the establishment expenses are given separately as management charges at fixed percentage of the expenditure (currently 8.5 *per cent* of the expenditure /estimated cost).
- The productivity of deployed manpower has been taken as expenditure on works to expenditure on establishment within a project. The productivity of Human Resource deployment in nine completed projects varied between 3.92 and 11.53 with mean value of 6.35 and median value of 5.13 against the benchmark of productivity on human resources deployment of 9.72.

Besides, the cost of work charged post as per Para 776 of Indian Railway Finance Code, Volume I is required to include leave salary, contribution towards passes, pension, etc. which is not being reflected in the expenditure on establishment component of D&G charges booked in an electrification project. The pension liability is to be assessed on actuarial valuation as per Para 339 of Indian Railway Finance Code, Volume I. The productivity of deployed manpower has been taken as expenditure on works to the expenditure on establishment within a project. The inclusion of leave salary, contribution towards passes, pension, etc. as a charge in D&G expenses would further reduce the productivity of deployed manpower. A significant reason for low productivity is delays in execution and completion of the project.

In view of provision of Management Fee of 8.5 *per cent* for RVNL, D&G charges of 0.25 *per cent* for zonal railways and inclusion of Project Management Consultancies in the project expenditure, for projects executed through RVNL, the productivity of deployed manpower in these projects could not be assessed in comparison to CORE (due to differential practices in the two entities). **Annexure 4.23**

It is recommended that

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.

During Exit Conference (March 2017) CORE stated that efforts are being made to control the D&G charges which has been curbed to a considerable extent.

Railway Board in their reply stated (March 2017) that the recommendation of Audit is acceptable and provisions already exist in D&G charges of the estimate. As such executing agencies are already empowered to decide on enhancing the productivity of deployed human resources.

4.8 Utilisation of blocks including costing of blocks

A 'block section' means that portion of the running line between two block stations[26] on to which no running train may enter until 'Line Clear' has been received from the block station at the other end of the block section. To undertake works on sections, a 'block' 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.

The utilization of block is related to project execution methodology applied by the implementing agency, nature of section to be electrified (new line, doubling, double line and single line) and involved contractors and personnel of the Railway administration. Block is a scarce resource, which is provided to the implementing agency for Railway Electrification by the concerned Zonal Railway. Availability of blocks and utilization by the implementing agency and the contractors is one of the critical areas for completion of the RE Project within prescribed cost and time. Data of the Block Utilization for Route Kilometre (RKM) of route electrified was studied in respect of the selected projects by audit.

It was observed that

- No benchmark for utilization of block has been prescribed by the Railway administration for RE Projects. Since utilization of block is not benchmarked, actual utilisation of blocks is also not monitored.
- For the 11 projects executed by CORE, block utilization per RKM in different RE projects ranged between 248 minutes and 1401 minutes with mean value of 794 minutes (based on information of block utilisation per RKM in different projects) and median value of 779 minutes. The block time utilized for the entire 1912 RKM in these 11 projects was 18834 hours.

[26] Block stations are those at which the Loco Pilot must obtain an authority to proceed, under the system of working, to enter the block section with his train. Non-block stations are stopping places, which are situated between two consecutive block stations, and do not form the boundary of any block section.

- The average block time utilised per RKM in respect of the 11 projects was 591.02 minutes.
- Block utilization details of RE projects executed by RVNL were not made available.

Annexure 4.24

It is recommended that

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.

During Exit Conference (December 2016 and March 2017) CORE, RVNL and Zonal Railways agreed with the audit recommendation. Railway Board in their reply stated (March 2017) that the matter regarding utilization of blocks including costing of blocks and further incentivizing/penalizing with respect to the prescribed benchmark for utilization, will be examined in consultation with Civil, Traffic and Finance Directorate of Railway Board.

4.9 Management of obligation of railways /CORE

The uncertainties in the contract should be minimum both for the contractor and Railway Administration to ensure timely completion of the work. Any uncertainty in the contract document ultimately impacts the projects and railways in terms of delays in completion, potential of higher financial bid by the contractors for all subsequent bids. It is in the interest of railways to fix a timeline for various activities to be performed by the railway administration for its obligations under the contract. This should include bill payment period. Railway Board (September 1992) also issued instructions[27] for fixing time for processing of the bills for payment right from the stage of measurement in various offices. The requirement for the contractor to get the details of his executed work incorporated in the records of the implementing agency is also an area of concern.

It was seen that no time limits were prescribed in CORE for various stages of processing of bills for payment, right from the measurement stage.

[27]Letter no.74-W/O/Part XVIII (Railway) dated 17.09.1992

It is recommended that

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.

During Exit Conference, CORE agreed with the Audit recommendation. Railway Board in their reply stated (March 2017) that instructions will be issued in due course to executing agencies for prescribing timeliness for various activities from measurement to passing of bills. As regards holistic project monitoring they stated that the recommendation will be examined in Railway Board.

Chapter 5 - Post project utilisation of Railway Electrification Projects

The abstract estimate of a project includes justification and benefits from the RE Projects including projected savings due to lesser fuel consumption, reduced detention, faster and greater Traffic (both Goods and Passengers) and avoiding traction change. Review of Post project utilisation of the electrified routes is done to assess the benefits derived from the project. This includes comparison of traffic projections as given in abstract estimates and actual traffic running on electric traction as well as actual savings vis-à-vis expected savings. Incomplete / balance activities (non-completion of TSS, SCADA, Electrification of Sidings, Traction availability, crew availability etc.) also has an impact on the benefits derived from the project. Audit reviewed the balance action remaining after CRS sanction and extent of utilisation of electrified section after completion of the works in selected 17 completed projects. Audit finding are described below:

5.1 Balance activities yet to be completed after CRS sanction

RE projects are monitored by the Railway Board on parameters of extent of energisation of 2.2 KV, energisation of 25 KV and sanction of Commissioner for Railway Safety (CRS). Railway Administration treated the project completed after CRS sanction. It was seen in Audit that despite sanction of CRS, a number of activities remains to be completed and financial transactions in the projects continue to take place in subsequent years after sanction of CRS. These balance activities include completion of work of transmission lines, completion of work of TSS, electrification of sidings, construction of residential quarters for maintenance staff, activities in yard, work of supervisory remote control attributable to implementing agencies for Railway electrification. However, in absence of the completion of these balance activities, the utilisation of the electrical section has remained negligible to at the most marginal. Besides, activities like availability of electric crew, locomotives, maintenance staff and general reluctance to change are other factors which are within the control for open line railway formations, and result in sub-optimal utilisation of these electrified sections.

The balance activities which were yet to be completed despite CRS sanction and treating the project as complete, in respect of 17 selected completed projects, were as follows:

Table 5.1 – Post project utilization of projects reviewed in sample			
Project	***Date of CRS sanction***	***Balance Activities yet to be completed***	***Responsible Department/ Agency***
Bhubaneswar-Kottavalasa	26.08.99 01.05.00, 25.04.01, 9.03.02 and 31.12.2004	Commissioning of one TSS at Malatiur on Khurda Roard-Puri section has not been completed even after lapse of over 12 years of electrification of the section.	Electrical Department
Krishnanagar-Lalgola	Nov-07	While authorizing the introduction of 25 KV AC single phase electric Traction (November 2007), the Commissioner of Railway Safety pointed out that as the Debagram TSS was feeding the entire section, it was to be ensured that the voltage at the furthest point did not drop below the prescribed limit, under any circumstances. Trains were to be regulated if required. Thus, to cope up with the low voltage problem, only 50 per cent of trains were converted from Diesel to Electric Traction. Out of 11 pairs of Passenger/Express trains in the Krishnanagar-Lalgola section, five pairs of train were running in Diesel Traction after completion of the Cossimbazar TSS in October 2009.	Electrical Department
Karepalli-Bhadrachalam-Manuguru	Nov-09	No work pending	--
Andal – Ukhra – Pandabeswar	19.11.10	No work pending	--
Ujjain-Indore and Dewas-Maksi	23.06.2012 & 05.01.2013	Due to non- electrification of Ruthiyai – Maksi section of WCR which is a missing link being an island diesel territory surrounded by electrified sections of Kota – Ruthiyai – Bina and Nagda – Ujjain – Maksi sections is an impediment in the optimum utilisation of this project.	NAP
Tiruchchi rappalli-Madurai	30.06.11 and 06.02.14	Lightning arrester counters not provided, DG-TSS-PTFE yet to be provided, MDU yard road no. 5, 6, 8 to 10 not wired, DG TSS & SER TSS not commissioned	Electrical Department
Barabanki-Gonda-Gorakhpur-Chhapra-Barauni	Jan 2012 and Nov 2016	There were severe leakages of transformer oil at Hajipur TSS which indicated that the transformers were of poor quality. The works of Noonkhar/TSS, Govind Nagar/TSS, Burhwal/TSS, Bachhawara/TSS and Ramdayalunagar/TSS were still incomplete even after more than one year of CRS sanction.	Electrical and Civil Engineering Department
Shakurbasti-Rohtak	10.01.2013	SCADA was not yet commissioned and the post was being manned.	Electrical Department
Jhansi-Kanpur	17.9.12,17.9.13 and 12.3.15	The work of Sarsoki TSS got delayed due to delays in land acquisition, Tower Wagon Shed and Siding were not ready at Chirgaon OHE Depot, incomplete work at Jhansi FP & SP; SCADA work was pending at JHS/SP main line, work of staff quarters at Orai, Pokhrayan, Chirgaon etc. were pending, which required to be done.	Electrical Department
Madurai-Tuticorin-Vanchim aniyachi-Nagercoil	15.12.2014	Oil filtration plants not supplied for Dindigul, Virudunagar & Kovilpatti/TSS and Split capacitor banks at 5 TSS in TNEB area to be provided	Electrical Department
Varanasi-Lohta-Janghai-Unchahar incl. Phaphamau-Allahabad	31.12.2015	The works of staff quarters in Varanasi, Bhadohi, Prayag and Unchahar are still pending. In addition to this some telecom works like earthing, PIJF cable laying and handing over of OFC in PFM-UCR section is in progress.	Civil Engineering and S&T Department

Table 5.1 – Post project utilization of projects reviewed in sample

Project	*Date of CRS sanction*	*Balance Activities yet to be completed*	*Responsible Department/ Agency*
Daund-Manmad	10.08.14 and 30.01.16	Stabilization of SCADA system, isolator at location 269/12 with flexible copper shunt and painting of SP/SSP structure bonds with green colour are still to be completed.	Electrical and Civil Engineering Department
Mathura-Alwar	23.03.2015	Deeg/TSS is yet to be charged, SCADA space is to be provided by NCR Hd. Qtrs and Railway Board for putting the servers, 6 new stations are yet to be electrified by CAO/NCR from this estimates.	Electrical & Construction Department
Ghaziabad-Moradabad	Jan-16	In SCADA work, out of nine Remote Terminal Units (RTUs), seven RTUs were installed and joint inspection had been done with Divisional Authorities. All the seven RTUs of SCADA are operational in the section. Rest work of two RTUs is still in progress. Miscellaneous work of Signalling & Telecommunication and Civil work are in progress.	Electrical Department
Gooty-Dharmavaram-Yelhenka	July-16	Works on two Traction Sub Stations (TSS) at Someshwara and Malugur was yet to be commissioned by the contractor.	Electrical Department
Roza-Sitapur-Burhwal	October and November 2016	Not made available to audit	
Alwar-Rewari	26.03.2016	Construction of Tower wagon shed at Alwar and Rewari. Balance work of RE's SP & SSP, Submission of erected drawing, emergency power supply arrangement at TRD depot, staff quarters at Alwar and Rewari.	Civil Engineering, Electrical Department

As can be seen from the above a number of balance activities were yet to be completed in these projects despite CRS sanction. Many of these balance activities have been critical for effective post project utilisation of the electrified sections.

5.2 Post completion utilisation of the electrified section

The justification given for taking up these RE projects reflected anticipated passenger and goods train to be run on electrified section using electric traction after completion. The same was compared with the actual traffic running on electric traction on the electrified sections and project wise details are given below:

Table 5.2 - Post project utilisation of 17 completed projects reviewed in audit

S. no	*Project Name*	*Estimated saving per annum as per Abstract Estimate (₹ in crore)*	*Date of last CRS sanction*	*Percentage utilization wrt projected utilization (%)*	*Percentage present utilisation (%)*	*Shortfall in achievement of projected savings (₹ in crore) wrt utilisation*		*Reasons*
						Projected	*Present*	
1	*Bhubaneswar -Kottavalasa*	NA	Mar 2002	199.64	100.00	nil	nil	Not applicable
2	*Krishnanagar -Lalgola*	NA	Nov 2007	NA	100.00	NA	nil	While authorizing the introduction of 25 KV AC single phase electric Traction (November 2007), CRS pointed out that the Debagram TSS was feeding the entire section and it

Table 5.2 - Post project utilisation of 17 completed projects reviewed in audit

S. no	Project Name	Estimated saving per annum as per Abstract Estimate (₹ in crore)	Date of last CRS sanction	Percentage utilization wrt projected utilization (%)	Percentage present utilisation (%)	Shortfall in achievement of projected savings (₹ in crore) wrt utilisation		Reasons
						Projected	Present	
								was to be ensured that the voltage at the furthest point did not drop below the prescribed limit, under any circumstances. Trains were to be regulated if required. Thus, to cope up with the low voltage problem, only 50 *per cent* of trains were converted from Diesel to Electric Traction. Out of 11 pairs of Passenger/ Express trains in the Krishnanagar-Lalgola section, five pairs of train were running in Diesel Traction after completion of the Cossimbazar TSS in October 2009.
3	*Karepalli-Bhadrachalam-Manuguru*	8.68	Nov 2009	NA	97.83	NA	16.04	One DEMU running on the section, all other are running on electric traction.
4	*Andal – Ukhra Pandabeswar*	17.44	Nov 2010	NAV	NAV	NAV	NAV	Section next to this section are under electrification.
5	*Ujjain-Indore and Dewas-Maksi*	17.45	Jan 2013	154.46	82.05	0.00	12.27	Due to non- electrification of Ruthiyai – Maksi section of WCR which is a missing link being an island diesel territory surrounded by electrified sections of Kota – Ruthiyai – Bina and Nagda – Ujjain – Maksi sections is an impediment in the optimum utilisation of this project.
6	*Tiruchchirappalli-Madurai*	23.29	Feb 2014	38.84	58.39	40.36	27.46	Due to non-availability of adequate AC trained loco pilots in Madurai division. Most of the goods trains running in Dindigul-Madurai section are coming from Karur, which is non-electrified section. Traction change facilities at Dindigul are inadequate. Sub-stations at Samayanallur has been commissioned only on 16 Nov 2016, 2 years 9 months after the last CRS sanction.
7	*Barabanki-Gonda-Gorakhpur-Chhapra-Barauni*	122.85	Nov 2016	6.29	42.18	19.19	11.84	There is lack of adequate electric locos which led to partial utilisation of the electrified section. Two TSS ate Burhwal and Nunkhar are yet to be commissioned and line no. 7 to 15 of Gorakhpur Station have

Table 5.2 - Post project utilisation of 17 completed projects reviewed in audit

S. no	Project Name	Estimated saving per annum as per Abstract Estimate (₹ in crore)	Date of last CRS sanction	Percentage utilization wrt projected utilization (%)	Percentage present utilisation (%)	Shortfall in achievement of projected savings (₹ in crore) wrt utilisation		Reasons
						Projected	Present	
								also not been electrified. Further, there are nine junction points in this section viz. Gonda, Manakpur, Gorakhpur, Gorakhpur Cantt., Bhatni, Siwan, Chhapra, Muzaffarpur and Samastipur. The branch lines from these junction points have not been planned for electrification Traction change point has also not been planned at each junction point.
8	*Shakurbasti-Rohtak*	28.21	Jan 2013	19.80	7.45	82.95	95.73	Reasons not available.
9	*Jhansi-Kanpur*	32.3	Mar 2015	72.68	55.23	28.68	47.00	TSS at Sarkosi, Tower Wagon Shed and siding at Chirgaon, SCADA yet to be completed.
10	*Madhurai-Tuticorin-VanchiManiyachchi-Nagercoil*	29.73	Dec 2014	52.96	48.71	27.97	30.50	Due to non-availability of adequate AC trained loco pilots in Madurai division. Most of the goods trains running in Dindigul-Madurai secton are coming from Karur, which is non-electrified section. Traction change facilities at Dindigul are inadequate. Sub-stations at VanchiManyachi Jn. have been commissioned only on 16 Nov 2016, 1 year 11 months after the CRS sanction.
11	*Varanasi-Lohta-Janghai-Unchahar incl. Phaphamau-Allahabad*	36.43	Dec 2015	15.38	14.16	28.26	28.67	Reasons not available.
12	*Daund - Manmad*	61.34	Jan 2016	5.95	4.01	52.89	53.98	Trains coming from Solapur-Manmad and Miraj-Daund-Manmad sections are running on diesel power as Solapur-Daund and Miraj-Pune sections are not electrified.
13	*Mathura-Alwar*	29.68	Mar-15	16.67	28.57	43.28	37.10	Deeg/TSS is yet to be charged, SCADA space is to be provided by NCR Hd. Qtrs and Railway Board for putting the servers, 6 new stations are yet to be electrified by CAO/NCR from this estimates. The section remains underutilised as the traction

Table 5.2 - Post project utilisation of 17 completed projects reviewed in audit

S. no	*Project Name*	*Estimated saving per annum as per Abstract Estimate (₹in crore)*	*Date of last CRS sanction*	*Percentage utilization wrt projected utilization (%)*	*Percentage present utilisation (%)*	*Shortfall in achievement of projected savings (₹ in crore) wrt utilisation*		*Reasons*
						Projected	*Present*	
								change point was not shifter to Alwar.
14	*Gaziabad-Muradabad*	42.31	Jan-16	22.22	15.79	27.42	29.69	Reasons not available.
15	*Gooty-Dharmavaram-Yelhenka including Dharmavaram-Sri Satya Sai Prashanthi nilayam-Penukonda*	16.79	July 2016		18.92	7.00	5.67	TSS at Someshwara and Malagur are yet to be commissioned. However, The Commissioner of Railway Safety (CRS) sanctioned running of trains on the entire Section in July 2016. Thus, the full quota of trains was not run on the section due to non-completion of residual works.
16	*Roza-Sitapur-Burhwal*	30.74	Nov 2016	8.40	3.83	2.35	2.46	Reasons not available.
17	*Alwar-Rewari*	8	Mar 2016	23.67	5.76	4.58	5.65	The connecting sections of Alwar-Bandikui, Rewari-Delhi, Rewari-Bhiwani are not electrified. 12 coal rakes were projected, which were to come from Mathura side. As in Mathura-Alwar section, Deeg TSS is yet to be commissioned, trains are not being run on this section on electric traction.
Total						**364.92**	**404.05**	

It was seen that the extent of utilisation of the electrified sections was sub-optimal. It was seen that

- Only in two sections, the utilization was equal to or more than the projected utilisation.
- In one section, though the utilisation was more than projected utilisation, it remained 82.05 *per cent* of the present overall utilisation.
- In two projects the present utilisation was 97.83 and 82.05 *per cent* of the projected figures.
- In 12 electrified sections, up to 59 *per cent* trains were being run with electric traction only. On an average the percentage utilisation was 25.25 *per cent* with median of 17.36 *per cent*.
- The shortfall in achievement of projected savings was ₹ 364.92 crore for 12 projects.

- The shortfall in achievement of projected savings with respect to present utilisation was ₹ 404.05 crore in 14 projects.

The main reasons for such under-utilisation of electrified sections were non-completion of balance activities, missing links which did not allow seamless operations of trains with electric traction on these routes, lack of planning in identifying traction change points and inadequate coordination between Zonal Railways, non-availability of adequate electric locos and loco pilots etc.

Annexure 5.1

5.3 Use of diesel traction on electrified section

One of the impacts of balance activities yet to be completed and missing links in seamless operations of trains on electric traction is that despite sections being electrified, trains are being run on diesel traction. Audit test checked data in respect of 15 Divisions of eight Zonal Railways involving 66 electrified sections of 15286 RKM where 345 trains were being run on electrified sections through Diesel Traction. Analysis of reasons for operation of Diesel Locomotives revealed the following main reasons as stated by eight Zonal Railway Administrations in respect of 345 trains:

- Missing links between electrified sections yet to be electrified. Running of trains with electric traction on these electrified section, requires tractions change at one or more points, which leads to detention and delays.
- Balance activities like commissioning of traction sub-stations yet to be completed.
- Coordination issues between Zonal Railways.
- Terminal constraints
- Shortage of electrical locomotives for passenger and goods trains.
- Paucity of MEMU rakes

The significant cases of use of diesel traction on electrified track were attributable to missing links. Railway Board has also identified a number of missing links affecting utilization of existing electrified sections **(Appendix IV)**. All such missing links should be taken up on priority so as to derive maximum benefits of the electrified sections. Non-completion of balance activities on time has also led to underutilization of electrified sections. Thus, post project utilisation was an area of concern, and IR needs to monitor projects for post project utilisation as well.

Annexure 5.2

During Exit Conference (March 2017) with NCR Administration the following reasons for meagre/sub-optimal post project utilisation emerged:

- Non-electrification of siding for two Power Houses at Rewari impacting utilisation of electrified Mathura-Alwar Section in North Western Railway.
- Lack of an overall view as officials of Zonal Railway do not look beyond their jurisdiction. Priority given to other Zonal Railways involved is always lower.
- Shortage of Crew and Electric Locos
- Traction change and interchange point lie in another Zonal Railway and there is a lack of co-ordination between the Zonal Railways involved.
- Terminal constraints, like, entry to any station takes much time (even from calling on signal) due to less number of platforms, availability of land, change in Planning during the execution stage, prior or even post completion of any Plan/Construction owing to lack of long term vision. They felt that Terminal constraints would render the electrification ineffective as regards to projected savings and efficiency and works for terminal facilities were needed to be taken up simultaneously with electrification.

NCR Administration felt that to optimally utilize the electrified section, pan-India view needs to be taken at Railway Board level. They were of the view that staff recruitment for electrified routes (both maintenance and loco drivers) should be a part of the project at its planning stage. Permanent cadre for CORE was stated to be required to reduce pressure on Zonal Railways, which themselves have considerable vacancies.

It is recommended that

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 un-avoidable reasons.

Railway Board in their reply (March 2017) noted the Audit recommendation and stated that Railway Board is already monitoring critical activities of RE projects not only with Zonal Railways, but also with State Authority for release of power supply for traction sub-stations.

However, as can be seen from the impact of balance critical activities pending on utilisation of sections post electrification, there is a need to incorporate internal control mechanism for monitoring post project utilisation of electrified sections. The constraints as discussed above further limit the extent of utilisation of electrified sections and holistic monitoring mechanism would ensure optimal utilisation of the assets created through railway electrification.

Chapter 6 – Conclusion and Recommendations

6.1 Conclusion

Indian Railways (IR) run 9,212 freight and 13,313 passenger trains over its 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. As on 31 March 2016, 64.80 *per cent* of the freight traffic and 51.3 *per cent* of the passenger traffic is hauled by electric traction. 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. Thus, in comparison to diesel traction, electric traction is not only more environment friendly option, but it is more economical as well.

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.

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 they have 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.

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 are 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, though time consuming, was hardly adding value to the process. We also noticed that new line projects were being assessed without electrification and electrification was added as a supplementary activity subsequently after a long gap.

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 CPDs, RVNL took up to 26 days in assigning project to their CPMs.

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.

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.

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-Katihaar-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 large.

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.

The agreements in CORE were executed up to 798 days after issue of Letter of Acceptance. 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 delays had a consequential impact on the execution and completion of the work.

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.

For 21 projects executed by CORE, the original period of completion was 3954 months. Total 2026 extensions for 8190 months were granted by CORE, 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.*

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 many of the cases of extensions and only token penalty was recovered from the defaulting contractors. As assessed by Audit, against and 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.

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 prescribed cost and time. It was seen that no benchmark for utilization of block has been prescribed by the Railway administration for RE Projects.

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.

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 and adversely impacted the effective utilization of the electrified sections.

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.

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.

6.2 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 un-avoidable reasons.***

New Delhi **(Nand Kishore)**
Dated: 15 June, 2017 **Deputy Comptroller and Auditor General**

Countersigned

New Delhi **(Shashi Kant Sharma)**
Dated: 16 June, 2017 **Comptroller and Auditor General of India**

Appendix I - List of 102 RE Projects as per IRPSM												
S.no	RE Project	RKM	Implementing Agency	Year of Sanction	Last sanctioned cost	Progress for Month recorded in IRPSM	Expenditure upto date	Throwforward 2017-2018	Latest Anticipated TDC	Estimate Status	Physical Progress	Remarks
A	B	C	D	E	F	G	H	I	J	K	L	M
1	Bokaro Steel City - Muri - Hatia - Bondamunda - Bimlagarh - Kiriburu / Barsuan incl. Purulia-Kotshila (434 km)	434	CORE	1991-1992	2823911	OCT' 2016	2666069	157742	31/03/2013	RE under prep.	99	Work completed. CR under preparation.
2	Ambala-Moradabad incl Laksar-Dehradun (353 km)	353	CORE	1992-1993	2739241	OCT' 2016	3299181	37339	31/03/2015	RE under prep.		Electrification work on Ambala - Moradabad completed. Electrification on Laksar - Haridwar-Dehradun is sanctioned by Board as MM. Work is being executed by Northern Railway Construction.
3	Chandil-Muri-Barkakana (119 km)	119	CORE	1992-1993	547609	OCT' 2016	547609	0	31/05/2013	RE under prep.	100	Main electrification work of the section i.e. Group-99 is complete. CR drawn.
4	Renigunta-Guntakal (308 km)	308	CORE	1992-1993	5001275	OCT' 2016	4440400	153318	31/07/2010	RE under prep.	98	Renigunta- Nandlur only by CORE. Completed. Nandalur - Guntkal is with RVNL. Completed, residual work in progress Work completed.
5	Kharagpur/Nimpura-Bhubaneswar incl. branch line of Talcher-Cuttack-Paradip (540 km)	540	CORE	1995-1996	4458371	OCT' 2016	4301699	157089	31/03/2013	RE under prep.	99	Work completed. Revised estimate along with Completion Estimate sanctioned by Railway Board .
6	Khurja-Hapur-Meerut City-Saharanpur incl Ghaziabad-Meerut (254 km)	254	CORE	1996-1997	2364447	OCT' 2016	2534545	57878	31/10/2010	RE under prep.	96	Work Completed . Residual work
7	Bhubaneswar-Kottavalasa incl Khurda Road-Puri (457 km)	457	CORE	1997-1998	3264825	OCT' 2016	2781945	470655	31/03/2013	RE under prep.	98	Electrrification work completed.
8	Udhna-Jalgaon (306 km)	306	CORE	1997-1998	1444333	OCT' 2016	1055856	388377	31/03/2013	RE under prep.	99	Section commissioned. Regular train operation on electric traction has been introduced. All works are completed. Completion Report submitted to CORE.
9	Patna-Gaya (92 km)	92	CORE	1999-2000	503867	OCT' 2016	503781	86	31/07/2010	RE under prep.	100	Completion report sanctioned by competent authority.
10	Ernakulam-Trivandrum incl. Trivandrum-Kanyakumari (427 km)	427	CORE	1999-2000	2578754	OCT' 2016	2469103	114174	31/03/2016	RE under prep.	95	work in progress
11	Sitarampur-Danapur-Mughalsarai via main line of Eastern Railway incl. Rampur-Dumra-Garhara-Barauni (562 km)	562	CORE	2003-2004	3861781	OCT' 2016	3861781	0	31/08/2010	Not Required	100	Completion report sanctioned by competent authority.
12	Moradabad- Lucknow-Utratia (338 km)	338	CORE	2005-2006	2587356	OCT' 2016	4427865	55063	31/10/2012	RE under prep.	90	Section commissioned.
13	Karepalli-Bhadrachalam Road-Manuguru (88 km)	88	CORE	2005-2006	660704	OCT' 2016	768047	18769	30/09/2013	RE under prep.	98	Electrification work of KRA-BDCR-MUGR Section has been completed. Conversion of existing tramway OHE to conventional OHE in between Dornakal - Karepalli and feeder wire from Bhadrachalam Road TSS to Pandurangapuram SSP was sanctioned by Board on 12.05.2010, as material modification to the original estimate, being executed by South Central Railway. The work of conversion of tramway to conventional OHE completed. Feeder erection works under progress and will be completed during 2013-14.
14	Andal-Ukhra-Pandaveswar (23 km)	23	CORE	2006-2007	425536	OCT' 2016	716554	28468	31/03/2013	RE under prep.	95	Electrification works on Andal - Pandaveshwar completed. Material modification for provision of new running lines & its electrification at Ukhra yard was sanctioned by Borad on 08.12.2009 and work is in progress by ER.
15	Utratia-Sultanpur-Mughalsarai (288 km)	288	CORE	2006-2007	2399832	OCT' 2016	4280993	7855	31/03/2016	RE under prep.	90	Mughalsarai to Utratia section commissioned .Electrification work of patch doubling tender floated.
16	Lingampalli-Wadi (161 km)	161	CORE	2006-2007	1158529	OCT' 2016	2010587	7107	31/03/2013	RE under prep.	100	1. Energised at 25 KV upto excluding Wadi yard. 2. Material modification for electrification of (a) M/s Vasavadatta cement siding & 2nd bay at VKB TSS and provision for 8 wheeler tower wagon with shed at VKB was sanctioned by Board on 07-09-09 for Rs.1057.04 lakhs and (b) M/s. Rajshree Cement Siding & M/s.SAIL Siding was sanctioned by Railway Board on 09.03.10 for Rs.905 Lakhs. Work in M/s. SAIL, M/S. Rajshree Cement Sidings completed. CRS authorization has been obtained on 17.02.2014.
17	Bina-Kota (303 km)	303	CORE	2006-2007	2325097	OCT' 2016	2375256	3282	31/10/2013	RE under prep.	99	All commissioned. Regular train operation on electric traction started after CRS authorisation.
18	Ujjain-Indore & Dewas-Maksi (115 km)	115	CORE	2006-2007	716027	OCT' 2016	722654	19764	31/03/2013	RE under prep.	95	Section commissioned. Civil works i.e.Railway quarters etc.are under construction. Augmentation of Mangaliagaon TSS by WR is yet to be completed.
19	Tiruchirapalli-Madurai (154 rkm)	154	CORE	2007-2008	1057954	OCT' 2016	1561285	52553	31/03/2016	RE under prep.	95	EIG papers under process. TNEB supply - Tower erection/Overhead Line work in progress.

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A	B	C	D	E	F	G	H	I	J	K	L	M
20	Barabanki-Gorakhpur-Barauni; incl Siwan-Thawe (757 km)	757	CORE	2007-2008	7137900	OCT' 2016	9688071	576636	31/12/2014	RE under prep.	75	Barabanki - Baruachak charged on 25 KV. CRS authorisation of Barabanki Gonda section received on 21/7/2014 Bruachak - Basti charged on 25 kV. Basti - Domingarh (excl) charged on 2.2 kV. Domingarh (excl) to Gorakhpur Cantt (incl) charged on 25 kv. CRS authorisation received on 04/08/2015. Gorakhpur Cannt(excl) - Bhatni(excl) charged on 25 KV. CRS authorisation received on 04/08/2015. Bhatni(incl)-Siwan(excl) charged on 25 kV and CRS inspection done on 03.12.2014. Chapra - Siwan-Thawe ch
21	Shakurbasti-Rohtak (60 km)	60	CORE	2007-2008	698282	OCT' 2016	781771	11663	31/03/2015	RE under prep.	99	Section commissioned.
22	Jalandhar-Jammu Tawi incl Jammu Tawi-Udhampur (275 km)	275	CORE	2007-2008	2279548	OCT' 2016	3350768	50398	31/03/2015	RE under prep.	95	CRS authorisation issued for SCPD- CHKB. CRS authorisation issued for PTK - JAT JAT - Bajalta & Udhampur - Manwal charged on 2.2 KV. 95% wiring complete. OHE adjustment & SED between Ram Nagar _Udhampur & Manwal & Bajalta station. Bajalta SP Control room casted Sanger SP work in progress
23	Barauni-Katihar-Guwahati incl Katihar-Barsoi (836 km)	836	CORE	2008-2009	8215325	NOV' 2016	7558774	1081571	31/03/2016	RE under prep.	65	
24	Madurai-Tuticorin-Nagercoil (262 km)	262	CORE	2008-2009	2792807	OCT' 2016	2503187	762650	31/03/2017	RE under prep.	98	TNEB supply - Foundation, Power erection & stringing under progress by TNEB. MEJ/TSS - Electrical work is in progress. Harbour siding - OHE works tender under finalisation.
25	Varanasi-Lohta-Janghai-Unchahar incl. Phaphamau-Prayag-Allahabad (207 km)	207	CORE	2008-2009	1514922	OCT' 2016	2014113	403989	31/03/2015	RE under prep.	95	Section charged on 25 KV. CRS sanction received on 04/12/2015 and commercial operation on Electric traction is introduced on 16/12/2015 the section.
26	Jhansi-Kanpur incl Ait-Konch & Kanpur Anwarganj-Kalyanpur (240 km)	240	CORE	2008-2009	1557269	OCT' 2016	1519119	78915	31/03/2013	RE under prep.	70	CRs inspection done on date:- 12.03.2015. Left over works under progress.
27	Ghaziabad-Moradabad (140 km)	140	CORE	2009-2010	1519085	OCT' 2016	1564831	82159	31/03/2015	RE under prep.	85	Foundation complete, Mast Erection complete,99.5% wiring done.25 KV energisation fitness work 70% complete.
28	Rohtak-Bhatinda-Lehra Muhabat (252 rkm)	252	CORE	2010-2011	3082347	OCT' 2016	1436041	1176558		RE under prep.	2	General works under progress.
29	Vizianagaram - Rayagada - Titlagarh - Raipur (465 rkm)	465	CORE	2010-2011	6363193	OCT' 2016	4077867	3666660		RE under prep.	84	All position for Vizianagaram -Rayagada-Titlagarh section only updated which is under execution by RE/BBS.Section from Titlagarh to Railpur is under execution by RVNL.OHE foundation, Mast & Bracket erection,wiring, Bracket Adjustment , SED & T/W checking etc. are in progress. Wiring completed for 139 RKM in Vizianagaram - Singapur Road section & 124 RKM in Singapur Road-Titlagarh.Vizianagaram - Garudabilli-Parvatipuram section commissioned for commercial services.
30	Pandabeswar-Sainthia-Pakur incl. Khana-Sainthia (205 rkm)	205	CORE	2010-2011	3342017	OCT' 2016	3084536	62545	31/08/2014	RE under prep.	98	Pandabeshwar - Kachujor-Mahishadahari commissioned after inspection of CRS. Khana -Sainthia & Rampurhat - Pakur charged on 2.2 KV. Mahishadahari-Sainthia(Ex.)-Rampurhat(In)charged on 25KV. Balance work under progress for 25kv charging and commissioning.
31	Mathura-Alwar (121 rkm)	121	CORE	2010-2011	1198263	OCT' 2016	820795	43184		RE under prep.	99	CRS inspection done on date 23.03.2015.
32	Rosa-Sitapur-Burhwal (181 rkm)	181	CORE	2010-2011	1319835	OCT' 2016	1590551	114105	31/05/2015	RE under prep.	70	Bhurwal to Sitapur section charged on 25.kV . For Sitapur to Rosa section OHE wiring in advance stage SED checkin & Tower wagon checkig in progress .
33	Gondia-Balharshah (250 rkm)	250	CORE	2010-2011	2046117	OCT' 2016	1656162	414914		RE under prep.	80	The contract for S&T works awarded. The contract for Electrical works (OHE, TSS & SCADA) awarded to M/s.MCPL-ECI(JV) on 10.10.12. OHE foundation commenced on 21.11.12. 140 RKM energized at 2.2KV till Dec, 2015.. * Fig showed in capital includes the sanctioned amount of DF4 as there is no separate row for DF4

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A	B	C	D	E	F	G	H	I	J	K	L	M
34	Shoranur-Mangalore-Penambur (328 rkm)	328	CORE	2010-2011	3858791	OCT' 2016	4449635	876505	31/03/2017	RE under prep.	85	Gr.157/158:(SRR-MAQ-PNMB) CRS/SBC Inspection was completed on 22.3.16 in KUL-CAN-CHV section. Authorisation was received on 24.3.2016. CHV-MAQ Section was test charged with 25 kV on 31.3.2016. CS/TSS was commissioned on 22.3.16 with KSEB supply availed. ETR/TSS - Electrical foundation work is in progress.KSEB supply - Tender awarded by RE for HT cabling work. TIR/TSS - Tender opening on 11.4.16 for electrical works. KSEB Supply - Tender under finalisation by KSEB. CHV/TSS - LOA issued for
35	Daund-Manmad incl. Puntamba - Shirdi (255 rkm)	255	CORE	2010-2011	2161800	DEC' 2016	3515400	89400	31/03/2016	RE under prep.	96	CRS sanction for Manmand-Puntamba-Shirdi section (81RKM) granted in Aug'14, CRS inspection for Puntamba-Daund section (174 Kms) CRS sanction granted in 15.10.15(98 RKM)and in 23.02.16(76 RKM) full saction commissioned.
36	Yelahanka - Dharmavaram - Gooty incl Penukonda-Dharmavaram via Sri Satya Sai Prashanthi Nilayam (306 rkm)	306	CORE	2010-2011	2285700	DEC' 2016	3232300	231500	31/03/2016	RE under prep.	90	Section completed, CRS for 90 RKM obtained on 15.07.15, balance 216 CRS sanction obtained on 13.07.16. Complete saction commissioned.
37	Alwar - Rewari (82 rkm)	82	CORE	2011-2012	1184823	OCT' 2016	1262319	133051		RE under prep.	95	CRS inspection of complete section on 25/26.03.2015 completed. Authorization received on 30.03.2016.
38	Jharsuguda - Sambalpur - Titlagarh & Jharsuguda - Ib Bypass (238 rkm)	238	CORE	2012-2013	3045183	OCT' 2016	954046	1371607		Det. Est. Sanc.	50	Work in progress.
39	Garwa Road - Chopan - Singrauli (257 rkm)	257	CORE	2012-2013	2843424	OCT' 2016	1781756	470200		RE under prep.	95	CRS authorization has been obtained between the section Garhwa Road - Meralgram RKM: 22 & train operation started from 05th February, 2016. 82 Km energized on 2.2 Kv between Meralgram - Chopan - Singrauli section up to the month of February, 2016 & balance work is in progress.
40	Itarsi - Katni - Manikpur incl Satna - Rewa and Manikpur - Chheoki (653 rkm)	653	CORE	2012-2013	8661152	OCT' 2016	6460397	140124		RE under prep.	45	All OHE contracts awarded
41	Guntakal - Bellary - Hospet incl. Tornagallu - Ranjitpura Branch Line (138 rkm)	138	CORE	2012-2013	2266800	DEC' 2016	74900	2341800		RE under prep.	12	Contract awarded to M/s ISOLUX-BRAPL(JV) on 19.08.15
42	Coimbatore North - Mettupalayam (33 km)	33	CORE	2012-2013	260805	OCT' 2016	224907	17059	31/03/2015	Det. Est. Sanc.	95	work is in progress.
43	Andal - Sitarampur via Jamunia - Ikra & Sripur with Kajoragram - Sonachara bypass line with 6 colliery sidings (57 rkm)	57	CORE	2012-2013	789771	OCT' 2016	678692	31616		RE under prep.	23	works are in progress.
44	Kumedpur - Malda - Singhabad (79 rkm) & Pakur - Malda (74 rkm)	153	CORE	2012-2013	2081255	NOV' 2016	951173	609970		Det. Est. Sanc.	68	Gr.171 = Foundation 0.51%, Mast Erection = 0.90% & Wiring = 7.77% Gr. 172 = 33 RKM from MLDT(Excl.) - NFK (Excl.) charged as anti theft with 2.2 KV on 31.03.2016
45	Nallapadu - Guntakal incl. Gooty - Pendekallu (426 rkm)	426	CORE	2012-2013	3633208	OCT' 2016	3033514	523780		RE under prep.	70	Work in progress
46	Amla - Chhindwara - Kalumna (257 rkm)	257	CORE	2012-2013	2678500	DEC' 2016	967600	1710800	31/03/2016	RE under prep.	35	Work is in progress in Amla-Chhindwada section(115 RKM). Progress of work in Chindwada Kalumna GC (142 RKM) in pace with Civil work.Tender for Chindwara-kalumna LOA issued on 11.08.16 to M/s KEC.
47	Manheru - Hissar (74 rkm)	74	CORE	2012-2013	921300	DEC' 2016	486000	190000		RE under prep.	55	Work in progress.
48	Sambalpur - Angul (156 rkm)	156	CORE	2012-2013	1986500	OCT' 2016	1098236	297164		RE under prep.		Work under execution by CEE/C/BBS under CAO/C/BBS of ECoR. OHE Tender between ANGL-BAMUR (Part-I)(171 TKM) awarded on 26.11.2013, 30 RKM LOP approved. 670 Nos.(Main-560 +Anchor-110) foundations casted, 244 Nos. mast erected. Balance work under progress. OHE Tender between BAMUR-SBP (Part-II) (219 TKM) has been awarded on 21.01.2015. PSI Tender schedule under preparation and GS tender upto Bamur has been floated.

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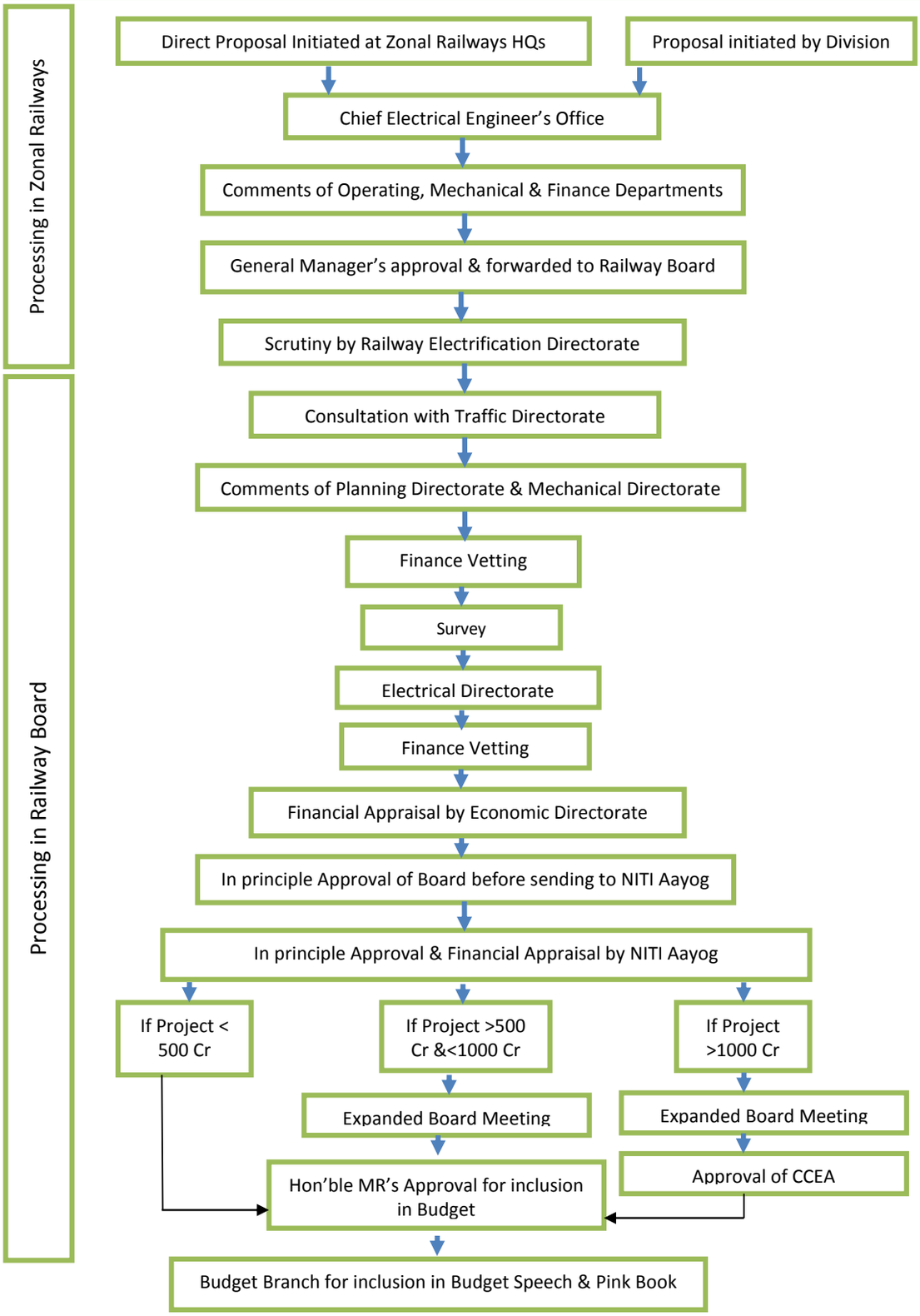
A	B	C	D	E	F	G	H	I	J	K	L	M
49	Singapur Road - Damanjodi (152 km)	152	CORE	2013-2014	1554990	OCT' 2016	385771	796494		RE under prep.	24	works in progress.
50	Katwa-Azimganj-Nalhati & Azimganj-Tildanga/New Farakka incl. Nalhati & Azimganj bypass line		CORE	2013-2014	2829194	OCT' 2016	148029	1173515		Det. Est. Sanc.	7	Work in progress
51	Delhi Sarai Rohilla - Rewari - Palanpur - Ahmedabad, incl. Kalol - Gandhinagar - Khodiyar and Alwar - Bandikui - Jaipur - Phulera (1087 km)	1087	CORE	2013-2014	10675000	OCT' 2016	1778894	5306186		Det. Est. Sanc.	5	Work for Gr. 183 & 187 under progress. For Gr 186 tender under finalization. For Gr 182, 184 & 185 (EPC) RFP under finalization.
52	Jakhal - Dhuri - Ludhiana (123 km)	123	CORE	2013-2014	1495300	DEC' 2016	359000	787500	31/03/2018	Det. Est. Sanc.	10	Contract awarded to M/s: Bright Power Projects(India) Pvt. Ltd Mumbai.on 26.09.15, work in progress,
53	Jakhal - Hisar (79 km)	79	CORE	2013-2014	780248	DEC' 2016	66100	114048	31/03/2018	Det. Est. Sanc.	10	Tender awarded to M/s: Bright-Vijaywargi (JV) Mumbai.on 26.09.15
54	Rajpura - Dhuri - Lehra Mohabat (151 km)	151	CORE	2013-2014	1875146	DEC' 2016	1900	1273146	31/03/2018	Det. Est. Sanc.	10	Tender Awarded to M/s Bright Vijaywargis (JV) on 10.12.15. work in progress,
55	Chhapra-Ballia-Ghazipur-Varanasi-Allahabad (330 rkm)	330	CORE	2014-2015	4151500	DEC' 2016	2184900	1853500	17/06/2018	Det. Est. Sanc.	10	Tender Opened, contract awarded to M/s STS-KPTL (JV), LOA issued on 18.06.15 55 RKM has been charged upto Sept'16.
56	Manpur-Tilaiya-Bakhtiarpur (132 km)	132	CORE	2014-2015	1400018	OCT' 2016	337259	768439		Det. Est. Sanc.	24	work is in progress.
57	Jasai - Jawaharlal Nehru Port Trust (9 rkm) (33 tkm)	33	CORE	2015-2016	0	OCT' 2016	0	62530		DE under prep.		in process
58	Panvel - Pen - Thal (75 rkm)	75	CORE	2015-2016	0	OCT' 2016	0	924600		DE under prep.		Estimate in process. work being executed by Central Rly.
59	Rohtak - Bhiwani (48 rkm)	48	CORE	2015-2016	546011	OCT' 2016	0	459311		Det. Est. Sanc.		Contract awarded for OHE works. Works in progress.
60	Valmiki Nagar - Narkatiaganj - Sugauli - Muzaffarpur incl Sugauli - Raxaul (240 rkm)	240	CORE	2015-2016	3029926	OCT' 2016	0	2864826		Det. Est. Sanc.		Detailed Estimate sanctioned. Tenders invited for OHE works.
61	Guntakal-Kalluru (40 rkm)	40	CORE	2015-2016	0	OCT' 2016	0	240000		DE under prep.		in process
62	Singrauli-Katni (260 rkm) (373 tkm)	260	CORE	2015-2016	2821750	OCT' 2016	0	1987650		Det. Est. Sanc.		Tender work in progress
63	Indore - Mhow (21 rkm) (33 tkm)	21	CORE	2015-2016	0	OCT' 2016	0	97700		DE under prep.		Tender due on 26.10.2015
64	Una Himachal-Amb Andaura (25 rkm)	25	CORE	2015-2016	206134	OCT' 2016	182	106034		Det. Est. Sanc.		Work in progress
65	Erode-Karur-Tiruchchirapalli & Salem-Karur-Dindigul (300 rkm)	300	CORE	2015-2016	3622291	OCT' 2016	2986	3455089		Det. Est. Sanc.		Detailed estimate approved.
66	Tiruchchirappalli - Nagapattinam - Karaikkal Port (153 rkm)	153	CORE	2015-2016	2272600	OCT' 2016	100	2072400		Det. Est. Sanc.		Detailed estimate under preparation.
67	Koderma - Hazaribagh - Barkakana - Ranchi (203 rkm)	203	CORE	2015-2016	2276359	OCT' 2016	0	1936259		Det. Est. Sanc.		Survey .
68	Kiul - Tilaya (87 rkm)	87	CORE	2015-2016	1006193	OCT' 2016	0	806093		Det. Est. Sanc.		work in progress
69	Bonidanga Link Cabin / Bonidanga - Barharwa - Sahibganj - Kiul incl. Tinpahar - Rajmahal (247 rkm)	247	CORE	2015-2016	3841466	OCT' 2016	0	3591366		Det. Est. Sanc.		Sanctioned
70	Idgah - Achnera - Mathura & Achnera - Bharatpur (87 rkm)	87	CORE	2015-2016	912333	OCT' 2016	5983	795329		Det. Est. Sanc.		work in Progress
71	Hissar - Bhatinda - Suratgarh - Phalodi - Jodhpur - Bhildi incl Phalodi - Jaisalmer (1230 rkm)	1230	CORE	2015-2016	0	OCT' 2016	0	9855000		DE under prep.		Detailed estimated prepared by RE projects and forwarded to COREA/ALD for sanction by GM. Niti Aayog approval pending.
72	Ajmer - Berach - Mavli - Udaipur (294 rkm)	294	CORE	2015-2016	3202825	OCT' 2016	146109	3014125		Det. Est. Sanc.		OHE works contract awarded. Works in progress.
73	Jhansi - Manikpur incl Khairar - Bhimsen (409 rkm)	409	CORE	2015-2016	4412783	OCT' 2016	45374	3950689		Det. Est. Sanc.		Detailed estimated Sanctioned. OHE contract awarded. Works in progress.
74	Zafrabad - Akbarpur - Tanda (101 rkm)	101	CORE	2015-2016	922436	OCT' 2016	64797	622336		Not Required		Contract awarded. works in progress.
75	Lalitpur - Udaipura (32 rkm)	32	CORE	2015-2016	477006	OCT' 2016	214	376906		Det. Est. Sanc.		Contract awarded for ohe works. work in progress
76	Paddapalli - Lingampet - Jagtiyal (83 rkm)	83	CORE	2015-2016	845425	OCT' 2016	0	680325		Det. Est. Sanc.		Work in progress
77	Pagidipalli - Nallapadu (285 rkm)	285	CORE	2015-2016	3742415	OCT' 2016	0	3576315		Det. Est. Sanc.		Work in progress
78	Manmad - Mudkhed - Dhone (868 rkm)	868	CORE	2015-2016	0	OCT' 2016	0	8537000		DE under prep.		Det Estimate prepared. Niti Aayog approval pending.
79	Ghazipur - Aunrihar - Manduadih (78 rkm)	78	CORE	2015-2016	0	DEC' 2016	0	23200		DE under prep.		DE in process
80	Utretia - Rae Bareli - Amethi - Janghai (214 rkm)	214	CORE	2015-2016	0	DEC' 2016	0	1662600		DE under prep.		In progress
81	Hospet - Hubli - Vasco da Gama (346 rkm)	346	CORE	2015-2016	0	DEC' 2016	0	4153300		DE under prep.		Est under preparation
82	Ahmedabad-Rajkot (233 rkm)	233	CORE	2015-2016	0	OCT' 2016	0	2898300		DE under prep.		in process
83	Mehsana-Viramgam-Samakhiyali (292 rkm)	292	CORE	2015-2016	0	OCT' 2016	0	2809300		DE under prep.		in process
84	Ratlam - Nimach - Chanderia - Kota (348 rkm)	348	CORE	2015-2016	0	OCT' 2016	0	2867400		DE under prep.		in process

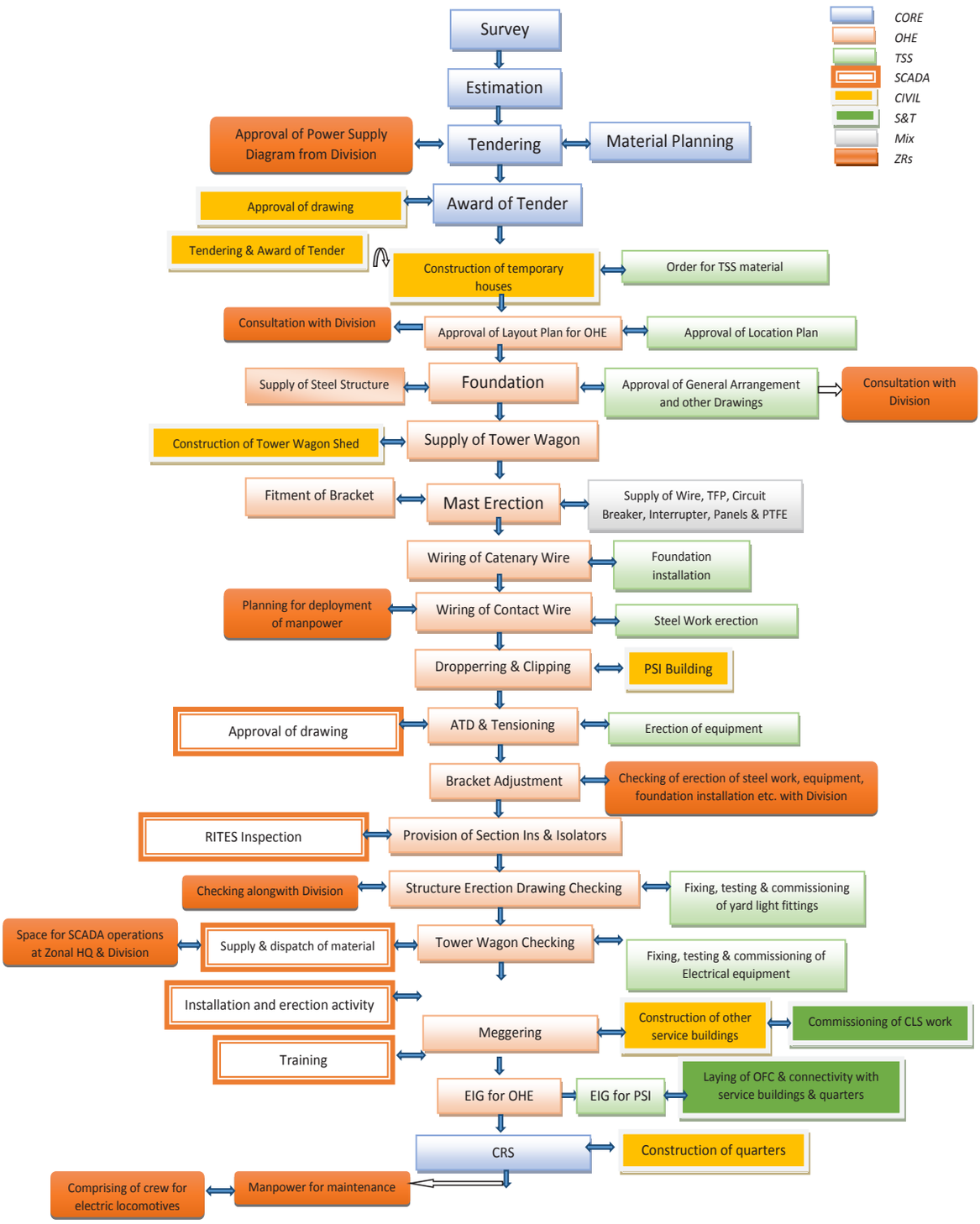
Appendix I - List of 102 RE Projects as per IRPSM												
S.no	*RE Project*	*RKM*	*Implementing Agency*	*Year of Sanction*	*Last sanctioned cost*	*Progress for Month recorded in IRPSM*	*Expenditure upto date*	*Throwforward 2017-2018*	*Latest Anticipated TDC*	*Estimate Status*	*Physical Progress*	*Remarks*
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*	*M*
85	Beas - Gownidwal Sahib - Taran Taran - Amritsar (72 km)	72	CORE	2016-2017	0	OCT' 2016	0	452000		DE under prep.		Under Progress
86	Chalisgaon-Dhule (56 km)	56	CORE	2016-2017	0	OCT' 2016	0	537900		DE under prep.		Work In progress
87	Mathura - Kasganj - Kalyanpur (338 km)	338	CORE	2016-2017	0	OCT' 2016	0	3058900		DE under prep.		In process
88	Gorakhpur Cantt - Kaptanganj - Valmikinagar (96 km)	96	CORE	2016-2017	1146708	OCT' 2016	0	1146708		Det. Est. Sanc.	0	Tender work in Progress
89	Aunrihar - Jaunpur (60 km)	60	CORE	2016-2017	0	DEC' 2016	0	423200		DE under prep.		Project tranfered CORE
90	Pen-Roha (40 km)	40	CORE	2016-2017	1284000	OCT' 2016	0	1283900		Det. Est. Sanc.		Detailed Estimate sanctioned by Competent Authority
91	Chunar-Chopan (100 km)	100	CORE	2016-2017	0	OCT' 2016	0	1293584		DE under prep.		Approval from NITI Ayog awaited
92	Jasai-Uran (10 km)	10	CORE	2016-2017	0	DEC' 2016	0	192049		DE under prep.		Not pertain to RVNLRE
93	Mansi - Saharsa - Dauram Madhepura - Purnea - Katihar (172 km)	172	CORE	2016-2017	0	OCT' 2016	0	2271400		DE under prep.	0	Detailed Estimate under preperation
94	Ranchi-Lohardaga -Tori (116 km)	116	CORE	2016-2017	0	OCT' 2016	0	1026588		DE.und.vetting		Detailed Estimate prepared. Under finance vetting
95	Pune-Miraj-Kolhapur (326 km)	326	CORE	2016-2017	0	DEC' 2016	0	6150056		DE under prep.		Project transfered to PGCIL
96	Noli-Tapri (143 km)	143	CORE	2016-2017	1592480	OCT' 2016	0	1592380		Det. Est. Sanc.		Tenders for OHE/TSS works invited.
97	Gondia-Nainpur-Jabalpur (229 km)	229	CORE	2016-2017	0	OCT' 2016	0	1942800		DE under prep.		Detailed Estimate under preparation
98	Vijaipur-Maksi (188 km)	188	CORE	2016-2017	0	OCT' 2016	0	2824800		DE under prep.		Executive agency changed to RITES
99	Chhindwara-Nainpur-Mandlafort (183 km)	183	CORE	2016-2017	0	DEC' 2016	0	907000		DE under prep.		Transfered to PGCIL
100	Jaipur - Sawai Madhopur - Ringas (188 km)	188	CORE	2016-2017	0	DEC' 2016	0	1637200		DE under prep.		Project transfered to RITES
101	Miraj-Londa (189 km)	189	CORE	2016-2017	0	DEC' 2016	0	2081400		DE under prep.		Project transfered to PGCIL
102	Samakhiyali - Gandhidham - Kandla Port - Mundra Port (63 km)	63	CORE	2016-2017	0	OCT' 2016	0	755900		DE under prep.		Niti Aayog approval pending

Refernce to the para: 2.1.4

Appendix II - Process of sanction of Railway Electrification Projects



Appendix III - Sequencing of Critical Activities Involved in Railway Electrification Projects



Appendix IV - List of missing links identified by Indian Railways					
S. no.	***Section***	***RKM***	***Approx. Cost (₹ in crore)***	***ROR (%)***	***Remarks***
1.	Miraj-Khurdwdi-Latur	377	339.30	20.21	Miraj-Kurudwadi is a missing link between the section undergoing electrification. Complete section will provide network approach on electric traction as Latur-Parbhani section SCR also indentified for electrification.
2.	Wani-Pimpalkhutti	66	59.40	15.28	Wani-Pimpalkhutti of CR & Pimpalkhutti-Mudkhed section of SCR are missing link between electrified & undergoing electrification territory.
3.	Samastipur-Khagaria	86	79.50	36.42	Missing link between two electrified section i.e. Hajipur-Barauni-Khagaria-Mansi and Muzaffarpur-Samastripur-Bachhwara sections.
4.	Shikohabad-Farrukhabad	106	95.40	0.64	Missing link between electrified Tundla-Shikohabad-Kanpur & Mathura-Farrukhabad-Kalyanpur saction for electrification of the section will provide an alternate route to Kanpur-Shikohabad-Tundla. it will also help in deconsting of Kanpur-Tundla section as few freight trains can be diverted through the proposed route.
5.	Akbarpur-Faizabad-Barabanki incl. Faizabad-Sultanpur	218	196.20	50.73	Missing link between electrified Lucknow-Barabanki-Basti section & Zafrabad-Akbarpur-Tanda undergoing for electrification.
6.	Amritsar-Batala-Bharaoli	104	93.60	25.97	Missing link between electrified Jalandhar-Mukerian-Bharoli (Pathankot). it will connect Jammu Tawi to Amritsar on electric traction seamlessly.
7.	Bathinda-Kotakapur-Firozpur City-Jalandhar City incl. Lohiankhas-Nakodar-Philaur and Nakodar-Jallandhar	301	270.90	21.02	Missing link between Ludhiana-Philaur-Jalandhar electrified section& Rohtak-Bhatinda-Lehra Muhabbat section undergoing for electrification.
8.	Phaphamau-Pratapgarh	46	41.40	22.06	Missing link between Varanasi-Phaphamau-Unchahar electrified section, & Utratia-Raebareli-Pratapharh-Janghai section undergoin for electrification.
9.	Rewari-Sadulpur	141	127.08	18.50	Rewari-Sadulpur-Ratangarh-Bikaner is a missing link between Delhi Sarai Rohilla Rewari-Ahmedabad section under electrification & Hisar-Bhatinda-Bikaner-Bhildi section included in budget 2015-16 for electrification. Ratangarh-Degana is also a link for Merta-Phulera which is also proposed for electrification.
10.	Sadulpur-Ratangarh-Bianer and Ratangarh-Dengana	389	350.66	15.93	

Appendix IV - List of missing links identified by Indian Railways					
S. no.	***Section***	***RKM***	***Approx. Cost (₹ in crore)***	***ROR (%)***	***Remarks***
11.	Bikaner-Merta-Jodhpur and Merta-Phulera	428	385.53	32.84	Bikaner & Jodhpur ends of Bikaner-Merta-Jodhpur falls on Hisar- Bhatinda-Bikaner-Jodhpur-Bhildi section included.
12.	Pimpalkuti-Mudkhed	183	165.00	14.32	Wani-Pimpalhutti of CR & Pimpalkhutti-Mudkhed section of SCR is missing link between electrified & undergoing electrification territory
13.	Parbhani-Parli Vaijnath-Vikarabad	332	298.80	15.89	Missing link between Wadi-Vikarabad-Secunderabad electrified section, & Manmad-Parbhani-Mudkhed section included in Budget 2015-16 for electrification.
14.	Thanjavur-Villupuram via Mayiladuthurai	229	206.10	18.76	Missing link between Chennai-Villupuram-Vriddhachalam electrified section & Tirchchirapppalli-Thanjavur-Karaikkal Port, undergoing for electrification. It will also provide port connectivity to Cuddalore port.
15.	Dindigul-Pallakkad	179	161.10	0	Missing link between two electrified sections i.e. Kanniyakumari-Dingdigul-Chennai & Shoranur- Pallakkad- Chennai. Electrification of the section will provide an alternate route to Chennai-Salem-Shoranur via Chennai-Tiruchchirappalli-Dindigul-Pallakkad.
16.	Mysore-Hasan-Mangalore incl. Hasan-Arsikere	349	314.10	16.19	It will connect Bangalore to Mangalore seamlessly on electric tractions as Bangalore to Mysore is going to be completed shortly.
17.	Bangalore-Tumkur-Hubli incl Birur-Talguppa	623	560.70	21.30	It will connect Bangalore to Vasco-da-gama on electric traction seamlessly. As Guntakal-Bellary-Hubli-Hospet-Vasco-Dagama is under electrification.
18.	Gadag-Hotgi	300	270.00	15.03	It is a missing link between two corridors under electrification i.e. Guntakal-Bellary-Hubli-Hospet-Casco-Da-gama & Pune-Hotgi-Wadi-Guntakal.
19.	Chikjajur-Bellary	184	165.60	19.14	Chikjajur-Bellary lies between Guntakal-Bellary-Huble-Casco-Da Gama under electrification and Bangalore-Tumkur-Hubli proposed for electrification.
20.	Ratlam-Fatehabad-Khandwa	257	231.30	11.77	Missing link between two electrified sections i.e. Mumbai-Ratlam-Delhi and Mumbai-Khandwa-Delhi. Presently this section is undergoing to gauge conversion. This will provide an alternate route to Rarlam-Udhna-Mumbai. it will be alternative route for Mumbai-Delhi via Khandwa-Indore-Maksi-Viajipur
Reference to the para: 5.3					

Annexure 3.1 - Calculation of ROR as per prescribed methodology and prescribed Consultation process				
S. no	***Name of the work***	***Status at the time of audit***	***Whether Rate of Return (ROR) was calculated as per prescribed methodology***	***Whether prescribed Consultation process was followed***
A	*B*	*C*	*D*	*E*
1	Bhubaneswar – Kottavalasa	Completed	Not Available	Not Available
2	Krishnanagar – Lalgola	Completed	N	Not Available
3	Karepalli-Bhadrachalam Road-Manuguru	Completed	Not Available	Not Available
4	Andal-Ukhra-Pandabeswar	Completed	N	Not Available
5	Ujjain-Indore and Dewas-Maksi	Completed	N	N
6	Tiruchirapalli-Madurai	Completed	N	Y
7	Barabanki-Gorakhpur-Barauni	Completed	N	N
8	Shakurbasti- Rohtak	Completed	N	N
9	Jhansi - Kanpur including Ait Jn.-Konch Branch line of NCR and Kanpur Anwarganj- Kalyanpur	Completed	N	N
10	Madurai-Tuticorin-VanchiManiyachchi-Nagercoil	Completed	N	N
11	Varanasi-Lohta-Janghai-Unchahar including Phaphamau-Allahabad	Completed	N	N
12	Daund – Manmad including PuntambaShirdi	Completed	N	N
13	Mathura-Alwar	Completed	N	N
14	Ghaziabad –Moradabad	Completed	N	N
15	Gooty - Dharmavaram - Yelahanka - including Dharmavaram - Sri SatyaSaiPrashanthiNilayam– Penukonda	Completed	Y	Y
16	Roza - Sitapur–Burhwal	Completed	N	N
17	Alwar-Rewari	Completed	N	N
18	Barauni-Katihar-Guwahati	In progress	Not Available	Not Available
19	Shoranur – Kannur – Mangalore - Panambur	In progress	N	N
20	Gondia – Ballarshah	In progress	N	N
21	Khana-Sainthia-Pakur including Pandabeswar-Sainthia	In progress	N	N

Annexure 3.1 - Calculation of ROR as per prescribed methodology and prescribed Consultation process				
S. no	***Name of the work***	***Status at the time of audit***	***Whether Rate of Return (ROR) was calculated as per prescribed methodology***	***Whether prescribed Consultation process was followed***
22	Garhwa Road-Chopan-Singrauli	In progress	N	N
23	Andal–Sitarampur	In progress	N	N
24	Guntkal-Bellary-Hospet including Torangallu-Ranjitpura	In progress	Y	Y
25	Amla-Chindwara-Kalumna	In progress	N	N
26	Itarsi-Katni-Manikpur-Chheoki including Satna-Rewa	In progress	N	N
27	Titlagarh –Sambalpur-Jharsuguda	In progress	N	N
28	Jakhal-Dhuri-Ludhiana	In progress	N	N
29	Chhapra-Ballia-Varanasi-Allahabad	In progress	N	N
30	Rohtak-Bhiwani	New work	N	N
31	Jhansi-Manikpur including Khairar-Bhimsen	New work	N	N
32	Erode-Karur-Tiruchirapalli	New work	N	N
33	New Katni-Singrauli	New work	N	N
34	Kiul-Tilaiya	New work	N	N
35	Guntakal-Kallur	New work	N	N
36	Ghazipur-Aunrihar-Manduadih	New work	N	N
			Y-Yes, N- No	Y-Yes, N- No
	Reference to the Para of the Report		***3.1***	***3.1***
		Total Count	***33***	***31***
		Count 'Y'	***02***	***3***
		Count 'N'	***31***	***28***

Annexure 3.2 - Time period of processing, assignment of work to implementing agency & subsequently to the field formation and time period for preparation of detailed estimate									
S. no	***Name of the work***	***Status at the time of audit***	***Name of Implementing Agency***	***Period of Processing (in days)***	***Time taken (in days) for assignment of work to the implementing agency after inclusion of project in the Works Programme***	***Time taken (in days) in assignment of work by the implementing agency to its field formations***	***Time taken (in days) for assignment of work to the field formations after inclusion of project in the Works Programme***	***Time taken (in days) for approval of detailed estimate after inclusion of the project in Works Programme***	***Time taken (in days) between preparation of Abstract Estimate and approval of Detailed Estimate***
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*
1	Bhubaneswar – Kottavalasa	Completed	C	NAV	NAV	NAV	NAV	NAV	NAV
2	Krishnanagar – Lalgola	Completed	C	NAV	NAV	NAV	NAV	1038	NAV
3	Karepalli-Bhadrachalam Road-Manuguru	Completed	C	NAV	NAV	NAV	605	540	NAV
4	Andal-Ukhra-Pandabeswar	Completed	C	NAV	NAV	NAV	NAV	149	NAV
5	Ujjain-Indore and Dewas-Maksi	Completed	C	1440	25	155	180	318	1758
6	Tiruchirapalli-Madurai	Completed	C	240	9	0	9	145	385
7	Barabanki-Gorakhpur-Barauni	Completed	C	360	NAV	NAV	548	40	226
8	Shakurbasti- Rohtak	Completed	C	120	49	0	49	148	268
9	Jhansi - Kanpur including Ait Jn.- Konch Branch line of NCR and Kanpur Anwarganj-Kalyanpur	Completed	C	1579	NAV	NAV	181	259	1838
10	Madurai-Tuticorin-VanchiManiyachchi-Nagercoil	Completed	C	810	218	159	377	526	1336
11	Varanasi-Lohta-Janghai-Unchahar including Phaphamau-Allahabad	Completed	C	805	212	0*	210	365	1170
12	Daund – Manmad including PuntambaShirdi	Completed	R	1170	-29[&]	20	-9[&]	67	1237
13	Mathura-Alwar	Completed	C	930	74	6	180	272	1138
14	Ghaziabad –Moradabad	Completed	C	540	337	1	338	332	872

Annexure 3.2 - Time period of processing, assignment of work to implementing agency & subsequently to the field formation and time period for preparation of detailed estimate

S. no	*Name of the work*	*Status at the time of audit*	*Name of Implementing Agency*	*Period of Processing (in days)*	*Time taken (in days) for assignment of work to the implementing agency after inclusion of project in the Works Programme*	*Time taken (in days) in assignment of work by the implementing agency to its field formations*	*Time taken (in days) for assignment of work to the field formations after inclusion of project in the Works Programme*	*Time taken (in days) for approval of detailed estimate after inclusion of the project in Works Programme*	*Time taken (in days) between preparation of Abstract Estimate and approval of Detailed Estimate*
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*
15	Gooty - Dharmavaram - Yelahanka - including Dharmavaram - Sri SatyaSaiPrashanthiNilayam–Penukonda	Completed	R	690	202	0*	202	299	287
16	Roza - Sitapur–Burhwal	Completed	C	1080	0	4	(-)7	251	1331
17	Alwar-Rewari	Completed	C	1080	-13[&]	6	-7[&]	302	1382
18	Barauni-Katihar-Guwahati	In progress	C	600	30	229	100	126	726
19	Shoranur – Kannur – Mangalore - Panambur	In progress	C	NAV	NAV	NAV	54	266	NAV
20	Gondia – Ballarshah	In progress	C	NAV	NAV	NAV	NAV	502	NAV
21	Khana-Sainthia-Pakur including Pandabeswar-Sainthia	In progress	C	704	238	0*	238	221	925
22	Garhwa Road-Chopan-Singrauli	In progress	C	NAV	NAV	NAV	560	325	NAV
23	Andal–Sitarampur	In progress	C	NAV	38	38	NAV	220	NAV
24	Guntkal-Bellary-Hospet including Torangallu-Ranjitpura	In progress	R	1006	NAV	NAV	NAV	426	672
25	Amla-Chindwara-Kalumna	In progress	R	NAV	15	0	15	450	NAV
26	Itarsi-Katni-Manikpur-Chheoki including Satna-Rewa	In progress	C	1346	NAV	NAV	38	465	NAV
27	Titlagarh –Sambalpur-Jharsuguda	In progress	C	NAV	16	22	38	523	NAV

Annexure 3.2 - Time period of processing, assignment of work to implementing agency & subsequently to the field formation and time period for preparation of detailed estimate									
S. no	***Name of the work***	***Status at the time of audit***	***Name of Implementing Agency***	***Period of Processing (in days)***	***Time taken (in days) for assignment of work to the implementing agency after inclusion of project in the Works Programme***	***Time taken (in days) in assignment of work by the implementing agency to its field formations***	***Time taken (in days) for assignment of work to the field formations after inclusion of project in the Works Programme***	***Time taken (in days) for approval of detailed estimate after inclusion of the project in Works Programme***	***Time taken (in days) between preparation of Abstract Estimate and approval of Detailed Estimate***
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*
28	Jakhaldhuri-Ludhiana	In progress	R	970	-12[&]	0*	-12[&]	540	1510
29	Chhapra-Ballia-Varanasi-Allahabad	In progress	R	35	124	26	150	286	200
30	Rohtak-Bhiwani	New work	C	870	0	0	180	300	1170
31	Jhansi-Manikpur including Khairar-Bhimsen	New work	C	1080	NAV	NAV	180	300	1380
32	Erode-Karur-Tiruchirapalli	New work	C	1760	189	6	195	309	2069
33	New Katni-Singrauli	New work	C	1505	0	30	30	298	1803
34	Kiul-Tilaiya	New work	C	NAV	0	0	180	360	NAV
35	Guntakal-Kallur	New work	R	NAV	Initially allotted to CORE in April 2015, subsequently transferred to RVNL in July 2015.	NAV	NAV	330	900
36	Ghazipur-Aunrihar-Manduadih	New work	R	330	50	40	90	Not Applicable	Not Applicable
	Reference to the Para of the Report			***3.1***					
	Max			***1760 days***	***337 days***	***229 days***	***605 days***	***1038 days***	***2069 days***
	Min			***35-days***	***0 day***	***0 day***	***0 day***	***40 days***	***200 days***

Annexure 3.2 - Time period of processing, assignment of work to implementing agency & subsequently to the field formation and time period for preparation of detailed estimate

S. no	Name of the work	Status at the time of audit	Name of Implementing Agency	Period of Processing (in days)	Time taken (in days) for assignment of work to the implementing agency after inclusion of project in the Works Programme	Time taken (in days) in assignment of work by the implementing agency to its field formations	Time taken (in days) for assignment of work to the field formations after inclusion of project in the Works Programme	Time taken (in days) for approval of detailed estimate after inclusion of the project in Works Programme	Time taken (in days) between preparation of Abstract Estimate and approval of Detailed Estimate
A	B	C	D	E	F	G	H	I	J
	Range in days			120 days to 1760 days	0 day to 337 days	0 day to 229 days	0 day to 605 days	40 days to 1038-days	200 days to 2069 days
	Range in months			1.17 months to 58.67 (59) months	0 month to 11.23 (11) months	0 month to 7.63 (8) months	0 month to 20.17 (20) months	1.33 (1) months to 34.60 (35) months	6.67 (7) months to 68.97 (69) months
	No. of Projects where information is not available			12	13	13	7	2	13
	No. of projects where information is available			24	23	23	29	34	23
	Mean value			29.24(29) months	2.57(3) months	1.08(1) month	5.62(6) months	11.08(11) months	35.63(36) months
	Median value			30 months	1 month	0.02(0) month	6 months	10.03 (10) months	39 months

& - Where the values are negative, nil value have been taken for the purpose of data analysis.

* - Information not available and hence taken as 'Nil' as the most optimistic value.

C- CORE, R-RVNL and NA- Not Available

Annexure 3.3 - Variation between Detailed Estimate and Abstract Estimate							
S. no	***Name of the work***	***Status at the time of audit***	***Implementing Agency***	***Abstract Estimate Cost (₹ in crore)***	***Detailed Estimate Cost (₹ in crore)***	***Percentage variation between Detailed Estimate and Abstract Estimate***	***Values of percentage variation taken for data analysis***
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*
1	Bhubaneswar – Kottavalasa	Completed	C	292.22	315.65	8.02	8
2	Krishnanagar – Lalgola	Completed	C	NAV	63.84	NAV	Not considered
3	Karepalli-Bhadrachalam Road-Manuguru	Completed	C	40.62	57.54	41.65	42
4	Andal-Ukhra-Pandabeswar	Completed	C	33.06	40.47	22.41	22
5	Ujjain-Indore and Dewas-Maksi	Completed	C	48.35	67.62	39.86	40
6	Tiruchirapalli-Madurai	Completed	C	86.32	92.38	7.02	7
7	Barabanki-Gorakhpur-Barauni	Completed	C	526.44	679.96	29.16	29
8	Shakurbasti- Rohtak	Completed	C	48	69.83	45.48	45
9	Jhansi - Kanpur including Ait Jn.- Konch Branch line of NCR and Kanpur Anwarganj-Kalyanpur	Completed	C	108.78	155.73	43.16	43
10	Madurai-Tuticorin-VanchiManiyachchi-Nagercoil	Completed	C	145.87	175.45	20.28	20
11	Varanasi-Lohta-Janghai-Unchahar including Phaphamau-Allahabad	Completed	C	132.87	151.49	14.01	14
12	Daund – Manmad including PuntambaShirdi	Completed	R	179.41	216.18	20.49	20
13	Mathura-Alwar	Completed	C	99.71	119.83	20.18	20
14	Ghaziabad –Moradabad	Completed	C	113.57	151.91	33.76	34
15	Gooty - Dharmavaram - Yelahanka - including Dharmavaram - Sri SatyaSaiPrashanthiNilayam–Penukonda	Completed	R	193.69	228.57	18.01	18
16	Roza - Sitapur–Burhwal	Completed	C	112.55	131.98	17.26	17
17	Alwar-Rewari	Completed	C	97.68	118.48	21.29	21
18	Barauni-Katihar-Guwahati	In progress	C	511.8	821.53	60.52	61
19	Shoranur – Kannur – Mangalore - Panambur	In progress	C	302.5	371.52	22.82	23
20	Gondia – Ballarshah	In progress	C	168.48	203.88	21.01	21
21	Khana-Sainthia-Pakur	In	C	341.5	299.5	-12.30	-12

Annexure 3.3 - Variation between Detailed Estimate and Abstract Estimate

S. no	*Name of the work*	*Status at the time of audit*	*Implementing Agency*	*Abstract Estimate Cost (₹ in crore)*	*Detailed Estimate Cost (₹ in crore)*	*Percentage variation between Detailed Estimate and Abstract Estimate*	*Values of percentage variation taken for data analysis*
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*
	including Pandabeswar-Sainthia	progress					
22	Garhwa Road-Chopan-Singrauli	In progress	C	228.4	252.75	10.66	11
23	Andal–Sitarampur	In progress	C	68.2	76.65	12.39	12
24	Guntkal-Bellary-Hospet including Torangallu-Ranjitpura	In progress	R	184.57	226.68	22.82	23
25	Amla-Chindwara-Kalumna	In progress	R	222.65	255.04	14.55	15
26	Itarsi-Katni-Manikpur-Chheoki including Satna-Rewa	In progress	C	927.01	861.34	-7.08	-7
27	Titlagarh –Sambalpur-Jharsuguda	In progress	C	292.38	280.82	-3.95	-4
28	Jakhaldhuri-Ludhiana	In progress	R	126.01	149.53	18.67	19
29	Chhapra-Ballia-Varanasi-Allahabad	In progress	R	299.52	415.15	38.61	39
30	Rohtak-Bhiwani	New work	C	44.05	54.6	23.95	24
31	Jhansi-Manikpur including Khairar-Bhimsen	New work	C	344.33	441.28	28.16	28
32	Erode-Karur-Tiruchirapalli	New work	C	296.75	362.22	22.06	22
33	New Katni-Singrauli	New work	C	258.33	272.58	5.52	6
34	Kiul-Tilaiya	New work	C	80.49	100.61	25	25
35	Guntakal-Kallur	New work	R	21.21	34.39	62.14	62
36	Ghazipur-Aunrihar-Manduadih	New work	R	42.33	Not Prepared	Not Applicable	Not considered
	Reference to the Para of the Report					***3.1 & 3.3***	
	Max			***62 per cent***		***62 per cent***	
	Min			***6 per cent***		***(-) 12 per cent***	
	Range			***6 per cent to 62 per cent***		***(-) 12 to 62 per cent***	
	No. of Projects where information is not available			***2***		***2***	
	No. of projects where information is available			***31***		***34***	
	Mean value			***25.51 per cent***		***22.59 per cent***	
	Median value			***22.59 per cent***		***21 per cent***	
	Exclusion of data (Negative)			***3***		***Nil***	

C-CORE, R- RVNL

Annexure 3.4 - Time period for assignment of work to CORE & subsequently to the field formations (CPD) and time taken for preparation of detailed estimate

S. no	*Name of the work*	*Status at the time of audit*	*Name of Implementing Agency*	*Time taken (in days) for assignment of work to CORE from 1st of April of inclusion of project in the Works Programme*	*Time taken (in days) in assignment of work by the CORE to its field formations*	*Time taken (in days) for assignment of work to the field formations from 1st of April of inclusion of project in the Works Programme*	*Time taken (in days) for approval of detailed estimate from 1st April of the year in which project was included in Works Programme*	*Time taken (in days) between preparation of Abstract Estimate and approval of Detailed Estimate*
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*
1	Bhubaneswar – Kottavalasa	Completed	CORE	NAV	NAV	NAV	NAV	NAV
2	Krishnanagar – Lalgola	Completed	CORE	NAV	NAV	NAV	1038	NAV
3	Karepalli-Bhadrachalam Road-Manuguru	Completed	CORE	NAV	NAV	605	540	NAV
4	Andal-Ukhra-Pandabeswar	Completed	CORE	NAV	NAV	NAV	149	NAV
5	Ujjain-Indore and Dewas-Maksi	Completed	CORE	25	155	180	318	1758
6	Tiruchirapalli-Madurai	Completed	CORE	9	0	9	145	385
7	Barabanki-Gorakhpur-Barauni	Completed	CORE	NAV	NAV	548	40	226
8	Shakurbasti- Rohtak	Completed	CORE	49	0	49	148	268
9	Jhansi - Kanpur including Ait Jn.- Konch Branch line of NCR and Kanpur Anwarganj- Kalyanpur	Completed	CORE	NAV	NAV	181	259	1838
10	Madurai-Tuticorin-VanchiManiyachchi-Nagercoil	Completed	CORE	218	159	377	526	1336
11	Varanasi-Lohta-Janghai-Unchahar including	Completed	CORE	212	0*	212	365	1170

Annexure 3.4 - Time period for assignment of work to CORE & subsequently to the field formations (CPD) and time taken for preparation of detailed estimate

S. no	*Name of the work*	*Status at the time of audit*	*Name of Implementing Agency*	*Time taken (in days) for assignment of work to CORE from 1st of April of inclusion of project in the Works Programme*	*Time taken (in days) in assignment of work by the CORE to its field formations*	*Time taken (in days) for assignment of work to the field formations from 1st of April of inclusion of project in the Works Programme*	*Time taken (in days) for approval of detailed estimate from 1st April of the year in which project was included in Works Programme*	*Time taken (in days) between preparation of Abstract Estimate and approval of Detailed Estimate*
	Phaphamau-Allahabad							
12	Mathura-Alwar	Completed	CORE	74	6	80	272	1138
13	Ghaziabad –Moradabad	Completed	CORE	337	1	338	332	872
14	Roza - Sitapur–Burhwal	Completed	CORE	0	4	(-)7	251	1331
15	Alwar-Rewari	Completed	CORE	-13[&]	6	-7[&]	302	1382
16	Barauni-Katihar-Guwahati	In progress	CORE	30	229	100	126	726
17	Shoranur – Kannur – Mangalore - Panambur	In progress	CORE	NAV	NAV	54	266	NAV
18	Gondia – Ballarshah	In progress	CORE	NAV	NAV	NAV	502	NAV
19	Khana-Sainthia-Pakur including Pandabeswar-Sainthia	In progress	CORE	238	0*	238	221	925
20	Garhwa Road-Chopan-Singrauli	In progress	CORE	NAV	NAV	560	325	NAV
21	Andal–Sitarampur	In progress	CORE	38	38	NAV	220	NAV
22	Itarsi-Katni-Manikpur-Chheoki including Satna-Rewa	In progress	CORE	NAV	NAV	38	465	NAV
23	Titlagarh –Sambalpur-Jharsuguda	In progress	CORE	16	22	38	523	NAV
24	Rohtak-Bhiwani	New work	CORE	0	0	180	300	1170

Annexure 3.4 - Time period for assignment of work to CORE & subsequently to the field formations (CPD) and time taken for preparation of detailed estimate

S. no	Name of the work	Status at the time of audit	Name of Implementing Agency	Time taken (in days) for assignment of work to CORE from 1st of April of inclusion of project in the Works Programme	Time taken (in days) in assignment of work by the CORE to its field formations	Time taken (in days) for assignment of work to the field formations from 1st of April of inclusion of project in the Works Programme	Time taken (in days) for approval of detailed estimate from 1st April of the year in which project was included in Works Programme	Time taken (in days) between preparation of Abstract Estimate and approval of Detailed Estimate
25	Jhansi-Manikpur including Khairar-Bhimsen	New work	CORE	NAV	NAV	180	300	1380
26	Erode-Karur-Tiruchirapalli	New work	CORE	189	6	195	309	2069
27	New Katni-Singrauli	New work	CORE	0	30	30	298	1803
28	Kiul-Tilaiya	New work	CORE	0	0	180	360	NAV
	Reference to the Para of the Report			**3.2**	**3.2**	**3.2**	**3.3**	**3.3**
	Max			***337 days***	***229 days***	***605 days***	***1038 days***	***2069 days***
	Min			***0 day***	***0 day***	***0 day***	***40 days***	***226 days***
	Range in days			***0 day to 337 days***	***0 day to 229 days***	***0 day to 605 days***	***40 days to 1038 days***	***226 days to 2069 days***
	Range in months			***0 month to 11.23 (11) months***	***0 month to 7.63 (8) months***	***0 month to 20.17 (20) months***	***1.33 (1) months to 34.6 (35) months***	***7.53 (7) months to 68.97 (69) months***
	No. of Projects where information is not available			***11***	***11***	***5***	***1***	***11***
	No. of projects where information is available			***17***	***17***	***23***	***27***	***17***
	Mean value			***2.79(3) months***	***1.29 (1) month***	***6.32(6) months***	***10.99(11) months***	***38.58(39) months***
	Median value			***1 month***	***0.20 month***	***6 months***	***10(10) months***	***39(39) months***

& - Where the values are negative, nil value have been taken for the purpose of data analysis.

* - Information not available and hence taken as 'Nil' as the most optimistic value.

Annexure 3.5 - Time period for assignment of work to RVNL & subsequently to the field formations (CPM) and time taken for preparation of detailed estimate

S. no	*Name of the work*	*Status at the time of audit*	*Name of Implementing Agency*	*Time taken (in days) for assignment of work to RVNL from inclusion of the project in Works Programme*	*Time taken (in days) in assignment of work RVNL to its field formations*	*Time taken (in days) for assignment of work to the field formations from the date of inclusion of project in the Works Programme*	*Time taken (in days) for approval of detailed estimate from inclusion of the project in Works Programme*	*Time taken (in days) between preparation of Abstract Estimate and approval of Detailed Estimate*
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*
1	Daund – Manmad including PuntambaShirdi	Completed	RVNL	-29[&]	20	-9[&]	67	1237
2	Gooty - Dharmavaram - Yelahanka - including Dharmavaram - Sri SatyaSaiPrashanthiNilayam– Penukonda	Completed	RVNL	202	0*	202	299	287
3	Guntkal-Bellary-Hospet including Torangallu-Ranjitpura	In progress	RVNL	NAV	NAV	NAV	426	672
4	Amla-Chindwara-Kalumna	In progress	RVNL	15	0	15	450	NAV
5	Jakhaldhuri-Ludhiana	In progress	RVNL	-12[&]	0*	-12[&]	540	1510
6	Chhapra-Ballia-Varanasi-Allahabad	In progress	RVNL	124	26	150	286	200
7	Guntakal-Kallur	New work	RVNL	Initially allotted to CORE and in April 2015 and subsequently transferred to RVNL in July 2015.	NAV	NAV	330	900
8	Ghazipur-Aunrihar-Manduadih	New work	RVNL	50	40	190	Not Applicable	Not Applicable

Annexure 3.5 - Time period for assignment of work to RVNL & subsequently to the field formations (CPM) and time taken for preparation of detailed estimate								
S. no	*Name of the work*	*Status at the time of audit*	*Name of Implementing Agency*	*Time taken (in days) for assignment of work to RVNL from inclusion of the project in Works Programme*	*Time taken (in days) in assignment of work RVNL to its field formations*	*Time taken (in days) for assignment of work to the field formations from the date of inclusion of project in the Works Programme*	*Time taken (in days) for approval of detailed estimate from inclusion of the project in Works Programme*	*Time taken (in days) between preparation of Abstract Estimate and approval of Detailed Estimate*
A	B	C	D	E	F	G	H	I
	Reference to the Para of the Report			***3.2***	***3.2***	***3.2***	***3.3***	***3.3***
	Max			***202 days***	***40 days***	***202 days***	***540 days***	***1510 days***
	Min			***0 day***	***0 day***	***0 day***	***67 days***	***200days***
	Range in days			***0 day to 202 days***	***0 day to 40 days***	***0 day to 202 days***	***67 days to 540 days***	***900 days to 1510 days***
	Range in months			***0 month to 6.73 (7) months***	***0 month to 1.33(1) month***	***0 month to 6.73 (7) months***	***2.23 (2) months to 18 months***	***30 months to 50.33 (50) months***
	No. of Projects where information is not available			***2***	***2***	***2***	***1***	***2***
	No. of projects where information is available			***6***	***6***	***6***	***7***	***6***
	Mean value			***1.94(2) months***	***0.48 month***	***2.98(3) months***	***11.42 (11) months***	***26.7 (27) months***
	Median value			***1.08 months***	***0.33month***	***2.75(3) months***	***11 months***	***26.2 (26) months***

& - Where the values are negative, nil value have been taken for the purpose of data analysis.

* - Information not available and hence taken as 'Nil' as the most optimistic value.

Annexure 3.6 - Variation between Detailed Estimate and Abstract Estimate for projects executed by CORE							
S. no	***Name of the work***	***Status at the time of audit***	***Implementing Agency***	***Abstract Estimate Cost (₹ in crore)***	***Detailed Estimate Cost (₹ in crore)***	***Percentage variation between Detailed Estimate and Abstract Estimate***	***Values of percentage variation taken for data analysis***
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*
1	Bhubaneswar – Kottavalasa	Completed	CORE	292.22	315.65	8.02	8
2	Krishnanagar – Lalgola	Completed	CORE	NAV	63.84	NAV	Not considered
3	Karepalli-Bhadrachalam Road-Manuguru	Completed	CORE	40.62	57.54	41.65	42
4	Andal-Ukhra-Pandabeswar	Completed	CORE	33.06	40.47	22.41	22
5	Ujjain-Indore and Dewas-Maksi	Completed	CORE	48.35	67.62	39.86	40
6	Tiruchirapalli-Madurai	Completed	CORE	86.32	92.38	7.02	7
7	Barabanki-Gorakhpur-Barauni	Completed	CORE	526.44	679.96	29.16	29
8	Shakurbasti- Rohtak	Completed	CORE	48	69.83	45.48	45
9	Jhansi - Kanpur including Ait Jn.- Konch Branch line of NCR and Kanpur Anwarganj-Kalyanpur	Completed	CORE	108.78	155.73	43.16	43
10	Madurai-Tuticorin-VanchiManiyachchi-Nagercoil	Completed	CORE	145.87	175.45	20.28	20
11	Varanasi-Lohta-Janghai-Unchahar including Phaphamau-Allahabad	Completed	CORE	132.87	151.49	14.01	14
12	Mathura-Alwar	Completed	CORE	99.71	119.83	20.18	20
13	Ghaziabad –Moradabad	Completed	CORE	113.57	151.91	33.76	34
14	Roza - Sitapur–Burhwal	Completed	CORE	112.55	131.98	17.26	17
15	Alwar-Rewari	Completed	CORE	97.68	118.48	21.29	21
16	Barauni-Katihar-Guwahati	In progress	CORE	511.8	821.53	60.52	61
17	Shoranur – Kannur – Mangalore - Panambur	In progress	CORE	302.5	371.52	22.82	23
18	Gondia – Ballarshah	In progress	CORE	168.48	203.88	21.01	21
19	Khana-Sainthia-Pakur including Pandabeswar-Sainthia	In progress	CORE	341.5	299.5	-12.30	-12

Annexure 3.6 - Variation between Detailed Estimate and Abstract Estimate for projects executed by CORE							
S. no	***Name of the work***	***Status at the time of audit***	***Implementing Agency***	***Abstract Estimate Cost (₹ in crore)***	***Detailed Estimate Cost (₹ in crore)***	***Percentage variation between Detailed Estimate and Abstract Estimate***	***Values of percentage variation taken for data analysis***
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*
20	Garhwa Road-Chopan-Singrauli	In progress	CORE	228.4	252.75	10.66	11
21	Andal–Sitarampur	In progress	CORE	68.2	76.65	12.39	12
22	Itarsi-Katni-Manikpur-Chheoki including Satna-Rewa	In progress	CORE	927.01	861.34	-7.08	-7
23	Titlagarh –Sambalpur-Jharsuguda	In progress	CORE	292.38	280.82	-3.95	-4
24	Rohtak-Bhiwani	New work	CORE	44.05	54.6	23.95	24
25	Jhansi-Manikpur including Khairar-Bhimsen	New work	CORE	344.33	441.28	28.16	28
26	Erode-Karur-Tiruchirapalli	New work	CORE	296.75	362.22	22.06	22
27	New Katni-Singrauli	New work	CORE	258.33	272.58	5.52	6
28	Kiul-Tilaiya	New work	CORE	80.49	100.61	25	25
	Reference to the Para of the Report			***3.3***		***3.3***	
	Max			***61 per cent***		***61 per cent***	
	Min			***6 per cent***		***(-) 12 per cent***	
	Range			***6 per cent to 61 per cent***		***(-) 12 per cent to 61 per cent***	
	No. of Projects where information is not available			***1***		***1***	
	No. of projects where information is available			***27***		***27***	
	Mean value			***24.82 per cent***		***21.9 per cent***	
	Median value			***22.24 per cent***		***21per cent***	

Annexure 3.7 - Variation between Detailed Estimate and Abstract Estimate for projects executed by RVNL							
S. no	***Name of the work***	***Status at the time of audit***	***Implementing Agency***	***Abstract Estimate Cost (₹ in crore)***	***Detailed Estimate Cost (₹ in crore)***	***Percentage variation between Detailed Estimate and Abstract Estimate***	***Values of percentage variation taken for data analysis***
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*
1	Daund – Manmad including PuntambaShirdi	Completed	RVNL	179.41	216.18	20.49	20
2	Gooty - Dharmavaram - Yelahanka - including Dharmavaram - Sri SatyaSaiPrashanthiNilayam–Penukonda	Completed	RVNL	193.69	228.57	18.01	18
3	Guntkal-Bellary-Hospet including Torangallu-Ranjitpura	In progress	RVNL	184.57	226.68	22.82	23
4	Amla-Chindwara-Kalumna	In progress	RVNL	222.65	255.04	14.55	15
5	Jakhaldhuri-Ludhiana	In progress	RVNL	126.01	149.53	18.67	19
6	Chhapra-Ballia-Varanasi-Allahabad	In progress	RVNL	299.52	415.15	38.61	39
7	Guntakal-Kallur	New work	RVNL	21.21	34.39	62.14	62
8	Ghazipur-Aunrihar-Manduadih	New work	RVNL	42.33	Not Prepared	Not Applicable	Not considered
	Reference to the Para of the Report					***3.3***	
	Max				***62 per cent***		
	Min				***15 per cent***		
	Range				***15 per cent to 62 per cent***		
	No. of Projects where information is not available				***1***		
	No. of projects where information is available				***7***		
	Mean value				***28 per cent***		
	Median value				***20 per cent***		

Annexure 3.8 - Comparison of Detailed Estimate Cost Per TKM for the work executed by CORE and RVNL

S. No	Name of the project	Status	Implementing agency	RKM	TKM	Year of approval of Detailed Estimate (DE)	Month of Approval of Detailed Estimate (DE)	Cost of DE (₹ in crore)	Cost per TKM	CORE DE Cost per TKM in year	RVNL DE Cost per TKM in year
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*
1	Ujjain-Indore and Dewas-Maksi	Completed	CORE	115	152	2000-01	Mar-01	67.62	**0.44**	0.44	-
2	Krishnanagar-Lalgola	Completed	CORE	127.67	147.8	2002-03	Feb-03	63.84	**0.43**	0.43	-
3	Andal – Ukhra – Pandabeswar	Completed	CORE	20.34	107.7	2006-07	Aug-06	40.47	**0.38**	0.33	-
4	Karepalli-Bhadrachalam Road-Manuguru	Completed	CORE	88.2	185	2006-07	Sep-06	57.54	**0.31**		
5	Barabanki- Gonda-Gorakhpur-Chhapra-Barauni	Completed	CORE	709	1700	2007-08	May-07	679.96	**0.40**	0.40	-
6	Tiruchchirappalli-Madurai	Completed	CORE	154	271	2007-08	Aug-07	92.38	**0.34**		
7	Shakurbasti-Rohtak	Completed	CORE	60	150	2007-08	Feb-08	68.78	**0.46**		
8	Jhansi-Kanpur including AitKonch and Kanpur-Anwarganj-Kalyanpur	Completed	CORE	240	316	2008-09	Dec-08	155.73	**0.49**	0.49	-
9	Barauni-Katihar-Guwahati	In progress	CORE/RVNL	836	1687	2008-09	Aug-08	821.5	**0.49**		
10	Madurai-Tuticorin-VanchiManiyachchi-Nagercoil	Completed	CORE	262	336.5	2009-10	Sep-09	175.5	**0.52**	0.57	-
11	Varanasi-Lohta-Janghai-Unchahar incl. Phaphamau-Allahabad	Completed	CORE	207	235	2009-10	Sep-09	151.49	**0.64**		

Annexure 3.8 - Comparison of Detailed Estimate Cost Per TKM for the work executed by CORE and RVNL

S. No	Name of the project	Status	Implementing agency	RKM	TKM	Year of approval of Detailed Estimate (DE)	Month of Approval of Detailed Estimate (DE)	Cost of DE (₹ in crore)	Cost per TKM	CORE DE Cost per TKM in year	RVNL DE Cost per TKM in year
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*
12	Shoranur –Kannur-Mangalore-Panambur	In progress	CORE	328	765	2010-11	Dec-10	371.5	**0.49**	0.51	0.70
13	Ghaziabad-Moradabad	Completed	CORE	140	330	2010-11	Mar-11	151.9	**0.46**		
14	Khana-Sainthia-Pakur including Pandabeswar-Sainthia	In progress	CORE	205	517	2010-11	Nov-10	299.5	**0.58**		
15	Daund - Manmad including Puntambo- Shirdi	Completed	RVNL	256	282	2010-11	Jun-10	216.18	**0.77**		
16	Gooty-Dharmavaram-Yelhenka including Sri Stay Si PrashanthiNilayam-Penukonda	Completed	RVNL	304	355	2010-11	Jan-11	228.57	**0.64**		
17	Mathura-Alwar	Completed	CORE	123	160	2011-12	May-11	119.83	**0.75**	0.68	-
18	Gondia- Ballarshah	In progress	CORE	250	266	2011-12	Aug-11	203.9	**0.77**		
19	Roza-Sitapur-Burhwal	Completed	CORE	181	230	2011-12	Dec-11	132	**0.57**		
20	Alwar-Rewari	Completed	CORE	82	193	2011-12	Feb-12	118.5	**0.61**		
21	Andal- Sitarampur	In progress	CORE	57	94	2012-13	Nov-12	76.65	**0.82**	0.73	-
22	Garhwa Road-Chopan-Singrauli	In progress	CORE	257	359	2012-13	Feb-13	252.8	**0.70**		
23	Itarsi-Katni-Manikpur-Cheoki- invludingSatna-Rewa	In progress	CORE	653	1611	2013-14	Jul-13	861.3	**0.53**	0.53	0.72

Annexure 3.8 - Comparison of Detailed Estimate Cost Per TKM for the work executed by CORE and RVNL											
S. No	***Name of the project***	***Status***	***Implementing agency***	***RKM***	***TKM***	***Year of approval of Detailed Estimate (DE)***	***Month of Approval of Detailed Estimate (DE)***	***Cost of DE (₹ in crore)***	***Cost per TKM***	***CORE DE Cost per TKM in year***	***RVNL DE Cost per TKM in year***
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*
24	Titlagarh -Sambalpur-Jharsuguda	In progress	CORE	238	550	2013-14	Sep-13	280.8	**0.51**		
25	Guntkal-Bellary-Hospet including Torangallu-Ranjitpura	In progress	RVNL	138	353	2013-14	May-13	226.68	**0.64**		
26	Amla-Chindwara-Kalumna	In progress	RVNL	257	317	2013-14	Jun-13	255.04	**0.80**		
27	Jakhal -Dhuri- Ludhiiana	In progress	RVNL	123	178	2014-15	Sep-14	149.53	**0.84**	-	0.86
28	Chhapra-Ballia-Varanasi-Allahabad	In progress	RVNL	330	482	2014-15	Jan-15	415.15	**0.86**		
29	Kiul-Tilaiya	New Work	CORE	87	101	2015-16	Jan-16	100.61	**1.00**	0.94	-
30	Jhansi-Manikpur including Khairar-Bhimsen	New Work	CORE	408	482	2015-16	Feb-16	441.28	**0.92**		
31	Rohtak-Bhiwani	New Work	CORE	48	56	2015-16	Feb-16	54.6	**0.98**		
32	Erode-Karur-Tiruchirapalli	New Work	CORE	300	359	2015-16	Feb-16	362.22	**1.01**		
33	New Katni-Singrauli	New Work	CORE/ IRCON	248	305	2015-16	Feb-16	272.58	**0.89**		
34	Guntakal-Kallur	New Work	RVNL	40.26	45	2016-17	May-16	34.38	**0.764**		0.764
35	Bhubaneswar-Kottavalasa	Completed	CORE	414	1012			315.65	**0.31**		
36	Ghazipur-Aunrihar-Manduadih	New Work	RVNL	78.61	93.61		Not yet prepared		**0.00**		
	Reference to Para of the report						***3.3***				

Annexure 4.1 - Project execution methodology used in selected RE projects								
S. No.	***Name of Project***	***Implementing Agency***	***Category of Work***	***EPC***	***Turnkey***	***Quasi-Turnkey***	***Conventional without stores***	***Conventional with stores***
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*
1	Bhubaneswar-Kottavalasa	CORE	Completed				Yes	
2	Krishnanagar-Lalgola	CORE	Completed				Yes	
3	Karepalli-Bhadrachalam-Manuguru	CORE	Completed				Yes	
4	Andal – Ukhra – Pandabeswar	CORE	completed			Yes		
5	Ujjain-Indore and Dewas-Maksi	CORE	Completed				Yes	
6	Tiruchchirappalli-Madurai	CORE	Completed					Yes
7	Barabanki-Gonda-Gorakhpur-Chhapra-Barauni	CORE	Completed				Yes	
8	Shakurbasti-Rohtak	CORE	Completed					Yes
9	Jhansi-Kanpur	CORE	Completed			Yes		
10	Madurai-Tuticorin-Vanchimaniyachi-Nagercoil	CORE	Completed					Yes
11	Varanasi-Lohta-Janghai-Unchahar incl. Phaphamau-Allahabad	CORE	Completed				Yes	
12	Mathura-Alwar	CORE	Completed				Yes	
13	Gaziabad-Moradabad	CORE	Completed				Yes	
14	Roza-Sitapur-Burhwal	CORE	Completed			Yes		
15	Alwar-Rewari	CORE	Completed			Yes		
16	Shoranur–Kannur-Mangalore-Panambur	CORE	In progress					Yes
17	Gondia-Ballarshah	CORE	In progress		Yes			
18	Khana-SainthiaPakur including Pandabeswar-Sainthia	CORE	In progress				Yes	
19	Garhwa Road-Chopan-Singrauli	CORE	In progress		Yes			
20	Andal-Sitarampur	CORE	In progress			Yes		

Annexure 4.1 - Project execution methodology used in selected RE projects								
S. No.	***Name of Project***	***Implementing Agency***	***Category of Work***	***EPC***	***Turnkey***	***Quasi-Turnkey***	***Conventional without stores***	***Conventional with stores***
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*
21	Itarsi-Katni-Manikpur-Cheoki-invludingSatna-Rewa	CORE	In progress			Yes		
22	Titlagarh – Sambalpur-Jharsuguda	CORE	In progress			Yes		
23	Rohtak- Bhiwani	CORE	New Work			Yes		
24	Jhansi-Manikpur incl. Khairar-Bhimsen	CORE	New work				Yes	
25	Erode-Karur-Tiruchchirappalli and Salem-Karur-Dindigul	CORE	New work			Yes		
26	Katni- Signarli	CORE	New Work				Yes	
27	Kiul-Tilaya	CORE	New Work			Yes		
28	Barauni -Katihar-Guwahati	CORE and RVNL	In progress		Yes(02)	Yes (01)	Yes (01)	
		Count		***0***	***3***	***10***	***11***	***4***
1	Daund – Manmad Including PuntambaShirdi	RVNL	Completed		Yes			
2	Gooty-Dharmavaram-Yelahanka- including Sri SatyaSaiPrashantiNilayam-Penukonda	RVNL	Completed		Yes			
3	Guntkal – Bellary – Hospet	RVNL	Work in progress		Yes			
4	Amla – Chindwara - Kalumna	RVNL	Work in progress		Yes			
5	Jakhal – Dhuri Ludhiana	RVNL	Work in progress			Yes		
6	Chhapra – Ballia – Varanasi – Allahabad	RVNL	Work in progress		Yes			
7	Guntkal-Kalur	RVNL	New work		Yes			
8	Gazipur-Aunrihar - Manduadih	RVNL	New work	NAP	NAP	NAP	NAP	NAP
		Count			***6***	***1***		
		Reference to the Para of the Report :		***4.1***				

Annexure 4.2 - Time taken for issue of NIT from the date of sanction of detailed estimate - CORE					
S. no	***Project***	***Category***	***Minimum value (in days)***	***Maximum value (in days)***	***Total no. of tenders invited in project***
A	*B*	*C*	*D*	*E*	*F*
1	Bhubaneswar-Kottavalasa	Completed	NAV	NAV	26
2	Krishnanagar-Lalgola	Completed	284	1658	24
3	Karepalli-Bhadrachalam-Manuguru	Completed	NAV	NAV	NAV
4	Andal – Ukhra – Pandabeswar	Completed	8	805	10
5	Ujjain-Indore and Dewas-Maksi	Completed	19	2179	29
6	Tiruchchirappalli-Madurai	Completed	-79	2135	11
7	Barabanki-Gonda-Gorakhpur-Chhapra-Barauni	Completed	12	3177	116
8	Shakurbasti-Rohtak	Completed	(-)75	2003	12
9	Jhansi-Kanpur	Completed	140	882	4
10	Madurai-Tuticorin-Vanchimaniyachi-Nagercoil	Completed	-35	929	5
11	Varanasi-Lohta-Janghai-Unchahar incl. Phaphamau-Allahabad	Completed	150	2100	14
12	Mathura-Alwar	Completed	7	1140	22
13	Gaziabad-Moradabad	Completed	26	1777	14
14	Roza-Sitapur-Burhwal	Completed	32	985	14
15	Alwar-Rewari	Completed	72	838	19
16	Barauni-Katihar-Guwahati	WIP	222	2905	46
17	Shoranur–Kannur-Mangalor-Panambur	WIP	-43	1779	8
18	Gondia-Ballarshah	WIP	75	1573	27
19	Khana-SainthiaPakur including Pandabeswar-Sainthia	WIP	-233	1392	30
20	Garhwa Road-Chopan-Singrauli	WIP	-123	1000	5
21	Andal-Sitarampur	WIP	175	1064	10
22	Itarsi-Katni-Manikpur-Cheoki- invludingSatna-Rewa	WIP	-141	846	53
23	Jharsuguda-Sambalpur-	WIP	-163	730	7

Annexure 4.2 - Time taken for issue of NIT from the date of sanction of detailed estimate - CORE					
S. no	***Project***	***Category***	***Minimum value (in days)***	***Maximum value (in days)***	***Total no. of tenders invited in project***
A	*B*	*C*	*D*	*E*	*F*
	Titlagarh				
24	Rohtak-Bhiwani	New	-10	250	5
25	Jhansi-Manikpur incl. Khairar-Bhimsen	New	NA	NA	2
26	Erode-Karur-Tiruchchirappalli and Salem-Karur-Dindigul	New	43	NAP	1
27	New Katni Jn.-Singrauli	New	NAV	NAP	NAV
28	Kiul-Tilaya	New	71	NAP	1
	Max.		***3177***		
	Min		***7***		
	Count		***24***	***22***	
	Range		***7 to 3177 days***		
	Average No. of tender WIP		**20**		
	Average No. of tender Completed		**24.4**		
Reference to the Para			***4.2.1***		

Annexure 4.3 - Time taken for issue of NIT from the date of sanction of detailed estimate-RVNL					
S. no	***Project***	***Category***	***Minimum value (in days)***	***Maximum value (in days)***	***Total no. of tenders invited in project***
A	*B*	*C*	*D*	*E*	*F*
1	Daund-Manmad	Completed	3	NAP	1
2	Gooty-Dharmavaram-Yelhenka	Completed	9	NAP	1
3	Guntkal-Bellary-Hospet	In progress	120	600	2
4	Amla-Chindwara-Kalumna	In progress	176	915	4
5	Jakhal -dhuri- Ludhiiana	In progress	159	NAP	1
6	Chhapra-Ballia-Varanasi-Allahabad	In progress	11	71	2
7	Guntakal - Kalluru	New	NAP	NAP	1
8	Gazipur City-Aunrihar-Manduadih	New	NAP	NAP	NAP
Total					***12***
		Max.	***176***	***915***	***4***
		Min	***3***	***71***	***1***
		Count	***6***	***3***	***7***
		Range	***3 to 915 days***		***1 to 4***
	Reference to the Para of the Report :		**4.2.1**		

Annexure 4.4 - Time taken for issue of LOA from sanction of detailed estimate - CORE					
S. no.	***Project***	***Category***	***Time taken in days (Least Value)***	***Time taken in days (Maximum Value)***	***Total number of contracts finalized in project***
A	*B*	*C*	*D*	*E*	*F*
1	Bhubaneswar-Kottavalasa	Completed	NAV	NAV	26
2	Krishnanagar-Lalgola Gr-123	Completed	387	1838	22
3	Karepalli-Bhadrachalam-Manuguru	Completed	NAV	NAV	NAV
4	Andal – Ukhra – Pandabeswar	Completed	81	998	10
5	Ujjain-Indore and Dewas-Maksi	Completed	81	2295	29
6	Tiruchchirappalli-Madurai	Completed	124	2667	7
7	Barabanki-Gonda-Gorakhpur-Chhapra-Barauni	Completed	160	3255	116
8	Shakurbasti-Rohtak	Completed	88	2108	12
9	Jhansi-Kanpur	Completed	471	1029	4
10	Madurai-Tuticorin-Vanchimaniyachi-Nagercoil	Completed	146	1063	5
11	Varanasi-Lohta-Janghai-Unchahar incl. Phaphamau-Allahabad	Completed	240	2190	14
12	Mathura-Alwar	Completed	149	1318	22
13	Gaziabad-Moradabad	Completed	197	1839	14
14	Roza-Sitapur-Burhwal	Completed	96	1062	12
15	Alwar-Rewari	Completed	194	1320	19
16	Barauni-Katihar-Guwahati	WIP	281	2978	46
17	Shoranur–Kannur-Mangalore-Panambur	WIP	98	1903	8
18	Gondia-Ballarshah	WIP	291	1700	27
19	Khana-SainthiaPakur including Pandabeswar-Sainthia	WIP	3	1549	30
20	Garhwa Road-Chopan-Singrauli	WIP	164	1215	5
21	Andal-Sitarampur	WIP	329	1251	10
22	Itarsi-Katni-Manikpur-Cheoki- invludingSatna-Rewa	WIP	48	1049	53
23	Jharsuguda-Sambalpur-Titlagarh	WIP	144	876	7

Annexure 4.4 - Time taken for issue of LOA from sanction of detailed estimate - CORE					
S. no.	***Project***	***Category***	***Time taken in days (Least Value)***	***Time taken in days (Maximum Value)***	***Total number of contracts finalized in project***
A	*B*	*C*	*D*	*E*	*F*
24	Rohtak-Bhiwani	New	202	205	4
25	Jhansi-Manikpur incl. Khairar-Bhimsen	New	NAV	NAP	1
26	Erode-Karur-Tiruchchirappalli and Salem-Karur-Dindigul	New	246	NAP	1
27	New Katni Jn.-Singrauli	New	114	NAP	1
28	Kiul-Tilaya	New	324	NAP	1
Total					***506***
	Minimum		***3***	***205***	
	Maximum		***471***	***3255***	
	Count		***25***	***22***	***27***
		Reference to the Para of the Report :		***4.2.2***	

Annexure 4.5 - Time taken for issue of LOA from sanction of detailed estimate - RVNL					
S.no	**Project**	**Category**	**Time taken in days (Least Value)**	**Time taken in days (Maximum Value)**	**Total number of contracts finalized in project**
A	*B*	*C*	*D*	*E*	*F*
1	Daund- Manmad	Completed	96	NAP	1
2	Gooty-Dharmavaram-Yelahanka	Completed	204	NAP	1
3	Guntkal-Bellary-Hospet	WIP	810	NAV	1
4	Amla-Chindwara-Kalumna	WIP	283	1141	4
5	Jakhal -dhuri- Ludhiiana	WIP	367	NAP	1
6	Chhapra-Ballia-Varanasi-Allahabad	WIP	157	259	2
7	Guntakal - Kalluru	New	210	NAV	1
8	Gazipur City-Aunrihar-Manduadih	New	NAP	NAP	NAP
Total					***11***
		Max	***810***	***1141***	***4***
		Min	***96***	***259***	***1***
		Count	***7***	***2***	***7***
		Range	***96 to 1141 days***		
		Total			***11***
	Reference to the Para of the Report :			***4.2.2***	

Annexure 4.6 – Value of the contracts awarded in 19 RE Projects, where number of contracts were more than five								
S.no	**Name of the Project**	**Total No of contract in project**	**No of contracts where money value not available**	**No of contracts where money value available**	**Minimum value of Contract (in crore)**	**Maximum value of Contract (in crore)**	**No. Of contracts below 50 lakh**	**No. Of contracts above 50 lakh**
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*
1	Bhubaneswar – Kottavalasa	26	8	18	0.0198	16.11	15	3
2	Krishnanagar – Lalgola	22	0	22	0.038	9.44	14	8
4	Andal-Ukhra-Pandabeswar	10	0	10	0.028	13.36	6	4
5	Ujjain-Indore and Dewas-Maksi	29	0	29	0.1	12.99	18	11
6	Tiruchirapalli-Madurai	7	0	7	1.2	23	0	7
7	Barabanki-Gorakhpur-Barauni	116	3	113	0.02	87.04	40	73
8	Shakurbasti-Rohtak	12	0	12	0.04	12.18	4	8
11	Varanasi-Lohta-Janghai-Unchaharincluding Phaphamau-Allahabad	14	0	14	0.37	27.23	3	11
12	Barauni-Katihar-Guwahati	46	0	46	0.06	165.68	12	34
14	Shoranur – Kannur – Mangalore - Panambur	8	3	5	0.98	29.66	0	5
15	Mathura-Alwar	22	0	22	0.06	3.72	8	14
16	Ghaziabad – Moradabad	14	6	8	0.53	24.82	0	8
18	Gondia – Ballarshah	27	0	27	0.09	54.03	5	22
19	Khana-Sainthia-Pakur including Pandabeswar-Sainthia	30	8	22	0.43	27.29	2	20
20	Roza - Sitapur – Burhwal	12	0	12	0.01	79.71	1	11
21	Alwar-Rewari	19	1	18	0.14	73.41	9	9

Annexure 4.6 – Value of the contracts awarded in 19 RE Projects, where number of contracts were more than five								
S.no	**Name of the Project**	**Total No of contract in project**	**No of contracts where money value not available**	**No of contracts where money value available**	**Minimum value of Contract (in crore)**	**Maximum value of Contract (in crore)**	**No. Of contracts below 50 lakh**	**No. Of contracts above 50 lakh**
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*
23	Andal - Sitarampur	10	0	10	0.018	24.8	4	6
26	Itarsi-Katni-Manikpur-Chheoki including Satna-Rewa	53	0	53	0.03	117.87	8	45
27	Titlagarh – Sambalpur-Jharsuguda	7	1	6	0.55	55.41	0	6
	Total	**508**	**34**	**474**			**149**	**325**
				min	**0.01**	**3.72**		
				max	**1.2**	**165.68**		
				mean	**0.24**	**45.14**		
Reference to the Para of the Report : 4.2.2								

Annexure 4.7 - Details of EMD recoverable and recovered due to delay in signing of agreement from the date of issue of LOA - CORE						
S. no.	***Name of Project***	***Category of Work***	***Period of Agreement from LOA (in days)***		***EMD Recoverable (₹ in lakh)***	***EMD Recovered (₹ in lakh)***
			Minimum Value	*Maximum Value*		
A	*B*	*C*	*D*	*E*	*F*	*G*
1	Bhubaneswar-Kottavalasa	Completed	10	80	*1.55*	*0*
2	Krishnanagar-Lalgola	Completed	6	387	29.37	0
3	Karepalli-Bhadrachalam-Manuguru	Completed	NAV	NAV	NAV	NAV
4	Andal – Ukhra – Pandabeswar	Completed	8	202	26.84	0
5	Ujjain-Indore and Dewas-Maksi	Completed	15	798	24.05	0
6	Tiruchchirappalli-Madurai	Completed	25	172	55.81	0
7	Barabanki-Gonda-Gorakhpur-Chhapra-Barauni	Completed	14	661	337	0
8	Shakurbasti-Rohtak	Completed	4	374	22.69	0
9	Jhansi-Kanpur	Completed	23	101	60	0
10	Madurai-Tuticorin-Vanchimaniyachi-Nagercoil	Completed	29	223	23.98	0
11	Varanasi-Lohta-Janghai-Unchahar incl. Phaphamau-Allahabad	Completed	19	111	41.77	0
12	Mathura-Alwar	Completed	12	157	36.72	0
13	Gaziabad-Moradabad	Completed	35	224	32.64	1.07
14	Roza-Sitapur-Burhwal	Completed	23	110	73.07	0
15	Alwar-Rewari	Completed	18	181	51.38	0
16	Barauni-Katihar-Guwahati	In progress	19	376	200.68	0
17	Shoranur–Kannur-Mangalore-Panambur	In progress	32	139	48.32	0
18	Gondia-Ballarshah	In progress	29	199	89.24	0
19	Khana-SainthiaPakur including Pandabeswar-Sainthia	In progress	8	167	64.72	0
20	Garhwa Road-Chopan-Singrauli	In progress	32	190	86.21	0
21	Andal-Sitarampur	In progress	8	127	37.96	0
22	Itarsi-Katni-Manikpur-Cheoki-invludingSatna-Rewa	In progress	1	327	283.86	0
23	Jharsuguda-Sambalpur-Titlagarh	In progress	51	194	58.79	*0*
24	Rohtak- Bhiwani	New	Not done	Not done	8.43	0
25	Jhansi-Manikpur incl. Khairar-Bhimsen	New	Not done	Not done	NAV	NAV
26	Erode-Karur-Tiruchchirappalli and Salem-Karur-Dindigul	New work	89	89	46.29	0
27	New Katni- Singrauli	New Work	13	NAV	NAV	NAV
28	Kiul-Tilaya	New Work	NAP	NAV	14.37	0
		Max	***89***	***798***		
		Min	***1***	***80***		
		Count	***24***	***23***		
		Range	***1 to 798 days***			***1755.74***
		Reference to the Para of the Report :		***4.4***		

Annexure 4.8 - Details of EMD recoverable and recovered due to delay in signing of agreement from the date of issue of LOA - RVNL						
S. no	***Name of Project***	***Category of Work***	***Period of Agreement from LOA (in days)***		***EMD Recoverable (₹in lakh)***	***EMD Recovered (₹in lakh)***
			Minimum Value	*Maximum Value*		
A	*B*	*C*	*D*	*E*	*F*	*G*
1	Daund-Manmad	Completed	27	NAP	0	0
2	Gooty-Dharmavaram-Yelhenka	Completed	69	NAP	200	0
3	Guntkal-Bellary-Hospet	In progress	198	NAP	347.21	0
4	Amla-Chindwara-Kalumna	In progress	80	204	104.77	0
5	Jakhal -Dhuri- Ludhiiana	In progress	54	NAP	154	0
6	Chhapra-Ballia-Varanasi-Allahabad	In progress	107	175	254.59	0
7	Guntakal - Kalluru	New	NAV	NAP	NAV	
8	Gazipur city-Aunrihar-Manduadih	New	NAV	NAP	NAV	NAV
		Max	***198***	***204***		
		Min	***27***	***175***		
		Count	***6***	***2***		
		Range	***27 to 204 days***		***1061***	***0***
		Reference to the Para of the Report :			***4.4***	

Annexure 4.9 - Details of contracts awarded in selected projects - CORE									
S. no	***Name of the project***	***Status***	***Implementing agency***	***Total number of contracts in project***	***Total number of contracts covered in audit***	***Number of contract executed within the prescribed period (7 days for CORE & 28 days for RVNL)***	***Number of contracts executed outside the prescribed period***	***Number of contracts where extensions were granted***	***Remarks***
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*
1	Bhubaneswar-Kottavalasa	Completed	CORE	26	13	3	10	13	13contracts not available
2	Krishnanagar-Lalgola	Completed	CORE	22	19	1	18	18	3 contracts not available
3	Karepalli-Bhadrachalam Road-Manuguru	Completed	CORE	NAV	NAV	NAV	NAV	NA	Nil
4	Andal – Ukhra – Pandabeswar	Completed	CORE	10	10	Nil	10	8	Nil
5	Ujjain-Indore and Dewas-Maksi	Completed	CORE	29	29	1	28	29	Nil
6	Tiruchchirappalli-Madurai	Completed	CORE	7	7	Nil	7	7	Nil
7	Barabanki- Gonda-Gorakhpur-Chhapra-Barauni	Completed	CORE	116	113	4	109	110	3 contracts not available
8	Shakurbasti-Rohtak	Completed	CORE	12	12	nil	12	11	Nil
9	Jhansi-Kanpur including Ait Konch and Kanpur-Anwarganj-Kalyanpur	Completed	CORE	4	4	nil	4	4	Nil
10	Madurai-Tuticorin-VanchiManiyachchi-Nagercoil	Completed	COR	5	5	Nil	5	5	Nil
11	Varanasi-Lohta-Janghai-Unchahar incl. Phaphamau-	Completed	CORE	14	14	Nil	14	13	Nil

Annexure 4.9 - Details of contracts awarded in selected projects - CORE									
S. no	***Name of the project***	***Status***	***Implementing agency***	***Total number of contracts in project***	***Total number of contracts covered in audit***	***Number of contract executed within the prescribed period (7 days for CORE & 28 days for RVNL)***	***Number of contracts executed outside the prescribed period***	***Number of contracts where extensions were granted***	***Remarks***
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*
	Allahabad								
12	Mathura-Alwar	Completed	CORE	22	22	nil	22	22	Nil
13	Ghaziabad-Moradabad	Completed	CORE	14	10	Nil	10	8	Nil
14	Roza-Sitapur-Burhwal	Completed	CORE	12	12	Nil	12	11	Nil
15	Alwar-Rewari	Completed	CORE	19	18	Nil	18	19	1 contract agreement not executed
16	Barauni-Katihar-Guwahati	In progress	CORE/RVNL	46	46	nil	46	46	one tender is under finalisation hence, not included
17	Shoranur –Kannur-Mangalore-Panambur	In progress	CORE	8	8	Nil	8	8	Nil
18	Gondia- Ballarshah	In progress	CORE	27	27	Nil	27	23	Nil
19	Khana-Sainthia-Pakur including Pandabeswar-Sainthia	In progress	CORE	30	22	*Nil*	*22*	21	Nil
20	Garhwa Road-Chopan-Singrauli	In progress	CORE	5	5	Nil	5	5	Nil
21	Andal- Sitarampur	In progress	CORE	10	10	Nil	10	10	Nil
22	Itarsi-Katni-Manikpur- Cheoki-invludingSatna-	In progress	CORE	53	52	4	48	18	02 not applicable & one contact

Annexure 4.9 - Details of contracts awarded in selected projects - CORE									
S. no	***Name of the project***	***Status***	***Implementing agency***	***Total number of contracts in project***	***Total number of contracts covered in audit***	***Number of contract executed within the prescribed period (7 days for CORE & 28 days for RVNL)***	***Number of contracts executed outside the prescribed period***	***Number of contracts where extensions were granted***	***Remarks***
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*
	Rewa								not available
23	Titlagarh - Sambalpur-Jharsuguda	In progress	CORE	7	7	Nil	7	4	Nil
24	Rohtak-Bhiwani	New	CORE	4	4	Nil	4	NAP	Nil
25	Jhansi-Manikpur including Khairar-Bhimsen	New	CORE	1	1	Nil	1	NAP	Not applicable
26	Erode-Karur-Tiruchirapalli	New	CORE	1	NAP	NAP	NAP	NAP	Not applicable
27	New Katni-Singrauli	New	CORE/IRCON	1	NAP	NAP	NAP	NAP	DE submission stage
28	Kiul-Tilaiya	New	CORE	1	NAP	NAP	NAP	NAP	Nil
Total				***506***	***470***	***13***	***457***	***413***	
			Reference to Para			***4.4, 4.5.2.1***			

Annexure 4.10 - Details of contracts awarded in selected projects - RVNL									
S. no	***Name of the project***	***Status***	***Implementing agency***	***Total number of contracts in project***	***Total number of contracts covered in audit***	***Number of contract executed within the prescribed period (7 days for CORE & 28 days for RVNL)***	***Number of contracts executed outside the prescribed period***	***Maximum number of extensions in contract involved in project***	***Remarks***
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*
1	Daund - Manmad including Puntambo-Shirdi	Completed	RVNL	1	1	1	nil	1	Nil
2	Gooty-Dharmavaram-Yelhenka including Sri Satya Sai Prashanthi Nilayam-Penukonda	Completed	RVNL	1	1	Nil	1	1	Nil
3	Guntkal-Bellary-Hospet including Torangallu-Ranjitpura	In progress	RVNL	1	1	Nil	1	0	Nil
4	Amla-Chindwara-Kalumna	In progress	RVNL	4	4	Nil	4	4	Nil
5	Jakhal -Dhuri- Ludhiana	In progress	RVNL	1	1	Nil	1	NA	Nil
6	Chhapra-Ballia-Varanasi-Allahabad	In progress	RVNL	2	2	Nil	2	NA	Nil
7	Guntakal-Kallur	New	CORE/RVNL	1	1		Tender yet to be finalised.		Nil
8	Gazipur - Aunrihar - Manuadih	New	RVNL	NAP	NAP	NAP	Tender yet to be finalised.		Nil
Total				***11***	***11***	***1***	***9***	***6***	
Reference to the Para of the Report :					***4.4, 4.5.2.1***				

Annexure 4.11 - Details of number of extensions granted to the contractors in contracts of projects executed by CORE					
S.no	***Project***	***Category***	***Original Period of Completion (in days)***	***Number of extensions***	***Period of extension in project***
A	*B*	*C*	*D*	*E*	*F*
1	Bhubaneswar-Kottavalasa	Completed	NAV	30	3535
2	Krishnanagar-Lalgola	Completed	2190	44	4590
3	Karepalli-Bhadrachalam-Manuguru	Completed	NAV	NAV	NAV
4	Andal – Ukhra – Pandabeswar	Completed	1740	52	6870
5	Ujjain-Indore and Dewas-Maksi	Completed	5430	171	19950
6	Tiruchchirappalli-Madurai	Completed	2340	67	7140
7	Barabanki-Gonda-Gorakhpur-Chhapra-Barauni	Completed	28674	581	94831
8	Shakurbasti-Rohtak	Completed	3122	78	11209
9	Jhansi-Kanpur	Completed	1680	34	5610
10	Madurai-Tuticorin-Vanchimaniyachi-Nagercoil	Completed	2640	54	4504
11	Varanasi-Lohta-Janghai-Unchahar incl. Phaphamau-Allahabad	Completed	4093	87	11188
12	Mathura-Alwar	Completed	5370	80	10350
13	Gaziabad-Moradabad	Completed	3431	45	5326
14	Roza-Sitapur-Burhwal	Completed	5100	44	5730
15	Alwar-Rewari	Completed	3840	62	7680
16	Barauni-Katihar-Guwahati	In progress	1320	216	NAV
17	Shoranur–Kannur-Mangalore-Panambur	In progress	4320	39	4935
18	Gondia-Ballarshah	In progress	8790	73	12180
19	Khana-SainthiaPakur including Pandabeswar-Sainthia	In progress	7830	184	18392
20	Garhwa Road-Chopan-Singrauli	In progress	1550	7	1466
21	Andal-Sitarampur	In progress	3030	41	4890
22	Itarsi-Katni-Manikpur-Cheoki-invludingSatna-Rewa	In progress	19009	59	7017
23	Jharsuguda-Sambalpur-Titlagarh	In progress	3128	8	1680
24	Rohtak-Bhiwani	New	NAV	NAP	NAP
25	Jhansi-Manikpur incl. Khairar-Bhimsen	New	NAV	NAP	NAP
26	Erode-Karur-Tiruchchirappalli and Salem-Karur-Dindigul	New	NAV	NAP	NAP
27	New Katni Jn.-Singrauli	New	NAV	NAP	NAP
28	Kiul-Tilaya	New	NAV	NAP	NAP
		Total	***118627***	***2026****	***245702****
		Total in Months	***3954.23***		***8190.07***
		count	***21***	***21***	***20***
		(8190 x 100)/ 3954	***= 207 %***		
** Figures in respect of Bhubaneswar-Kottavalasa not included as original period of completion not available*					
Reference to the Para of the Report : 4.5.2.1					

Annexure 4.12 - Details of contracts awarded in projects executed by CORE									
S. No.	***Name of Project***	***Category of Work***	***Total number of contracts in project***	***Number of completed contracts***	***No of ongoing contract***	***Number of contracts completed under original DOC***	***Number of contracts terminated***	***Number of contracts under Arbitration***	***Number of contracts with vigilance***
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*
1	Bhubaneswar-Kottavalasa	Completed	26	NAV	NAV	NAV	0	0	0
2	Krishnanagar-Lalgola	Completed	22	22	0	4	1	0	1
3	Karepalli-Bhadrachalam-Manuguru	Completed	NAV	NAV	NAV	NAV	NAV	NAV	NAV
4	Andal – Ukhra – Pandabeswar	Completed	10	10	0	2	NAV	NIL	NIL
5	Ujjain-Indore and Dewas-Maksi	Completed	29	NAV	NAV	NAV	0	3	0
6	Tiruchchirappalli-Madurai	Completed	7	7	0	0	0	0	0
7	Barabanki-Gonda-Gorakhpur-Chhapra-Barauni	Completed	116	83	24	6	9	NAV	0
8	Shakurbasti-Rohtak	Completed	12	7	1	0	4	0	0
9	Jhansi-Kanpur	Completed	4	2	2	0	0	0	0
10	Madurai-Tuticorin-Vanchimaniyachi-Nagercoil	Completed	5	3	2	0	1	NAP	NAP
11	Varanasi-Lohta-Janghai-Unchahar incl. Phaphamau-Allahabad	Completed	14	10	3	0	1	0	0
12	Mathura-Alwar	Completed	22	18	4	0	0	1	0
13	Gaziabad-Moradabad	Completed	14	2	8	2	1	0	0
14	Roza-Sitapur-Burhwal	Completed	12	2	7	1	4	3	6
15	Alwar-Rewari	Completed	19	NAV	NAV	NAV	NAV	NAV	NAV
16	Barauni-Katihar-Guwahati	In progress	46	27	19	0	0	0	0
17	Shoranur–Kannur-Mangalore-Panambur	In progress	8	2	6	0	0	0	0

Annexure 4.12 - Details of contracts awarded in projects executed by CORE									
S. No.	***Name of Project***	***Category of Work***	***Total number of contracts in project***	***Number of completed contracts***	***No of ongoing contract***	***Number of contracts completed under original DOC***	***Number of contracts terminated***	***Number of contracts under Arbitration***	***Number of contracts with vigilance***
18	Gondia-Ballarshah	In progress	27	NAV	NAV	NAV	NAV	NAV	NAV
19	Khana-SainthiaPakur including Pandabeswar-Sainthia	In progress	30	13	8	1	1	NAV	NAV
20	Garhwa Road-Chopan-Singrauli	In progress	5	0	5	0	NAV	NAV	NAV
21	Andal-Sitarampur	In progress	10	2	8	0	NAV	Nil	Nil
22	Itarsi-Katni-Manikpur-Cheoki-invludingSatna-Rewa	In progress	53	0	53	0	0	0	7
23	Jharsuguda-Sambalpur-Titlagarh	In progress	7	0	7	NAP	NAV	NAV	NAV
24	Rohtak- Bhiwani	New	4	0	4	NAV	0	0	0
25	Jhansi-Manikpur incl. Khairar-Bhimsen	New	1	NAV	NAV	NAV	0	0	0
26	Erode-Karur-Tiruchchirappalli and Salem-Karur-Dindigul	New	1	0	1	NAP	NAP	NAP	NAP
27	New Katni Jn. - Singrauli	New	1	0	1	NAV	NAV	NAV	NAV
28	Kiul-Tilaya	New	1	0	1	NAV	NAV	NAV	NAV
		Total	***506***	***210***	***164***	***16***	***22***	***7***	***14***
Reference to the Para of the Report : 4.5.2.1									

Annexure 4.13 - Details of number of extensions granted to the contractors in contracts of projects executed by RVNL					
S.no	***Project***	***Category***	***Original Period of Completion (in days)***	***Number of extensions***	***Period of extension in project***
A	*B*	*C*	*D*	*E*	*F*
1	Daund - Manmad	Completed	570	14	3060
2	Gooty-Dharmavaram-Yelhenka	Completed	630	6	1170
3	Guntkal-Bellary-Hospet	In progress	720	NAP	NAP
4	Amla-Chindwara-Kalumna	In progress	2340	10	2010
5	Jakhal -dhuri- Ludhiiana	In progress	900	NAP	NAP
6	Chhapra-Ballia-Varanasi-Allahabad	In progress	3285	NAP	NAP
7	Guntakal - Kalluru	New	NAP	NAP	NAP
8	Gazipur City-Aunrihar-Manduadih	New	NAV	NAP	NAP
		Total	***8445***	***30***	***6240***
		Total in Months	***281***		***208***
		count	***6***	***3***	***3***
		Increased = $\frac{208x100}{281}$ = 74.02%			
Reference to the Para of the Report : 4.5.2.1					

Annexure 4.14 - Details of contracts awarded in projects executed by RVNL									
S. no.	***Name of Project***	***Category of Work***	***Total number of contracts in project***	***Number of completed contracts***	***No of ongoing contract***	***Number of contracts completed under original DOC***	***Number of contracts terminated***	***Number of contracts under Arbitration***	***Number of contracts with vigilance***
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*
1	Daund - Manmar	Completed	1	1	0	0	0	0	0
2	Gooty-Dharmavaram-Yelhenka	Completed	1	0	1	0	0	0	0
3	Guntkal-Bellary-Hospet	In progress	1	0	1	NAP	0	0	0
4	Amla-Chindwara-Kalumna	In progress	4	0	4	0	0	0	0
5	Jakhal -dhuri- Ludhiiana	In progress	1	0	1	NAP	0	0	0
6	Chhapra-Ballia-Varanasi-Allahabad	In progress	2	0	2	NAP	0	0	0
7	Guntakal - Kalluru	New	1	0	1	NAP	NAP	NAP	NAP
8	Gazipur city-Aunrihar-Manduadih	New	NAP	NAP	NAP	NAP	NAP	NAP	NAP
		Total	***11***	***1***	***11***	***0***	***0***	***0***	***0***
Reference to the Para of the Report : 4.5.2.1									

Annexure 4.15 – Details of extensions granted under various clauses in the selected projects - CORE											
S.no	***Project***	***Category***	***Number of extensions granted***	***Period of extension in project***	***Number of extensions where clause of GCC was not mentioned***	***Number of extensions where clause was mentioned***	***Extensions where GCC clause was mentioned (Period in days)***	***Number of extensions where GCC clause mentioned as on contractor account while granting extension***	***Extensions where GCC clause mentioned as on contractor account while granting extension (Period in days)***	***Number of extensions where GCC clause mentioned but not on contractor account while granting extensions***	***Extensions where GCC clause mentioned but not on contractor account while granting extension (Period in days)***
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*
1	Bhubaneswar-Kottavalasa	Completed	30	3535	0	30	3535	0	0	30	3535
2	Krishnanagar-Lalgola	Completed	44	4590	13	31	2430	0	0	31	2430
3	Karepalli-Bhadrachalam-Manuguru	Completed	NAV	NAV	NAV	NAV	NAV	NAV	NAV	NAV	NAV
4	Andal – Ukhra –Pandabeswar	Completed	52	6870	16	36	5190	0	0	36	5190
5	Ujjain-Indore and Dewas-Maksi	Completed	171	19950	171	0	0	0	0	0	0
6	Tiruchchirappalli-Madurai	Completed	67	7140	67	0	0	0	0	0	0
7	Barabanki-Gonda-Gorakhpur-Chhapra-Barauni	Completed	581	94831	556	25	3212	0	0	25	3212
8	Shakurbasti-Rohtak	Completed	78	11209	47	31	3462	21	1861	10	1646

Annexure 4.15 – Details of extensions granted under various clauses in the selected projects - CORE											
S.no	***Project***	***Category***	***Number of extensions granted***	***Period of extension in project***	***Number of extensions where clause of GCC was not mentioned***	***Number of extensions where clause was mentioned***	***Extensions where GCC clause was mentioned (Period in days)***	***Number of extensions where GCC clause mentioned as on contractor account while granting extension***	***Extensions where GCC clause mentioned as on contractor account while granting extension (Period in days)***	***Number of extensions where GCC clause mentioned but not on contractor account while granting extensions***	***Extensions where GCC clause mentioned but not on contractor account while granting extension (Period in days)***
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*
9	Jhansi-Kanpur	Completed	34	5610	34	0	0	0	0	0	0
10	Madurai-Tuticorin-Vanchimaniyachi-Nagercoil	Completed	54	4504	52	2	120	2	120	NAV	NAV
11	Varanasi-Lohta-Janghai-Unchahar incl. Phaphamau-Allahabad	Completed	87	11188	85	2	270	1	106	1	161
12	Mathura-Alwar	Completed	80	10350	43	37	5970	11	2040	26	3930
13	Gaziabad-Moradabad	Completed	45	5326	10	35	3560	25	2440	10	1120
14	Roza-Sitapur-Burhwal	Completed	44	5730	27	17	1740	8	690	9	1050
15	Alwar-Rewari	Completed	62	7680	24	38	4890	25	3150	13	1740
16	Barauni-Katihar-Guwahati	In progress	216	NAV	0	216	NAV	0	NAV	216	NAV
17	Shoranur–	In progress	39	4935	39	0	0	0	0	0	0

Annexure 4.15 – Details of extensions granted under various clauses in the selected projects - CORE											
S.no	*Project*	*Category*	*Number of extensions granted*	*Period of extension in project*	*Number of extensions where clause of GCC was not mentioned*	*Number of extensions where clause was mentioned*	*Extensions where GCC clause was mentioned (Period in days)*	*Number of extensions where GCC clause mentioned as on contractor account while granting extension*	*Extensions where GCC clause mentioned as on contractor account while granting extension (Period in days)*	*Number of extensions where GCC clause mentioned but not on contractor account while granting extensions*	*Extensions where GCC clause mentioned but not on contractor account while granting extension (Period in days)*
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*
	Kannur-Mangalore-Panambur										
18	Gondia-Ballarshah	In progress	73	12180	0	73	12180	10	1710	63	10470
19	Khana-SainthiaPakur including Pandabeswar-Sainthia	In progress	184	18392	184	0	0	0	0	0	0
20	Garhwa Road-Chopan-Singrauli	In progress	7	1466	5	2	490	1	270	1	220
21	Andal-Sitarampur	In progress	41	4890	32	9	1080	1	120	8	960
22	Itarsi-Katni-Manikpur-Cheoki-invludingSatna-Rewa	In progress	59	7017	31	28	3618	2	122	26	3496
23	Jharsuguda-Samba	In progress	8	1680	0	0	0	0	0	0	0

Annexure 4.15 – Details of extensions granted under various clauses in the selected projects - CORE											
S.no	***Project***	***Category***	***Number of extensions granted***	***Period of extension in project***	***Number of extensions where clause of GCC was not mentioned***	***Number of extensions where clause was mentioned***	***Extensions where GCC clause was mentioned (Period in days)***	***Number of extensions where GCC clause mentioned as on contractor account while granting extension***	***Extensions where GCC clause mentioned as on contractor account while granting extension (Period in days)***	***Number of extensions where GCC clause mentioned but not on contractor account while granting extensions***	***Extensions where GCC clause mentioned but not on contractor account while granting extension (Period in days)***
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*
	lpur-Titlagarh										
24	Rohtak-Bhiwani	New Work	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
25	Jhansi-Manikpur incl. Khairar-Bhimsen	New work	NAV	NAV	NAV	NAV	NAV	NAV	NAV	NAV	NAV
26	Erode-Karur-Tiruchchirappalli and Salem-Karur-Dindigul	New work	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
27	Katni- Signarli	New Work	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
28	Kiul-Tilaya	New Work	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
		Total	***2056***	***249073***	***1436***	***612***	***51747***	***107***	***12629***	***505***	***39160***
				8302 months			***1723 months***		***421 months***		***1187***
Reference to Para of the Report : 4.5.2.1, 4.5.3											

Annexure 4.16 - Details of liquidated damages leviable on contractor's account as assessed by audit in RE projects executed by CORE (₹ in lakh)									
S. no	***Name of Project***	***Category***	***Number of extensions***	***Period of extension in project***	***Cases where GCC clause mentioned as on contractor account while granting extension (Number)***	***Cases where GCC clause mentioned as on contractor account while granting extension (Period) in days***	***Amount of LD levied***	***Amount of LD recovered***	***Amount of penalty recovered***
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*
1	Bhubaneswar-Kottavalasa	Completed	30	3535	0	0	NAV	NAV	NAV
2	Krishnanagar-Lalgola	Completed	44	4590	0	0	0	0	0
3	Karepalli-Bhadrachalam-Manuguru	Completed	NAV	NAV	NAV	NAV	NAV	NAV	NAV
4	Andal – Ukhra – Pandabeswar	Completed	52	6870	0	0	0	0	0
5	Ujjain-Indore and Dewas-Maksi	Completed	171	19950	0	0	0	0	86.40
6	Tiruchchirappalli-Madurai	Completed	67	7140	0	0	0	0	0.08
7	Barabanki-Gonda-Gorakhpur-Chhapra-Barauni	Completed	581	94831	0	0	0	0	0.89
8	Shakurbasti-Rohtak	Completed	78	11209	21	1861	27	27	5.46
9	Jhansi-Kanpur	Completed	34	5610	0	0	0	0	0.23
10	Madurai-Tuticorin-Vanchimaniyachi-Nagercoil	Completed	54	4504	2	120	0.66	0.66	4.8
11	Varanasi-Lohta-Janghai-Unchahar incl. Phaphamau-Allahabad	Completed	87	11188	1	106	0	0	0
12	Mathura-Alwar	Completed	80	10350	11	2040	10	10	0.18
13	Gaziabad-Moradabad	Completed	45	5326	25	2440	0	0	11
14	Roza-Sitapur-Burhwal	Completed	44	5730	8	690	0	0	0
15	Alwar-Rewari	Completed	62	7680	25	3150	0	0	0.4
16	Barauni-Katihar-Guwahati	In progress	216	NAV	Nil	NAV	0	0	13.64
17	Shoranur-Kannur-	In progress	39	4935	0	0	0	0	0

Annexure 4.16 - Details of liquidated damages leviable on contractor's account as assessed by audit in RE projects executed by CORE (₹ in lakh)									
S. no	***Name of Project***	***Category***	***Number of extensions***	***Period of extension in project***	***Cases where GCC clause mentioned as on contractor account while granting extension (Number)***	***Cases where GCC clause mentioned as on contractor account while granting extension (Period) in days***	***Amount of LD levied***	***Amount of LD recovered***	***Amount of penalty recovered***
	Mangalore-Panambur								
18	Gondia-Ballarshah	In progress	73	12180	10	1710	0	0	20
19	Khana-SainthiaPakur including Pandabeswar-Sainthia	In progress	184	18392	0	0	NAV	NAV	0.15
20	Garhwa Road-Chopan-Singrauli	In progress	7	1466	1	270	0	0	5
21	Andal-Sitarampur	In progress	41	4890	1	120	0	0	0.17
22	Itarsi-Katni-Manikpur-Cheoki- invludingSatna-Rewa	In progress	59	7017	2	122	0	0	NAV
23	Jharsuguda-Sambalpur-Titlagarh	In progress	8	1680	0	0	0	0	0
24	Rohtak- Bhiwani	New	NAP	NAP	NAP	NAP	NAP	NAP	NAP
25	Jhansi-Manikpur incl. Khairar-Bhimsen	New	NAV	NAV	NAV	NAV	NAV	NAV	NAV
26	Erode-Karur-Tiruchchirappalli and Salem-Karur-Dindigul	New	NAP	NAP	NAP	NAP	NAP	NAP	NAP
27	Katni- Signarli	New	NAP	NAP	NAP	NAP	NAP	NAP	NAP
28	Kiul-Tilaya	New	NAP	NAP	NAP	NAP	NAP	NAP	NAP
		Total	***2056***	***249073***	***107***	***12629***	***37.66***	***37.66***	***148.4***
				8302 months	***21 months***				
Reference to the Para of the Report : 4.5.3									

Annexure 4.17 - Details of GCC clause under which extensions granted to contractors in contracts of projects executed by RVNL

S.no	Project	Category	Number of extensions granted	Period of extension in project	Number of extensions where clause of GCC was not mentioned	Number of extensions where clause was mentioned	Extensions where GCC clause was mentioned (Period in days)	Number of extensions where GCC clause mentioned as on contractor account while granting extension	Extensions where GCC clause mentioned as on contractor account while granting extension (Period in days)	Number of extensions where GCC clause mentioned but not on contractor account while granting extensions	Extensions where GCC clause mentioned but not on contractor account while granting extension (Period in days)
A	B	C	D	E	F	G	H	I	J	K	L
1	Daund-Manmad	Completed	14	3060	0	14	3060	2	480	12	2580
2	Gooty-Dharmavaram-Yelhenka	Completed	6	1170	NAV	NAV	NAV	NAV	NAV	NAV	NAV
3	Guntkal-Bellary-Hospet	In progress	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
4	Amla-Chindwara-Kalumna	In progress	10	2010	10	0	0	NAV	NAV	NAV	NAV
5	Jakhal -dhuri-Ludhiiana	In progress	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
6	Chhapra-Ballia-Varanasi-Allahabad	In progress	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
7	Guntakal - Kalluru	New	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
8	Gazipur city-Aunrihar-Manduadih	New	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP	NAP
Total			***30***	***6240***	***10***	***14***	***3060***	***2***	***480***	***12***	***2580***
				208 Months					***16 months***		

Reference to the Para of the Report : 4.5.2.1, 4.5.3

Annexure 4.18 - Details of liquidated damages leviable on contractor's account as assessed by audit in RE projects executed by RVNL (₹ in crore)									
S. no	***Name of Project***	***Category***	***Number of extensions***	***Period of extension in project***	***Cases where GCC clause mentioned as on contractor account while granting extension (Number)***	***Cases where GCC clause mentioned as on contractor account while granting extension (Period) in days***	***Amount of LD levied***	***Amount of LD recovered***	***Amount of penalty recovered***
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*K*
1	Daund - Manmad	Completed	14	1500	2	480	1.51	1.51	NAV
2	Gooty-Dharmavaram-Yelhenka	Completed	6	1170	NAV	NAV	3.14	3.14	1.53
3	Guntkal-Bellary-Hospet	In progress	NAP	NAP	NAP	NAP	0	0	NAP
4	Amla-Chindwara-Kalumna	In progress	10	2010	NAV	NAV	0	0	0.16
5	Jakhal -dhuri-Ludhiiana	In progress	NAP	NAP	NAP	NAP	0	0	NAP
6	Chhapra-Ballia-Varanasi-Allahabad	In progress	NAP	NAP	NAP	NAP	0	0	NAP
7	Guntakal - Kalluru	New Work	NAP	NAP	NAP	NAP	NAP	NAP	NAP
8	Gazipur city-Aunrihar-Manduadih	New	NAP	NAP	NAP	NAP	NAP	NAP	NAP
		Total	***30***	***4680***	***2***	***480***	***4.65***	***4.65***	***1.69***
						16 months			
Reference to the Para of the Report : 4.5.3									

Annexure 4.19- Liquidated damages leviable due to extensions on account of reasons attributable to the contractors as assessed by audit in contracts of projects executed by CORE

S. no	*Project*	*Category*	*Number of extensions*	*Period of extension in project*	*Audit Assessment for the extensions attributable to the contractor (in days)*	*Audit Assessment for the leviable LD (₹ in crore)*	*LD levied (₹ in crore)*	*Audit Assessment of the period of extension on contractor' account (in days)*	*Audit Assessment of period of extension on other than contractors' account including Railways (in days)*
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*
1	Bhubaneswar-Kottavalasa	Completed	30	3535	1437	NAV	NAV	1437	2098
2	Krishnanagar-Lalgola	Completed	44	4590	810	0.51	0	810	3780
3	Karepalli-Bhadrachalam-Manuguru	Completed	NAV	NAV	NAV	NAV	NAV	NAV	NAV
4	Andal – Ukhra – Pandabeswar	Completed	52	6870	2265	0.64	0	2265	4605
5	Ujjain-Indore and Dewas-Maksi	Completed	171	19950	6480	1.07	0	6480	13470
6	Tiruchchirappalli-Madurai	Completed	67	7140	4470	14.52	0	4470	2670
7	Barabanki-Gonda-Gorakhpur-Chhapra-Barauni	Completed	581	94831	29591	123.18	0	29591	65240
8	Shakurbasti-Rohtak	Completed	78	11209	3945	6.46	0.27	3945	7264
9	Jhansi-Kanpur	Completed	34	5610	720	4.65	0	720	4890
10	Madurai-Tuticorin-Vanchimaniyachi-Nagercoil	Completed	54	4504	4383	19.23	0.66	4384	120
11	Varanasi-Lohta-Janghai-Unchahar incl. Phaphamau-Allahabad	Completed	87	11188	1813	1.65	0	1813	9375

Annexure 4.19- Liquidated damages leviable due to extensions on account of reasons attributable to the contractors as assessed by audit in contracts of projects executed by CORE

S. no	*Project*	*Category*	*Number of extensions*	*Period of extension in project*	*Audit Assessment for the extensions attributable to the contractor (in days)*	*Audit Assessment for the leviable LD (₹ in crore)*	*LD levied (₹ in crore)*	*Audit Assessment of the period of extension on contractor' account (in days)*	*Audit Assessment of period of extension on other than contractors' account including Railways (in days)*
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*
12	Mathura-Alwar	Completed	80	10350	2100	5.42	0	2100	8250
13	Gaziabad-Moradabad	Completed	45	5326	2940	1.7	0	2940	2370
14	Roza-Sitapur-Burhwal	Completed	44	5730	1620	14.78	0	1620	4110
15	Alwar-Rewari	Completed	62	7680	210	0.46	0	210	7470
Total			***1429***	***198513***	***62784***	***194.23***	***0.93***	***62784***	***135712***
					2092.8 month/13 =160.98	***194.23 month / 13 = 14.94***			
1	Rohtak- Bhiwani	New Work	NAP	NAP	NAP	NAP	NAP	NAP	NAP
2	Jhansi-Manikpur incl. Khairar-Bhimsen	New work	1	NAV	NAV	NAV	NAV	NAV	NAV
3	Erode-Karur-Tiruchchirappalli and Salem-Karur-Dindigul	New work	NAP	NAP	NAP	NAP	NAP	NAP	NAP
4	Katni- Signarli	New Work	NAP	NAP	NAP	NAP	NAP	NAP	NAP
5	Kiul-Tilaya	New Work	NAP	NAP	NAP	NAP	NAP	NAP	NAP
Total			***1***	***0***	***0***	***0***	***0***	***0***	
1	Barauni-Katihar-Guwahati	In progress	216	NAV	NAV	NAV	0	NAV	NAV
2	Shoranur–Kannur-Mangalore-Panambur	In progress	39	4935	3218	28.89	0	3218	1717

Annexure 4.19- Liquidated damages leviable due to extensions on account of reasons attributable to the contractors as assessed by audit in contracts of projects executed by CORE

S. no	*Project*	*Category*	*Number of extensions*	*Period of extension in project*	*Audit Assessment for the extensions attributable to the contractor (in days)*	*Audit Assessment for the leviable LD (₹ in crore)*	*LD levied (₹ in crore)*	*Audit Assessment of the period of extension on contractor' account (in days)*	*Audit Assessment of period of extension on other than contractors' account including Railways (in days)*
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*
3	Gondia-Ballarshah	In progress	73	12180	4980	2.4	0	4980	7200
4	Khana-SainthiaPakur including Pandabeswar-Sainthia	In progress	184	18392	2258	7.09	NAV	2258	16134
5	Garhwa Road-Chopan-Singrauli	In progress	7	1466	1230	14.92	0	1230	240
6	Andal-Sitarampur	In progress	41	4890	1320	1.76	0	1320	3570
7	Itarsi-Katni-Manikpur-Cheoki-invludingSatna-Rewa	In progress	59	7017	3619	0.99	0	3619	3398
8	Jharsuguda-Sambalpur-Titlagarh	In progress	8	1680	0	0	0	0	1680
Total			***627***	***50560***	***16625***	***56.05***	***0***	***16625***	***33939***
					554.17 / 7 project = 79.17 months				
Reference to the Para of the Report : 4.5.3									

Annexure 4.20 - Liquidated damages leviable due to extensions on account of reasons attributable to the contractors as assessed by audit in contracts of projects executed by RVNL

S. no.	*Name of Project*	*Implementing Agency*	*Category of Work*	*Number of extensions*	*Period of extension in project*	*Audit Assessment for the extension Period attributable to contractor account (in days)*	*Audit Assessment for the leviable LD (₹ in crore)*	*Audit Assessment for the levied LD (₹ in crore)*	*Audit Assessment Period of extension on contractor account (in days)*	*Audit Assessment Period of extension on non-contractor account including Railways. (in days)*
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*
1	Daund - Manmad	RVNL	Completed	14	3060	2490	12.56	1.52	2490	570
2	Gooty-Dharmavaram-Yelahanka	RVNL	Completed	6	1170	930	16.45	3.14	930	240
3	Guntkal-Bellary-Hospet	RVNL	Work in Progress	NAP	NAP	NAP	NAP	NAP	NAP	NAP
4	Amla-Chindwara-Kalumna	RVNL	Work in Progress	10	2010	NAV	NAV	NAV	NAV	NAV
5	Jakhal -dhuri- Ludhiana	RVNL	Work in Progress	NAP	NAP	NAP	NAP	NAP	NAP	NAP
6	Chhapra-Ballia-Varanasi-Allahabad	RVNL	Work in Progress	NAP	NAP	NAP	NAP	NAP	NAP	NAP
7	Guntakal - Kalluru	RVNL	New Work	NAP	NAP	NAP	NAP	NAP	NAP	NAP
8	Gazipur city-Aunrihar-Manduadih	RVNL	New Work	NAP	NAP	NAP	NAP	NAP	NAP	NAP
Total				***30***	***6240***	***3420***	***29.01***	***4.66***	***3420***	***810***
						114 months				
Reference to the Para of the Report : 4.5.3										

Annexure 4.21 - Details of time value of money incurred in the selected projects due to delay in completion and extensions and loss of projected savings in the contracts of projects executed by CORE (₹ in crore)

S. no.	*Name of Project*	*Category of Work*	*Amount of interest/ dividend paid during the project*	*Loss in projected savings where scheduled date of completion is over*	*Value of Detailed Estimate*	*Expenditure up to March 2016*
A	*B*	*C*	*D*	*E*	*F*	*G*
1	Bhubaneswar-Kottavalasa	Completed	179.25	NAV	315.65	322.03
2	Krishnanagar-Lalgola	Completed	35.03	56.34	63.84	*100.49*
3	Karepalli-Bhadrachalam-Manuguru	Completed	30.27	15.2	57.54	88.11
4	Andal – Ukhra – Pandabeswar	Completed	25.9	23.28	40.47	71.48
5	Ujjain-Indore and Dewas-Maksi	Completed	6.26	38.03	71.60	72.21
6	Tiruchchirappalli-Madurai	Completed	44.98	165.35	92.38	155.51
7	Barabanki-Gonda-Gorakhpur-Chhapra-Barauni	Completed	223.66	875.22	679.96	934.91
8	Shakurbasti-Rohtak	Completed	23.3	NAP	69.83	78.55
9	Jhansi-Kanpur	Completed	34.29	64.40	155.73	151.65
10	Madurai-Tuticorin-Vanchimaniyachi-Nagercoil	Completed	44.32	376.55	175.45	249.35
11	Varanasi-Lohta-Janghai-Unchahar incl. Phaphamau-Allahabad	Completed	29.81	175.02	151.49	197.86
12	Mathura-Alwar	Completed	9.11	27.61	119.83	79.63
13	Gaziabad-Moradabad	Completed	15.12	26.47	151.9	143.67
14	Roza-Sitapur-Burhwal	Completed	*16.19*	80.14	131.98	153.67

Annexure 4.21 - Details of time value of money incurred in the selected projects due to delay in completion and extensions and loss of projected savings in the contracts of projects executed by CORE (₹ in crore)

S. no.	*Name of Project*	*Category of Work*	*Amount of interest/ dividend paid during the project*	*Loss in projected savings where scheduled date of completion is over*	*Value of Detailed Estimate*	*Expenditure up to March 2016*
A	*B*	*C*	*D*	*E*	*F*	*G*
15	Alwar-Rewari	Completed	10.36	14.19	118.48	123.62
16	Barauni-Katihar-Guwahati	In progress	89.75	496.06	821.53	697.37
17	Shoranur –Kannur-Mangalore-Panambur	In progress	17.72	94.09	371.52	394.38
18	Gondia-Ballarshah	In progress	11.67	57.92	203.88	140.47
19	Khana-Sainthia-Pakur including Pandabeswar-Sainthia	In progress	42.71	169.45	299.5	304
20	Garhwa Road-Chopan-Singrauli	In progress	6.65	38.9	252.75	146.3
21	Andal-Sitarampur	In progress	2.88	6.722	78.98	59.07
22	Itarsi-Katni-Manikpur-Cheoki-invludingSatna-Rewa	In progress	20.79	NAP	861.34	508.59
23	Jharsuguda-Sambalpur-Titlagarh	In progress	3.25	NAV	280.81	96.73
Total (for Completed and Works in progress)			***923.27***	***2798.94***		
Reference to the Para of the Report: 4.5.4						

Annexure 4.22 Details of time value of money incurred in the selected projects due to delay in completion and extensions and loss of projected savings in the contracts of projects executed by RVNL (₹ in crore)

S. no	*Project*	*Category of Work*	*Amount of interest/dividend paid during the project*	*Loss in projected savings where scheduled date of completion is over*	*Value of Detailed Estimate (₹ In crore)*	*Updated Expenditure as per IRPSM (₹ In crore)*
A	*B*	*C*	*D*	*E*	*F*	*G*
1	Daund-Manmad	Completed	6.67	17.79	216.18	267.1
2	Gooty-Dharmavaram-Yelhenka	Completed	33.49	28.10	228.37	285.15
3	Guntkal-Bellary-Hospet	Work in Progress	NAP	159.18	*226.68*	*7.49*
4	Amla-Chindwara-Kalumna	Work in Progress	2.43	NAP	255.04	234.79
5	Jakhal -dhuri-Ludhiiana	Work in Progress	NAP	NAP	*149.53*	0.77
6	Chhapra-Ballia-Varanasi-Allahabad	Work in Progress	NAP	NAP	*415.15*	*129.79*
		Total	***42.59***			
Reference to the Para of the Report : 4.5.4						

Annexure 4.23 - Details of D&G charges in respect of selected projects executed by CORE														
S. no	***Project***	***Implementing Agency***	***Group Number***	***Status of work***	***Total D&G Expenditure (₹ in crore) Provision***	***Total D&G Expenditure (₹ in crore) Actual***	***Total Expenditure of Project (₹ in crore) Estimate***	***Total Expenditure of Project (in crore) Actual***	***Physical Progress in percentage terms***	***Date of CRS if applicable***	***Date of Completion Report***	***Productivity of Deployed men power***	***Excess D&G expenses on establishment (in crore)***
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*	*M*	*N*
1	Barauni-Katihar-Guwahati	CORE	149, 150, 151, 152	In progress	21.36	63.77	821.53	697.37	0.2	BJU-Mansi: 3.2.16	No CR drawn	9.94	42.41
2	Barabanki-Gonda-Gorakhpur-Chhapra-Barauni	CORE	142, 142 (mod), 141, 141 (mod), 140A, 140B	Completed	69.38	155.82	679.96 Revised estimate 713.79	934.91	75	Barauni-Chhapra Kachehary:26.06.2012 Bachhwara-Hajipur via MFP:10.12.2014 Hajipur-Sonpur:14.01.2015 Goldenganj-Chhapra:01.10.2012 Chhapra-Siwan-Thawe:23.06.2014 Siwan-Bhatni:10.12.2014 Bhatni-Gorakhpur Cantt.-Domingarh:04.08.2015 Gonda-Basti:22.02.2016 Barabanki-Gonda:21.07.2014	No CR drawn	4.99	86.44
3	Varanasi-Lohta-Janghai-Unchahar incl. Phaphamau-Allahabad	CORE	153	Completed	12.62	32.3	151.49	197.86	95	31.12.2015	No CR drawn	5.13	19.68
4	Roza-Sitapur-Burhwal	CORE	164	Completed	11.6	30.67	131.98	153.67	80	Sitapur-Burhwal: 6.10.16 Roza-Sitapur: 30.11.2016	No CR drawn	4.01	19.07

Annexure 4.23 - Details of D&G charges in respect of selected projects executed by CORE													
S. no	***Project***	***Implementing Agency***	***Group Number***	***Status of work***	***Total D&G Expenditure (₹ in crore) Provision***	***Total D&G Expenditure (₹ in crore) Actual***	***Total Expenditure of Project (₹ in crore) Estimate***	***Total Expenditure of Project (in crore) Actual***	***Physical Progress in percentage terms***	***Date of CRS if applicable***	***Date of Completion Report***	***Productivity of Deployed men power***	***Excess D&G expenses on establishment (in crore)***
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*	*M*	*N*
5	Krishnanagar-Lalgola	CORE	123	Completed	4.8	20.42	63.84	100.49	100	20.11.2007	7.5.2012	3.92	15.62
6	Shakurbasti-Rohtak	CORE	145	Completed	5.74	13.24	68.78	78.55	99	10.01.2013	No CR drawn	4.93	7.5
7	Andal – Ukhra – Pandabeswar	CORE	135	Completed	4.16	10.07	41.16	71.48	95	19.11.10	No CR drawn	6.10	5.91
8	Karepalli-Bhadrachalam-Manuguru	CORE	130	Completed	4.86	7.03	57.54	88.11	98	16.11.2009	No CR drawn	11.53	2.17
9	Andal-Sitarampur	CORE	168	In progress	5.95	8.05	78.98	59.07	50	NAP	No CR drawn	6.34	2.1
10	Gaziabad-Moradabad	CORE	159	Completed	14.05	15.43	151.9	143.67	1	19.1.2016	No CR drawn	8.31	1.38
11	Khana-SainthiaPakur including Pandabeswar-Sainthia	CORE	162A & 162B	Completed	29.11	29.54	299.5	272.5	79	NAP	NAP	8.22	0.43
12	Gondia-Balharshah	CORE	161	In progress	15.89	13.37	203.88	140.47	50	NAP	No CR drawn	9.51	-2.52
13	Garhwa Road-Chopan-Singrauli	CORE	176	In progress	21.12	14.22	252.75	146.3	0.4	GHD-Meralgram Section only 22 RKM (out of 257 RKM) on 22.01.2016	No CR drawn	9.29	-6.9
14	Jharsuguda-Sambalpur-	CORE	170A	In progress	27.29	1.68	280.81	96.73	10	28.03.2016Jharsuguda-Lapanga section)	No CR drawn	56.58	-25.61

Annexure 4.23 - Details of D&G charges in respect of selected projects executed by CORE													
S. no	***Project***	***Implementing Agency***	***Group Number***	***Status of work***	***Total D&G Expenditure (₹ in crore) Provision***	***Total D&G Expenditure (₹ in crore) Actual***	***Total Expenditure of Project (₹ in crore) Estimate***	***Total Expenditure of Project (in crore) Actual***	***Physical Progress in percentage terms***	***Date of CRS if applicable***	***Date of Completion Report***	***Productivity of Deployed men power***	***Excess D&G expenses on establishment (in crore)***
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*	*M*	*N*
	Titlagarh,												
				Total	***247.93***	***415.61***							***202.71***
				Count	***14***	***14***					***9 completed works***		***11***
				Min	***4.16***	***1.68***						***3.92***	***0.43***
				Max	***69.38***	***155.82***						***11.53***	***86.44***
				Mean	***17.71***	***29.69***						***46.35***	***18.43***
				Median	***13.34***	***14.82***						***5.13***	***7.5***
Exclusion of data (negative)												***Nil***	***3***
Note 1- Out of total 23 projects where information related to D&G charges was made available partially/fully, Provision of D&G was not made available for 8 cases. Similarly actual expenditure of D&G was not made available in 7 cases. Hence, 14 cases where both the Provisioned and Actual expenditure is available in used for comparison purpose. ***2- Min, Max, Mean and Median value calculation for productivity of deployed Manpower is done for completed projects only.*** ***3- Productivity on human resources deployment is worked out as – (Total expenditure – expenditure on D&G)/expenditure on D&G***													
Reference to Para of the Report: 4.7													

Annexure 4.24 - Details of block utilised per project for projects executed by CORE									
S. no	***Project***	***Group Number***	***Date of CRS***	***RKM***	***TKM***	***Block utilisation data for RKM***	***Block Utilisation (in hrs.)***	***Block Utilisation per RKM (in minutes)***	***Remarks***
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*
1	Bhubaneswar-Kottavalasa	110,111 & 112	26.8.1999 to 31.12.2004 (in five phases)	414	1012		NAV		
2	Krishnanagar-Lalgola	123	20-11-2007	127.67	147.768		NAV		
3	Karepalli-Bhadrachalam-Manuguru	130	16.11.2009	88	185		NAV		
4	Andal – Ukhra – Pandabeswar	135	19.11.10	20.34	107.66		NAV		
5	Ujjain-Indore and Dewas-Maksi	138	22-06-12 Ujjain-Indore section and 04-01-13 for Dewas-maksi section	115	152	115	1493	779	
6	Tiruchchirappalli-Madurai	144	TPJ-DG:30.6.11 & DG-MDU: 6.2.14	154	271		NAV		
7	Barabanki-Gonda-Gorakhpur-Chhapra-Barauni	142, 142(Mod), 141, 141(Mod), 140A, 140B	Barauni-Chhapra Kachehary:26.06.2012 Bachhwara-Hajipur via MFP:10.12.2014 Hajipur-Sonpur:14.01.2015 Goldenganj-Chhapra:01.10.2012 Chhapra-Siwan-Thawe:23.06.2014 Siwan-Bhatni:10.12.2014 Bhatni-Gorakhpur Cantt.-Domingarh:04.08.2015 Gonda-Basti:22.02.2016 Barabanki-Gonda:21.07.2014	709.14	1700		NAV		
8	Shakurbasti-Rohtak	145	10-01-2013	60	154	60	982	982	
9	Jhansi-Kanpur	148	17-09-2012,17-09-2013 and12-03-2015	220	316	220	2304	628	

Annexure 4.24 - Details of block utilised per project for projects executed by CORE									
S. no	***Project***	***Group Number***	***Date of CRS***	***RKM***	***TKM***	***Block utilisation data for RKM***	***Block Utilisation (in hrs.)***	***Block Utilisation per RKM (in minutes)***	***Remarks***
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*
10	Madurai-Tuticorin-Vanchimaniyachi-Nagercoil	154	15-12-2014	262	337		NAV		
11	Varanasi-Lohta-Janghai-Unchahar incl. Phaphamau-Allahabad	153	31-12-2015	207	235	207	2105	610	
12	Mathura-Alwar	163	23-03-2015	123	160	123	1978	965	
13	Gaziabad-Moradabad	159	19.1.2016	140	330	140	1731	742	
14	Roza-Sitapur-Burhwal	164	Sitapur-Burhwal: 6.10.16 Roza-Sitapur: 30.11.2016	181	230		1202.2 hours (Block data not available from 1.7.15 to 15.12.15		
15	Alwar-Rewari	165	26.03.2016	82	193	82	1231	901	
16	Barauni-Katihar-Guwahati	149,150, 151,152	BJU-Mansi: 3.2.16	836	NAV	836	NAV	NAV	Work in progress
17	Shoranur–Kannur-Mangalore-Panambur	157, 158	30.3.2015,22.3.2016	328	765	157	3096	1183	
18	Gondia-Balharshah	161	Not applicable	250	266	131	654	300	Work in progress
19	Khana-SainthiaPakur including Pandabeswar-Sainthia	162A & 162B	NAP	205	517	NAV	NAV	NAV	
20	Garhwa Road-Chopan-Singrauli	176	GHD-Meralgram Section only 22 RKM (out of 257 RKM) on 22.01.2016	257	385.5		NAV		
21	Andal-Sitarampur	168	Not applicable	57	94		NAV		Work in progress

Annexure 4.24 - Details of block utilised per project for projects executed by CORE									
S. no	***Project***	***Group Number***	***Date of CRS***	***RKM***	***TKM***	***Block utilisation data for RKM***	***Block Utilisation (in hrs.)***	***Block Utilisation per RKM (in minutes)***	***Remarks***
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*
22	Itarsi-Katni-Manikpur-Cheoki-invludingSatna-Rewa	173A, 173B, 174 & 175	Not done	653	1611	653	2695	248	Work in progress
23	Jharsuguda-Sambalpur-Titlagarh,	170	28.03.2016(Jhasuguda-Lapanga section)	238	550	24.2	565	1401	Work in progress
							Block Utilization per RKM Min	***248***	
							Block Utilization per RKM Max	***1401***	
							Block Utilization per RKM Count	***11***	
							Mean of Block Utilization per RKM	***794***	
							Median of Block Utilization per RKM	***779***	
							Total Hours of Block Utilization	***18834***	
							Total RKM for block utilization	***1912.2***	
Average block time utilized per RKM = = 18834X60/1912 = 591.02 min. per RKM									
Reference to the Para of the Report: 4.8									

Annexure 5.1 - Post project utilisation of 17 completed projects reviewed in audit

S. No.	Project Name	Estimated Number of trains per day operated throug electric traction as per the Abstract		Estimated saving per annum as per Abstract Estimate (` in crore)	Date of CRS	No. of months since CRS as of 31.12.2016	Data collected for the Post Project Utilisation relates to the period	No. of trains operating per day		No. of trains operating on electric traction per day		Percentage utilization w.r.t. projected utilization (%)	Percentage present utilisation of the section (%)	Shortfall in achievement of projected savings (₹ in crore)		Reasons
		passenger	goods					passenger	goods	passenger	goods	*(Col.9*100/ Col.3)*	*(Col.9*100/ Col.8)*	*[Col.4 *(100-Col.10)* Col.6/12 * 100]*	*[Col.4 *(100-Col.11)* Col. 6/12 * 100]*	
1	*2*	*3a*	*3b*	*4*	*5*	*6*	*7*	*8a*	*8b*	*9a*	*9b*	*10*	*11*	*12A*	*12B*	
1	Bhubaneswar-Kottavalasa	41.56	29.85	NA	26.08.99, 01.05.00, 25.04.01 and 9.03.02	177	Mar-16	94.28	48.28	94.28	48.28	199.64	100.00	nil	nil	Not applicable
2	Krishnanagar-Lalgola	NA	NA	NA	20.11.07	109	Dec-16	16	2	16	2	NA	100.00	NA	nil	While authorizing the introduction of 25 KV AC single phase electric Traction (November 2007), CRS pointed out that as the Debagram TSS was feeding the entire section, it was to be ensured that the voltage at the furthest point did not drop below the prescribed limit, under any circumstances. Trains were to be regulated if required. Thus, to cope up with the low voltage problem, only 50 per cent of trains were converted from Diesel to Electric Traction. Out of 11 pairs of Passenger/Express trains in the Krishnanagar-Lalgola section, five pairs of train were running in Diesel Traction after completion of the Cossimbazar TSS in October 2009.
3	Karepalli-Bhadrachalam-Manuguru	NA	NA	8.68	16.11.2009	85	NA	6	40	5	40	NA	97.83	NA	16.04	One DEMU running on the section, all other are running on electric traction.
4	Andal – Ukhra – Pandabeswar	13	8	17.44	19.11.10	73	NA	18	18	7	NAV	NAV	NAV	NAV	NAV	Section next to this section are under electrifiaction.
5	Ujjain-Indore and Dewas-Maksi	20	2.64	17.45	23.06.12 and 05.01.13	47	April to December 2016	40.64	1.98	33.11	1.86	154.46	82.05	0.00	12.27	Due to non- electrification of Ruthiyai – Maksi section of WCR which is a missing link being an island diesel territory surrounded by electrified sections of Kota – Ruthiyai – Bina and Nagda – Ujjain – Maksi sections is an impediment in the optimum utilisation of this project.
6	Tiruchchirappalli-Madurai	94	18	23.29	30.06.11 and 6.02.2014	34	Jan-17	70	4.5	42	1.5	38.84	58.39	40.36	27.46	Due to non-availability of adequate AC trained loco pilots in Madurai division. Most of the goods trains running in Dindigul-Madurai secton are coming from Karur, which is non-electrified section. Traction change facilities at Dindigul are inadequate. Sub-stations at Samayanallur has been commissioned only on 16 Nov 2016, 2 years 9 months after the last CRS sanction.
7	Barabanki-Gonda-Gorakhpur-Chhapra-Barauni	612.22	310.326	122.85	January 2012 and November 2016	2	Jan-17	96	41.5	44	14	6.29	42.18	19.19	11.84	There is lack of adequate electric locos which led to partial utilisation of the electrified section. Two TSS ate Burhwal and Nunkhar are yet to be commissioned and line no. 7 to 15 of Gorakhpur Station ahve also not been electrified. Further, there are nine junction points in this section viz. Gonda, manakpur, Gorakhpur, Gorakhpur Cantt., Bhatni, Siwan, Chhapra, Muzaffarpur and Samastipur. The branch lines from these junction points have not been planned for electrification Traction change point has also not been planned at each junction point.
8	Shakurbasti-Rohtak	32.2	38.5	28.21	10.01.2013	44	Nov-16	118	70	14	0	19.80	7.45	82.95	95.73	Reasons not available.
9	Jhansi-Kanpur	18	9.6	32.3	17.9.12, 17.9.13 and 12.3.15	39	Jan-17	25	11.32	11	9.06	72.68	55.23	28.68	47.00	TSS at Sarkosi, Tower Wagon Shed and siding at Chirgaon, SCADA yet to be completed.
10	Madhurai-Tuticorin-VanchiManiyachchi-Nagercoil	64	3.6	29.73	15.12.2014	24	Jan-17	62	11.5	34	1.8	52.96	48.71	27.97	30.50	Due to non-availability of adequate AC trained loco pilots in Madurai division. Most of the goods trains running in Dindigul-Madurai secton are coming from Karur, which is non-electrified section. Traction change facilities at Dindigul are inadequate. Sub-stations at VanchiManyachi Jn. have been commissioned only on 16 Nov 2016, 1 year 11 months after the CRS sanction.
11	Varanasi-Lohta-Janghai-Unchahar incl. Phaphamau-Allahabad	122	86	36.43	31.12.15	11	Nov-16	202	24	24	8	15.38	14.16	28.26	28.67	Reasons not available.
12	Daund - Manmad	18.581	12.2	61.34	10.08.14 and 30.01.16	11	Mar-16	34.64	11.04	1.06	0.77	5.95	4.01	52.89	53.98	Trains coming from Solapur-Manmad and Miraj-Daund-Manmad sections are running on diesel power as Solapur-Daund and Miraj-Pune sections are not electrified.
13	Mathura-Alwar	6	12	29.68	Mar-15	21		4	6.5	1	2	16.67	28.57	43.28	37.10	Deeg/TSS is yet to be charged, SCADA space is to be provided by NCR Hd. Qtrs and Railway Board for putting the servers, 6 new stations are yet to be electrified by CAO/NCR from this estimates. The section remians underutilised as the traction change point was not shifter to Alwar.
14	Gaziabad-Muradabad	74	7	42.31	Jan-16	10	Nov-16	104	10	14	4	22.22	15.79	27.42	29.69	Reasons not available.
15	Gooty-Dharmavaram-Yelhenka including Dharmavaram-Sri Satya Sai Prashanthi nilayam-Penukonda	NA	NA	16.79	1.07.2016	5		52.73	3.31	9.94	0.66		18.92	7.00	5.67	TSS at Someshwara and Malagur are yet to be commissioned.However, The Commissioner of Railway Safety (CRS) sanctioned running of trains on the entire Section in July 2016. Thus, the full quota of trains was not run on the section due to non-completion of residual works.
16	Roza-Sitapur-Burhwal	27	20	30.74	16-03-2016 6.10.2016 & 30.11.2016	1	Jan-17	56	47	2.28	1.67	8.40	3.83	2.35	2.46	Reasons not available.
17	Alwar-Rewari	0	12	8	26.03.2016	9	April to Dec 2016	34.36	14.96	0	2.84	23.67	5.76	4.58	5.65	The connecting sections of Alwar-Bandikui, Rewari-Delhi, Rewari-Bhiwani are not electrified. 12 coal rakes were projected, which were to come from Mathura side. As in Mathura-Alwar section, Deeg TSS is yet to be commissioned, trains are not being run on this section on electric traction.
														364.92	**404.05**	

Annexure 5.2 - Section where trains are run on Diesel Traction despite Electrification						
Zonal Railway	***Selected Divisions***	***No of trains***		***Name of electrified section where trains are being run on diesel traction***	***Distance (in kms)***	***Reasons furnished by Railway Administration for running trains on diesel traction on electrified routes***
		Up	*Down*			
A	*B*	*C*	*D*	*E*	*F*	*G*
ECR	Dhanbad	4	4	Barkakana Junction-Garwa road	218	Avoid unnecessary delays due to shunting of engines etc. as these trains had also to cover a part of their journey in the non-electrified sections e.g. train No. 12401 was running with diesel loco from Mughalsarai to Islampur because route from Fatuha to Islampur remained non-electrified and route only from Mughalsarai to Fatuha is electrified.
	Mugalsarai	4	4	Kiul-Danapur	132	
				Fatuha-Mugalsarai	234	
				Mugalsarai-Rajendra Nagar Terminus	214	
				Gaya-Mugalsarai	203	
ECOR	Waltair	100	100	Visakhapatnam Junction-Viajanagram junction	*62*	(1) End to end electrification is not completed with some pair of routes remaining non electrified; (2) Direction wise demand for diesel /electric power has a bearing on the running of power (3) Un-even demand (4) Moving of trains on diesel routes from other Zonal Railways (5) Shortage of electric engines It is also observed that electrified sections are mostly 30 *per cent* of the entire route.
				Visakhapatnam Junction-Palasa	143	
	Khurda Road	66	66	Bhuvneshwar-Palasa	240	
				Puri-Khurda Road	44	
NCR	Allahabad	3	3	Chunar-Allahabad	120	Total route run by diesel locos trans from the start to end is not electrified in four sections of NCR i.e Allahabad -Chunar (Chopan -Karna not electrified, Tundla -Farukhabad (Shikohabad -Farukhabad not electrified), Bandikuin -Rishikesh (Harduaganj-Chandausi Junction-Rishikesh not electrified) and Jhansi-Tikamgarh (Lalitpur -Tikamgarh not electrified). The engines of the trains are changed at the traction changing point as per operational feasibility and availability of engines. In two sections i.e. Jhansi -Lucknow and Jhansi -Kanpur, commissioning of new traction substation is not complete, hence only limited electric engines are allowed over this route.
				Shikohabad-Tundla	36	
				Aligarhjn-Tundla	78	
	Jhansi	3	3	Lalitpur -Jhansi	90	
				Jhansi-Lucknow	293	
				Jhansi -Kanpur Central	220	
SR	Diesel locos are operated in electrified sections due to non-availability of fuelling provisions at stations requiring traction change, some of the trains requiring traction change twice enroute, traffic congestions and non-commissioning of TSS etc. Section wise constraint stated by SR Administration are as follows.					
	Chennai	4	4	Chennai Egmore-Villupuram	158	Operational constraints at Villupuram due to congestion

Annexure 5.2 - Section where trains are run on Diesel Traction despite Electrification						
Zonal Railway	***Selected Divisions***	***No of trains***		***Name of electrified section where trains are being run on diesel traction***	***Distance (in kms)***	***Reasons furnished by Railway Administration for running trains on diesel traction on electrified routes***
		Up	*Down*			
A	*B*	*C*	*D*	*E*	*F*	*G*
				Chennai Egmore-Vriddhachalam	213	Fuelling of diesel locos plying on Villapuram -Salem diesel territory is being done at Villapuram. Once Salem fuelling point is commissioned, this train will run on AC traction between Chennai Egmore-Vriddhachalam.
	Trivendrum Central	68	68	Chennai Egmore-Madurai	496	Double traction change at Villapuram and Tiruchirapalli would lead to wastage of locos besides increasing the running time by 30 minutes which would affect the superfast character.
				Chennai central - Yelahanka	364	AC traction at Yelhanka is operationally not feasible as viewed by SWR Administration. However, AC traction up to Guntakal will be examined in consultation with SCR.
				Erode-Gooty	538	AC traction up to Gooty will be examined in consultation with SCR (AC trained crew available in SCR)
				Guntakal-Villupuram	547	AC traction up to Guntakal will be examined in consultation with SC Railway (AC trained crew available in SCR)
				Salem- Shoranur Junction	249	Non-completion of Tirur sub station and due to inadequate AC coaching locos
				Salem-Kochuveli	532	Congestion at Erode and due to inadequate AC coaching locos
				Erode-Yelahanka	286	AC traction at Yelhenka is opeartionally not feasible as viewed by SWR. However, AC traction up to Guntakal will be examined in consultation with SCR.
				Coimbatore-Guntakal	649	AC traction up to Guntakal will be examined in consultation with SCR (AC trained crew available in SCR)
				Errode-Guntakal	614	AC traction up to GTL will be examined in consultation with SC Railway (AC trained crew availability in SCR)
				Shoranur-Alappuzha	164	Non-completion of Tirur sub station and due to inadequate AC coaching locos
				Shoranur-Ernakulam	107	Non-completion of Tirur sub station and due to inadequate AC coaching locos

Annexure 5.2 - Section where trains are run on Diesel Traction despite Electrification						
Zonal Railway	***Selected Divisions***	***No of trains***		***Name of electrified section where trains are being run on diesel traction***	***Distance (in kms)***	***Reasons furnished by Railway Administration for running trains on diesel traction on electrified routes***
		Up	*Down*			
A	*B*	*C*	*D*	*E*	*F*	*G*
				Nagercoil Jn.-Thiruvanathapuram	72	Terminal contraints at Thiruvanathapuram and the rake is being moved to Kochuveli yard using diesel loco
				Shoranur Junction-Thrisurcity	33	Non-completion of Tirur sub station and due to inadequate AC coaching locos
				Kollam -Kottayam	96	Non-completion of Tirur sub station and due to inadequate AC coaching locos
				Nagercoil Junction - Kollam	135	Due to inadequate AC coaching locos
				Kollam-Kanayakumari	152	Traction change at Kollam increase the running time and affect the path of this sensitive commuter train between Punalur and Trivendrum Central.
				Kochuveli-Shoranur	306	Traction change at Shoranur pose operational problems.
				Errode-Kochuveli	492	No reason given
				Shoranur-Kochuveli	306	Traction change at Shoranur pose operational problems.
				Shoranur-Trivandrum	313	
SECR	Raipur	7	7	Korba -Raipur	203	Diesel Trains are run on electrified sections involving larger non electrified sections in comparison to smaller electrified sections to avoid traction change causing detention to locos and additional requirement of locos. Railway Administration also added that such operation is duo to operational convenience. Further, availability of diesel loco in the electrified territory is also important from disaster management point of view.
				Korba -Gondia	370	
				Durg-New Katni Jn.	459	
				Raipur-New Katni Jn.	422	
	Bilaspur			Bilaspur-Raipur	111	
				Bilaspur-Gondia	281	
SER	Trains were running by diesel engine as patch of sections remained non-electrified and to overcome operating constraints for better utilisation of rakes.					
	Kharagpur	4	4	Balasore-Rupsa	18	Two trains (78012/78013 and 78016/78017)) run between Balasore to Bangriposi and back, out of which only Balasore-Rupsa section is electrified. As the entire route is not electrified the trains are being run by DEMU rake for better utilisation of the rolling stock.

Annexure 5.2 - Section where trains are run on Diesel Traction despite Electrification						
Zonal Railway	***Selected Divisions***	***No of trains***		***Name of electrified section where trains are being run on diesel traction***	***Distance (in kms)***	***Reasons furnished by Railway Administration for running trains on diesel traction on electrified routes***
		Up	*Down*			
A	*B*	*C*	*D*	*E*	*F*	*G*
	Chakradharpur	10	10	Rourkela-Jharsuguda	100	Two trains (58131/58132 and 58133/58134) is running between Rourkela and Puri via Jharsuguda-Sambalpur-Angul section which is still non-electrified. As such, the train is being run by diesel loco. However, the electrification work in the abovementioned section is under progress and Railway Administration ensured that the running of this train with diesel loco will be discontinued as soon as the electrification work is completed.
				Tatanagar- Gua	149	This train is being run by utilising 15 hours lie-over of 78031/78032 Tata-Badampahar non-electrified route to ensure better utilisation of the rake.
				Chakradharpur-Jharsugoda	202	Two trains (78101/78102 and 78103/78104) run between Chakradharpur to Sambalpur and back, out of which only Chakradharpur - Jharsuguda section is electrified. As the entire route is not electrified the trains are being run by DEMU rake for saving of one conventional rake and one loco. However, Railway Administration ensured that after completion of electrification work in Jharsuguda – Sambalpur – Angul section, both the services will be replaced by electric hauled conventional/ MEMU rakes.
SWR	Bangalore	6	6	Bangawati-Marikuppam	16	It was noticed that in all three sections under SWR trains continued to run diesel traction only. During discussion with the Executive, it emerged that the position remained the same due to paucity of additional MEMU rakes.
				Marikuppam-Bangaluru city	87	
				Bangalore Cantt.-Bangarapet Junction	66	
WCR	Bhopal	45	45	Itarsi-Khandwa	183	Operating department opined that elimination of under-wire running is nor operationally feasible due to traction change as it affects Goods trains operation; whereas in some cases, such elimination is not economically viable as it will cause undue detention leading to wastage of crew and
				Bina-Khandwa	415	
				Bina -Nishatpura	135	
				Bhopal-Bina	138	

Annexure 5.2 - Section where trains are run on Diesel Traction despite Electrification						
Zonal Railway	***Selected Divisions***	***No of trains***		***Name of electrified section where trains are being run on diesel traction***	***Distance (in kms)***	***Reasons furnished by Railway Administration for running trains on diesel traction on electrified routes***
		Up	*Down*			
A	*B*	*C*	*D*	*E*	*F*	*G*
				Bhopal-Itarsi	94	excessive lie over of locos. In respect of some trains, proposal for elimination is pending with adjoining Railways like NWR, SECR and NCR.
				Mahadeokhedi-Maksi	264	
				Guna-Ruthiai	40	
				Bhopal-Khandwa	554	
				MahadevKhedi-Ruithiai	132	
				Bhopal-Guna	257	
	Kota	21	21	Kota -Swaimadhopur	108	
				Nagda-Swaimadhopur	333	
				Ruthiai - Swaimadhopur	272	
				Nagda-Bharatpur	515	
				Bayana-Sawaimadhopur	141	
				Ramganjmandi-Kota	72	
		345	***345***		***15286 RKM***	
Reference to Para of the report				***5.3***		