Chapter - II

2. Performance Audit on Power Sector PSUs

2.1 Performance Audit on 'Creation of infrastructure (220kV/110kV stations and lines) for transmission of power by Karnataka Power Transmission Corporation Limited'.

Executive Summary

Introduction

Karnataka Power Transmission Corporation Limited (the Company), which was incorporated (July 1999) under the Companies Act, 1956 as a wholly owned company of Government of Karnataka (GoK), is a transmission licensee under Section 14 of the Electricity Act, 2003 (the Act). The Company builds, maintains and operates an efficient, coordinated and economical intra-State transmission system and provides *inter-alia* non-discriminatory open access to its transmission system for use by any licensee or generating company or any consumer on payment of the transmission charges as may be specified by the Karnataka Electricity Regulatory Commission.

Audit Objectives

The Performance Audit was conducted to assess whether:

- the Substations and Transmission lines were conceptualized, planned and executed efficiently; and
- the intended benefits *viz.* energy savings, reduction of line losses, maintaining quality and uninterrupted power supply, *etc* were realised within the stipulated time.

Audit Findings

- The Company failed to prepare Perspective Plan and Rolling Plans periodically as envisaged in the Grid Code. The Company undertook works, which were not in the Perspective Plans, while it did not execute those stations included in the Perspective Plan, resulting in overloading of substations in the places identified in the Perspective Plan, while the substations executed outside the Perspective Plan were not optimally utilised. *(Paragraph 2.1.8)*

- The Company created transmission capacity beyond the norms specified in the Manual on Transmission Planning Criteria issued by the Central Electricity Authority (CEA). As on 31 March 2019, there was an excess transmission capacity of 5,230 MVA involving capital cost of ₹ 3,870 crore, which was an avoidable burden placed on the consumers as the cost incurred

on creation of such excess capacity was factored into transmission tariff recoverable from the Distribution licensees. *(Paragraph 2.1.9)*

- The process of approval of designs of substations took 5 to 13 months from the date of issue of Letters of Intent (LoI), thereby delaying the commencement of works. This was due to not revisiting the location of the substations to verify the site conditions and not finalizing the designs and layout plans prior to tendering and awarding the works. *(Paragraph 2.1.11.1)*

- The Company repeatedly failed to (i) identify presence of Railway projects and forest lands along the line routes/substation locations during survey, (ii) file for statutory clearances immediately upon their identification in survey and ensure simultaneous clearance for right of way along with award of works as per extant order and follow up at highest level in the administration, (iii) terminate and re-award the contracts and to take action on the defaulting contractors and (iv) invoke the enabling provisions of the Indian Telegraph Act for ensuring right of way. These lapses in ensuring ROW occurred in as many as 24 out of 53 projects involving total expenditure of ₹ 800.19 crore spanning across six zones despite favourable rulings of various courts and strong enabling provisions of the Indian Telegraph Act. As a result, not only the completion of works was delayed, but also envisaged energy savings were lost. *(Paragraphs 2.1.13, 2.1.14 and 2.1.15)*

- In eight substation works, the commissioning of substations was delayed by four to twelve months either due to delay in placement of purchase orders by the Company or delay in supply of switchgear by the vendor. There was no system in place to trigger placement of purchase orders considering the scheduled date of completion and lead supply time required for vendor. *(Paragraph 2.1.16)*

- Due to delays in completion of 50 out of 53 test-checked projects for periods ranging from one month to twelve years, the Company lost energy savings of 1,656 Million Units valued at about ₹ 556.42 crore though an expenditure of ₹ 1,559.27 crore was incurred on them. The delay in completion results in increased tariff for the consumers as the interest charges on such capital expenditure is passed on to consumers in tariff. The Company had incurred ₹ 566.92 crore on 20 of the 50 works which were still in progress (December 2019). Considering average interest rate of 9.73 *per cent* on the loans borrowed for capital works during five-years (2014-2019), the annual interest of ₹ 55.16 crore incurred on the value of investment made on the incomplete assets would be factored for Tariff fixation resulting in higher tariff. *(Paragraph 2.1.18)*

Introduction

2.1.1. Karnataka Power Transmission Corporation Limited (the Company), which was incorporated (July 1999) under the Companies Act, 1956 as a wholly owned company of Government of Karnataka (GoK), is a transmission licensee under Section 14 of the Electricity Act, 2003 (the Act). The Company was established to build, maintain and operate an efficient, coordinated and economical intra-State transmission system and to provide inter-alia non-discriminatory open access to its transmission system for use by any licensee or generating company or any consumer on payment of the transmission charges as may be specified by the Karnataka Electricity Regulatory Commission.

The Company functions under the administrative control of the Energy Department, Government of Karnataka (GoK). The Management of the Company is vested with the Board of Directors (BoD) comprising maximum of twelve directors including the Managing Director appointed by the GoK. The day-to-day operations of the Company are carried out by the Managing Director with the assistance of four functional directors.

In order to carry out its functions relating to transmission system at the field level, the Company has six transmission zones[35], each headed by a Chief Engineer, 15 Circles and 15 Major Works Divisions, each headed by a Superintending Engineer and an Executive Engineer, respectively. Also, the operation and maintenance of the transmission system is looked after by 32 Transmission Lines and Substations (TL&SS) divisions.

2.1.1.1. The main source of income was the transmission charges collected from the Distribution Companies as approved by the Karnataka Electricity Regulatory Commission (KERC). For meeting its capital expenditure, apart from equity infused by the GoK, the Company largely depends on borrowings from Banks and Financial Institutions. The Commission allows the Company to recover its costs in full and return on equity at the approved rates.

2.1.1.2. The Company added 2,864 MW of transmission capacity during the five-year period of 2014-15 to 2018-19. The Company enables the Electricity Supply Companies (ESCOMs) to serve nearly 2.55 crore consumers of different categories spread across 1.92 lakh square kilometres in the State. The transmission system availability[36], which varied between 99.43 *per cent* and 99.60 *per cent* during 2014-15 to 2018-19, was always above the target of 98 *per cent* fixed by the KERC. Further, the Transmission losses, which were reduced from 3.67 *per cent* to 3.16 *per cent* during 2014-15 to 2018-19, were lower than the target levels of 3.92 *per cent* to 3.47 *per cent* fixed by the KERC throughout the same period. The Company received incentive of ₹ 206.30 crore for maintaining the transmission losses within the target and also for achieving the system availability above the target levels.

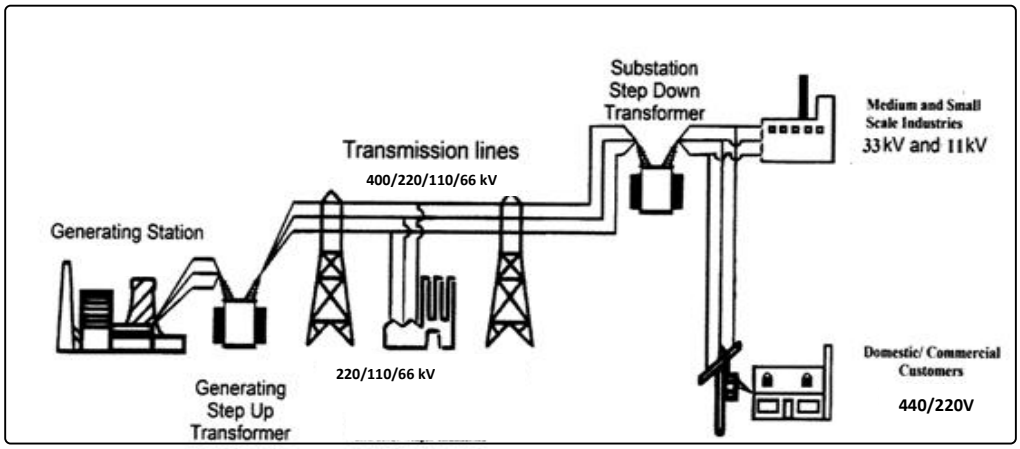
[35] Bengaluru, Mysuru, Tumakuru, Hassan, Kalaburgi and Bagalkote.
[36] A measure to assess the capability of transmitting electricity at its rated voltage.

Brief description of the transmission process

2.1.1.3. Transmission of electricity is defined as bulk transfer of power over long distances at high voltages, generally at 66kV and above. Electric power generated at relatively low voltages (11kV) in power generating plants is stepped up to high voltage (66/110/220/400kV) before it is transmitted in the transmission system to minimise the transmission losses. At substations[37] on the transmission system, transformers step down the power to a lower voltage and deliver it to distribution lines, which in turn carry power to the intended consumers.

A pictorial representation of a typical transmission process is provided below in the form of a schematic graph:

Chart No.2.1.1: **A pictorial representation of a typical transmission process**



Audit objectives

2.1.2. The Performance Audit was conducted to assess whether:

- the Substations and Transmission lines were conceptualized, planned and executed efficiently; and
- the intended benefits *viz.* energy savings, reduction of line losses, maintaining quality and uninterrupted power supply, *etc* were realised within the stipulated time.

Scope of Audit

2.1.3. A Performance Audit[38] on the activities of the Company, covering the period 2007-08 to 2011-12, was last included in the Audit Report of the Comptroller and Auditor General of India on Public Sector Undertakings, GoK for the year 2011-12.

[37] Substations are facilities within the high voltage electric system used for stepping-up/ stepping-down voltages from one level to another, connecting electric systems and switching equipment in and out of the system.

[38] The Report has not been discussed by the Committee on Public Sector Undertakings (COPU) as of July 2020. A brief audit recommendations are mentioned in ***Paragraph 2.1.7***.

The present Performance Audit covers conceptualization, planning, execution of substations and transmission lines (220kV/110kV) and realisation of the intended benefits by the Company during 2014-15 to 2018-19.

Out of 160 works (completed and ongoing) valued at ₹ 2,975.63 crore executed by the Company during 2014-15 to 2018-19, 53 works valued ₹ 1,705.52 crore were selected for test-check in audit[39]. Audit sample ensured selection of at least 25 *per cent* of works in each of the six Zones of the Company.

Since audit is done on a sample, there may be similar errors/omissions in other projects/works being implemented by the Company, but not covered in audit. The Company may, therefore, like to internally examine all such other projects/works being executed, with a view to ensure that they are being carried out as per requirement and rules.

Audit Methodology

2.1.4. Audit methodology adopted for achieving the Audit Objectives involved explaining the audit objectives, criteria and scope of audit to the Government and the Management of the Company through an Entry Conference held on 4 February 2019. The Methodology also included issue of audit observations to and discussions with the Management seeking their replies. During the course of audit, records were scrutinised at Energy Department of GoK, Corporate Office of the Company at Bengaluru and its six Zonal Offices and fifteen Major Works Divisions.

The Performance Audit Report was issued to the Government/Management seeking their views. Besides, discussions were held with the Government and the Management in the Exit Conference that took place on 19 December 2019. The views furnished (December 2019/April 2020) by the Management/Government have been incorporated in the Report.

The Performance Audit was conducted in conformity with the Auditing Standards issued by the Comptroller and Auditor General of India.

Audit Criteria

2.1.5. The audit criteria adopted for the Performance Audit were derived from the following sources:

- Electricity Act, 2003, Regulations, guidelines/norms, orders and directions issued by the Karnataka Electricity Regulatory Commission (KERC) and Central Electricity Regulatory Commission (CERC) and Central Electricity Authority (CEA), Karnataka Electricity Grid Code and Indian Telegraph Act, 1885.

- Circulars/orders of the GoI/GoK, Perspective Plan and Annual Programme of Works prepared by the Company, Directions of the Board

[39] The selected works represents 33.13 *per cent* in terms of number of works and 57.32 *per cent* in terms of value as compared to the total number of works and value.

of Directors (BoD) of the Company and its sub-committees, internal circulars and manuals of the Company, Feasibility Reports and Detailed Project Reports and Contract agreements.

Acknowledgement

2.1.6. Audit acknowledges the cooperation and assistance extended by the Energy Department, GoK and Management of the Company in facilitating the conduct of Performance Audit.

Audit Findings

Previous audit recommendations

2.1.7. The Performance Audit on the 'Working of Karnataka Power Transmission Corporation Limited' included in the Audit Report of the Comptroller and Auditor General of India on Public Sector Undertakings, GoK for the year ended March 2012 recommended *inter-alia* that:

- The construction of substations and lines should be need based, against the backdrop of scarce resources, to avoid idling and excess capacity creation. The planning and execution require re-orientation to have synchronization of various aspects of implementation of the projects to facilitate taking up of issues such as forest and other statutory clearances, road cutting permissions, *etc* well in time and resolving them before award of works;

- There is a need to conduct effective survey of the line corridors to avoid problems such as the right of way during the course of construction. Adequate enquiries about suitability of the area and encumbrance should precede the acquisition of land and hindrance free land should be available to the contractors for construction of substations, along with award of work.

Audit noticed during the present Performance Audit that the Company had done little to take corrective action and that the problems of planning and execution including securing right of way, delay in obtaining forest and other statutory clearances continued to persist. They are brought out in the subsequent paragraphs.

Conceptualisation and Planning

Perspective plan and rolling plans

2.1.8. The Karnataka Electricity Grid Code (Grid Code) mandates the Distribution licensees to conduct load forecasting studies, which would form the basis of planning for expansion of Transmission System and based on which the Company was required to prepare Perspective Plan for a five-year period and Rolling Plans annually. These plans were to be filed with the State Regulatory Commission (KERC).

Audit observed that:

- the Company prepared a Perspective Plan for ten-year period (2012-22) based on a load forecasting study, instead of preparing for every five-year period. This Plan was filed in December 2013, with a delay of 33 months from the due date (April 2011). Further, the Company also did not submit to KERC the Rolling Plans during 2013-14 to 2015-16, while Rolling Plans for the next three years 2016-17, 2017-18 and 2018-19 were submitted at one go in September 2016, against the requirement of annual submission.

- the Company had executed 63 (66/110/220kV) substations, which were not part of the Perspective Plan, by incurring ₹ 859.78 crore during first five-year plan period (2012-13 to 2016-17), while 52 substations of various capacities (66/110/220/400kV) which were included in the Perspective Plan (2012-17) were left out. A zone-wise analysis revealed that 33 substations were established in Mysuru Zone against the requirement of 18 substations projected in the Perspective Plan, while there was reduction in number of substations executed in Bengaluru zone (30 substations executed against the requirement of 33 substations) and Tumakuru zone (13 substations executed against requirement of 23 substations). It is pertinent to mention here that 26 substations in Bengaluru and 11 substations in Tumakuru were loaded beyond their capacity (December 2019). Moreover, out of 63 substations not part of the Perspective Plan but executed by the Company, the optimal load of 80 *per cent* was achieved only in 22 substations (35 *per cent*), while the peak load of 15 substations was less than 50 *per cent* and in the remaining 26 substations, peak load was between 50 *per cent* and 80 *per cent.* As such, the preparation of Perspective Plan did not serve the purpose, as the substations were not executed where they were required.

Thus, the Company had not only failed to prepare the Perspective and Rolling Plans periodically as envisaged in the Grid code, it had also undertaken works which were not in the Perspective Plans, while also not executing those stations identified for execution in the Plans resulting in failure to reduce the overload in substations at Bengaluru and Tumakuru. Annual updation of the load forecast through Rolling Plans and preparation of Perspective Plan periodically could have given a true picture for the Company to assess the requirement of transmission capacity.

The Government replied (April 2020) that care would be taken for filing the Perspective Plan with the Commission within the stipulated time in future. It was further stated that the under-loading of substations below 50 *per cent* was due to non-completion of connected 11kV link lines by the Electricity Supply Companies (ESCOMs) and non-creation of industries in the vicinity of these substations as expected.

The fact remained that the Perspective Plans and Rolling Plans were not prepared as per the Grid Code, and even where plans were prepared there were deviations without justified reasons and without making any course corrections to the plan. This caused overloading of substations in the places identified in

the Perspective Plan, while the substations executed outside the Perspective Plan were not optimally utilised. Further, it is also evident from the reply that there was lack of co-ordination between the Company and the ESCOMs as the substations were created without ensuring completion of connected 11kV lines.

In fact, KERC had also pointed out (February 2015) in its study of capital expenditure programme of the Company that the Perspective Plan was not being reviewed on a periodic basis and the Company while planning the capital works did not entirely depend on Perspective Plan but included the projects identified by its field offices and intermediate requests of ESCOMs. It was also pointed out that there was no mid period review or course correction carried out to the Perspective Plan, though it was an essential part of the planning.

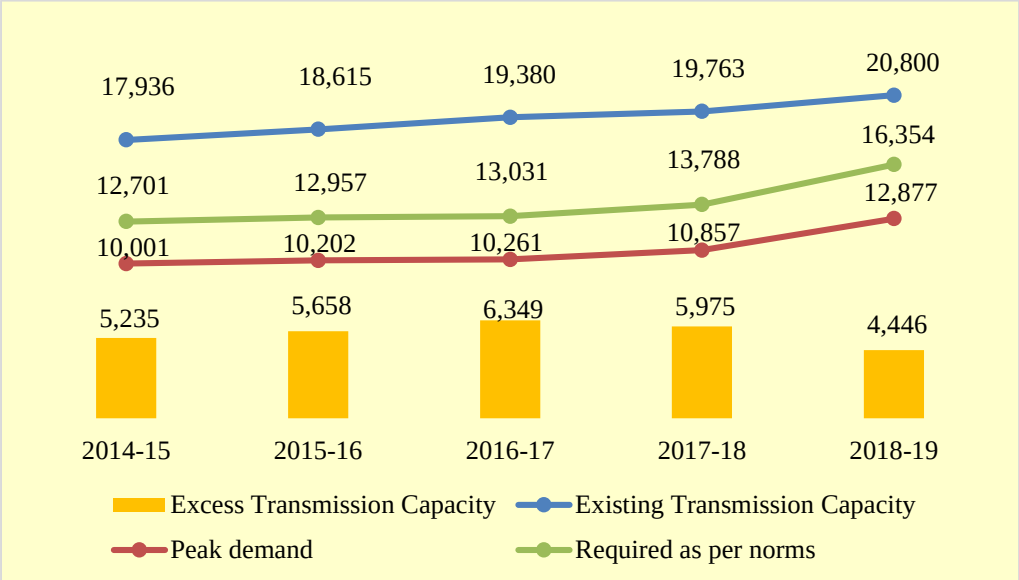
Creation of transmission capacity beyond norms

2.1.9. As per the Manual on Transmission Planning Criteria issued by the CEA, the new transmission additions required for system strengthening need to be planned keeping a margin of 27 *per cent*[40].

The peak electricity demand met in the State in 2018-19 as per the National Electricity Plan published by the Ministry of Power, GoI and the reports of the CEA, was 12,877 MW. Hence, the required transmission capacity after considering margin of 27 *per cent* was 16,354 MW. Against which, the actual transmission capacity in the State stood at 20,800 MW as on 31 March 2019.

The following graph depicts the transmission capacity created *vis-à-vis* the peak demand met[41] during 2014-15 to 2018-19.

Chart No:2.1.2: **Transmission capacity *vis-à-vis* actual peak load (MW)**



(Source: Tariff orders of KERC, CEA reports and information furnished by the Company)

[40] 10 *per cent* in the thermal loading limits of lines and transformers, 15 *per cent* in the interregional links and a margin of about + 2 *per cent* in the voltage limits.

[41] Peak Load refers to the simultaneous maximum demand of the system being studied under a specific time duration (e.g. annual, monthly, daily, *etc*).

Audit observed that the existing transmission capacity was in excess of requirement in all the five years, varying between 27 *per cent* and 49 *per cent* during 2014-15 to 2018-19. The transmission capacity was in excess by 27 *per cent* with reference to the requirement in 2018-19. As on 31 March 2019, the excess transmission capacity works out to 5,230 MVA[42] involving capital cost of ₹ 3,870 crore[43]. This cost was an avoidable burden placed on the consumers as the cost incurred on creation of these assets was factored into transmission tariff recoverable from the Distribution licensees.

The Government replied (April 2020) that the transmission capacity was created keeping in view the margin of around 25 *per cent* to the thermal loading limits of the transmission elements to meet the criteria of Manual on Transmission Planning. The excess capacity addition would suffice during system exigencies and future/unpredicted load generation scenarios.

The reply is not acceptable, as the excess transmission capacity worked out by audit is with reference to the annual peak load recorded after considering the margin of 27 *per cent* allowed by CEA.

Status of audit sampled works

2.1.10. The status of 53 works selected by audit is given in the following table:

Table No.2.1.1: **Status of completion of sampled works as of December 2019**

Sl. No	Description	Completed works	Ongoing works
1	Total number of works	33	20
2	Number of works completed within schedule date	3	-
3	Number of works with delay in completion beyond scheduled date		
	• **Less than one year**	11	3
	• **1 to < 3 years**	9	6
	• **3 to 5 years**	3	1
	• **> 5 years**	7	10

Audit observed that 53 works were due for completion between August 2004 and September 2019. However, only 33 out of 53 selected works were completed. Moreover, out of the 33 completed works, only three works were completed within the scheduled date of completion, 30 works were completed with delay ranging from one month to twelve years from the schedule date, while 20 works were still in progress (December 2019) ranging between three months and more than twelve years beyond their scheduled completion date.

The reasons for delay/non-completion of works were mainly deficiencies in execution of works such as, not ensuring right of way, not initiating proposals

[42] The transmission capacity in MVA is arrived at by dividing the power factor (0.85) with transformer capacity in MW, *i.e.* (4,446 MW)/0.85 = 5,230 MVA.

[43] Considering awarded (15.9.2016) cost of ₹ 5.92 crore for 8 MVA substation at Dashavara, the cost per MVA works out to ₹ 0.74 crore. Hence, the cost of excess transmission network is 5,230 MVA x ₹ 0.74 crore = ₹ 3,870 crore.

well in advance for statutory clearances from Railways, Forest, lack of timely action on defaulting contractors and inadequate monitoring. These issues are discussed in the subsequent paragraphs.

Execution of works

Designs and layout plan for substations

2.1.11. As per the orders issued (August 2000) by the Company, the Chief Engineer of the Zone concerned, after acquisition of land, was responsible for geo-technical investigation and survey of the land for the substation, which was then forwarded to the Superintending Engineer (Technical), who would inspect the site and furnish layout drawings and other details. The Chief Engineer of the Zone prepared estimates, which formed the basis for preparing a Detailed Project Report (DPR). The Planning and Coordination wing vetted and approved the DPRs. Audit observed that there were deficiencies in drawings and layout plans, as detailed below:

2.1.11.1. In four substations works, the designs and layout plans had undergone changes subsequent to award of works and in two Gas Insulated Substations (GIS), there were delays in finalizing the designs (refer ***Appendix-7*)**. The process of approval of revised designs took 5 to 13 months from the date issue of Letters of Intent (LoI), thereby delaying the commencement of works by that period. The change in layout plans was warranted due to location of site being at lower level than the surrounding land causing water logging, change in orientation of incoming lines, *etc*. These conditions were not mentioned in the survey/DPRs. An illustrative case is given alongside in Box 2.1.1.

Box No. 2.1.1
220/110kV substation at Mallat:

DPR for the work was approved in July 2012 and the work was awarded in February 2013. Audit observed that Block level and layout plan was changed, as the substation site was situated at lower level than the surrounding land and road causing water logging during rainy season. Further, it was found that the site consisted of black cotton soil requiring extra filling with murram. These hindrances were not mentioned in the survey/DPR.

The Government (April 2020) replied that necessary instructions would be issued to avoid such incidents in future.

Audit noticed that though there was a gap of 6 to 21 months between approval of DPRs and award of works (Sl.no.1 to 4 of ***Appendix-7***), the Company did not revisit the location of the substation to verify the site conditions before awarding works. Finalizing the designs and layout plans post-award of works, instead of carrying them out prior to tendering and awarding the works resulted in avoidable delay. Further, in respect of GIS substations (Sl.no.5 to 6 of ***Appendix-7***), where the designs were to be obtained from the manufacturer/supplier, there was a delay in finalising and approving the designs by five and 13 months respectively.

The Government replied (April 2020) that the DPR was prepared after studying site conditions and its suitability for the projects. However, the site conditions have changed subsequent to award of works thereby design and layout plans

had to be changed. It is evident from the reply that the Company did not verify the suitability of designs at the time of award of works, causing unwarranted delay.

Right of way

2.1.12. As per the Transmission Lines Construction Manual of the Company, the survey of lines is to be made as accurately as possible as any error would lead to unnecessary delays in execution and increased expenditure. It also stipulates that after having marked the various feasible routes of the line on the topo sheets, a preliminary walkover survey is to be carried out and Right of Way (ROW) is to be established before detailed survey. Appropriate places for power line crossing, Railway and Road crossings should be located during the walkover survey. On completion of walkover survey, a route alignment should be prepared and then a detailed survey for tower alignment needs to be carried out. The Order (August 2000) issued by the Company also stipulates that forest, railways and post and telegraph (PTCC) clearance proposals have to be simultaneously taken up by the Major Works division with the authorities concerned soon after the line /location of the site are finalised.

Additionally, the Company was empowered under the Indian Telegraph Act, 1885 read with notification dated 24 March 2006 issued by the GoI under the Indian Electricity Act, 2003, to enter any premises or land upon which the electricity supply lines or other works have been lawfully placed by it for the purpose of transmission of energy.

Audit observed several lapses by the Company in ensuring timely commencement and completion of projects such as, faulty surveys that failed to detect existing infrastructure along the planned line locations, delays in approaching the statutory authorities concerned for the necessary clearances, prolonged delays in commencement of projects/awarding contracts, poor enforcement of contracts, *etc*.

Such lapses by the Company and the resultant prolonged delays in completion of projects led to delay in realisation of envisaged benefits such as energy savings, improvement of reliability of supply, meeting additional load growth, *etc.* Besides, some of the substations remained idle due to non-completion of associated lines. The gist of significant system deficiencies is highlighted below (***Paragraphs 2.1.13. to 2.1.15***), while other similar instances are detailed in ***Appendix-8a*** *(*completed works) and ***Appendix-8b*** (on going works).

Deficiencies in Surveys/failure to identify existing critical infrastructure, forest land, railway lines, etc in the proposed line corridor.

2.1.13. The cases of delay in completion due to failure to identify railway lines, forest land, and other critical infrastructure passing through the line corridor during surveys are discussed below:

Table No.2.1.2: **Cases of failure to identify forest, railway lines, *etc* in the survey**

Sl. No.	Project	Date of LoI/ Scheduled Date of Completion	Nature of Lapse	Impact
1	Substation at Magadi along with associated lines.	March 2008/February 2009	The identified land for substation was a forest land, which was noticed only during execution of works.	• Delay of six years. • Substation was under-loaded at 32 *per cent* of its capacity due to non-completion of lines. • Lost energy savings of 3.2 MUs.
2	Substation at Pavagada and connected lines.	January 2013/ July 2014	The February 2011 survey did not mention existence of railway crossing (Tumakuru – Rayadurga) in the line corridor.	• Delay of more than four years. • Lost energy savings of 362 MUs.
3	Double Circuit (DC) line from Vasanthanarasapura PGCIL substation to Madhugiri substation.	July 2015/ July 2016	• The June 2013 survey did not mention the existence of railway project and Industrial area of KIADB. • Ignorance of available information on this railway project noticed (February 2014).	• Delay of three years. • Expenditure of ₹ 105.20 crore remained unproductive for three years. • Avoidable payment of compensation ₹ 39.56 crore to PGCIL[44].

A brief of each of the above cases is brought out below:

Substation at Magadi along with associated lines

2.1.13.1. The existence of forest land was identified only during the course of execution of works, which caused delay in forest clearance by more than three years (March 2008 to October 2011). This further caused abandoning of work by the contractor (M/s Deepak Cables India Ltd) and subsequent court litigation due to filing a case against the Company for cancelling the contract and re-awarding. The work was re-awarded to another agency (M/s KEC International Ltd) in May 2015. The substation was commissioned in February 2017 with an alternate line (Nelamangala-Anchepalya 220kV line), as the associated 220kV DC line from 400/220kv Bidadi PGCIL substation to 220/66/11kV Magadi substation was not completed (December 2019) due to objections from the farmers.

The Government replied (April 2020) that 220kV source line (Bidadi to Magadi) was pending as the farmers objected to the line work demanding higher compensation. The reply is silent on non-identification of forest land prior to award of work. The Company also failed to invoke the favourable provisions

[44] 220kV transmission line from Vasanthanarasapura to Antarasanahalli was taken up to evacuate power from 765/400/220kV Vsanthanarasapura PGCIL substation. As the PGCIL substation was kept idle due to non-completion of downstream assets by the Company, CERC while passing tariff order for PGCIL ordered for recovery from DISCOMs of the State. BESCOM which is the end beneficiary paid compensation of ₹ 39.56 crore to PGCIL and claimed refund from KPTCL, which was responsible for non-completion of evacuation lines.

of the Indian Telegraph Act according to which the land owners cannot obstruct to the work.

Substation at Pavagada and connected lines

2.1.13.2. The Company failed to consider the existence of the railway project, when it surveyed the line in 2011. It was only during the course of execution of the work, the Company noticed (February 2014) that 37 out of 208 locations of the line was passing through railway line (Tumakuru – Rayadurga). The Railway authorities informed (April 2014) that the said railway project was taken up in 2009 itself. Moreover, there was delay in getting the approval (October 2018) for change in alignment, and the work was completed in November 2018.

The Government replied (April 2020) that the marking stones of Tumakuru-Rayadurga railway track were not available during survey but was identified only during visit for soil classification in February 2014 and thereafter deviation in route was finalized with Railways. The reply is not acceptable as the survey was already done by 2006, the Railway had taken up the project in 2009, and the Company should have been aware of it. Sharing of work proposals with the railways before awarding the work could have averted the delay.

DC line from Vasanthanarasapura PGCIL substation to Madhugiri substation

2.1.13.3. The survey (May/June 2013) did not mention the existence of Tumakuru- Rayadurga line taken up in 2009. Despite the Company being aware of existence of Railway project in February 2014 during the execution of another line (Substation at Pavagada and connected lines), it had approached the Railways only in July 2015, after the contractor raised the issue of existence of Railway line in the line corridor. Moreover, both the works were executed by the same Division of the Company (Tumakuru). The Company also erred in its survey by not identifying the towers 1 to 43 passing through industrial area of Karnataka Industrial Area Development Board (KIADB) and existence of private land at Tower No. 1, 2, 3, 37, 38 and 39. The expenditure of ₹ 65.79 crore incurred on 203 out of 209 towers remained unproductive pending completion of six towers passing through private land. Also, another transmission line (Vasanthanarasapura to Antarasanahalli) on which ₹ 39.41 crore was spent by the Company got delayed as it was to pass through the same towers. The work was completed only in August 2019 with delay of three years.

The Government replied (April 2020) that it had no knowledge of proposal of Tumakuru-Rayadurga railway line. There were severe protests from farmers for payment of compensation for the tower area and hence the work had to be stopped until compensation was paid. The reply is not acceptable as the Company was aware of the railway line in February 2014, when Pavgada substation work was executed. The orders for compensation were issued by the District Commissioner in February 2016 and payment of compensation was also the responsibility of the Company. The Company should have invoked the provisions of Indian Telegraph Act, 1885 for hindrance free right of way.

Delay in obtaining statutory clearances.

2.1.14. The cases of delay in approaching the authorities concerned (railways, forest, *etc*) for construction of substations/lines are detailed in the following table.

Table No.2.1.3: **Cases of delay in obtaining the clearances from forest/railways**

Sl. No.	Project	Date of Letter of Intent (LoI)/ Scheduled date of Completion	Nature of Lapse	Impact
1	110kV Single Circuit (SC) line from Belgaum to Ghataprabha substation.	June 2007/ December 2007	• Six years delay in obtaining forest clearance despite knowledge of forest land enroute the proposed line corridor. • Delay in re-awarding of works by five years.	• Delay of ten years three months. • Power Interruptions in Belgaum City.
2	Substation and lines at Vikas Tech Park in Devarabeesanahalli.	June 2010/October 2011	Delay of 3 to 20 months from LoI in approaching various authorities for clearances, and consequent delays in receipt of approvals.	• Delay of five years five months. • Expenditure of ₹ 31.90 crore incurred on substation unfruitful for more than five years.
3	Shifting of 220/110kV line passing through HAL land.	May 2016/ December 2016	11 months delay in submission of proposals for forest clearance despite existence of forest being mentioned in the survey.	• Delay of two Years.

A brief of each of the above cases is brought out below:

110 kV SC line from Belgaum to Ghataprabha Substation

2.1.14.1. The Company took up the work of 110 kV SC line from Belgaum to Ghataprabha Substation to improve power supply to Belgaum City, without approaching the forest department despite knowing the fact that the existing line was passing through forest land. The line work which progressed for 34.517 kms out of 49.045 kms as of August 2012 was interrupted due to objections from the forest department. Though clearances were subsequently obtained in June 2013, the Company, however, delayed entrustment of the balance work to the new agency (M/s Mallikarjun Electricals) and its completion by almost five years (March 2018). The Company made correspondence with the contractor (M/s Deepak Cables India Ltd) by issuing reminders for completing the balance works, for which the contractor did not respond and hence re-awarded the balance work after termination. As a result of delay, the existing substations (220kV substations at Belgaum and Chikkodi) were overloaded and the power supply to Belgaum city was interrupted.

The Government replied (April 2020) that the existing line was passing through the forest area and since the new line has been constructed in the same corridor, forest proposal was not prepared and submitted. The reply is not acceptable as the Company should have been aware of the requirements under the Forest Act,

1980 and it failed to take precautionary confirmation about clearances of the Forest Department in time.

Substation at Vikas Tech Park in Devarabeesanahalli

2.1.14.2. There was abnormal delay in approaching various authorities for permission after issue of LoI (June 2010), *viz*. Railways (20 months), Lake development authority (12 months) and the Forest authorities (3 months). Consequently, the receipt of approvals was delayed, (received between October 2012 and November 2013). Besides, the Company did not resolve the objections raised by the private land owners under the enabling provisions of the Indian Telegraph Act. Thereby, completion of line works (March 2017) was delayed by more than five years from the scheduled date (October 2011). As a result, expenditure of ₹ 31.90 crore incurred on construction of substation, which was completed in October 2011, remained unfruitful until completion of lines, *i.e.* March 2017.

The Government replied (April 2020) that tenders were invited for both overhead lines and substation with an intention to charge substation along with line. However, due to right of way issues and court cases, line works could not be completed. The reply is silent on reasons for delay in approaching various authorities for clearances and non-invoking the enabling provisions of the Indian Telegraph Act.

Shifting of 220/110kV line passing through HAL land

2.1.14.3. Despite clear information in the survey report that the proposed line corridor passed through reserve forest, proposals for forest clearance were submitted in March 2017, eleven months after the date of commencement (May 2016). Clearance was obtained in March 2018 and line work completed in December 2018, resulting in a delay of two years from its scheduled date of completion.

The Government replied (April 2020) that obtaining forest clearance is a lengthy process and that the proposals could not be processed prior to the initiation of the shifting work due to paucity of time. Further, it was stated that there was protest from land owners during execution due to transmission line passing through the coconut and arecanut garden. The reply is not acceptable as it was a known fact that forest clearance was a lengthy process and the Company should have initiated proposals well in advance. Protest from land owners should have been dealt as per the provisions of the Indian Telegraph Act.

Non-enforcement of conditions of contract and enabling provisions of the Indian Telegraph Act, delay in re-awarding the contracts, etc.

2.1.15. The cases of non-enforcement of provisions of Indian Telegraph Act and non-invoking of conditions of contract, delay in awarding of contracts, *etc* are discussed below:

Table No.2.1.4: **Cases of delay in completion due to non-enforcement of law and contract conditions, delay in re-award of contracts, *etc*.**

Sl. No.	Project	Date of LoI/ Scheduled Date of Completion	Nature of Lapse	Impact
1	220 kV substation at Kudalgi and 220kV DC lines	November 2012/May 2014	• Delays in handing over of the substation site, approaching railway authorities. • Non-invoking provisions of the Indian Telegraph Act and contractual provisions.	• Non-completion of work even after lapse of more than five years from scheduled date. • Lost energy savings of 206.71 MUs.
2	66kV and 220kV lines from Vajamangala substation to Kadakola substation	August 2009, March 2010/February 2010, March 2011.	• Delay in re-awarding the work	• Delay of six years. • Lost energy savings of 5.46 MUs. • ₹ 3.72 crore remained unfruitful for five years. • Additional expenditure of ₹ 1.87 core.
3	Upgradation of Mulky substation and 110kV SC line from Nandikur to Mulky	January 2008/ August 2008	• Non-invoking of contract conditions despite default by the contractor. • Non-enforcement of provisions of Indian Telegraph Act.	• Non-completion of contract even after lapse of more than 11 years. • Additional expenditure of ₹ 3.41 crore. • Lost energy savings of 153.29 Mus. • Power interruptions in the areas coming under Mulky substation.
4	DC line from Chikkodi substation to Kudachi substation	May 2003/August 2004	Non-invoking of contractual provisions	• Delay of more than 11 years. • Additional expenditure of ₹ 5.37 crore.

A brief of each of the above cases is brought out below:

Construction of 220 kV substation at Kudalgi and 220kV DC lines

2.1.15.1. There were delays in handing over of the substation site (February 2013) by three months and approaching (September 2013) railway authorities by ten months after award of work and consequent delay in receipt of approvals from railways (November 2015). The Company had also failed to invoke penal provisions of the contract though there were delays in execution by the contractor (M/s LNARSY). Further, the Company did not invoke provisions of Indian Telegraph Act despite the District Court of Bellary passing the orders in favour of the Company in April 2018. This resulted in non-completion of work (December 2019) even after lapse of five years from scheduled date (May 2014).

The Government replied (April 2020) that all necessary steps were taken to obtain statutory approvals and also for paying compensation to the land owners. It was also stated that 95 *per cent* of 220kV station work was completed and 96

of 119 towers were erected for 220kV DC line. The remaining towers were pending completion for want of settlement of compensation to farmers.

The reply is silent on reasons for delays occurred at various stages, *viz*. handing over of site, approaching railways and non-invoking penal provisions for delays by the contractor. The reply that the works were not completed pending settlement of compensation is not acceptable as the Court while passing the order (April 2018) observed that as per the provisions of the Indian Telegraph Act, 1885, the Company was empowered to enter upon any premises/land upon which the electricity supply lines or other work have been lawfully placed by it for the purpose of transmission of energy. The Court order further stated that in case of dispute, if any, on the sufficiency of the compensation, the land losers could file suit in the court separately without obstructing the work.

66kV and 220kV lines from Vajamangala substation to Kadakola substation

2.1.15.2. The work of 66kV line was completed at a cost of ₹ 3.72 crore between the locations 1 to 3 and 21 to 86 and kept idle charged[45] since June 2011, due to objections from the affected Housing Societies between the locations 4 and 20. The case filed by these Housing Societies was disposed off in the DC Court, Mysuru in favour of the Company in November 2010. Similar objections were raised again during construction of 220kV line as the line passed through the same corridor (66kV) and the Company resolved the issue by agreeing to change in design of towers to Multi Circuit Multi Voltage (MCMV). Both the contracts were short-closed and fresh contract was awarded in August 2014 for the locations 4 to 20.

Despite receiving favourable Court verdict as early as November 2010, the Company delayed the process of finalising the estimates for change in design of towers and re-awarding the contract (August 2014). In the process, work completion (March 2016) was delayed by six years from scheduled date (March 2010) and incurred additional expenditure of ₹ 1.87 crore[46] due to change in design of towers.

The Government replied (April 2020) that delay was due to right of way issues and change in type of towers. The reply is not acceptable as the Company took abnormal time of almost four years to re-award the work even after resolving the ROW, which was not justified.

Upgradation of substation and construction of 110kV SC line from Nandikur to Mulky

2.1.15.3. The contractor (M/s Deepak Cables) had delayed the submission (June 2010) of check survey by more than two years from the date of award (January 2008). There were neither recorded reasons for such delay nor the Company initiated action on the contractor as per the terms of contract. The contract was terminated in May 2016 after almost eight years of scheduled date of completion

[45] Line is charged with power to avoid theft of conductors, pending completion of works.

[46] The difference between revised cost for 220/66kV MCMV line (₹ 3.72 crore) and the cost for 220kV and 66kV lines as per original contracts from location 4 to 20 (₹ 1.85 crore).

(August 2008) at risk and cost after incurring expenditure of ₹ 2.94 crore out of the contract value of ₹ 5.98 crore. The balance works awarded (January 2019) to M/s Ghana Constructions at ₹ 6.45 crore, though were to be completed by October 2019, were not completed due to non-clearance of right of way.

The Government replied (April 2020) that two cases pertaining to the work were pending before High Court of Karnataka. It was also stated that liquidated damages of ₹ 42.54 lakh were recovered from the agency and the escalated cost on account of termination will be recovered after completion of balance works. The reply is not acceptable as the Company did not invoke contractual terms for the default by M/s Deepak Cables. Secondly, the Company failed to invoke provisions of the Indian Telegraph Act for completing the pending works, as the compensation for right of way clearance should have been dealt with separately.

Construction of double circuit line from Chikkodi substation to Kudachi substation

2.1.15.4. The work awarded (May 2003) to M/s Mysore Electrical Industries Limited (MEI) at ₹ 7.48 crore was short closed in March 2010, after six years of scheduled date (August 2004), the reasons stated to be poor quality of work and MEI's inability to continue. The balance work awarded (April 2012) to M/s Deepak Cables (India) Ltd at ₹ 6.29 crore to complete by January 2013, was also not completed and the contract was terminated in September 2015. The work was completed in January 2016 through another agency (M/s Shiva kumar and Company) at a cost of ₹ 6.82 crore.

The Company was aware of the fact that MEI and M/s Deepak Cables (India) Ltd had breached the terms of contracts by not completing the work within the schedule, however, it did not take timely action to terminate the contracts. Instead, it had just issued reminders to the firms. Thereby, the Company lost eleven years (2004 to 2015). Further, the Company incurred ₹ 12.85 crore for completing the work, against the original contract price of ₹ 7.48 crore, causing additional cost of ₹ 5.37 crore.

The Government replied (April 2020) that in case of MEI, retention money/penalty of ₹ 2 crore had been retained. The reply further stated that it had decided to recover ₹ 4.15 crore towards risk and cost and non-returning of materials from M/s Deepak Cable (India) Ltd, of which ₹ 0.63 crore was recovered through forfeiture of bank guarantee. The reply is silent on reasons for delayed termination of contracts and the action taken to recover the balance cost of ₹ 3.52 crore from M/s Deepak Cable (I) Ltd.

As is apparent from the foregoing paragraphs, the majority of the works were held up as the Company repeatedly failed to:

i. identify presence of Railway projects and forest lands along the line routes/substation locations during survey;

ii. file for statutory clearances immediately upon their identification in the survey and ensure simultaneous clearance for right of way along with award of works as per extant order and follow up at the highest level in the administration;

iii. terminate and re-award the contracts and to take action on the defaulting contractors; and

iv. invoke the enabling provisions of the Indian Telegraph Act for ensuring right of way.

The fact that the above lapses in ensuring ROW occurred in as many as 24 out of 53 projects involving total expenditure of ₹ 800.19 crore[47] (13 completed - ₹ 493.78 crore and 11 ongoing - ₹ 306.41 crore) spanning across six zones despite favourable rulings of various courts and strong enabling provisions of the Indian Telegraph Act indicates that it is more likely a case of suboptimal efficiency by the concerned authorities rather than a mere case of non-compliance due to reasonable systemic limitations that usually occur in establishing linear infrastructure.

Deficiency in the system of placing orders for switch gears

2.1.16. Switchgear, which is composed of electrical disconnect switches, fuses or circuit breakers, is used in a substation to de-energise equipment to allow work to be done and to clear faults downstream. The Zonal Chief Engineer concerned was responsible for placing the purchase orders and for making available the switchgear well before the scheduled completion of the work.

Box No. 2.1.2
There was no system in place to trigger placement of purchase orders considering the scheduled date of completion and lead supply time required for vendor resulting in delays in commissioning of the substations.

Audit observed that, in eight substation works, the commissioning of substations was delayed by four to twelve months either due to delay in placement of purchase orders by the Company or delay in supply of switchgear by the vendor (refer ***Appendix-9*)**. In three cases (Sl.No.1,3 & 4 of ***Appendix-9***), purchase orders were placed on or after the scheduled date of Completion and in four cases (Sl. No.5 to 8 of ***Appendix-9***), the vendor had delayed the supply of switchgears.

Audit further observed that the Company, in line with its standing order dated 7 June 2012, met the entire requirement of switchgears for its substations from the Mysore Electrical Industries Limited (MEI), a wholly owned undertaking of GoK involved in the business of manufacturing of switchgears. However, the Company did not place the orders sufficiently in advance before completing the substation, by factoring in the supply capacity and lead time of MEI. This could have averted the idling of substations for want of switchgears. There was no system in place to trigger placement of purchase orders considering the scheduled date of completion and lead supply time required for MEI. This had caused unwarranted delays in commissioning of the substations.

[47] Refer ***Appendix 8a, Appendix 8b and Paragraph 2.1.13, 2.1.14 and 2.1.15***.

The Government replied (April 2020) that penalty was levied for delayed supply as per the terms and conditions of purchase order. Necessary instructions would be issued to all the transmission zones for placement of orders within time.

The reply is not acceptable, the Company should evolve a system to ensure timely placement of orders and supply of switchgears to avert the idling substations constructed with huge investment, as the invoking penalty does not address the issue.

Monitoring

2.1.17. As per the conditions of the contracts, the contractors had to submit a detailed Programme Evaluation Review Technique (PERT) chart consisting of various key phases of the work such as design, procurement, field erection activities within fifteen days of the date of Letter of Award of Contract. These were to be reviewed, updated, once every month and monitored by the respective Superintending Engineers. Further, as per the circular issued (July 2016) by the Company, the contractors should furnish to the Engineer the Monthly Progress Report detailing out the progress achieved on all erection activities along with photographs.

Audit observed that:

- the contractors submitted an Activity Chart in test checked cases of 53 works, detailing the milestones for different activities, *viz*. submission of designs and drawings, supply of materials, erection, *etc*. However, the milestones referred to in the Activity Charts were not reviewed at the Divisional level;

- there was no evidence in support of contractors submitting monthly progress reports along with photographs and the Company reviewing them for corrective action, in cases where there was breach of milestones;

- the Company had a web based Project Monitoring System (PMS) envisaged for online monitoring of different activities/projects from planning to execution stage. However, PMS did not capture pre-construction planning activities, potential risks and mitigation measures during execution. It did not support uploading of photographs or GIS information to track progress of the work with reference to Activity Chart, which would have potentially added robustness to the monitoring system. Also, there was no tool for evaluation of benefits post completion of projects.

Absence of effective monitoring was evident from the fact that 30 works were completed with delay ranging from one month to twelve years from the schedule date and 20 works were still under progress with delay ranging from three months to twelve years beyond their scheduled dates of completion.

The Government replied (April 2020) that the works were reviewed monthly at Division level and quarterly at Zonal level. It was also stated that necessary

instructions would be issued to the project monitoring cell and to all the Zonal Chief Engineers to review the works regularly as per activity chart and obtain evidence in support of progress made from contractors. The reply is not acceptable, as the bottlenecks in completion of the works were not addressed in a timely manner, which led to non-completion of works beyond their scheduled dates. This indicated that monitoring at Divisional and Zonal level was not effective.

The Government during Exit Conference (19 December 2019) emphasized the need for uploading the progress of works on daily basis to the system so that action can be taken against the defaulting contractor and also any issues hampering the progress could be resolved without loss of time.

Outcome analysis

2.1.18. The Detailed Project Report *inter alia* brings out the benefits of the project. While the total energy savings was mentioned in quantitative terms, other benefits *viz*. reducing line/system losses, maintaining quality and uninterrupted power supply, improvement of reliability of power supply, reducing line length, improvement in tail-end voltage, improvement in voltage conditions, releasing load or future growth were not quantitative. A few DPRs included improvement of power supply to specific areas and reduction in overloading of identified stations.

The Company did not have a system of ex-post analysis on project benefits and there was no mechanism to measure the benefits envisaged. In the absence of these, audit could not vouch-safe the extent of benefits realised in respect of 33 completed projects.

Audit analysed the quantifiable loss due to delays in completion of 50 of the 53 test-checked projects. In respect of 30 projects which were completed at a cost of ₹ 992.35 crore after delays ranging from one month to twelve years, the Company lost energy savings of 1,597 Million Units (MUs). Further, 20 of the 50 works were still in progress (December 2019) with delays ranging from three months to more than twelve years beyond their scheduled completion dates, on which the Company had incurred ₹ 566.92 crore. The Company had also lost energy savings of 1,715 MUs in these incomplete projects till date (December 2019).

Thus, due to delays in completion of these 50 of 53 test-checked projects, the Company lost energy savings valued at about ₹ 556.42 crore[48] though an expenditure of ₹ 1,559.27 crore was incurred on them. The delay in completion results in increased tariff for the consumers as the interest charges on such capital expenditure is passed on to consumers in tariff. The Company had

[48] The total envisaged energy savings as per projections made in the Detailed Project Reports for 50 projects (30 completed with delay and 20 works not completed beyond their scheduled dates) was 3,312 MUs valued at ₹ 1,112.83 crore (1,597 MUs on completed works + 1,715 MUs on incomplete works). In the absence of ex-post analysis of project benefits, the loss has been calculated considering 50 *per cent* of the projected energy savings at an average purchase cost of power during 2018-19 (3,312 MUs x ½ = 1,656 MUs x ₹ 3.36 per unit = ₹ 556.42 crore).

incurred ₹ 566.92 crore on 20 of the 50 works which were still in progress (December 2019). Considering average interest rate of 9.73 *per cent* on the loans borrowed for capital works during five-years (2014-2019), the annual interest of ₹ 55.16 crore incurred on the value of investment made on the incomplete assets would be factored for Tariff fixation resulting in higher tariff.

In fact, KERC while approving Tariff Order 2019, noted that every year the Company was carrying forward huge amount of works-in-progress to the next year, which would have unjustified tariff implications and would amount to burdening the consumers with higher tariff without passing on the corresponding benefits to them.

Conclusion

2.1.19. It was appreciable that the Company was able to maintain the Transmission System Availability, a measure to assess the capability of transmitting electricity at its rated voltage, at more than 99 *per cent*, and also achieve Transmission losses at lesser than the targets fixed by KERC, throughout the period 2014-15 to 2018-19. The Company received an incentive of ₹ 206.30 crore for meeting the targets set by KERC. Audit, however, observed deficiencies in planning and execution of works which eventually led to non-achievement/deferment of the desired benefits.

2.1.19.1. ***Planning***

- The Company had failed to prepare and file with the KERC the Perspective Plan and the Rolling plans, periodically, as required under the Grid Code and guidelines issued by CEA. Audit also observed that on one hand, the Company executed projects not in the Perspective Plan, while on the other, it did not execute projects envisaged in the Perspective Plan. The stations that exist in the vicinity of the proposed stations, which were not executed were seen to be overloaded;

- The existing transmission capacity of the Company was in excess of requirement during all the five years. The transmission capacity in 2018-19 was 20,800 MW against the requirement, of 16,354 MW (peak demand *plus* system margin of 27 *per cent*), as per the Manual on Transmission Planning Criteria issued by the CEA, resulting in excess capacity of 4,446 MW (5,230 MVA). The cost of creating such excess capacity was about ₹ 3,870 crore, which would be passed on to consumers in tariff.

2.1.19.2. ***Execution of works***

While assessing whether the works/projects of the transmission network were planned and executed efficiently by the Company, Audit observed that only 3 out of the 53 works/projects were completed within their scheduled completion dates. The reasons for delay in completion of the balance works/projects were:

- Failure to re-assess the project site and prepare revised layout plans/designs before tendering the work as there were changes in ground

conditions due to long delays in tendering the work from date of the approval of its DPR;

- Delay in approval of designs for the substations and lines;
- Failure to identify forest land and railway projects in the survey resulting in delay in applying and obtaining clearances from Forest Department/Railways;
- Failure to file for statutory clearances immediately upon their identification in the survey and ensure simultaneous clearance for right of way along with award of works;
- Failure to invoke the enabling provisions of the Indian Telegraph Act for ensuring right of way, despite having favourable judgments;
- Failure to take timely action to short-close and invoke penal provisions on the defaulting contractors;
- Inadequate monitoring to address the delay in completion of works.

Recommendations

The Company may:

1. **adhere to the norms fixed in the Manual on Transmission Planning Criteria before planning for additions to the existing transmission capacity so as to avoid creation of excess transmission capacity;**
2. **conduct proper survey, ensure hindrance free line corridor while awarding the works by initiating proposals well in advance to obtain statutory clearances, *viz*. forest, railways, *etc* in coordination with the Government and resolving the right of way problems, if need be, by invoking the provisions available under Indian Telegraph Act, 1885 so that the completion of works are not hampered;**
3. **revisit the location of substations prior to award of works to ensure that the layout plans, designs and drawings as proposed in the DPRs hold good and ensure completion of connected source and evacuation lines before establishing substations;**
4. **identify and take stringent action on the defaulting contractors and ensure prompt enforcement of contractual obligations to complete the projects in time;**
5. **strengthen the Project Monitoring System so as to capture pre-construction planning activities, potential risks and mitigation measures during execution and also uploading of photographs or GIS information to track progress of the work with reference to Activity Chart. Also, a tool for evaluation of benefits post completion of projects may be included.**