सत्यमेव जयते

Report of the Comptroller and Auditor General of India on Planning and implementation of transmission projects by Power Grid Corporation of India Limited

भारतीय लेखापरीक्षा और लेखा विभाग ✦ INDIAN AUDIT AND ACCOUNTS DEPARTMENT

लोकहितार्थ सत्यनिष्ठा
Dedicated to Truth in Public Interest



Union Government (Commercial)
No. 9 of 2020
(Performance Audit)

Report of the Comptroller and Auditor General of India

on

Planning and implementation of transmission projects by Power Grid Corporation of India Limited

for the year ended March 2019

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Preface

Power Grid Corporation of India Limited (PGCIL), a Maharatna Central Public Sector Enterprise, is mandated under the Electricity Act to ensure development of an efficient, coordinated and economical system of interstate transmission lines for smooth flow of electricity from generating stations to load centres. Transmission service provider is a key intermediary between generator and distributor of electricity and an efficient and effective transmission network facilitates generation and utilization of power. Inadequacies in transmission network and delay in commissioning of transmission projects may not only result in loss of revenue to PGCIL but may also lead to congestion in evacuation of power. On the other hand creation of lines of higher capacity than required or abnormal redundancies in transmission assets may result in extra financial burden on beneficiaries and public at large.

In the above backdrop, performance audit was taken up to assess the effectiveness of planning and implementation of transmission projects by PGCIL during Twelfth Plan (2012-2017) along with status of augmentation of transmission network up to March 2018.

The Audit Report has been prepared in accordance with the Performance Audit Guidelines and Regulations on Audit and Accounts, 2007 of the Comptroller and Auditor General of India.

Audit wishes to acknowledge the co-operation received from PGCIL and Ministry of Power, Government of India at each stage of the audit process.

Executive Summary

Introduction

Inter-state and intra-state transmission systems are interconnected and together constitute the electricity grid. Power Grid Corporation of India Limited (PGCIL), a Central Public Sector undertaking was established under the administrative control of Ministry of Power (MoP) in 1989 for manning, constructing, operating and maintaining transmission facilities for development of national grid. Subsequently, PGCIL was also notified (December 1998) as Central Transmission Utility (CTU) by GOI and was thereby mandated under section 38 (2) (c) of the Electricity Act, 2003 to discharge all functions of planning and co-ordination relating to inter-state transmission system and to ensure development of an efficient, coordinated and economical system of inter State transmission lines.

This Performance Audit covers all activities from conceptualisation to implementation of selected major transmission projects executed by PGCIL between April 2012 and March 2017 along with the status of augmentation to the transmission network by PGCIL. Major audit findings are summarised below:

Major Audit Findings:

Absence of Network Plan

National Electricity Plan, November 2012 (NEP) required CTU (PGCIL) to coordinate with State Transmission Utilities (STUs) and other stake holders to prepare a well-co-ordinated transmission plan for the country. Guidelines for encouraging competition in development of transmission projects (April 2006) of Ministry of Power enjoined upon CTU the key responsibility of network planning and development based on National Electricity Plan (NEP) in coordination with concerned agencies. As per guidelines, Network Plan was required to include (i) the projects for new transmission lines and substations and (ii) strengthening and up-gradation of the existing lines and was to be updated annually and hosted on the website.

However, CTU failed to discharge its key responsibility of preparing an annual Network Plan based on NEP (November 2012) for transmission capacity addition during 2012-13 to 2016-17.

(Para No.3.2.1)

Mismatch between transmission projects and associates

National Electricity Policy, 2005 requires that while planning new generation capacities, requirement of associated transmission capacity would need to be worked out simultaneously in order to avoid mismatch between generation capacity and transmission facilities.

Out of 11 generation linked transmission projects selected in audit, eight projects were completed till July 2018. Out of these eight projects, there was delay in commissioning of six transmission systems associated with generation projects in the States of Chhattisgarh, West Bengal and Odisha due to which there was congestion in evacuation of power.

(Para No. 3.2.2)

Insufficient focus on upgradation of existing lines

Due to absence of Network Plan, a structured mechanism to assess and focus on the requirement for upgradation of the existing lines in advance was not available with PGCIL. NEP 2012 stated that a better alternative to laying out new lines (in many cases) could be to upgrade the existing corridors to higher voltage or to re-conductor the lines to higher capacity. NEP, therefore, emphasised the need to consider the possibility of increasing the transmission capacity of existing lines in the planning stage itself. Audit observed an instance where PGCIL preferred laying a new line instead of pursuing an available option to upgrade the existing line. Audit further noticed that recommendations of CERC committee for improving loadability or re-conductoring of lines also remained substantially unattended to by PGCIL. As a result, high loading in some of the lines (like 400 kV Singrauli – Anpara S/c line, 400 kV Anpara and Obra line, and 400 kV Mohindergarh - Bhiwani line) which were suggested for re-conductoring in January 2015, was observed that was causing transmission congestion in Northern Region.

(Para No.3.2.4)

No plan for augmentation of transfer capacity in long term

Two parameters viz. Transmission Capacity and Transfer Capacity are relevant for assessing the capacity of inter – regional corridors. Transmission capacity of a corridor is arrived at by adding the ratings of all transmission lines connecting two regions. Transfer capacity on the other hand, is the ability of a corridor, as a whole, to reliably move power from one region to another. NEP 2012, stipulates that the transmission capacity being summation of capacities of inter-regional links is a figurative representation of the bonds between the regions and does not indicate actual power transfer capacity across different regions/ states.

Thus, transmission capacity, has no meaningful role in indicating capacity of corridors to handle power flows. However, PGCIL assessed the need for augmentation of capacity of inter-regional corridors based on 'Transmission Capacity' only and does not fix targets or monitors augmentation of Total Transfer Capacity (TTC), although as per CERC Regulations declaration of TTC for four years is required to be done by PGCIL on 31 March each year.

Audit, however, observed that PGCIL fixed targets and prepared plans only for the transmission capacity to be augmented over a period but no targets were fixed or declaration made for achieving the transfer capability in long term. In the absence of the declaration of TTC for four years as per the regulatory requirements, there was no benchmark to assess the actual performance of the company in terms of its capability to transfer power.

It was observed that at the end of Twelfth Five Year Plan, TTC of different corridors ranged between 19.97 *per cent* and 83.66 *per cent* of their respective transmission capacity. In the absence of the declaration of TTC for four years as per the regulatory requirements, there was no benchmark to assess the actual performance of the company in terms of its capacity to transfer power.

Audit further observed that in some corridors, despite significant addition to transmission capacity in XII Plan {ER-NR (8900 MW) and WR-SR (10600 MW)}, TTC in terms of percentage to transmission capacity actually decreased from 25.56 *per cent* to 19.97 *per cent* in ER-NR corridor and from 65.79 *per cent* to 40.76 *per cent* in WR-SR corridor.

(Para No. 3.2.5 and 3.2.6)

Reduced margins for Short and Medium Term Open Access

Access to transmission system is given to users through Long Term Access (LTA)/ Medium Term Open Access (MTOA)/ Short Term Open Access (STOA). As per NEP 2005, network expansion should be planned and implemented keeping in view the anticipated transmission needs that would be incident upon the system in the open access regime.

However, the transmission planning process was largely driven by the LTA to Inter-state Transmission system (ISTS) and access to short term and medium-term users is being provided from within the margins available in the system. As, some generators take connectivity without LTA and evacuate power through MTOA and STOA for which no augmentation is carried out, this results in congestion in ISTS. It is evident from the information provided by POSOCO that due to inadequate margins available in the transmission system for short term open access there were rejections (3,06,156 MWhr during the year 2017-18) of STOA requests for transfer of power from different regions.

Non-availability of adequate margins for short term transactions resulted in congestion and affected free flow of power from surplus to deficient regions which was also visible as variations in the electricity prices over regions.

(Para No. 3.2.7)

Issues in obtaining forest clearances

Works and Procurement Policy of PGCIL (WPPP) required detailed survey of forest stretches and river crossings to be carried out before preparation of Bill of Quantities (BOQ) and Notice Inviting Tender (NIT) cost estimates. However, quantities for the purpose of BOQ and NIT cost estimate were prepared based on forest atlas, toposheet and walkover survey of the area resulting in significant variations in forest areas encountered by various transmission lines. Out of 18 selected projects, variations in forest area in two projects ranged between 20 and 30 *per cent* and in 15 projects, it was more than 30 *per cent* and consequent variation in transmission line length (the variation was less than 10 *per cent* in 31 transmission lines, between 10-20 *per cent* in 15 lines, between 20-30 *per cent* in seven lines and more than 30 *percent* in 19 lines) resulting in extra cost of ₹118.31 crore on account of quantity variation.

Besides, in three projects, there were instances of delays in submission of proposals for forest clearance from the stipulated time by PGCIL. Various documents which were required to be submitted under Forest (Conservation) Act, 1980 at the time of application for forest proposal were not submitted by PGCIL, which resulted in re-submission of forest proposals and consequent delays.

(Para No. 4.2.1)

Delay in execution of projects and scope for better monitoring

Out of the 18 selected projects, only two projects were completed within scheduled time upto December 2018 and 13 projects were completed with delays ranging from 4 to 71 months. Remaining three projects were under execution with anticipated delays ranging from 6 to 109 months in completion. Some of the reasons for delay for e.g. delay in submission of proposals for forest clearance, delay in providing front/ site by PGCIL, delay in supply/ issue of material/ quantity clearance by PGCIL, delay in finalising amendment in LOA/ approval of Bill of Material, etc. could have been controlled by better project management. Due to delay in completion of projects within prescribed CERC timelines, PGCIL also lost the opportunity of earning ₹112.48 crore during the project life towards additional Return on Equity as part of tariff.

(Para 4.3.4 and 4.6)

Absence of mechanism to assess utilisation of completed transmission lines

The Company had not devised any mechanism or fixed any criteria/ benchmark for assessing the utilisation of the completed and commissioned transmission lines. Audit analysis of the utilisation of 30 completed transmission lines (completed between December 2013 and March 2019) of 18 selected projects based on the power flow data obtained from POSOCO disclosed that peak/ maximum power flows in 18 out of 30 lines (60 *per cent*) remained below 40 *per cent* of their respective maximum

loadability during the period since their inception to March 2019. This underscores the need for PGCIL to set up a system of regular monitoring for line utilisation and to take steps for optimum utilisation of assets.

(Para No. 4.7.1)

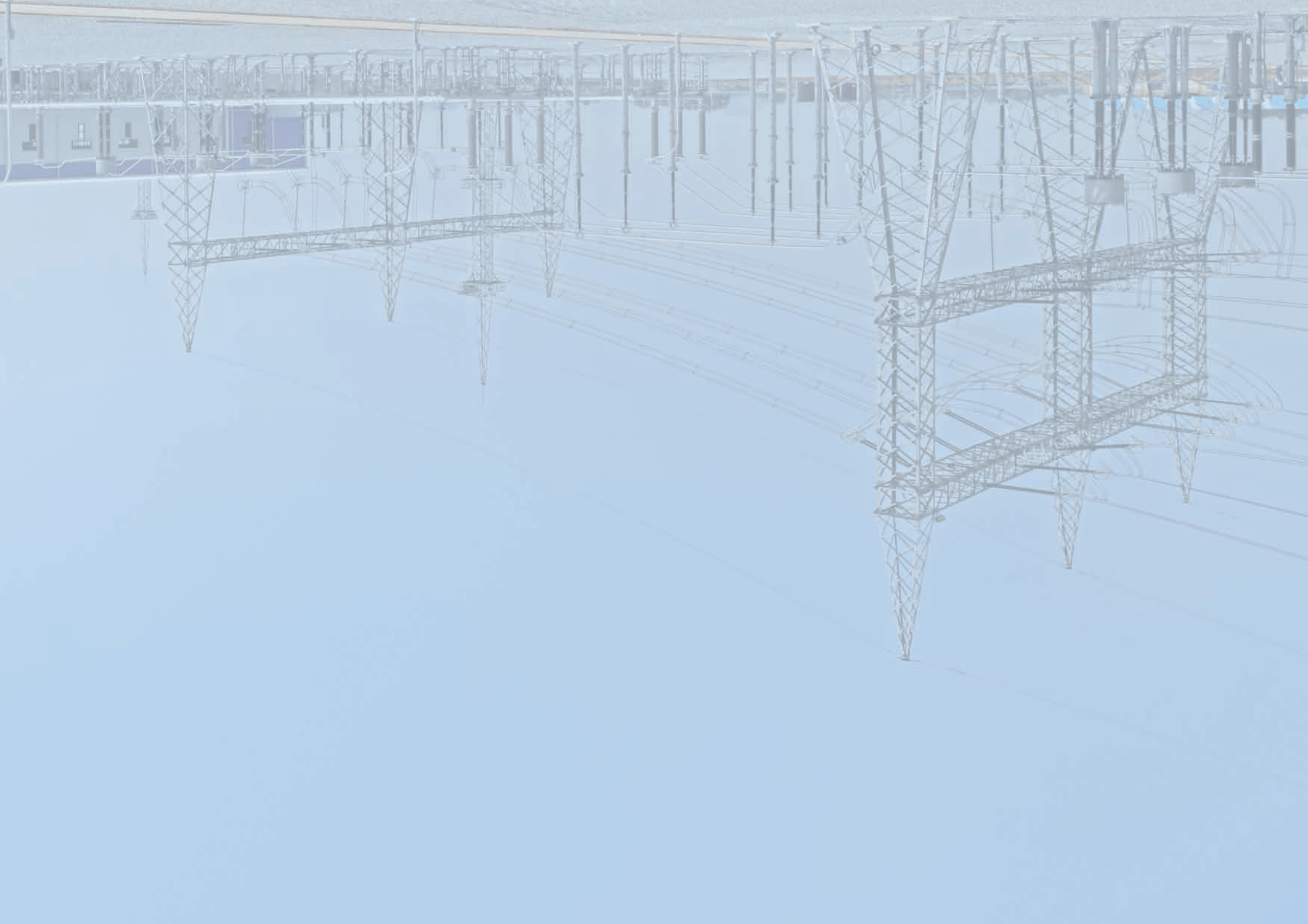
Monitoring mechanism for implementation of transmission projects, though in place, needed further strengthening as only one to four meetings were held by each Region during 2012-17 against the requirement of holding 30 project review meetings during that period. Thus, in the absence of timely follow up on the progress of work or action taken for timely completion of projects the intended purpose of monitoring was not served.

(Para 5.2 and 5.3)

Recommendations

Based on the Audit findings, the following recommendations are made to facilitate improvement in planning and implementation of transmission projects:

1. The existing regulations may be reviewed to assess the need for modification, in order to address the requirements of STOA.
2. CTU may prepare Annual Network Plan based on the NEP plan as per directions given by Ministry.
3. A comprehensive re-optimisation study may be undertaken by an independent group (Internal technical audit team) to improve economy and efficiency in general and reliability, resilience, IR TTCs and ISTS-STU TTCs in particular.
4. CTU may ensure coordinated planning and execution of inter-state transmission system with associated generation projects as well as with intra-state transmission system to avoid mismatch. PGCIL may also put in place an institutional mechanism to review and monitor the status of interconnected transmission schemes and to update transmission data files for planning software.
5. PGCIL may record efforts made to explore the possibilities of upgradation of the existing transmission lines before deciding construction of new line.
6. PGCIL may disclose on its website and monitor the key parameters of TTC over a four-year period as per the CERC regulations.
7. PGCIL may initiate advance action for detailed survey for preparing BOQ and NIT cost estimates and submit forest proposals within the stipulated time to expedite the project execution.
8. PGCIL may take steps to minimise delays in project execution due to factors which are controllable by PGCIL through effective monitoring.



Chapter - 1

1.1 Introduction

India's power transmission networks constitute vital arteries of the entire power value chain. It goes without saying that the growth of power sector is contingent to development of a robust and a non-collapsible transmission network. Over the past decades, the total power capacity has witnessed commendable growth, with more than 232 GW of generation capacity currently installed. However, the peak load supply is only 141 GW, and aggravating this situation further is the fact that some of the power surplus regions do not have adequate power evacuation infrastructure which could alleviate the recurring supply shortages in other regions. With a planned generation capacity addition estimated at 88 GW in the Twelfth (12^{th}) Plan along with improved generation and resolution of fuel issues for existing capacity, a corresponding increase in transmission capacity is needed to ensure that power generated reaches the end consumer.

The development and present status of the transmission system (of 220kV and above voltage level) from the 10^{th} Plan (2002-07) to the 12^{th} Plan (2012-17) is indicated in Table 1.1.

Table 1.1

Transmission Lines: (in ckm[1])	**At the end of 10^{th} plan**	**At end of 11^{th} plan**	**12^{th} plan targets and achievements**		**% completion**
			Targets	**Achievements**	
HVDC Bipole line	5,872	9,432	7,440	6124	**82.31**
765 kV	2,184	5,250	27,000	25990	**96.26**
400 kV	75,722	1,06,819	38,000	50968	**134.13**
220 kV	1,14,629	1,35,980	35,000	27288	**77.97**
Total Transmission Line, ckm	1,98,407	2,57,481	1,07,440	110370	**102.73**

Source CEA Reports

Transmission planning is a continuous process of identification of transmission systems, addition requirements, need and timeframe of implementation commensurate with generation addition and growth in demand for electricity. It has to be in consonance with the principle of development of power system enshrined in Section 3 of the Electricity Act, 2003, (the Act) i.e. 'for development of the power system based on optimal utilisation of resources such as coal, natural gas, nuclear substances or materials, hydro and renewable sources of energy'.

Electricity is a concurrent subject under the Constitution of India (Entry No.38 in List III of Seventh Schedule). Hence, both Central and State Governments are responsible for development of electrical energy in the country. Inter-state and intra-state transmission systems are interconnected and together constitute the electricity grid. Assessment of demand is an important pre-requisite for planning

[1] ***Circuit Kilometre***

capacity addition. Section 3 (4) of the Act requires the Central Electricity Authority (CEA) to frame a National Electricity Plan once in five years and revise the same from time to time in accordance with the National Electricity Policy. Also, section 73 (a) of the Act provides that formulation of short-term and perspective plans for development of the electricity system and coordinating the activities of various planning agencies for the optimal utilization of resources to subserve the interests of the national economy, shall be one of the functions of the CEA.

The CEA is vested with the responsibility of planning the entire electricity system while the Central Transmission Utility (CTU) is responsible for planning the transmission system in coordination with all stakeholders. Also, prior approval of the appropriate government is required to construct an overhead transmission line as per Section 68 of the Act. Ministry of Power (MoP) grants approval to Power Grid Corporation of India Limited (PGCIL) to take up implementation of transmission projects.

1.2 Profile of Power Grid Corporation of India Limited

PGCIL was established in 1989 to implement the decision (August 1989) of GOI to form a 'National Grid' with the following main responsibilities:

(i) to plan, promote and build an integrated and efficient power transmission network in all aspects including investigation, planning, engineering and design;

(ii) to prepare preliminary feasibility and detailed project reports;

(iii) to construct, own, operate and maintain transmission lines, sub-stations, load despatch and communication facilities and appurtenant work;

(iv) wheeling of power generated at various power stations in accordance with the policies and objectives laid down by GOI from time to time; and

(v) keeping abreast of technology development in transmission, load despatch and communication system.

PGCIL took over (April 1991 to August 1993) transmission assets from seven Central Generating Companies[2] and also took control of existing five[3] Regional Load Despatch Centres (RLDC) in the country between 1994 and 1996. National Load Despatch Centre (NLDC) was inaugurated (February 2009) with the responsibility of monitoring operations and grid security of the national grid and to supervise scheduling and despatch of electricity over inter-regional lines in coordination with RLDCs. These functions were transferred (October 2010) to a wholly-owned subsidiary {i.e. Power System Operation Corporation Limited

[2] ***NTPC Ltd., NHPC Ltd., North Eastern Power Corporation Ltd., SJVN Ltd., Neyveli Lignite Corporation Limited, Nuclear Power Corporation Limited and THDC India Limited***

[3] ***Northern Regional Load Despatch Centre, Southern Regional Load Despatch Centre, Western Regional Load Despatch Centre, Eastern Regional Load Despatch Centre and North Eastern Regional Load Despatch Centre***

(POSOCO)} of PGCIL, which was established in March 2009 (in January 2017, POSOCO was separated from PGCIL and became a separate Company). Over the years, five regional grids were integrated in stages through inter-regional links to finally form a National Grid in December 2013.

PGCIL was notified (December 1998) as the CTU by GOI and is mandated under section 38 (2) (c) of the Act to, *inter-alia* ensure development of an efficient, co-ordinated and economical system of inter-state transmission lines for smooth flow of electricity from generating stations to load centre.

PGCIL was conferred Miniratna[4] (Category-I) status by GOI in October 1998, Navratna[5] status in May 2008 and, thereafter, Maharatna[6] status in October 2019. As on 31 March 2017, the authorised capital and paid up capital were ₹10,000 crore and ₹5,231.59 crore respectively and 57.*90 per cent* of its equity was held by GOI. Equity shares of PGCIL were listed on National Stock Exchange (NSE) and Bombay Stock Exchange (BSE) in October, 2007.

1.3 Physical performance of PGCIL

The physical performance of PGCIL during last six years ending of 31 March of each financial year of 12th plan is given below in Table 1.2.

Table 1.2[7]

Particulars	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Length of transmission lines (ckm)	1,00,200	1,06,804	1,15,637	1,29,354	1,39,077	1,48,149
Number of sub-stations	167	184	192	207	219	234
Transformation capacity (in Mega Volt Ampere)	1,64,763	2,05,923	2,31,709	2,54,848	2,89,543	3,31,163
Transmission Network availability (in *per cent*)	99.90	99.92	99.78	99.72	99.79	99.81

1.4 Role of PGCIL

Transmission system projects are conceived based on requirements assessed by PGCIL in consultation with the CEA, power generators, beneficiaries, regulators and other utilities. PGCIL carries out the work of planning, execution, operation and maintenance of the inter-state transmission system projects for evacuation of power, within and across regions.

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4 ***Miniratna status provides powers to the Board of PGCIL to undertake new projects, modernisation, purchase of equipment, etc. up to ₹300 crore or equal to their net worth whichever is lower without approval of GOI***

5 ***Navratna status provided powers to the Board of PGCIL to undertake new transmission projects of any amount without approval of GOI***

6 ***Maharatna status provides powers to the Board of PGCIL to undertake new transmission projects / replacement of any amount without approval of GOI***

7 ***These figures represent end period status except Transmission network availability, which is during the year***

1.5 Rationale of Performance Audit

A Performance Audit on "Planning and Implementation of Transmission Projects by PGCIL and Grid Management by POSOCO" was conducted by this office in the year 2012-13 covering the period from April 2007 to March 2012. The audit findings were included in the Audit Report No. 18 of 2014 of the Comptroller and Auditor General of India. The Report was tabled in Parliament in August 2014 and was selected for examination by the Committee on Public Undertakings (COPU). COPU tabled its Report containing 13 recommendations in Parliament in February 2016. Action Taken Note (ATN) of the COPU report was submitted by the Ministry in March 2017 and vetting remarks for the same were submitted to COPU by CAG's Office. On perusal of the ATN and vetting remarks, COPU stated that the Government had accepted 10 recommendations, one recommendation need not be pursued and for two recommendations only interim replies had been furnished by the Government. COPU has noted that the 10 recommendations which had been accepted by the Government needed to be monitored and further details were called for by COPU.

There have been instances of transmission lines being forced to take a different route than planned, resulting in the entire project budget going out of control. Power transmission constraints have also made it difficult to evacuate excess power and channel it to regions that face shortages. Projects have had to purchase power from costlier sources while others remained under - utilised. Hence, there is an urgent need to timely address underlying issues in the transmission sector to ensure that power demand is effectively met in the future.

The present Performance Audit also analysed shortcomings persisting in the system and areas, which need further improvement.

Chapter - 2

Audit Framework

2.1 Scope of Audit

The Performance Audit covers all activities from conceptualisation to implementation of selected major transmission projects executed by PGCIL between April 2012 and March 2017 along with the status of augmentation to the transmission network by PGCIL.

2.2 Audit objectives

Audit objectives of the Performance Audit were to assess:

(i) whether transmission plans for projects of all types (generation linked, grid strengthening, inter-regional and green corridors[8]) were optimal, adequate and in line with National Electricity Policy,

(ii) whether the projects were executed economically, efficiently and effectively, and

(iii) the impact of investment on improvement of national transmission grid capacities.

2.3 Audit criteria

The Audit criteria adopted for the performance audit are:

(i) Electricity Act, 2003;

(ii) National Electricity Policy, 2005;

(iii) National Electricity Plan and Perspective Plan;

(iv) Tariff Policy, 2006, subsequent amendments and revisions;

(v) Regulations issued by the Central Electricity Regulatory Commission (CERC) relating to transmission;

(vi) XII Plan documents and Report of the Working Group on Power for the XII plan;

(vii) Decision of the Board of Directors and Sub-committees of Board level;

(viii) Decision of Standing Committee for power system planning, Regional Power Committees (RPC) and Project Review Meetings;

(ix) Operational and other feedback/ comments sent by POSOCO to CEA, CERC and PGCIL;

(x) Data maintained by POSOCO (List of lines, power-flows, outages etc.;

[8] ***Green corridor is a transmission corridor, planned and executed, to evacuate power mainly from renewable sources like wind and solar energy***

(xi) Guidelines/ Decisions of Ministry of Power/ MNRE/ Ministry of Environment & Forest/ CEA etc.; and

(xii) Works & Procurement Policies and Procedures, CVC guidelines etc.

2.4 Audit Methodology

An Entry Conference was held with the Management of PGCIL on 8 May 2018, wherein scope of audit, audit objectives, audit criteria and audit sample were discussed. Field audit was conducted during May 2018 to September 2018 wherein relevant records in PGCIL were examined and discussions were held with the Management. During the course of audit, observations were issued to the Management for their comments. Draft report was issued to the management on 05 November 2018 for their comments. Replies of the management were received on 03 January 2019. Exit Conference was held on 07 January 2019 with the Management of PGCIL. Draft report was issued to the Ministry of Power on 05 February 2019 for their comments. The reply of Ministry was received on 27 June 2019 and Exit Conference with the Ministry was held on 07 January 2020. Minutes of Exit Conference and reply of Ministry have been suitably considered while finalising this draft report.

2.5 Audit Sample and coverage

PGCIL executed 294 projects[9] during the period 2012-17 through 1,773 contract packages. Sampling was carried out in two stages. In the first stage, projects were selected and in the second stage individual contracts under selected projects were selected. Out of the 294 projects on which capital expenditure of ₹1,09,987.30 crore was incurred during the period 2012-17, 18 high value projects involved capital expenditure of ₹52,599.60 crore (47.82 *per cent*). Excluding two[10] of these projects which were covered in the earlier Performance Audit and one project[11], wherein both planning and award of contract packages was finalised before 12th Plan period(2012-2017), the remaining 15 projects have been selected for examination in the present Performance Audit. Capital expenditure incurred on the 15 projects was ₹46,179.10 crore (41.98 *per cent*) out of total expenditure of ₹1,09,987.30 crore upto March 2017.

Besides, PGCIL also executed nine transmission projects valuing ₹2,999.70 crore for Renewable Energy through 157 contract packages. Out of nine projects, three high value ongoing projects (Green Energy Corridor projects) with total capital expenditure of ₹2,352.88 crore (78.43 *per cent*) upto March 2017 have been selected.

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[9] ***Other than nine transmission projects for Renewable Energy***

[10] ***Transmission System Associated with Mundra Ultra Mega Power Project and Transmission system for Phase I generation Projects in Orissa - Part B***

[11] ***Common system associated with Coastal Energen Private Limited and Ind-Barath Power (Madras) Limited LTOA Generation Projects in Tuticorin Area (Part-B)***

Thus, the total sample of selected 18 projects[12] constitutes 42.95 *per cent* of the total population in terms of value and 5.94 *per cent* in terms of number of projects[13]. List of 18 projects selected is given in ***Annexure 1.*** Fifteen of these projects were completed while three projects were on-going as on December 2018.

Further, 326 contracts[14] were awarded for erection of the above 18 projects out of which, 120 contracts[15] had been selected by adopting Stratified Random sampling using IDEA software.

2.6 Audit findings

Audit findings are discussed in the subsequent chapters under the following headings:

Chapter 3: Planning of Transmission System.

Chapter 4: Project Execution and Utilisation of Completed lines.

Chapter 5: Project Monitoring. and

Chapter 6: Conclusion and Recommendations.

2.7 Acknowledgement

The cooperation extended by the Management of PGCIL and Ministry of Power in facilitating smooth conduct of the performance audit is appreciated and acknowledged.

[12] ***3 renewable energy projects and 15 other projects***

[13] ***In the earlier Performance Audit, 20 projects were selected which constituted 37 per cent in terms of value and 14 per cent in terms of number of projects planned and executed by PGCIL during April 2007 and March 2012***

[14] ***86 for renewable energy and 240 for other projects***

[15] ***32 for green energy and 88 for other projects***

Chapter - 3

Planning of transmission system

3.1 Planning process of transmission projects

Inter-state Transmission system (ISTS) is planned by PGCIL on the basis of requests for long term access (LTA) received from Inter-State Generating Stations and inputs from POSOCO/ State Utilities/ CEA. On the basis of such inputs, power system studies are carried out by PGCIL either for evacuation of power from new generation project or for strengthening of transmission system/ removal of transmission constraints as required. The proposals for transmission schemes, including results of studies, are brought out in the form of Agenda at the meeting of Standing Committee for Power System Planning (SCPSP)[16] of the concerned regions. The proposal for a new transmission scheme is technically approved by the SCPSP. Empowered Committee on Transmission, under the chairmanship of Member (Power System), CEA, discusses and recommends to Ministry for implementation of transmission elements either through Tariff Based Competitive Bidding (TBCB) or through cost plus basis by PGCIL as per Tariff Policy. After approval of Ministry of Power for nomination of PGCIL for execution of project on cost plus basis, PGCIL prepares Detailed Project Report (DPR), which is submitted to CMD/ BOD for investment approval. Detailed planning process is explained in ***Annexure 2.*** Audit examined the planning process of PGCIL and observed the following inadequacies:

3.2 Deficiencies in planning of Transmission system

3.2.1 Absence of Network Plan

As per the provisions of Electricity Act 2003, CEA has been entrusted with the responsibility of preparing National Electricity Plan (NEP) for both generation and transmission. CTU is mandated to discharge all functions of planning and co-ordination relating to inter-state transmission system and to ensure development of an efficient, coordinated and economical system of inter-State transmission lines for smooth flow of electricity. As per National Electricity Policy 2005, CTU has the key responsibility of network planning and development based on the NEP, 2012 in coordination with all concerned agencies.

Further, as per Guidelines for encouraging competition in development of transmission projects (April 2006) of Ministry of Power, CTU has the key responsibility of network planning and development based on NEP in coordination with concerned agencies. The practice of carrying out network

[16] ***SCPSP for each region is constituted by CEA for carrying out its duties of integrated planning under section 73 (a) of the Electricity Act, 2003. These committees are headed by Member CEA and have representative of Central Transmission Utilities, State Transmission Utilities, Central Generating Units (CGUs) etc. as members. SCPSP provides technical approval to the projects***

planning by the Government/ Transmission Companies was noticed in different countries[17]. Network Plan is required to include (i) projects for new transmission lines and substations and (ii) strengthening and upgradation of existing lines. Guidelines further added that network plan will be hosted on the website of the CTU and is to be reviewed and updated as and when required but not later than once a year.

In compliance with the above provisions, CEA notified NEP (November 2012) for generation and transmission capacity addition during 2012-17. However, audit observed that no Network Plan was found available in the records or on the website of CTU.

Due to absence of Network Plan, a structured mechanism for timely dissemination of the likely additions/ modifications to the transmission system to stakeholders, and for assessing and focusing on the requirement for upgradation of the existing lines in advance was not available as discussed in the subsequent para.

In the Exit Conference with Ministry, Management stated (January 2020) that as per Electricity Act, CEA is to formulate short term and perspective plan and in this exercise, CTU extends necessary support in preparation of comprehensive network plan. Based on NEP and inputs from stakeholders, schemes were finalised and discussed in the Standing Committee from time to time and implemented. Planning of annual transmission network beforehand may not be possible as it depends on various inputs from stakeholders.

Reply of Management/ is not acceptable because as per the guidelines of Ministry, CEA was to prepare perspective plan whereas CTU was to prepare Network Plan based on perspective plan for implementation, and host the same on the website which was not done. Internationally also, for example in United Kingdom[18](UK), network planning is carried out annually by their system operator.

3.2.1.1 Non-availability of timely information to stake holders about new projects

Audit observed that as per the 12th five year plan 2012-17, PGCIL had planned to execute 162 projects during that period. However, 182 unplanned projects were also executed while 41 planned projects were not undertaken, making a total execution of 303 projects by March 2017. But these changes were nowhere reflected as part of any network plan. A professional approach to planning requires that additional schemes be conceived at the beginning of each financial year and the information be disseminated for the information of stakeholders. In the absence of annual plan, the overall transmission plan becomes an aggregation of additional plans approved in each meeting of the SCPSP and there is a

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[17] ***As per Power and Energy Journal Volume 14 Number 4 July August 2016 of Institute of Electrical and Electronics Engineers, USA***

[18] ***National Grid ESO is the electricity system operator of UK published Forward Plan 2020-21, which apart from other things included system insight, Planning and Network development***

possibility that each individual scheme would focus on addressing the immediate issue, thereby, compromising the larger perspective of an economical and optimum transmission plan.

A well-defined Network Plan to map these changes on an annual basis, which was hosted on the website would have provided timely and useful information to the STUs and other stakeholders (States/ Centre regulators, generator and DISCOMs). Besides, this would have included measures being taken up by PGCIL for enhancement of inter-regional and inter-state power transfer capacity and removing transmission constraints, which would be of added value. A proper network plan and its dissemination would help strengthen the mechanism for the CTU to discharge its coordination role as mandated in the Electricity Act. This would aid in reducing the possibilities of mismatch of the transmission system with linkages of other stakeholders like generators and STUs, etc. Few instances of mismatch of the transmission system of PGCIL with generators and STUs are highlighted in Para 3.2.2 in this Report.

3.2.2 Mismatch of planning of transmission lines

3.2.2.1 Mismatch in planning transmission lines for evacuation of power from generation projects

National Electricity Policy, 2005 requires that while planning new generation capacities, requirement of associated transmission capacity would need to be worked out simultaneously in order to avoid mismatch between generation capacity and transmission facilities. CERC regulations on "Grant of Connectivity, Long Term Access and Medium Term Open Access" also allow injection of infirm power *(i.e.* power generated by a power station prior to its date of commercial operation) by a generating station into transmission system six months prior to its commissioning. Therefore, transmission system associated with a generation project should precede the date of commercial operation of the generating station at least by six months.

Out of 11 generation linked transmission projects selected in audit, eight projects were completed till July 2018. Out of these eight projects there was delay in commissioning of six transmission systems associated with generation projects in the States of Chhattisgarh, West Bengal and Odisha due to which there was congestion in evacuation of power. Details of generation projects and associated transmission projects are discussed in Table 3.1.

Table 3.1

Sl. No.	Name of Transmission projects/ generating Projects	Installed capacity (In MW)	Scheduled Commissioning of Generation Project	Scheduled Commissioning of Transmission Project	Actual commissioning of Generation Project	Actual commissioning of Transmission Project
(i) System strengthening in North/ West part of WR for IPP projects in Chhattisgarh, (ii) System strengthening in western part of WR for IPPs in Chhattisgarh and (iii) WR – NR HVDC Interconnector for IPP Projects in Chhattisgarh.						
1	RKM Powergen Ltd. (4x360)	1,440	June 2011 onwards	July 2014 to June 2015	October 2015	Sept 2017 to Dec 2017
2	Athenea Chhattisgarh Power Ltd. (2x600)	1,200	June 2013 onwards	July 2014 to June 2015	Not commissioned	Sept 2017 to Dec 2017
3	Jindal Power Ltd. (4x600)	2,400	March 2012 onwards	July 2014 to June 2015	September 2013	Sept 2017 to Dec 2017
4	Jindal Power Ltd. (225 MW Dongamahua CPP + 175 MW Tamnar TPS	400	July 2010, Existing	July 2014 to June 2015	Existing	Sept 2017 to Dec 2017
5	SKS Power Gen. Ltd. (4x300)	1,200	December 2012 onwards	July 2014 to June 2015	April 2017	Sept 2017 to Dec 2017
6	Korba West Power Co. Ltd. (1x600)	600	Nov 2012	July 2014 to June 2015	March 2013	Sept 2017 to Dec 2017
7	DB Power Ltd. (2x600)	1,200	October 2013	July 2014 to June 2015	October 2013	Sept 2017 to Dec 2017
8	KSK Mahanadi Power Co. Ltd (6x600)	3,600	February 2012 onwards	July 2014 to June 2015	August 2013	Sept 2017 to Dec 2017
9	BALCO (4x300)	1,200	October 2010 onwards	July 2014 to June 2015	October 2011 (interim arrangement started)	Sept 2017 to Dec 2017
10	Vandana Vidyut Ltd. (2x135+1x270)	540	Jan 2012 onwards	July 2014 to June 2015	December 2013	Sept 2017 to Dec 2017
11	Lanco Amarkantak Power Pvt. Ltd (2x660)	1,320	Jan 2012 onwards	July 2014 to June 2015	Not yet commissioned	Sept 2017 to Dec 2017
12	Chhattisgarh Steel & Power Ltd. (1x35+1x250)	285	June 2013	July 2014 to June 2015	Not yet commissioned	Sept 2017 to Dec 2017
13	Chhattisgarh state Power Tr. Co. Ltd.			July 2014 to June 2015	-	Sept 2017 to Dec 2017
14	GMR Chhattisgarh Energy	1,370	August 2013 onwards	July 2014 to June 2015	February 2015	Sept 2017 to Dec 2017
(iv) Transmission system for Phase –I generation projects in Orissa (Part C)						
1	Sterlite Energy Ltd.	2,400	June 2010	March 2014	October 2010	August 2015
2	GMR Kamalanga Energy Ltd.	1,050	November 2011	March 2014	March 2013	August 2015
3	Navbharat Power Pvt. Ltd.	1,050	March 2012	March 2014	Not commissioned	August 2015
4	Monet Power Company Ltd.	1,050	July 2012	March 2014	Not commissioned	August 2015
5	Jindal India Thermal Power Ltd.	1,200	March 2012	March 2014	May 2014	August 2015
6	Lanco Babandh Power Pvt. Ltd.	2,640	December 2013	March 2014	Not commissioned	August 2015
7	Ind Barath Energy (Utkal) Ltd.	700	December 2011	March 2014	Feb 2016	August 2015

Sl. No.	Name of Transmission projects/ generating Projects	Installed capacity (In MW)	Scheduled Commissioning of Generation Project	Scheduled Commissioning of Transmission Project	Actual commissioning of Generation Project	Actual commissioning of Transmission Project
(v) Transmission project for Ph-I Generation projects in Jharkhand and West Bengal Part A2 (vi) Transmission project for Ph-I Generation projects in Jharkhand and West Bengal Part B						
1	Adhunik Power	540	January 2012	August 2014 and October 2014	November 2012	April 2016 and October 2016
2	Essar Power (Jharkhand)	1,200	March 2013	August 2014 and October 2014	Uncertain	April 2016 and October 2016
3	Corporate Power Ph-I & II	1,080	September/ December 2013	August 2014 and October 2014	Uncertain	April 2016 and October 2016
4	West Bengal State Electricity Transmission/ Generation	1,000	Progressively by 2014-15	August 2014 and October 2014	-	April 2016 and October 2016

It can be seen from Table 3.1 that there was a clear mismatch between the scheduled commissioning of transmission system (March 2014 and June 2015) for the above projects vis à vis scheduled commissioning of the generating stations (June 2010 to December 2013), which was not in conformity with the requirements of the CERC Regulations. In addition to delay in planning the transmission projects, there were further delays in the execution of these transmission projects as none of the above transmission projects was commissioned as per their scheduled commissioning dates. There was a delay of eight months to one year in preparation and approval of DPR for these projects from the timelines fixed as per PGCIL's policy. Moreover, PGCIL took around 7-14 months for submitting application for forest clearance after investment approvals in the above six transmission projects. Accordingly, execution of the transmission projects was delayed even beyond their scheduled completion dates. Thus, generation projects were actually commissioned while the corresponding transmission projects were not ready to evacuate their power. Resultantly, interim arrangements had to be made for 21 to 56 months to evacuate the power produced by generating stations as given in Table 3.2.

Table 3.2

Sl. No.	Generation projects	Capacity	Period of interim arrangements
1	RKM Powergen Pvt. Ltd.	4X360 MW	Sep 14 to June 16
2	Korba West Power Co. Ltd.	1X600 MW	Feb 13 to April 16
3	KSK Mahanadi Power Co. Ltd.	6X600 MW	Aug 12 to Dec 16
4	BALCO	4X300 MW	Oct 11 to June 16
5	Vandana Vidyut	2X135MW+270MW	July 12 to March 17

Interim arrangements for injecting power disturbs power flow patterns, reduces reliability and can cause overloading of the transmission lines. Moreover, operational feedbacks submitted (February 2014 and January 2016) by POSOCO highlighted that non-availability of transmission system planned for evacuation of power from generation projects like Vandana Vidyut, KSK Mahanadi Power Co. Ltd, Korba West Power Co. Ltd, BALCO and Sterlite power projects, resulted in transmission constraints in Chhatisgarh and adjoining areas.

Management/ Ministry stated (January/ June 2019) that in some cases the applications for long term open access were received with a very small time gap of two to three years between date of application and the year of commissioning of generating units whereas implementation of transmission system generally takes about three to four years from the date of award. Accordingly, interim arrangements were planned in the respective Regional Standing Committee meetings for evacuation of power from the generation projects.

Reply of the management is to be viewed against the following facts;

- Even considering the time gap of two to three years given by the generators against the required time of three to four years for setting up a transmission system, the interim arrangements made by PGCIL for 21 months to 56 months cannot be justified. Further as per the Guidelines (April 2006) of Ministry of Power, CTU has the key responsibility of network planning and development based on NEP and not based on the LTA applications.
- Although it is correct that interim arrangements were agreed in the Standing Power Committee because scheduled commissioning of some of the generation projects was ahead of scheduled commissioning date of associate transmissions systems, actual implementation of generation projects was delayed. If the associated transmission systems are commissioned as per their own scheduled time frame, connectivity through interim arrangement could be avoided.

Thus, due to delay in completion of transmission lines, PGCIL was forced to evacuate power through interim arrangement against the directions given in the NEP which, as per POSOCO, resulted in congestion in Chhattisgarh and adjoining areas.

In the Exit Conference, Ministry agreed (January 2020) with the audit observation that delay should be an exception and not the rule.

3.2.3 Planning for evacuation of Renewable Energy

Forum of Regulators (FORs), a body of CERC Power Regulators, entrusted (5 October 2011) a detailed study for "Preparing a plan for transmission infrastructure development for likely capacity addition of Renewable Energy (RE) based power plants in the States rich in RE potential" to PGCIL.

PGCIL, along with State transmission utilities, conducted studies and prepared a Green Energy Corridor (GEC) Report which was submitted (September 2012) to Ministry of New and Renewable Energy. As per above report, a total of 17,683 MW RE capacity addition was envisaged by the end of 31 March 2017 in Rajasthan and Gujarat (potential States) out of which 5,212 MW was assessed surplus available for evacuation through ISTS after considering renewable purchase obligation (RPO) between 7-15 *per cent* for the host States and balance available for interstate transmission. For evacuation of the surplus 5,212 MW RE

power after intra State consumption by host states, PGCIL proposed 765 kV transmission corridor from Bhuj Pooling Station in Gujarat (WR) to Moga in Punjab (NR). Subsequently, CEA re-assessed (17 June 2013) RE capacity for Rajasthan and Gujarat to 10,423 MW. However, surplus available power after considering RPO of the host states was not re-assessed in the changed scenario.

Audit observed that against the planned RE capacity of 10,423 MW, 6,928[19] MW was commissioned in Gujarat and Rajasthan during the period 2012-17. However, transmission corridor planned for evacuation of RE power was not commissioned upto 31 March 2017. Only the part of the corridor from Bhuj-Ajmer was actually commissioned in stages from December 2017 to March 2019.

Management/ Ministry stated (January/ June 2019) that till 31 March 2017, no envisaged RE generation materialised for interconnection at GEC-Inter-state network. It was also stated that most of the RE generation had come up in Intra state only for host state consumption. Accordingly, GEC–ISTS scheme commissioning was rescheduled.

The reply itself indicates deficiencies in the planning because despite commissioning of 66.47[20] *per cent* of planned RE generation capacity in Rajasthan and Gujarat, no RE power was available for Inter-State transfer. It indicates that there was deficiency in the assessment of internal consumption of RE power in host States and also in the assessment of existing margin available in transmission system at the time of planning the system.

In the Exit Conference with Ministry, Audit requested (January 2020) Management to provide details of RE power evacuated from these corridors along with updated status of commissioning of the corridor. While the Ministry provided (May 2020) the details of RE capacity connected to ISTS, the details of power evacuated from these corridors were not provided which would have facilitated the assessment of adequacy and utilisation of the system.

However, Audit obtained the data of actual power flows from this line from POSOCO, which indicated that the average power flows in different sections of this corridor ranged between 2.93 to 6.79 *per cent* only and peak power flows never exceeded 30.65 *per cent*.

Thus, Green Energy Corridor transmission system planned for evacuation of RE power through Inter-State transmission network was not used effectively for its envisaged purpose due to deficiencies in the assessment of requirements.

3.2.4 Insufficient focus on up-gradation of existing lines in planning process

While discussing the challenges in the implementation of 11th Plan, NEP 2012 stated that the main challenges faced by implementing agencies in completion of transmission works included delay in forest clearance, problems of right of way

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[19] ***Addition during period 2012-17 by, Gujarat:3,065 MW and Rajasthan: 3863MW***

[20] ***Addition of RE generating capacity in Gujarat and Rajasthan during 12th Plan i.e. 6,928 MW against the envisaged RE generating capacity addition of 10,423 MW***

and challenges in acquiring land for substations. NEP, therefore, emphasised the need to optimise the transmission corridors by considering the possibility of increasing the transmission capacity of existing lines through use of re-conductoring and other measures in the planning stage itself.

Audit observed that in the absence of network plan, PGCIL had not prepared any separate plan for upgradation of the existing system. The planned projects of the NEP (162 projects) all pertained to new projects. Further, as PGCIL does not have system to assess the need for upgradation before laying new line, this data is not captured in their records. In the Exit Conference, CMD/ PGCIL admitted that efforts made to maximise utilisation of existing system before evolving new system may not be recorded. During audit examination also, it was noted that, DPRs of 18 projects selected for audit did not indicate any studies having been conducted to explore the possibility of up-gradation of existing transmission lines before planning new lines as suggested by NEP 2012. Therefore, structured system of considering the possibility of upgradation of existing lines and considering re-optimisation of the system was not available. During 2012-17, while PGCIL commissioned 233 new lines, upgradation was carried out to only eight lines.

Inadequate focus on upgradation of existing lines was also evident from the following instances:

(i) In compliance of CERC directions, a Committee comprising of CTU, CEA and POSOCO studied the maximum loadability limits for transmission lines and communicated to PGCIL (12 January 2013) various measures[21] to improve line loadability[22] of 222 lines of 400 kV and above. However, PGCIL took action to improve the loadability of only 10 lines by making line reactors switchable.

(ii) Again, during their fourth meeting (January 2015) of the Committee on congestion in transmission, constituted by CERC, POSOCO reiterated the measures communicated in January 2013 and inter-alia added that there was need for re-conductoring of 12 out of 17 lines involved in 1,341.01 circuit km in four regions to mitigate congestion in long term.

All the lines identified by the Committee for reconductoring/ upgradation had critical importance in the meshed grid e.g. robustness of Meerut - Muzaffarnagar line and Muzaffarnagar - Roorkee lines has a crucial role in meeting power requirements of large industrial and agricultural load centres of West UP and to facilitate transfer of hydro power from THDC to West UP. Similarly, Farakka - Malda line has an important role to meet power requirements of the North Bengal and Sikkim hills during the period of low hydro generation in the hills. Singraul - Anpara line- is important because it was a link between the two large generating

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[21] ***Providing line-in-line-out load centres at intermediate points in respect of 98 lines, conversion of line reactors as bus reactors in respect of 222 lines, etc.***

[22] ***Loadability of a transmission line in power system is limited by thermal limit, surge impedance limit and stability limit etc.***

regions. Therefore, non-upgradation of these lines has consequences related to sub-optimal utilization of the system.

The recommendations (January 2015) of the Committee for upgradation of lines remained largely unattended. Resultantly, transmission constraints continued to be observed by POSOCO even as late as October 2019 in the Northern Region and Southern Region due to high loading in five of these lines viz., 400 kV Singrauli – Anpara S/c line, 400 kV Anpara and Obra line, 400 kV Mohindergarh - Bhiwani line, 400 kV Hiriyur - Neelmangala line and 400 kV Dadri – G. Noida S/c, 400 kV line. Thus, absence of adequate measures to upgrade the lines as suggested by CERC committees/ POSOCO ultimately resulted in transmission constraints.

Studies, for example, an international report[23] (June 2013), on 'Integrated Transmission Planning and Regulation', have demonstrated that the latent transmission capacity can be released to network users through application of advanced network, information and communication technologies on existing transmission network, thereby postponing or even eliminating the need of asset heavy network reinforcement.

In this regard, Audit further observed that re-conductoring of existing Farakka – Malda 400 kV D/C transmission line by PGCIL resulted in increase in the total transfer capacity of ER-NER corridor from 900 MW to 1,400 MW and that of ER-NR from 3,780 MW to 3,900 MW. Thus, inadequate focus on re-conductoring deprived PGCIL of the possibility to enhance the transfer capacity of the Inter-regional corridors and effectively optimize the utilisation of existing transmission network, as repeatedly impressed upon by various committees and NEP.

In the Exit Conference, Ministry stated (January 2020) that out of these 17 lines, eight lines in NR were discussed in the Standing Committee meeting (February 2016) for proposed re-conductoring. In the meeting, POSOCO admitted that all of these lines except 400 kV Singrauli - Anpara S/c and 400 kV Anpara - Obra were overloaded in the past but after commissioning of other new parallel circuits, these lines were operating at normal load and hence did not require re-conductoring. Further, two lines in ER viz. Farakka - Malda line and Maithon - Maithon RB 400 kV D/c line were discussed in the said meeting and approved for re-conductoring. However, remaining seven lines in three Regions (i.e, WR, SR and ER) were not deliberated upon for re-conductoring in any meeting of Standing Committee and therefore, no action for re-conductoring of these seven lines was taken.

Reply of Ministry is to be viewed against the facts:

(i) The issue was discussed during the 8th meeting of Co-ordination Forum held in April 2019 wherein Chairperson, CERC stated that re-conductoring option was cheaper as compared to construction of new line and suggested that some regulatory mechanism needs to be put in place to encourage putting up new conductors for increasing the capacity of existing transmission line

[23] ***Electricity Policy Research Group, University of Cambridge, London***

(ii) Efforts made to examine utilization of the existing network capacity to the extent possible using various technologies have not been recorded.

(iii) The reply is silent on the specific action taken against the recommendation of the Committee to upgrade the remaining seven lines. Moreover, PGCIL had preferred laying new parallel transmission lines in place of option to upgrade existing transmission lines as suggested by the committee.

3.2.5 No plan for augmentation of transfer capacity in long term

Two parameters viz. Transmission capacity and Transfer capacity are relevant for assessing the capability of Inter-Regional (IR) corridor. Transmission capacity of IR corridor is the sum of the ratings of transmission links joining two regions. IR Transfer capability, on the other hand, is a holistic measure of the ability of the IR corridor along with interconnected ISTS links to transfer power from one region to another.

As per NEP 2012, the transmission capacity being summation of capacities of inter-regional links is a figurative representation of the bonds between the regions. These aggregate numbers do not indicate actual power transfer capability across different regions/ states. Thus, transmission capacity has a limited role in indicating capability of corridors to handle power flows.

As per clause 16.1 of 'Procedure for making application for grant of medium term open access to inter-state transmission system' approved by CERC, PGCIL has to notify Total Transfer Capability [24](TTC) for four years on the 31st day of March each year. Further, the sub-committee of the Central Advisory Committee (CAC) of CERC constituted to examine transmission congestion related issues recommended (June 2015) that in view of the necessity for transparency in declaration of TTC/ ATC in planning horizon, the results of long term studies carried out by CTU should be made available on their website.

Audit, however, observed that PGCIL fixed targets and prepared plans only for the transmission capacity to be augmented over a period but no targets were fixed or declaration made for achieving the transfer capability in long term.

Non-declaration of TTC on long term horizon was highlighted in the CAG Audit Report No.18 of 2014. COPU, in their 20th Report (2017-18), also emphasised that PGCIL should declare TTC targets as per CERC regulations because without such long-term planning it was not possible to grant long-term access and medium-term open access to Inter-State transmission systems. In their reply to COPU, Ministry stated that PGCIL had engaged an international consultant for advising on TTC and related issues.

Audit observed that at present, TTC declaration appears on the PGCIL website till the month of January 2020, however, no long-term declaration has been done by PGCIL. In the absence of the declaration of TTC for four years as per the

[24] ***Total Transfer capacity means the amount of electric power that can be transferred reliably over the transmission system under a given set of operating conditions***

regulatory requirements, there was no benchmark to assess the actual performance of PGCIL in terms of its capability to transfer power. Moreover, there was no practice of declaring the targets for intra-regional transfer capability *viz.* between ISTS and State Transmission Systems (STU system). One of the crucial information that ISTS was expected to provide to the States as power drawing entities was how much power (in MW) they would be able to draw through ISTS in future in order to meet their load demand. This would help in planning for procurement of power through ISTS i.e. from outside the State. For this, ISTS capability to bring power up to the State boundary and capability of the STU system to draw that power is required to be assessed. This is the crux of coordinated planning for which the Act mandates that CTU would coordinate with all required agencies. This vital deliverable was found missing.

Ministry stated (June 2019) that as per the recommendation of the international consultant, the TTC/ ATC is to be declared by the operator i.e. POSOCO and System Operating Limit (SOL)[25] is to be declared by CTU. It has been decided that the guideline/ methodology for calculation of SOL would be submitted by CTU.

In the Exit Conference with Ministry, representative of CEA stated (January 2020) that action plan on the recommendation of the international consultant will be finalized by June 2020.

The reply is to be viewed against the fact that it is essential to monitor and declare TTC in the long run as per requirements of extant CERC Regulations since 2009 which has not been done so far.

3.2.6 Status of augmentation of Inter-Regional Transfer capability

Audit analysed the status of actual augmentation of Transfer Capability *vis-a-vis* transmission capacity during 2012-17 as given in Table 3.3.

Table 3.3

Corridor	Transmission Capacity (at the end of 12th Plan)	TTC as per CTU (April 2017)	% age of TTC to transmission capacity
	(In MW)		
ER-NER	2,860	1,400	48.95
ER-NR	21,030	4,200	19.97
ER-WR	12,790	-	-
ER-SR	7,830	3,460	44.19
NER-NR	3,000	-	-
WR-NR	15,420	12,900	83.66
WR-SR	12,120	4,940	40.76
Total	**75,050**		

[25] ***SOL is defined as the value (such as MW, MVar, Amperes, Frequency or Volts) that satisfies the most limiting of the prescribed operating criteria for a transmission system configuration to ensure operation within acceptable reliability criteria***

Audit observed that at the end of 12th five-year plan, the TTC of different corridors ranged between 19.97 *per cent* and 83.66 *per cent* of their respective transmission capacity. It was further observed that for every pair of double circuit AC line[26], IR transmission capacity considered achievable by CEA in the NEP 2012 is less than 50 *per cent* of its transmission capacity. For example, gross thermal rated capacity for double circuit 400kV quad bundled ACSR moose[27] conductors is of the order of 3,957 MW[28] but the IR capacity target for the same in NEP as per CEA is only 1,600MW. This implies that NEP targets are already less than 50 *per cent* of thermal rated capacity of the individual links and CTU should endeavor to achieve at least the same. The actual TTC achieved in all the regions except WR-NR was less than even 50 *per cent* of the achievable targets. Thus, the actual achievement of CTU indicates significant scope for improvement through diligent optimization.

Audit further analysed the corridor-wise addition to TTC achieved by PGCIL *vis-à-vis* addition in the transmission capacity in the 12th Plan and observed as given in Table 3.4.

Table 3.4

Corridor	Transmission capacity (at the end of 11th Plan)	TTC[29] (March 2012)	% age of TTC to transmission capacity 11th Plan	Transmission capacity (at the end of 12th Plan)	TTC as per CTU (March 2017)	%age of TTC to transmission capacity
ER-NER	1,260	570	45.24	2,860	1,400	48.95
ER-NR	12,130	3,100	25.56	21,030	4,200	19.97
ER-WR	4,390	1,000	22.78	12,790	-	-
ER-SR	3,630	830	22.87	7,830	3,460	44.19
NER-NR	-	-	-	3,000	-	-
WR-NR	4,220	2,200	52.13	15,420	12,900	83.66
WR-SR	1,520	1,000	65.79	12,120	4,940	40.76
Total	**27,150**			**75,050**		

It may be seen from the above that:

(i) Even though significant transmission capacity had been added in XII Plan in ER-NR (8,400 MW) and WR-SR (10,600 MW) corridors, TTC in terms of percentage to transmission capacity actually decreased from 25.56 to 19.97 *per cent* in ER-NR corridor and from 65.79 to 40.76 *per cent* in WR-SR corridor.

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[26] ***Transmission lines which carry three phase power are usually configured as either single circuit or double circuit. A single circuit configuration has three conductors for the three phases. While a double circuit configuration has six conductors (three phases for each circuit)***

[27] ***Aluminium conductor steel reinforced of 500 sq mm diameter***

[28] ***√3X400kVX0.714kAmp=3957MW at 50 deg C ambient temperature, final temperature 85 deg Solar radiations = 1045 Watt/m2. Wind Speed = 2 km/hour Absorption Coefficient = 0.8 Emissivity Coefficient = 0.45 and Age > 1 year***

[29] ***AS per NLDC because CTU did not have practice of declaring TTC at that time***

(ii) Although significant transmission capacity was added in ER-WR (8,400 MW) and NER-NR (3,000MW) corridors, TTC was not worked for these corridors.

Ministry stated (July 2019/ May 2020) TTC is dynamic in nature and is dependent on network topology of ISTS as well as Intra - State Transmission System including Load –Generation scenario and weakest link in the corridor etc. Further management added that aggregate transmission capacity which is a static value between two areas may differ vastly from TTC which is dynamic in nature.

Reply of the management is to be viewed against the fact that:

(i) Audit has compared the TTC declared by CTU one year in advance i.e. TTC 'as planned' for future which at the time of its declaration cannot be affected by day to day real time dynamic factors. On the other hand, TTC as declared regularly by POSOCO at a point of time may be affected by dynamic factors such as load generation balance etc. which is not the subject matter of the audit observation. Further, internationally also some norms to assess adequacy of inter-regional transfer capacity with reference to operating requirement had been fixed. Like the European Council as per their Ten year Transmission Network development Plan 2012, had proposed a criterion for interconnection development, asking Member states a minimum import capacity level equivalent to 10 *per cent* of their installed production. In United Kingdom and USA the planning and evaluation of the transmission network is carried out in terms of transfer capacity.

(ii) During the 8th meeting of the Co-ordination Forum convened by CEA in April 2019 for smooth and coordinated development of power system in the country, Joint Chief (Engg.) of CERC stated that CTU grants LTA to applicants 34 years hence and grants LTA to such applicants on "existing system" or "with system strengthening". While granting such LTA it uses the numbers of ATC of three to four hence to decide the need of system strengthening. Therefore, it must declare these numbers for market participants to bring transparency. Moreover, declaration of such ATC with clear indications of the assumptions and possibility of updating thereof based on the changing conditions would facilitate the market rather than misleading it.

3.2.7 Reduced margins for Short and Medium Term Open Access

Access to transmission system is given to users through Long Term Access (LTA) or Medium Term Open Access (MTOA) or Short Term Open Access (STOA). As per National Electricity Policy 2006, network expansion should be planned and implemented keeping in view the anticipated transmission needs that would be incident on the system in the open access regime. Prior agreement with the beneficiaries would not be a pre-condition for network expansion.

The above requires a robust transmission system to cater to the requirements of all categories of customers. Audit observed that while the requirements for long term

access were taken care of by dedicated planning of transmission system, the access to short and medium-term customers was provided from the margins available within the system. Non-achievement of adequate power transfer capability as per the projections in the NEP (highlighted in the preceding paragraph) reduced the availability of margins thereby impacting short term power transactions as brought out subsequently.

A Committee formed by CERC in December 2015 to review the transmission planning, connectivity, Long Term Access, Medium Term Open Access and other related issues observed in their report (September 2016) that margins for short term and medium-term customers were inadequate.

Based on the information provided by POSOCO, Audit also observed that due to inadequate margins available in the transmission system for short term open access, there were rejections of STOA requests by POSOCO for purchase for power from different regions. The details of requests for STOA rejected in different regions[30]are given in Table-3.5.

Table 3.5

(In MW)

Year	NRLDC*	SRLDC	NERLDC	WRLDC	ERLDC
2012-13	21,86,265.66	0	561.8	17,652.76	1,263
2013-14	31,27,936.41	17,340.04	423	1,413.44	18,783.23
2014-15	71,72,611.02	0	576.57	2,240.65	4,243.16
2015-16	64,59,258.32	0	0	169.05	167.55
2016-17	1,75,69,275.81	3,275.55	0	610.05	407.39

****It is provided by POSOCO in MWhr.***

Thus, sufficient margins were not available for short term transactions in line with the spirit of the Electricity Act and National Electricity Policy.

Ministry stated (June 2019) that

(i) As per CERC Open Access in inter-state transmission Regulation 2008, for STOA, the short term customers shall be eligible for access to the surplus capacity available on the inter-state transmission system after use by the long term customer and medium term customers by virtue of (a) inherent design margin (b) margin available due to variation in power flow and (c) margin available due to inbuilt spare transmission capacity created to cater to future load growth or generation addition. Hence, ISTS system is planned to take care of power transfer requirement under long term.

(ii) As per Report of CERC on Short Term Open Access, the volume of electricity transacted through power exchange that could not be cleared as percentage to unconstrained cleared volume was reduced from 17 *per cent* in 2012-13 to 0.5 *per cent* in 2017-18 by implementing additional inter regional links by PGCIL.

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[30] ***Northern Region Load Despatch center (NRLDC), Southern Region Load Despatch Centre (SRLDC), North Eastern Region Despatch Centre (NERLDC), Western Region Load Despatch Centre (WRLDC) and Eastern Region Load Despatch Centre (ERLDC)***

The reply is to be viewed against the facts that;

(i) National Electricity Policy, 2005 requires transmission network expansion to be planned and implemented keeping in view the anticipated needs that would be incident on the system in the open access regime. It also adds that prior agreement with the beneficiaries would not be a pre-condition for network expansion. Moreover, CERC regulations do not prevent PGCIL from taking up system strengthening schemes in the absence of LTA for which separate regulatory approval can be obtained from CERC. In fact, in addition to LTA driven schemes, many system strengthening schemes are regularly approved in the SCPSP.

(ii) As per Monthly report of CERC on Short Term Transactions of Electricity in India (March 2019), volume of electricity that could not be cleared in Indian Energy Exchange due to congestion was 3.44 *per cent* of the unconstrained cleared volume. Also in terms of time, congestion occurred is 35.62 *per cent*[31] during March 2019. Further as per data furnished by POSOCO, during the year 2017-18, 3,06,156 MWhr/ 11,597 MW of short term applications were rejected due to non-availability of margins in NR and SR region respectively.

In the Exit Conference, Ministry stated (January 2020) that system should have the capacity to accommodate all types of open access and for that regulation can be modified.

Therefore, existing planning process needs to be reviewed in view of present Regulations and Open Access Policy.

3.2.8 Need for planning to address regional power transfer requirements

Non-availability of adequate margins for short term transactions as discussed above was also visible in congestion and variations in the electricity prices over regions. The Country is divided into 13 bid areas (IEX) for power exchange transactions. In case there is no congestion, single price prevails across all bid areas called Market Clearing Price. Otherwise in case of congestion across a transmission corridor, the net power of upstream areas will not flow to downstream deficit areas resulting in variation in prices in different bid areas. The prices prevailing in different bid areas in such case are called Area Clearing prices. A comparison of Market Clearing Price[32] with Area Clearing price[33] in Indian Energy Exchange (IEX) is given in Table 3.6.

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[31] ***Percentage of time congestion occurred during the month (Number of hours congestion occurred/total number of hours in the month)***

[32] ***MCP is the clearing price for cleared transactions in the whole country, if there is no congestion at all***

[33] ***The country is divided into 13 bid areas (IEX) for power exchange transactions. The criteria for defining these areas is the location of the physical constraints in the structure of transmission network, including national and/or control area border. In case of congestion across a transmission corridor, the net sale of upstream areas will not flow to downstream deficit areas. The cleared prices in all areas i.e., Area Clearing Prices (ACPs) are adjusted so that the flow of power across transmission corridor is same as available transfer capability***

Table 3.6
Comparison of Market Clearing Price and Area Clearing price in IEX

Year	MCP (₹ per kWhr	Area clearing prices in bid areas (₹ per kWhr)												
		A1	A2	E1	E2	N1	N2	N3	S1	S2	S3	W1	W2	W3
2012-13	3.49	3.26	3.26	2.91	2.1	3.13	3.13	3.13	**6.86**	**7.29**	-	3.07	3.07	2.80
2013-14	2.80	2.44	2.44	2.42	2.42	2.55	2.55	3.10	**4.73**	**5.57**	-	2.52	2.52	2.25
2014-15	3.51	4	3.24	3.22	3.22	3.23	3.23	3.27	**5.11**	**5.93**	-	3.07	3.07	3.05
2015-16	2.73	2.47	2.47	2.47	2.47	2.77	2.77	2.79	**3.79**	**4.28**		2.46	2.46	2.46
2016-17	2.41	2.29	2.29	2.29	2.29	2.58	2.58	2.61	**2.79**	**2.79**	**2.92**	2.29	2.29	2.29

Source: Data obtained from the website of Indian Energy Exchange

It is evident from Table 3.6 that there has been a reduction in Market Clearing Price of electricity traded through power exchange but the Area Clearing Prices in bid areas in Southern Region continued to be higher than Market Clearing Price on an average annually.

Economic Survey 2015-16 stated that on 29 December 2015, no congestion was observed in the electricity grid and a single price was discovered in the IEX.

Audit observed that though formation of National Grid was completed in December 2013, single price (₹2.30/ kWh) was discovered on 29 December 2015 in the power exchange (IEX) in short term transactions, *i.e.,* almost after two years. Thereafter, only on 23 days (from the period 29 December 2015 to 31 March 2017) single price was discovered on the power exchange, IEX. During the intervening period (2013-15) there were wide variations in the prices prevailing in the different regions and regional inequalities in power prices still persist as the Area Clearing Price ranged between ₹2.29 per kWhr to ₹2.92 per KWhr even in 2016-17.

Thus, there is still a need to improve the inter-regional power transfer capability to reduce congestion and to ensure smooth flow of power and remove regional inequalities in power prices.

Ministry stated (June 2019) that with continuous expansion and growth in transmission capacity upon implementation of new transmission schemes based on anticipated power transfer requirement, the percentage time blocks congested has improved from 21.8 *per cent* during Q1 of 2017-18 to 0.6 during Q1 of 2018-19 and from 8.8 *per cent* during Q2 of 2017-18 to 0.5 *per cent* during Q2 of 2018-19 for southern region. Management further added that One Nation – One Grid – One Price was also achieved for all 76 days in Q2 of 2018-19.

In the Exit Conference, Ministry stated (January 2020) that One Nation One Grid and One price has since been achieved.

Reply of the management is to be viewed against the fact that on an average annual basis, Area Clearing Price of electricity traded through power exchange in Southern Region (S1, S2 and S3) continued to be higher than the Market Clearing

Price from the period 2012-13 to 2018-19. Further, One Nation – One Grid - One price was achieved only on 57 days and 25 days in Q3 and Q4 of 2018-19, respectively. Thus, variations in the prices prevailing in the different regions and regional inequalities in power prices continue to persist.

Also COPU, in its 20th Report (2017-18) on Planning and Implementation of Transmission Projects by PGCIL and Grid Management by POSOCO, had stated that by commissioning of a number of transmission elements at ISTS level and effective project management by PGCIL, corridor capacity will increase progressively which in turn would pave the way for single price of power across the country. Electricity trade results in optimisation of resources, creates competition and increases the possibility and options for supplying cheaper and regular power to consumers. Benefitting the consumers through competitive electricity trade is enshrined in the preamble of the Electricity Act. Therefore, existing planning process needs to be reviewed with focus on maximising power transfer capability of the power system with the mandated aim of achieving overall economy and efficiency in the power sector.

3.3 Investment approval of projects

Records relating to planning of 18 selected transmission projects taken up for implementation during April 2012 to March 2017 with the status of augmentation to transmission network made by PGCIL upto March 2017 were examined in audit. Results of examination are as under:

3.3.1 Non-adherence to stipulated timelines for preparing detailed project reports

As per provisions contained in Works & Procurement Policy and Procedure (WPPP) of PGCIL, a time limit of eight weeks has been prescribed for approval of DPR by CMD after in-principle clearance from CEA.

In 14 out of 18 selected projects, there was delay ranging from three weeks to 165 weeks beyond the stipulated eight weeks' time in WPPP for obtaining internal clearance of DPR from CMD after approval of the projects in the respective Standing Committee Meetings. Thus, the time limit was not adhered to by PGCIL for preparation and approval of DPR by CMD as prescribed in the WPPP.

Such delay on the part of PGCIL to fulfil its own obligations has a cascading effect on the overall completion and commissioning of various projects as evident from the fact that out of 18 selected projects, only two projects were completed within the scheduled time upto December 2018 and 13 projects were completed with delays ranging from 4 to 71 months. The remaining three projects are to be completed with anticipated delays ranging from 6 to 109 months. Thus, it becomes imperative that all efforts should be made to strictly adhere to various internal timelines.

Ministry stated (June 2019) that delay in approval of the DPRs has no material impact in commissioning of the schemes as the initial delay is taken care of during implementation phase of the projects. The conclusion that delays in implementation arise out of cascading effect of DPR approval is not a true representation analysis of the situation.

Reply needs to be viewed against the fact that out of 18 selected projects only two projects were completed within stipulated time period. This shows that delay in approval of DPR is also one of the factors of delay in commissioning of the transmission projects.

Chapter - 4

Project Execution

4.1 Introduction

Award of contract for execution of transmission projects face high uncertainty from a number of factors that increase the project costs and risks such as non-fixation of final scope of work to be executed, inadequate experience, inadequate production capacity etc. This makes it necessary for PGCIL to apply for forest clearance timely, adequately fix the pre-bid criteria and thoroughly assess the bids submitted by the bidders against that criteria as many participants, submit aggressive and unviable bids and later on, either delay or abandon the work, resulting in delay of transmission lines.

PGCIL had developed Work and Procurement Policy and Procedure (WPPP) September 2001 which was subsequently revised in November 2016 to standardise systems and procedures during pre-award and post award stages. It also benchmarked the time frame for various activities.

Audit examined the changes in the procurement policy, pre bid, evaluation of bids and execution activities in respect of 120 contracts pertaining to 18 projects selected for audit awarded at corporate office and noticed the following in respect of Pre-award stage which covers two activities i.e., pre-bid activities and post-bid activities:

4.2 Forest clearance

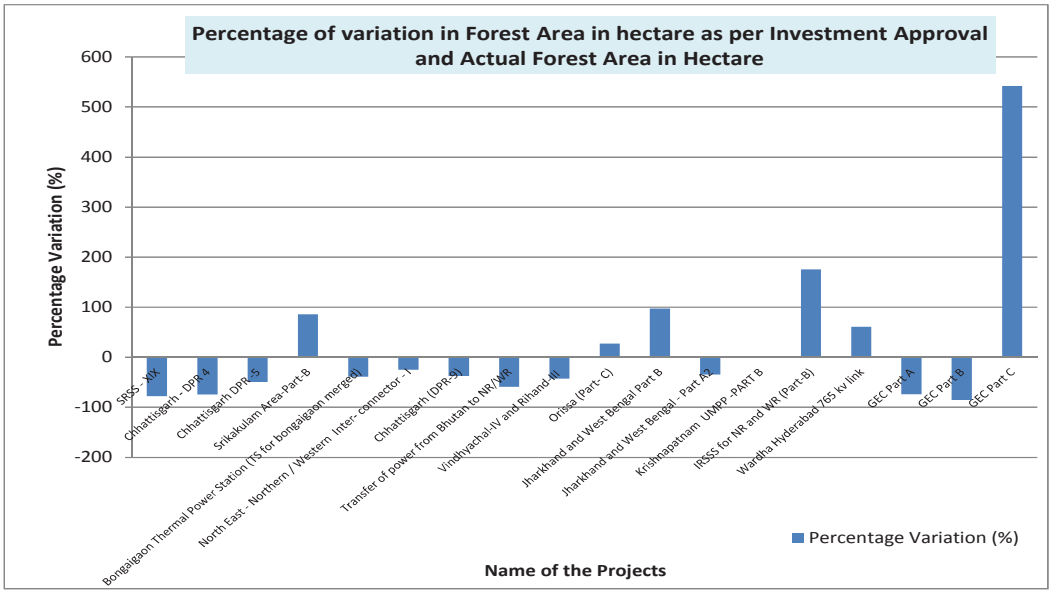
The Electricity Act, 2003 empowers the licensee with the Right of Way (ROW) under the Telegraph Act 1885. In 2011, CEA estimated that 23 out of 120 transmission projects faced delays because of the developer's inability to get ROW or acquire land and get timely clearances from the host of stakeholders like Forest Department, Aviation Department, Defence, and Power and Telecommunication Coordination Committee. Audit also noticed the following observations in respect of forest clearances for transmission lines executed by PGCIL:

4.2.1 Non-conducting detailed survey of forest stretches before preparation of cost estimates

WPPP of PGCIL required that detailed survey of forest stretches and river crossing should be carried out before preparation of Bill of Quantities (BOQ) and Notice Inviting Tender (NIT) cost estimates.

Audit observed that PGCIL encountered variation of forest land as detailed survey of forest stretches was not conducted at the time of BOQ and NIT cost estimates as per WPPP of PGCIL in all the 18 selected projects. In 11 projects, the actual forest area was found less than the assessment of area ranging between 25.30 *per cent* and 85.37 *per cent* as per Investment Approval (wherein BOQ and cost estimates were approved) while in six projects the actual forest area was

found to be more than assessment of area ranging between 27.01 *per cent* and 542.04 *per cent*. In one[34] project, although a forest stretch of 45.17 hectares was assessed during Investment approval, no forest stretch was found during actual survey conducted for the project. The variations in assessed forest area as compared to actual forest area encountered ranged between 20 and 30 *per cent* in two cases while it was more than 30 *per cent* in 15 projects as depicted in the following chart:



Audit observed that forest areas initially submitted by PGCIL had to be re-submitted due to re-alignment of forest area. Audit further analysed the reasons for variation in forest area and observed that such re-alignment had arisen due to various reasons like errors in assessing actual forest area, change in area after verification etc. as detailed in ***Annexure-3.***

Due to change in the forest area of project, the line length of projects also increased/ decreased. In 18 selected projects, actual line length of all the 71 transmission lines had variations as compared to the line length of the project in the investment approval. In 40 transmission lines, actual length was less while in 31 transmission lines, the actual executed length was more. The difference in executed length as compared to Investment approval length was less than 10 *per cent* in 28 cases, between 10-20 *per cent* in 14 cases, between 20-30 *per cent* in 9 cases and more than 30 *per cent* in 20 cases.

Thus, due to change in forest area and line length of project, there was quantity variation which resulted in cost variation from (-)₹174.62 crore to ₹266.91 crore in 12 projects for which Revised Cost Estimates were approved. PGCIL had to incur an extra cost on account of quantity variation of ₹118.31 crore[35].

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[34] ***Transmission System for Krishnapatnam UMPP-Part B project***

[35] ***₹669.97 crore excess cost less ₹551.66 crore saving***

Management stated (January 2019) that:

(i) It is accepted that carrying out detailed survey in forest in advance expedites forest clearance process.

(ii) In most instances line length indicated in the Feasibility Report (FR) was tentatively chosen based on walk over survey. However, during actual execution of work, line length changed based on the detailed survey of the line.

Management's reply confirms the audit observation that the detailed survey of forest stretches and river crossing was not carried out before preparation of BOQ and NIT cost estimates as mandated by its own WPPP which resulted in variations in forest areas/ line lengths/ quantities etc.

Ministry stated (June 2019) that it may not be feasible to complete the detailed survey before preparation of BOQ due to constraints. However, PGCIL is in the process of revising the provisions of WPPP.

Reply of the Ministry is to be viewed against the fact that delays in forest clearances were one of the main reasons for delay in implementation of transmission lines. This fact was also highlighted by the NEP 2012 while discussing the challenges in the implementation of 11th Plan.

Therefore, for timely completion of transmission projects, practice of survey of forest stretches after award of contracts needs to be reviewed.

4.2.2 Delay in submission of forest proposal to forest authority

Advance action for survey in forest area saves considerable time involved in identification of forest area and helps in preparation of forest proposal to enable its submission within prescribed time after investment approval.

Initially, PGCIL had not laid down any timelines for submission of application for forest clearance after investment approval of the respective projects. However, in compliance of Audit Report No 18 of the C&AG of India for the year 2014, PGCIL fixed (August 2014) a target time or submission of forest proposals, i.e., within three months of investment approval.

Audit observed that in three projects for which investment approval was accorded after August 2014, the earliest applications for forest clearance were submitted with delays ranging from three to eight months. Audit also noticed that in the remaining 11 out of 17 projects[36] where forest stretch was involved, Management took two to 39 months for submission of earliest applications for forest clearance.

Management/ Ministry stated (January/ June 2019) that:

(i) even after identification of forest areas and completion of detailed survey of forest stretches, many other preparatory aspects like land scheduling with Revenue Department, NoC from various other State Authorities, PWD, Irrigation

[36] ***No forest stretch was involved in one project, viz; Transmission System for Krishnapatnam UMPP -PART B***

and District Collector, cost benefit analysis etc. are also required and completion of these activities usually takes considerable time.

(ii) the process for submission of forest proposals has been made online with effect from 15 August 2014, and the online portal requires more detailed information in addition to what was specified in the Forest (Conservation) Rules, 2003 issued by Ministry of Environment, Forest and Climate Change (MoEFCC).

Reply of the Management's/ Ministry is to be viewed in light of the following facts that:

(i) PGCIL itself had fixed a target timeline for submission of forest proposals within three months of investment approval, and as such, all the activities associated with forest proposals need to be completed within this time frame.

(ii) The timeline of three months for submission of forest proposals was made effective by PGCIL from 28 August 2014, i.e. after the commencement of online application system for forest application. Hence, it follows that PGCIL considered three months from the date of investment approval as sufficient time to fulfil all formalities associated with submission of forest proposals on the online web portal as well.

Audit further observed that forest clearances were delayed because of re-alignment of forest area by PGCIL after submission of forest clearance proposal, re-submission of forest proposal because of non-submission of relevant documents at the time of initial forest proposal and delay in submission of forest proposal to the Forest Authority. Some cases of interest have been elaborated below:

4.2.3 Re-submission of forest proposal because of non-submission of relevant documents at the time initial forest proposal

As per check-list of documents/ information required for proposal for diversion of forest land for non-forest use under Forest (Conservation) Act, 1980, various documents[37] were required to be mandatorily submitted at the time of application for forest proposal.

However, as per the records made available to Audit, it was observed that forest proposals pertaining to eight out of 18 selected transmission projects were returned to PGCIL by Forest Authorities on several occasions due to non-submission of the prescribed documents and due to other deficiencies like incompleteness/ mistakes/ shortcomings etc. in the submitted proposals. This added to unnecessary delays in forest clearance process and in the overall commissioning of the associated transmission project.

[37] ***Such as certificate in compliance with Scheduled Tribes and Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Width of the Right of Way for transmission line, Maps showing the required forest land, Cost Benefit Analysis, purpose-wise breakup of total land required etc.***

Management stated (January 2019) that compilation of documents for submission on the online portal consumes a lot of time and in case of absence/ incompleteness of documents, proposals are being referred back by Nodal Officers. It was further stated that in many cases, resubmission is necessitated due to encroachment of forest land for cultivation and this issue comes to light only during joint verification. Ministry added (July 2019) that after the introduction of online system, different States have finalised their own checklists which include State specific requirements beyond the MoEF checklist. The Nodal Officer is returning the proposal on non-submission of various State specific documents such as NoCs from departments of irrigation, PWD etc.

Management's reply is to be viewed against the fact that in all the instances pointed out by Audit (except for Green Energy Corridors Part B and Part C), forest proposals were submitted prior to August 2014, i.e., before the commencement of system of submission of forest proposals via the online portal. Moreover, PGCIL has to submit complete documents (whether on the online portal or otherwise and whether required by MOEF or States) at the time of submission itself, in order to negate instances of non-acceptance of forest proposals by Nodal Officers. Besides, Management has accepted that in case of absence/ incompleteness of documents, proposals are being referred back by Nodal Officers. Lastly**,** PGCIL is expected to be aware of State-specific requirements, as it is a core of area of functioning.

In the Exit Conference, Ministry directed (January 2020) Management to prepare standard checklist for submission of proposals.

Award of contracts

4.3 Pre-bid activities

Pre-bid activities include the steps/ procedures taken by PGCIL before issuance of bids for procurement of goods and services from the manufacturers/ suppliers. It includes contract packaging, cost estimation, planning of qualifying criteria and technical specifications and bidding documents as per WPPP, CVC circulars, statutory provisions, etc.

Qualifying criteria covers various basic requirements, which a bidder must possess to bid for a particular contract/ package. It helps in identifying such bidders who have the experience of delivering the required goods and services to be procured. Audit examined various qualifying criteria and observed the following:

4.3.1 Adoption of balance capacity assessment criteria without basis

WPPP (November 2016) of PGCIL requires assessment of the manufacturing capacity of the bidders for execution of the works (like tower parts, conductors, insulators etc.) to be awarded by PGCIL. WPPP further states that the prospective bidder shall be considered to have the manufacturing capacity during a financial

year provided the annualized requirement of the item in question for which bids have been opened during the said financial year does not exceed 0.67 times the annual manufacturing capacity of the bidder (considering that the balance bid capacity is utilised for contracts awarded by other organisations).

Thus, as per WPPP, analysis of the pending orders with the bidder was done away with and it was presumed by PGCIL that manufacturing capacity of all the bidders to the extent of 67 *per cent* would be available for orders awarded by it. The reasons and basis for taking 67 *per cent* capacity of all the bidders were not available on record.

During review of contracts awarded to M/s Prem Cables Limited for supply of conductors, audit noticed that during the period 2011-12 to 2014-15 the supply of conductors to other organisations ranged from 48 *per cent* to 100 *per cent.* Moreover in case of Apar Industries Limited, the supply of conductor for the years 2013-14 and 2014-15 to other organisations was more than 33 *per cent*.

The Management/ Ministry replied (January 2019 and June 2019) that the criteria relating to manufacturing capacity wherein PGCIL takes exposure on a particular bidder by placing orders in a year upto 67 *per cent* of the bidder's total manufacturing capacity is a step to enhance transparency and objectivity.

The reply is to be seen in light of the fact that the Management has not indicated the basis for fixing the criteria of 67 *per cent*. Further, the revised criteria overlooked the actual spare capacity available with the bidder, which may be more or less than 67 *per cent*. Thus, PGCIL's assumption regarding utilisation of 67 *per cent* capacity of all its suppliers/ contractors by them may not be considered appropriate as it leaves scope of under/ over assessment of manufacturing capacity of bidders, which might either result in awarding of order to incapable parties or rejection of bids of the capable parties.

4.3.2 Ambiguity in clause regarding fatal accidents

In bidding documents, it is *inter-alia* stated that "*Subsequent to Bidder's involvement in three cumulative fatal accidents during any financial year, bids submitted by such bidder for all packages whose date of bid opening, originally scheduled and/ actual, falls within the three months period reckoned from date of the last fatal accident shall be considered non-responsive. However, if there is no bid from bidder during said three months, any one bid submitted after three months will be considered non-responsive."*

Audit noticed that:

(i) Three fatal accidents occurred during 2014-15 (third fatal accident on 10 December 2014) at PGCIL's worksites of the contactor i.e. M/s Kalptaru Power Transmission Ltd. (KPTL). As such, this contractor was not eligible for any contract whose bids were opened upto 10 March 2015. However, PGCIL

awarded three[38] contracts valuing ₹316.60 crore to this contractor whose bids were opened before 10 March 2015.

(ii) In terms of Model Request for Proposal issued (April 2014) by the Planning Commission for infrastructure projects including construction of transmission lines, there is a need to collect details of fatal accidents reported during the past five years. PGCIL did not capture the data specifically of the fatal accidents of the bidders from them in the bid documents. In the absence of such details, PGCIL considered information of accidents only in respect of past works executed by those prospective bidders for PGCIL instead of details of all the fatal accidents of the bidders. It would be pertinent to mention that other CPSEs like NTPC while inviting the bids were asking details from the bidders about the fatal accidents occurred during the last three years at works executed by them. Besides, PGCIL has not provided the complete list of fatal accidents occurred on work sites of PGCIL for the period 2012-17 despites reminders[39]

(iii) PGCIL also did not specify, which one bid submitted after three months will be considered non-responsive, if there is no bid from bidder during the three months from the occurrence of last fatal accident.

Ministry stated (June 2019) that there should not be any specific criteria for treating bids submitted after three months to be unresponsive because if two or more bids of such bidder are opened on the same day after three months, making a particular one bid out of them as unresponsive would enable the bidder to choose to avoid bidding in a particular package, thereby derailing the entire process. There could be a possibility of reporting of fatal accident by other organization without having a comprehensive framework in place.

Reply is to be viewed in light of the fact that failure to collect details of fatal accidents from bidder is non-compliance of guidelines issued by Planning Commission.

4.3.3 Finalisation of the Types of tower and its procurement

NEP 2012 suggested adoption of emerging technologies like satellite imaging for carrying out detailed survey and route alignment. It further provided that wind zone mapping and standard design of various types of towers and soil investigation should be done in advance, so that, construction time for the transmission system could be substantially reduced.

However, review of contract agreements for tower erection packages disclosed that:

(i) Satellite imaging for carrying out detailed survey and route alignment as required in NEP was not being done. Instead detailed survey including route

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[38] ***Three contracts having NOA no 5217, 5312 and 5311 having LOA value ₹110.37 crore, ₹102.87 crore and ₹103.36 crore respectively***

[39] ***Requisition dated 16.10.2019, reminder dated 14.11.2019, and 05.12.2019 to Director (Finance)***

alignment, profiling, was carried out by the contractors after award of work. Similarly, soil investigation was not being done as per NEP in advance, rather the contractors in their detailed survey, carried out soil investigation (type of soil whether fissured rock, hard rock, river crossing etc.).

(ii) Design (tower type), fabrication of towers and foundation drawings for all type of towers were proposed by the contractors to PGCIL after conducting detailed survey subsequent to the award of work. The same was then required to be approved by PGCIL within two months of award of work to the contractors.

(iii) During review of execution of the contracts, delay ranging from three months to 13 months in seven contracts was noticed on account of various reasons, inter-alia including modification/ removal of defect of design of tower and change in quantity of tower etc.

The Management/ Ministry replied (January 2019 and June 2019) that only walkover/ preliminary survey is undertaken separately before NIT due to shortage of times and detailed survey is carried out by the contractor during execution stage. Various designs of standard type towers and standard foundations are developed by PGCIL generally in advance. Only in some cases location specific foundations are designed based on the soil conditions/ other inputs received from site.

The reply is to be viewed in light of the fact that though PGCIL had developed standard towers and pile foundation designs, full benefit thereof (in terms of saving of time of construction as envisaged by NEP) could not be reaped as spotting of different types, design and quantities of tower was finalised based on detailed survey only after award of work leading to delay ranging from three to 13 months in seven contracts as mentioned above. Moreover, in the said contracts the time taken by PGCIL between project conceptualisation/ approval and start of implementation/ issuance of NIT was 1.5 years to 7 years against the normal time of one year for carrying out detailed survey allowed to the contractors.

4.3.4 Delay in achieving various pre-award milestones

WPPP of PGCIL prescribes timelines for the entire process of award of contracts considering the date of in-principle approval of project by the CEA as zero date. However, w.e.f. January 2011 Empowered Committee (instead of CEA[40]) decides whether the project is to be awarded to PGCIL or through TBCB. Audit observed that PGCIL had not modified the zero date as the date of approval of project by the Empowered Committee. Hence, WPPP may need a review.

Further, the delay in achieving various pre-award milestones were mainly due to delays in approval of DPR from the last date of standing Committee meeting, delays in initiating application for forest clearance and non-completion of

[40] ***Audit has calculated delay in four schemes (which were approved w.e.f. January 2011) from date of approval by Empowered Committee and from in-principle approval of CEA in other schemes***

intermediate activities like request from the bidders to extend time for bid submission, delay in evaluation of bids etc. The details of the delays in various pre-award activities are summarised in table 4.1 below:

Table 4.1

Delay Period beyond the prescribed timeline	No of Cases		
	Delay in issue of NIT from in-principle approval of CEA/ approval by Empowered Committee	Delay in Opening of bids from in-principle approval of CEA/ approval by Empowered Committee	Delay in notification of award from in-principle approval of CEA/ approval by Empowered Committee
30 to 50 weeks	17	18	10
50 to 100 weeks	31	49	57
100 to 150 weeks	11	17	13
More than 150 weeks	14	13	13
Total	**73**	**97**	**93**

The delay in achieving pre award milestones contributed to the overall delay in final execution of the line. Out of 18 selected projects, only two projects were completed within the scheduled time upto December 2018 and 13 projects were completed with delays ranging from 4 to 71 months. The remaining three projects were to be completed with anticipated delays ranging from 6 to 109 months.

Management/ Ministry stated (January/ June 2019) that assessment of vendors, amendment to bid documents, poor response from vendors, clearing from funding agencies, forest stretches encountered etc. impacted the process leading to award of contracts.

The fact remained that the reasons leading to delay as mentioned by PGCIL are either general factors common for the projects and are well considered at the time of fixation of the timelines for various milestones in WPPP or were possible to be controlled by better Management like proper survey before making forest applications, etc. which have been discussed in the paras above.

4.4 Post-bid activities (evaluation of bids)

Post-bid activities include evaluation of bidders' capacity and capability against the prescribed qualifying criteria. It also includes examination of bids in consonance with guidelines of Central Vigilance Commission (CVC), lending agencies like World Bank, etc. and WPPP of PGCIL. Audit reviewed the evaluation procedures and observed non-compliance of different guidelines and improper/ non-assessment of bidders' capacity.

4.4.1 Non-judicious rejection of a qualified bidder

PGCIL had invited bids for Tower package for 765 kV S/C Varanasi-Balia Transmission Line on 09 May 2012. Eight bidders submitted their bids against the above tower package. Out of these eight bidders, seven bidders (including M/s KEC International Limited and M/s Gammon India Limited) were found

technically qualified. PGCIL awarded (29 January 2013) the Tower package to M/s KEC International Limited (M/s KIL) at a contract price of ₹172.78 crore.

In respect of the above, Audit noticed that M/s Gammon India Limited (GIL) and M/s KIL, were meeting the financial criteria as per their details given in their respective technical bids. However, prior to opening of price bids of all the bidders, financial capacity of M/s GIL, only, on the basis of its financial results was analysed by PGCIL. Based on the assessment, it was decided not to consider the financial bid of M/s GIL as its net profit during the year 2010-11 and 2011-12 was on a decreasing trend and it had negative cash generation from operation (after net of repayment of Long Term Loan and Dividend payment). However, Audit analysed the cash flows of M/s GIL and M/s KIL for four years i.e., from 2009-10 to 2011-12 and noticed that cash flow from operations (net of repayment of loans and dividends) were negative during two out of above three financial years for both the bidders. Moreover, overall rating in respect of M/s GIL was above the threshold rating considered for further award of contracts and it satisfied all technical qualifying criteria. In spite of the above, M/s GIL was non-judiciously disqualified and the contract was awarded to M/s KIL.

Management/ Ministry (January/ June 2019) replied that certain red flags about the financial capacity of GIL had been noticed, taking note of the same and the direction of BOD, it was considered prudent that the financial position of GIL be re-looked.

The reply is to be viewed in light of the fact that similar detailed financial analysis in respect of other bidders including M/s KIL was not carried out by PGCIL. Further, cash flow from operations (net of repayment of loans and dividends) were negative during three out of four financial years under consideration for M/s GIL and M/s KIL. Thus, the fact remained that the qualified bidder was non-judiciously rejected.

4.4.2 Improper capacity assessment of the bidders

As per WPPP 2001 (clause B.5.8.8), the assessment of bidders includes examination of their financial capacity, and analysis of spare capacity[41] to execute the contract (net of current commitment).

4.4.2.1 Non-assessment of capacity of bidders

In 11[42] out of 120 cases it was observed that the production capacity of bidder was not assessed. While assessing the capacity of the bidders, it was mentioned in the

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[41] ***Spare capacity is the project execution capacity***

[42] ***BHEL (Contract No. 459), (ii) JV of M/s GET&D India Ltd. and M/s Alstom Grid Energia Ltd Brazil (Contract No. 4718), (iii) TBEA Shenyang Transformer Group Co. Ltd (Contract No. 4724), (iv) L&T (5373,5371), (v) JV of ABB, India &ABB, AB Sweden (Contract No. 4873), (vi) Hyosung Corporation (Contract No. 4300), (vii) ABB (Contract No. 4317), (viii) Xian XD Switchgear Electric Co Ltd (Contract No. 5343), (ix) Techno Electric & Engg. Company Ltd (contract No. 5345) and (x)[42] M/s GET&D India Limited, Noida and (xi) JV of M/s GET&D India Ltd. and M/s Alstom***

evaluation report at the bidders had executed/ had been executing various contracts of similar nature and complexity of various utilities including PGCIL. Hence, in view of the above, all the bidders were considered to have requisite capacity to execute the subject package. Audit further observed that out of the above 11 contracts in two cases, there was delay in supply of insulators by the contractor[43] and scheduled date for supply was October 2015. This contract was short closed (March 2017) due to non-supply of insulators which consequently impacted avoidable delay of 18 months in commissioning of transmission line. In second contract[44], there was delay of 12 months on the part of contractor in supply of shunt reactors for Jhatikara substation which resulted in consequent avoidable delay in commissioning of transmission line for Ph-I generation projects in Jharkhand and West Bengal Part B. This indicated that non assessment of the balance capacity of the bidders with respect to its operating activities before award of the contract ultimately contributed to time overrun in execution of contracts.

Management/ Ministry stated (January 2019/ June 2019) that assessment of bidders is generally carried out for new bidders or when there are some issues like addition in manufacturing capacity, financial issues, etc.

Reply is to be viewed in light of the fact that in view of WPPP of PGCIL, assessment report of all bidders coming under the zone of consideration should contain the analysis of the net spare manufacturing erection capacity to execute the contract. The same was not adhered to which resulted in delay in commissioning of transmission lines as discussed above. In the Exit Conference, Ministry directed (January 2020) Management to maintain complete records indicating evaluation of the bid criteria.

4.4.2.2 Improper assessment of spare capacity of bidders

As per WPPP 2001, the assessment of capacity of a bidder should take into account the contracts awarded but pending execution by PGCIL as well as other power utilities. It was observed that in 24[45] contracts the entire details of work in hand as submitted by the bidders were not considered while evaluating the spare capacity. Audit further observed in one contract[46] pertaining to supply and erection of six sub stations under 765/ 400kv Raipur pooling Stations at Jabalpur, Jhatrikara, Gwalior, Wardha, Vindyachal, and Raipur. There was delay of 34 weeks (8 months) on the part of contractor for supply of ICTs which consequently impacted the commissioning of main and tie bays of both 765 KV & 400KV of Raipur Pooling Station by eight months.

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[43] ***BHEL***

[44] ***JV of M/s GET&D India Ltd. and M/s Alstom***

[45] ***LOA Nos: (1) 4930, (2) 4755, (3) 5487, (4) 5570, (5) 5260, (6) 5267, (7) 5614, (8) 5312, (9) 5310, (10) 5309, (11) 4729,(12) 4730, (13) 4701, (14) 4702, (15) 5811, (16) 4579, (17) 5339, (18) 5420, (19) 5613, (20) 2850, (21) 2851,(22) 5507,(23) 5728 & (24)5727***

[46] ***M/s GET&D India Limited*, Noida**

Management/ Ministry stated (January 2019 and June 2019) that collected commitment of manufacturing to other utilities by the manufacturer was taken into consideration at the time of evaluation.

The reply is to be viewed against the fact that even though PGCIL obtained the details of the commitments of bidders to other utilities as part of bid, the same had not been fully considered while assessing the spare capacity of the bidders as pointed out above. In the Exit Conference, Ministry directed (January 2020) Management to maintain complete records indicating evaluation of the bid criteria.

4.4.2.3 Improper analysis of financial capacity of the bidders

In terms of the Companies Act, 2013, turnover means the aggregate value of the realisation of amount made from the sale, supply or distribution of goods or on account of services rendered, or both, by PGCIL during a financial year. As per the approved Standard Qualifying Requirement (QR), Minimum Average Annual Turnover (MAAT) should be computed by excluding all non-recurring income.

Audit, however, noticed that the criterion for turnover was not consistent with definition of turnover given in the Companies Act, 2013. Besides, the QR Committee did not adopt a consistent methodology with regard to exclusion of all non-recurring income to work out MAAT. Further, detailed MAAT computation was also not found available on record despites reminders. Thus, correctness of computation of MAAT could not be verified.

Management/ Ministry stated (January 2019 and June 2019) that based on the suggestion of Audit, as a step towards system improvement, PGCIL had decided to align "Turnover" as defined by the Companies Act, 2013.

Audit appreciates the assurance given by Management to adopt the turnover as defined in the Companies Act, 2013 for bid evaluation to avoid any ambiguity in computation of MAAT.

4.5 Execution and completion of projects

Execution of contracts is carried out through Regional Offices, which are supposed to ensure that the work is carried out as per the stipulated detailed timelines. Audit observed delays in execution of contracts awarded under various projects. The reasons for delays were analysed as below:

4.5.1 Analysis of delay in completion of contracts

At the time of seeking investment approval, scheduled timeline for completion of project is laid down by the Management. During review of execution of selected 120 contracts executed by PGCIL under 18 projects relating to transmission projects, delay in completion of the erection/ supplies ranging from one month to 40 months was noticed in 109 contracts. Out of the above 109 delayed contracts; reasons for delay in 24 contracts were *inter alia* on the part of contractor and LD in respect of only 13 contracts was levied. In seven contracts finalisation of time

extension/ liquidated damages was in process and in remaining four contracts LD was not levied.

The major reasons attributable to PGCIL for such long delay are summarised in table 4.2.

Table 4.2

Reasons for delay	Number of Contracts	Period of Delay in months
Delay in providing clear front site by PGCIL to the contractors for the start of work like substation lands at Champa & Banaskantha , site at Krishnapatnam etc.	23	3 to 36
Delay in owner's supply material like tower, stubs, conductor etc. mandatory spares.	21	3 to 36
Delay in tower quantity finalization, change in tower type after detailed survey.	11	9 to 31
Scope and Quantity variation after detailed/ check survey, hold imposed to control CWIP.	11	1 to 39
Delay in type testing of insulators/ statutory clearances .	6	1 to 14
Other reasons		
Delay in starting of manufacturing activities/ inadequate mobilisation of resources/ delay in supply by agency/ contractor.	24	2 to 40
Delay in obtaining Forest clearance/ railway crossing/ tree cutting permission etc.	18	5 to 40
Delay in obtaining right of way.	48	2 to 40

The above delays in execution of contracts along with delay in applications for forest clearance, Right of way and pre - award activities by PGCIL as discussed in the foregoing paragraph 4.2 ultimately led to cascading effect on completion of 16 out of 18 selected projects.

Management/ Ministry stated (January/ June 2019) that delays in receiving various clearances adversely affect encumbrance free sites to contractor for work and inputs for survey.

The reply needs to be viewed against the fact that delay in receiving clearances was also due to delayed submission of applications by PGCIL with forest department or submitting applications without complete documents, which was avoidable. Moreover, as accepted by PGCIL, detailed survey was carried out after the award of work which further delayed the execution due to various social & environmental issues not factored in the planning and pre-award stages. Therefore, there was scope to reduce the delay in project execution by better Management.

4.6 Impact of Delay

As per CERC (Terms and Conditions of Tariff) Regulations, 2009, applicable for the period 2009-2014, an additional Return on Equity at the rate of 0.5 *per cent* is allowed if projects are commissioned on or after 1st April 2009 within the timeline specified in Appendix-II of the CERC's regulations. Delays in execution of contracts as mentioned above led to delay in completion of different transmission lines ranging from 6 to 69 months from the scheduled date of completion. Therefore, PGCIL has forgone additional return on equity of

₹112.51 crore due to non-completion of projects within stipulated timeline from the date of commissioning till the end of CERC Tariff Regulation 2014-19. The reasons for such delays were primarily attributable to issues pertaining to Right of Way, Forest clearance, etc. as discussed in foregoing paras.

Management/ Ministry stated (Feb/ June 2019) that the additional RoE, which is an incentive, cannot be perceived as an automatic income/ earning. Stringent timelines are stipulated such that projects under normal circumstances cannot be implemented in these time schedules. In the Exit Conference, Ministry stated (January 2020) that PGCIL should have made efforts to accomplish the work within the time prescribed by CERC and endeavour to avail additional return on equity.

4.7 Utilisation of Completed lines

4.7.1 Non-charging of relinquishment of LTA charges from the customers

As per the Regulation -18 of the Grant of Connectivity, LTA and Medium Term Open Access in Inter-State Transmission and related matters Regulations, 2009 issued by Central Electricity Regulatory Commission, a long term customer may relinquish the long term access rights fully or partly before the expiry of the full term of long term access by making payment of compensation for stranded capacity.

During review of records relating to relinquishment of LTA partially/ fully by customers, it was observed that total 21,853 MW of LTA were surrendered by the customers from September 2010 to March 2018. In addition, customers with 4,983 MW of LTA had changed their target region which was also considered as reduction in LTA by CERC and was, thus, equivalent to relinquishment of LTA. However, no relinquishment charges have been collected from the customers till date. PGCIL filed petitions with CERC pleading difficulties in the identification/ utilization/ non-utilisation of transmission elements in a meshed network for a long period. CERC directed CEA to suggest methodology to work out stranded capacity and the formulae for calculating corresponding relinquishment charges of LTA keeping in view the load generation scenario and power flows considered at the time of planning and changes subsequent to proposed relinquishment. Till a decision is taken based on the recommendations of CEA, CTU shall continue to take the relinquishment charges in accordance with Regulation 18 of the Connectivity Regulations. However, no recovery has so far been made even though CTU has worked out an amount of ₹41.09 lakh per MW as an indicative figure.

Further, as per Regulation 18(3) of the connectivity Regulations, compensation paid by the long term customer for the stranded capacity shall be used for reducing transmission charges payable by other long term customers and medium term customers in the year in which such compensation payment is due in the ratio

of transmission charges payable for that year by such long-term customers and medium term customers.

Management/ Ministry stated (June 2019) that the methodology for calculation for relinquishment charges for different long term access customers have been enumerated by CERC vide order dated 8 March 2019. Based on the CERC directions, billing of the above relinquishment charges are under process from the respective LTA customers.

Further, as per information provided by Management (May 2020), total relinquishment charges recoverable from customers was ₹7,205.41 crore and after adjustment of the available bank guarantees available with PGCIL, an amount of ₹6,853.43 crore is yet to be recovered from the relinquished customers.

Management's reply underscores the fact that relinquishment charges from respective LTA customers are yet to be collected.

Hence, non-collection of compensation charges by PGCIL for stranded capacity as a result of relinquishment of transmission assets, consumers are being put under extra financial burden.

4.7.2 Assessment of utilisation of completed transmission lines of selected projects

PGCIL had not devised any mechanism or fixed any criteria/ benchmark for assessing the utilisation of the existing transmission lines.

In the absence of a regular line utilisation assessment system in place in PGCIL, Audit analysed utilisation of 30 completed transmission lines[47] (completed between December 2013 and March 2019) of the 18 selected projects based on the power flow data obtained from POSOCO. Analysis of the average power flows as well as maximum power flows at any point of time in these lines since the respective date of commissioning of each line upto March 2019 is detailed in ***Annexure 4*** and the results of audit analysis summarised in Table 4.3.

Table 4.3 Analysis of average power flows

Average power flows as a percentage of Maximum loadability of the line	Number of lines
Less than 10 *per cent*	12
Between 10 to 30 *per cent*	15
Between 30 to 60 *per cent*	2
Above 60 *per cent*	1
Total	**30**

The above indicates that 27 lines (90 *per cent*) had average power flows less than 30 *per cent.* Audit also noticed that maximum power flows in 18 out of 30 lines (60 *per cent*) remained below 40 *per cent* of their respective maximum loadability during the period since their inception to March 2019.

[47] ***Out of total 56 lines covered in 18 projects as per selected sample, 37 lines had length of more than 100 Km for which power flow data was requested from POSOCO. POSOCO provided data (June 2019) in respect of 30 lines which was analysed in audit***

As already discussed in para 3.2.4 above, various Committees had studied and communicated (January 2013 and January 2015) measures to improve line loadability of various lines to mitigate congestion in the long run. However, PGCIL had not adequately taken action on the recommendations of the Committees to improve loadability of the identified lines some of which were found to be cautioning congestion even in October 2019.

The above indicates that in some cases there was excess capacity, which was not being optimally utilised while in others there was need to enhance the capacity to mitigate congestion. This underscores the need for PGCIL to set up a system of regularly monitoring for line utilisation and take steps for optimum utilisation of assets.

Management stated (July 2019) that

(i) There are wide variations in daily/ monthly/ seasonal loads and power systems are planned to facilitate evacuation of power in peak conditions.

(ii) The above transmission lines were planned to transfer power from various generating projects many of which were abandoned.

(iii) These corridors are linked to resource rich areas therefore with growing power requirements more power is likely to flow from these lines. The objective of tariff policy also implies optimal development of transmission network ahead of generation with adequate margin for reliability.

In the Exit Conference, Ministry (January 2020) stated that this was an important issue under analysis in the Ministry.

The reply needs to be viewed against the fact that

(i) In 18 out of 30 selected lines even the maximum power flows remained less than the 40 *per cent* loadability of the lines.

(ii) The reply indicates that the execution of transmission lines was not matched with the progress of corresponding generation projects resulting in stranded capacity.

(iii) The reply does not indicate any concrete plans or projected timeframe in which the excess capacity is likely to be put to optimum use due to growing power requirements.

4.7.3 Non-utilisation of transmission lines/ substations due to non-commissioning of intra state/ downstream network

As per NEP, Central Transmission Utility (CTU) and State Transmission Utilities (STUs) are responsible for planning and development of the transmission system. NEP prepared by the CEA serves as guiding document in this process. CTU is responsible for the national and regional transmission system planning and development. STUs are responsible for planning and development of the intra-

state transmission system. CTU would have to coordinate with STUs and other stakeholders for preparing a well-coordinated transmission plan for the Country.

Audit observed that presently CTU as such was not having any institutional mechanism of coordination of inter-state and intra state transmission systems. Coordination of various agencies/ stakeholders was being carried out through the mechanism of discussions in the Standing Committee of CEA and Regional Power Committee.

A Sub-committee of Central Advisory Committee (CAC) on congestion, constituted by CERC (June 2015) highlighted the issue of mismatch between inter-state and intra-state transmission system and directed CTU to submit quarterly report on augmentation of transmission system in the country to CERC for better coordination and to avoid mismatch. However, compliance of the same had not been done by CTU. CERC further observed (26 March 2018) *inter alia* that the actions taken by CTU and CEA for coordination were not yielding the desired results in development of matching state network. CERC again directed (26 March 2018) CTU to submit six monthly exception reports in case of mismatch to CEA and CERC. The first such exception report was submitted to CERC on 13 February 2019 after almost 11 months.

Review of records disclosed the following:

(i) Out of the 18 selected projects some of the transmission assets in two[48] projects commissioned by PGCIL could not be utilized due to non-completion of associated network or mismatch in commissioning of upstream/ downstream network by States. Accordingly, CERC refused to approve the actual date of commercial operation as claimed by PGCIL due to non-completion of associated network or mismatch and did not award any tariff to PGCIL for these assets despite commissioning thereof**.**

(ii) In the meeting of Sub-committee (January 2015) constituted by CERC to examine the congestion in transmission system, POSOCO highlighted the issue of non-availability of underlying network[49] at four[50] sub–stations in three out of 18 selected projects which adversely affected the transfer capacity of lines. POSOCO in their operational feedback (April 2017) reiterated that due to non-availability of underlying network of three sub-stations *viz.* (Bhiwani, Kurukshetra and Chittorgarh) out of which Bhiwani sub-station was pointed out by them in January 2015 and yet to be completed by respective States were responsible for transmission constraints in the system.

Thus, it may be seen that there were instances of non-utilisation of interstate transmission line/ substations due to non-commissioning of downstream network, resulting in idle investment till the commissioning of associate or downstream/

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[48] ***Padge – kudus 400 kV transmission line and 02 Nos 400/ 220 kV, 500 MVA ICT & 08 nos 220 kV bays at Kurukshetra***

[49] ***Connected intra-state network***

[50] ***(i) Bhiwani, (ii) Sholapur (Pg),(iii) Pune and(iv) Aurangabad(Pg)***

upstream network. This situation adversely affected the smooth power flow as highlighted by POSOCO from time to time. Audit is of the opinion that PGCIL in its role as CTU should have taken proactive steps to ensure coordinated planning and execution of transmission system to avoid non-utilisation of inter-state transmission system due to non-commissioning of intra-state/down-stream transmission network.

Management stated (January 2019) that the recommendations of Sub-Committee on congestion constituted by CAC were advisory in nature and were accepted by CERC in its order dated 26 March 2018. Ministry added (June 2019) that six monthly exception reports in case of mismatch of Inter State transmission with Intra state transmission network has been now sent to CEA and CERC.

Reply of the management is to be viewed against the fact that CERC vide its order dated 26 March 2018 *inter alia* had stated that actions taken by CTU and CEA had not yielded the desired results in development of matching state network. Though CTU had belatedly submitted six monthly exception reports in case of mismatch to CEA/CERC, CTU/PGCIL may also take proactive action to resolve these mismatches as CERC had denied the tariff to PGCIL in case of non-commissioning of underlying network as discussed above.

Chapter - 5

Project Monitoring

5.1 Project Monitoring

PGCIL monitors projects through a two tier monitoring system at both pre-award and post-award stages of contracts. For corporate level monitoring, Corporate Monitoring Group (CMG) Department and for Regional level monitoring, Planning Environment & Social Management (PESM) Departments of the concerned regions under PGCIL are the responsibility centers.

5.2 Pre-award monitoring

Procurement Policy of PGCIL prescribed monthly pre-award meetings at the level of Executive Director (Contract Services) and review meetings at the level of Director (Projects) once in two months.

However, it was noticed that out of 60 pre-award monthly meetings to be held during the period 2012-13 to 2016-17, only 11 meetings were held. Further pre award meetings was held only once in a year during 2012-13, 2014-15 and 2016-17 and no pre award meeting was held during 2015-16. Moreover, minutes of meetings were also not maintained.

During these meetings, Executive Director (Contract Services)/ Director (Projects) had instructed early supply of inputs/ finalization of QR for timely floating of NIT, issuance of NOA *etc.* A review of 18 selected transmission projects where specific target dates for NIT and NOA were fixed in these meetings held during April 2013 to March 2017 revealed that in seven transmission projects the targets were not met and delay ranging from 6 days to 819 days was observed.

Management/ Ministry replied that (January/ June 2019) that all efforts are made to ensure completion of various activities by dates committed or specified.

The fact remained that no follow up actions were pursued in the following meetings and delay ranging from 50 weeks to more than 150 weeks in the award of 93 contracts relating to 17 transmission projects. Thus, in the absence of timely follow up on the progress of work or actions taken for timely completion of projects the intended purpose of monitoring was not served.

5.3 Post-award monitoring

5.3.1 Project Review Meetings

WPPP provided that, for better coordination amongst various departments at Corporate Office and Regions as well as smooth execution of projects, Region-wise Project Review Meetings (PRMs) shall be held and chaired by the Executive Director of respective Region, once in two months. Review of records, however, revealed the following:

(i) PRMs were not held at prescribed intervals as only one to four[51] meetings were held by each Region during 2012-17 against the requirement of holding 30 PRM meetings during that period.

Targets were fixed in the PRMs in terms of completion, submission of compliance reports, resolution of critical issues etc. In the absence of regular meetings it would be difficult to monitor the targets set and early resolution of critical issues which in turn affected smooth execution of projects.

(ii) Slow progress of work, slow/ non-mobilisation of resources by the contractors was also discussed in the meetings. However, in the absence of timely follow up on the progress of work or actions taken for timely completion of projects, the intended purpose of monitoring was not served.

(iii) The problems/ constraints like delay in land acquisition/ severe right of way problems, forest clearance, delay in readiness of substations and stringing problem etc. were discussed about 11 out of 18 selected transmission projects for long time but remained unresolved.

Thus, PRMs were held for all the projects. However, these meetings had no significant impact in controlling the delays of 1 to 39 months in providing site fronts, delay in owner supply material like tower, conductors etc., change in scope and quantity due to inadequate survey, delay in starting of manufacturing actives by manufactures in respect of 10 schemes. Thus, in the absence of timely follow up on the progress of work or actions taken for timely completion of projects the intended purpose of monitoring was not served.

Management/ Ministry replied that (January/ June 2019) that with the increase in number of projects and use of IT infrastructure, monitoring of projects through video conferencing is done more effectively and at lesser cost.

The reply is to be viewed against the fact that no minutes of above video conferencing were made available and in the absence of same, adherence of WPPP with regard to holding of required meetings could not be ensured. This has also contribution of avoidable delays in execution of 10 schemes.

5.3.2 Quarterly Performance Review at Ministry level

In addition to project monitoring system at PGCIL's level as discussed above, MoP also monitored the performance of PGCIL projects every quarter. However, status of quarterly performance review meetings held during 2012-17 revealed that only 10 meetings were held against 20 required meetings with intervening gap of three to 16 months.

Review of above ten meetings, disclosed that:

(i) In 2012-13 only one meeting was held on 12 March 2013 (3rd quarter) in which Secretary (Power) directed PGCIL to take up action on certain issues.

[51] ***WR I-2, WR II-1 NR I-4, NR II-4, NER-1, SR I-4, ER II-4.NR III-1and Odisha-1***

However, in the next meeting held on 7 November 2013 no compliance/ progress in respect of the above was discussed as per the minutes. Similarly, no follow up of the directions given by Secretary Power in the meeting held on 7 November 2013 were found recorded in the minutes of the subsequent meetings.

(ii) In 2014-15, only one meeting was held on 23 September 2014 whose minutes were not found on records.

(iii) The meeting for 1st, 2nd and 3rd quarter for 2015-16 was held on 22 February 2016 with a gap of about 16 months from the last meeting held on 23 September 2014.

Ministry (June 2019) stated that henceforth Quarterly Progress Report (QPRs) would be held regularly and PGCIL was advised to furnish action taken report of last QPR meeting before the next QPR meeting.

Audit appreciates the assurance given by the Ministry with regard to holding of regular meetings in future to ensure the action taken on the directions given in preceding meetings.

5.4 Project completion reports

PGCIL did not have any system of preparing project completion reports after completion of projects to bring out at one place all technical and financial details of the project, major problems faced during implementation and specific initiatives/actions taken to resolve them. Such reports, if available, could have been used to bring on record any special process or methodology to be adopted and its experience/achievement as well as any important aspects to be kept in view in future projects.

Management/ Ministry (June 2019) stated that study, deliberations and updating of the format for project closure report are under progress and the project closure report would be prepared for all future projects.

Audit appreciates the assurance given by the Management/Ministry with regard to preparing project completion reports in future. However, on the similar issues raised in the CAG report no 18 of 2014 Ministry had assured (March 2014) to suitably consider the audit findings in revised WPPP/ ERP. But, it was observed that no changes/modifications regarding the above were made in revised WPPP 2016.

5.5 Non-monitoring of 24x7 power supply across the country

The objectives of 24x7 Power for All (PFA) programme of GOI are to supply quality, reliable and affordable power 24x7 to all domestic, commercial and industrial consumers by March 2019. To implement 24x7 PFA, a Central Programme Monitoring Unit (CPMU) under the chairmanship of Joint Secretary (Distribution) Ministry of Power, GOI with ED (T&D), REC as convener had been constituted with officials from various CPSEs.

Audit observed that:

(i) Director (Projects), PGCIL was required to submit to Ministry a monthly/ quarterly report focusing on various key areas related to various inter-state transmission systems such as physical progress, achievements and/ or other related issues. However, no such system of periodic reporting pertaining to 24x7 schemes had been set up by PGCIL. The issue was reiterated in the meeting for 'Monitoring of 24x7 PFA' held on 22 January 2018 under the chairmanship of Joint Secretary (Distribution), But, till date no such monthly progress report for 24x7 schemes has been furnished by PGCIL to Ministry.

(ii) Monitoring of 24x7 PFA scheme is being done entirely through a dedicated web portal and Central Programme Monitoring Unit (CPMU) requested PGCIL to update the progress of various interstate projects. The web portal serves as a dashboard for the Programme which is easily accessible by all parties associated. It was not intimated to Audit if PGCIL had been updating the portal with information which is important to stakeholders such as the status of completion of various transmission lines/substations, achievements and/or other related issues or not.

Thus, monitoring by PGCIL in the PFA scheme indicates that there was scope for further improvement.

Management/ Ministry stated (January 2019/ June 2019) the following:

(i) Monthly/ quarterly reports focusing on the key areas related to various inter-state transmission systems, including those identified by the States to meet "24x7 Power for All" are sent to Ministry of Power and Ministry of Program Implementation.

(ii) As suggested by Audit, efforts will be made in the next review meeting of CPMU, to collect necessary details for uploading this information on dedicated web portal for 24x7 Power for All also.

Management's/ Ministry's reply is to be viewed against the following facts:

(i) No specific report focusing on lines identified under 24x7 Power for All scheme is being forwarded to Ministry.

(ii) Regarding updation of the online portal for 24x7 Power for All, Management has accepted the audit observation.

Chapter - 6

Conclusion and Recommendations

6.1 Conclusion

Planning for transmission system in PGCIL was marked by non-preparation of an Annual Network plan, absence of any plan for augmentation of transfer capacity in the long run and mismatch in planning transmission system for evacuation of power from new generating projects.

CTU was mandated to coordinate with stake-holders like STUs and prepare a network plan based on NEP in coordination with concerned agencies. A well-defined Network Plan for information to the STUs and other stakeholders of the likely capacity addition to the transmission system was essential to serve as an effective planning and coordination tool. However, no network plan was prepared by CTU. Network plan was also required to consider the possibilities for upgradation of existing lines before laying new lines. In the absence of a network plan, a structured mechanism to assess and focus on the requirement for upgradation/re-optimisation of the existing lines before setting up new lines remained unavailable. Besides, PGCIL did not take adequate measures to upgrade the existing transmission system as suggested by CERC committees/ POSOCO which resulted in transmission constraints and high loading in some of the lines.

PGCIL has not declared its plans/ targets for augmentation of transfer capability in long term against the specific regulatory requirement of declaration of TTC for four years. In the absence of the long term declaration of TTC, there was no benchmark to assess the actual performance of PGCIL in terms of its capacity to transfer power. At the end of the 12th Five Year Plan actual TTC achieved in all the regions except WR-NR was less than even 50 *per cent* of the achievable targets as per NEP. Non-achievement of adequate TTC as per the projections in the NEP reduced the availability of margins thereby impacting short term power transactions.

Although transmission projects were required to precede commissioning of generation projects by at least six months, six out of eight transmission projects were completed after commissioning of linked generation projects. This resulted in mismatch between commissioning of generation projects and associated transmission projects. As a result, PGCIL had to make interim arrangements in respect five generation projects resulting in congestion in Chhattisgarh and adjoining areas.

Execution of transmission projects suffered delays due to delays in submission of forest proposals by PGCIL, submission of incomplete documents with the

forest proposals, time taken in land acquisition, delay in providing front/ site by PGCIL, etc.

Only two out of the 18 selected projects were completed within scheduled time while 13 were completed with delays ranging from 04 to 71 months. Anticipated delays in the remaining three projects ranged from 6 to 109 months. PGCIL also lost the opportunity of earning ₹112.51 crore during the project life towards additional Return on Equity which would have been allowed in terms of CERC Regulations by timely completion of the projects.

Project monitoring meetings both at pre-award and post award stages were not held as per prescribed intervals and no follow up actions were taken to resolve the critical issues noticed by Management in subsequent meetings. Besides, the completed lines were also not optimally utilised as even the peak power flows in 18 out of 30 selected lines remained below 40 *per cent* of their respective maximum loadability. Hence, proper monitoring mechanism was also required for assessing the utilisation of existing lines.

6.2 Recommendations

Based on the Audit findings discussed in the forgoing chapters the following recommendations are made to facilitate improvement in planning and implementation of transmission projects:

1. The existing regulations may be reviewed to assess the need for modification, in order to address the requirements of Short Term Open Access.
2. CTU may prepare Annual Network Plan based on the NEP plan as per directions given by Ministry.
3. A comprehensive re-optimization study may be undertaken by an independent group (Internal technical audit team) to improve economy and efficiency in general and reliability, resilience, IR TTCs and ISTS-STU TTCs in particular.
4. CTU/ PGCIL may ensure coordinated planning and execution of inter-state transmission system with associated generation projects as well as with intra-state transmission system to avoid mismatch. PGCIL may also put in place an institutional mechanism to review and monitor the status of interconnected transmission schemes and to update transmission data files for planning software.
5. PGCIL may record efforts made to explore the possibilities of upgradation of the existing transmission lines before deciding construction of new line.
6. PGCIL may disclose on its website and monitor the key parameters of TTC over a four-year period as per the CERC regulations.

7. PGCIL may initiate advance action for detailed survey for preparing BOQ and NIT cost estimates and submit forest proposals within the stipulated time to expedite the project execution.

8. PGCIL may take steps to minimize delays in project execution due to factors which are controllable by PGCIL through effective monitoring.

New Delhi
Dated: 30 July 2020

(Shubha Kumar)
Deputy Comptroller and Auditor General
and Chairperson, Audit Board

Countersigned

New Delhi
Dated: 31 July 2020

(Rajiv Mehrishi)
Comptroller and Auditor General of India

Annexure

Annexure 1
(As referred to in Para 2.5)

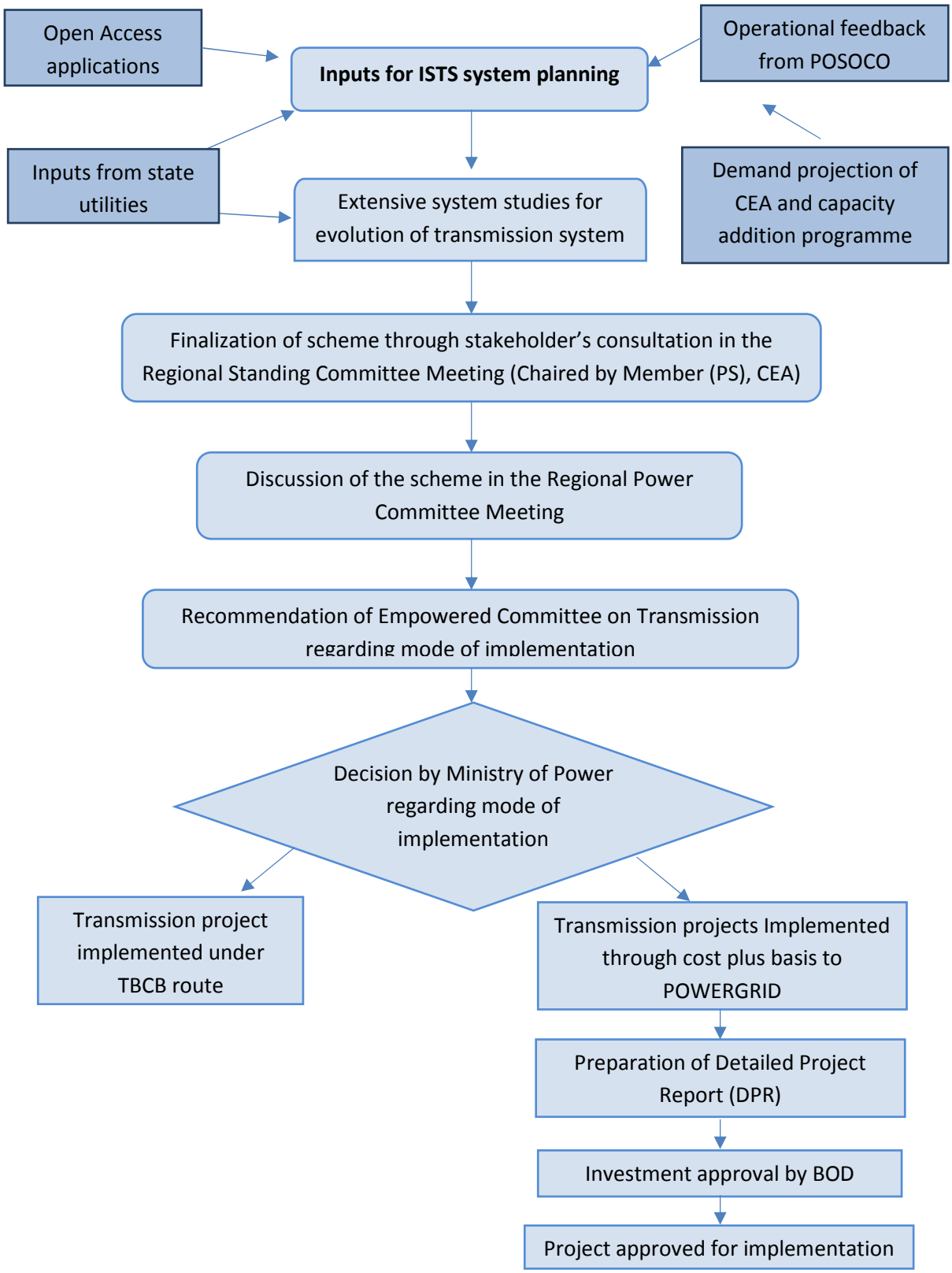
Statement showing18 selected projects for Performance Audit along with completion status as on December 2018

Sl. No.	Name of the Project	Date of Investment Approval	Investment approval cost (₹ in crore)	Capital expenditure upto 31 March 2017 (₹ in crore)	Whether completed or on-going as on December 2018
	System Strengthening Project				
1	System Strengthening - XIX in Southern Regional Grid (SRSS - XIX)	31.08.2012	1,935.35	1,717.50	Completed in March 2015
2	Transmission System for Krishnapatnam UMPP -PART B	08.02. 2012	1,927.16	1.718.60	Completed in April 2016
	Total			**3,436.10**	
(II)	**Generation Associated project**				
3	Transmission System Strengthening in Western Part of WR FOR IPP Generation Projects in Chhattisgarh - DPR 4	17.11.2011	2,127.51	2,356.30	Completed in December 2017
4	System Strengthening in North/ West part of WR for IPP Projects in Chhattisgarh (DPR -5)	27.12.2011	1,746.65	1,825.10	Completed in December 2017
5	Common System associated with East Coast Energy Private Limited and NCC, Power Projects Limited LTOA Generation Projects in Srikakulam Area-Part-B	28.03.2013	2,514.88	1,955.60	Completed in December 2018
6	Transmission System associated with Pallatana Gas Based Power Project and Bongaigaon Thermal Power Station (TS for bongaigaon merged)	25.02.2010	2,144.00	1,804.20	Completed in November 2018
7	North East - Northern / Western Inter- connector - I (Subansiri&Kameng)	24.02.2009	11,130.19	8,125.90	On-going (Anticipated date March 2022)
8	WR-NR HVDC Interconnector for IPP Projects in Chhattisgarh (DPR-9)	26.03.2012	9,569.76	7,084.30	Completed in September 2017
9	Transmisison system for development of pooling Station in Northern part of West Bengal and Transfer of power from Bhutan to NR/WR	15.04.2010	4,404.57	3,089.40	Completed in March 2018
10	Transmission System of Vindhyachal-IV and Rihand-III (1000MW) Generation Projects	16.03.2010	4,672.99	2,874.50	Completed in August 2015
11	Transmission System For Phase-I Generation Projects in Orissa (Part- C)	15.03. 2011	2,569.25	2,699.00	Completed in August 2015
12	Transmission system for Phase-I generation Projects in Jharkhand and West Bengal Part B	08.02.2012	3,201.44	3,628.90	Completed in October 2016
13	Transmission System Phase-I Generation Projects in Jharkhand and West Bengal - Part A2	27.12.2011	2,422.66	2,383.30	Completed in April 2016
	Total			**37,826.50**	

Sl. No.	Name of the Project	Date of Investment Approval	Investment approval cost (₹ in crore)	Capital expenditure upto 31 March 2017 (₹ in crore)	Whether completed or on-going as on December 2018
(III)	**Inter - Regional**				
14	Inter-Regional System Strengthening Scheme for NR and WR (Part-B)	24.12.2014	6,517.36	2,779.70	Completed in April 2018
15	Wardha - Hyderabad 765 KV Link [Earstwhile Common Transmission Scheme Associated with ISGS Projects in Vemagiri Area of Andhra Pradesh - Part -B]	29.01.2015	3,662.02	2,136.80	Completed inJuly 2017
	Total			**4,916.50**	
(IV)	**Green Corridor**				
16	Green Energy Corridor: Inter State Transmission Scheme (ISTS) Part A	17.04.2015	1,479.30	525.54	Completed in June 2018
17	Green Energy Corridors: Inter State Transmission Scheme (ISTS) - Part - B	17.04.2015	3,705.61	1,564.20	On-going (Anticipated date February 2019)
18	Green Energy Corridor: Transmission scheme for Renewable Generation Projects – Part C	02.07.2015	2,247.37	263.14	On-going (Anticipated date January 2019)
	Total			**2,352.88**	
	Grand total (I+II+III+IV)			**48,531.98**	

Annexure 2
(As referred to in Para 3.1)

Flow chart showing the activities from transmission project conceptualization to project approval



Annexure 3
(As referred to in Para No. 4.2.1)

Statement showing instances of re-alignment of forest area after submission of forest clearance proposal

Sl. No.	Transmission Projects	Details	Management's Reply	Audit Remarks
1	Transmission System associated with Pallatana Gas Based Power Project and Bongaigaon Thermal Power Station project	In Pasighat - Roing 132 kV SC line, initial forest proposal was submitted on 14 September 2010 (for Pasighat Division- 36.07 Ha and Roing Division - 117.7 Ha). However, the same was withdrawn by PGCIL and a fresh proposal was submitted (31 January 2012) due to re-alignment of line as the earlier route envisaged for Pasighat Division was inaccessible and was subject to prolonged disruption of road communication. This delayed the forest clearance process.	1) **Pasighat – Roing 132 kV SC line**: The forest proposal was submitted based on preliminary survey of the route. However, during detailed survey it was noticed that the locations were inaccessible for almost 7 to 8 months during monsoons; and communication remained cut off for most part of the year and the locations became accessible only after October.	1) **Pasighat – Roing 132 kV SC line:** The initial proposal was submitted on 14 September 2010 and the same was withdrawn by POWERGRID on 31 January 2012, i.e., after a lapse of almost two years. This needs justification. Besides, had POWERGRID carried out the detailed survey before preparation of BOQ and Cost estimates as mandated by WPPP, the fact about the inaccessibility of the route would have become apparent much earlier and re-alignment of the proposed land could have been avoided. Instead, POWERGRID had submitted the proposal based on preliminary survey only.

Sl. No.	Transmission Projects	Details	Management's Reply	Audit Remarks
		➢ Similarly, in Pallatana - Surajmaninagar (TSECL) 400 kV DC line (Udaipur region), forest proposal was re-submitted (22 January 2011) since the earlier proposal (2 July 2010) was for 3.923 Ha, whereas after joint verification, the actual forest area was found to be of 3.345 Ha only. The forest area required for diversion was yet again reduced (04June 2011) to 2.161 Ha due to incorrect alignment of the transmission line on the map.	2) **Pallatana - Surajmaninagar 400 kV DC line**: The area was revised to 3.345 Ha based on joint verification; and later to 2.161 Ha as some of the plot was confirmed as non-forest area. It was further stated that identification of land is the responsibility of State Revenue Department and POWERGRID has no role in the same.	2) **Pallatana - Surajmaninagar 400 kV DC line:** WPPP requires carrying out of detailed survey of forest stretches likely to be involved **before** preparation of BOQ and Cost estimates (i.e., before attaining Investment Approval). This essentially means that detailed surveys should be carried out **before** submission of forest proposals. Had POWERGRID followed the same in principle, instances of deviations in the area assessed by POWERGRID from the area assessed by State Authorities could have been minimised. Further, Management's contention that identification of land is the responsibility of State Revenue Department and POWERGRID has no role in the same is not tenable as the task of carrying out of detailed survey of forest stretches to be encountered before investment approval by POWERGRID is clearly mandated by its own WPPP.

Sl. No.	Transmission Projects	Details	Management's Reply	Audit Remarks
2	Transmission line associated with 'North East-Northern/Western Interconnector-I (Subansiri&Kameng) project	➢ In case of 'Lower Subansiri – BiswanathChariyali (Pooling Point) kV 2 DC lines with twin lapwing conductor' of Arunachal Pradesh, first forest clearance proposal was submitted by Company 05 June 2008. However, forest proposal was returned by Forest Division on 01-04-2009, stating that the actual forest area to be diverted would be 84 Ha, instead of 24.117 Ha as claimed by PGCIL. This error was because PGCIL had not adhered to the guidelines of Forest Conservation Act, 1980 regarding 'effective area' to be considered for 400kV Transmission Lines. Accordingly, PGCIL revised and re-submitted the proposal for diversion of 74.32 Ha of land vide their letter dated 13.04.2009.	1) **Lower Subansiri – Biswanath Chariyali (Pooling Point) kV 2 DC lines with twin lapwing conductor (Arunachal Pradesh and Assam Portion)**: The affected area for forest compensation was calculated considered following the principles of avoidance, minimization and mitigation; and hence, different widths of Right of Ways (6m width and 46m width) were considered for laying of the transmission lines.	1) **Lower Subansiri – Biswanath Chariyali (Pooling Point) kV 2 DC lines with twin lapwing conductor (Arunachal Pradesh and Assam Portion):** It is evident that the guideline of Forest Conservation Act, 1980 regarding 'effective area' to be considered for 400 kV transmission lines was not adhered to by POWERGRID. Besides, the reply is silent regarding how forest land under Subansiri Reserved Forest in Assam falling under NHPC could not be identified during survey carried out by POWERGRID.
		➢ **Kameng - Balipara 400 kV DC line:** Similarly, for the Assam portion of the	2) **Kameng - Balipara 400 kV DC line (Assam and Arunachal Pradesh)**: The	2) **Kameng - Balipara 400 kV DC line**: Width of ROW for different types of transmission

Sl. No.	Transmission Projects	Details	Management's Reply	Audit Remarks
		Transmission line, although the initial forest proposal was submitted on 05-06-2008, it was identified later on that 7.105 Ha of forest land under Subansiri Reserved Forest in Assam fell under the project area of NHPC. Hence, proposal for diversion of the same was forwarded to the Nodal Officer on 09.02.2009. However, PGCIL, vide their letter dated 16.05.2009, submitted a separate proposal for diversion of 9.89 Ha (instead of the earlier 7.105 Ha) of forest land because it was felt that there should be a change in consideration of total effective land. ➢ Similarly, in the case of Kameng - Balipara 400 kV DC line, initial proposal submitted on 13.06.2008 was for 95.842 Ha (for Arunachal Pradesh). However, on field	variation in the proposal was due to consideration of different widths for hill tops with deep valleys on the underside and rest of the area. However, Forest Authorities directed POWERGRID to consider ROW corridor of 46m for the entire stretch.	lines has been mandated by Forest Conservation Act, 1980 and therefore, the re-alignment of forest area in the instant case could have been avoided had POWERGRID ensured adherence with the same.

Sl. No.	Transmission Projects	Details	Management's Reply	Audit Remarks
		verification, the actual area was found to be 133.56 Ha and as such, on 06.05.2009 POWERGRID was asked to resubmit the proposal with the revised area and the same was forwarded to DFO on 12.05.2009.		
3	Transmission system for Phase I generation Projects in Jharkhand and West Bengal (Part B) Project	➢ In case of Varanasi - Sarnath 400 kV DC Quad Transmission Line associated with above project, application for Varanasi region for 0.092 Ha was submitted on 27-12-2013. However, later Company assessed that some more forest stretch would be involved in Jaunpur region as well for which forest clearance proposal was submitted on 23.06.2014.	1) **Varanasi - Sarnath 400 kV DC Quad Transmission Line**: Since it was made mandatory to file forest proposal online, the same was submitted online on 12 March 2014.	1) **Varanasi - Sarnath 400 kV DC Quad Transmission Line**: Management's reply is not specific to audit observation, i.e., re-submission of forest proposal on 23 June 2014 on account of requirement of additional forest stretch for Jaunpur region.

Annexure 4
(As referred to in Para 4.7.2)

Statement showing Details of line loading in respected of selected transmission schemes

Sl. No.	Project Name	Transmission line	date of commissioning	Max loadability per ckt (MW)	Average power flow	Max power flow	% average power flow	% of max power flow w.r.t Max loadability
1	System Strengthening - XIX in Southern Regional Grid (SRSS - XIX)	1) Kurnool - Thiruvalam 765 KV DC line (355 KM)	Nov-14	2,500	622.18	1619.55	24.89	64.78
2	Transmission System Strengthening in Western Part of WR FOR IPP Generation Projects in Chhattisgarh - DPR 4	1) Wardha - Aurangabad 765 KV DC line (350 KM)	Jul-14	2,500	1,151.38	1648.79	46.06	65.95
		2) Aurangabad - Boisar 400 KV DC Quad (336 KM)	Dec-17	2,186	295.77	645.68	13.53	29.54
3	System Strengthening in North/ West part of WR for IPP Projects in Chhattisgarh (DPR -5)	1) Aurangabad - Padghe 765KV DC (279 KM)	Dec-17	2,500	439.44	1217.38	17.58	48.70
4	Common System associated with East Coast Energy Private Limited and NCC, Power Projects Limited LTOA Generation Projects in Srikakulam Area-Part-B	1) Angul - Jharsuguda 765 KV DC (245 KM)	Dec-18	2,500	586.38	735.81	23.46	29.43
		2) Jharsuguda - Dharamjaigarh 765 KV DC line (156 KM)	Nov-18	2,500	508.12	255.93	20.32	10.24
5	Transmission system associated with Pallatana Gas Based Power Project abd Bongaigaon Thermal Power Station	1) Silchar - Purba Kanchan Bari (TSECL) 400 kv dc line - 122 km	Jun-15	360	19.19	96.33	5.33	26.76
		2) Silchar - Melriat (New) 400KV DC line - 160 km	Nov-18	360	26.86	70.48	7.46	19.58
		3) Silchar - Imphal (New) 400 KV dc line - 140 km	Mar-15	1,093	78.67	346.97	7.20	31.74
6	North East - Northern / Western Inter-connector - I (Subansiri & Kameng)	1) Biswanath Chariyali - Agra Pole –I 800kv 6000MW HVDC bipole line - 1971 km	Oct-15	3,000	244.00	2021	8.13	67.37
		2) Balipara - Bongaigaon 400 kV DC Line (Quad) - 300 KM	Nov-14	2,186	145.90	965.05	6.67	44.15
7	WR-NR HVDC Interconnector for IPP Projects in Chhattisgarh (DPR-9)	1) 800 kV, 3000MW HVDC bipole between Champa	Mar-17	3,000	612.42	1859	20.41	61.97

Sl. No.	Project Name	Transmission line	date of commissioning	Max loadability per ckt (MW)	Average power flow	Max power flow	% average power flow	% of max power flow w.r.t Max loadability
		Pooling Station (WR) - Kurukshetra (NR)-Pole -I (with provision to upgrade HVDC terminal to 6000MW at a later date) (1365 KM)						
		2) 800 kV, 3000MW HVDC bipole between Champa Pooling Station (WR) - Kurukshetra (NR)-Pole –II (with provision to upgrade HVDC terminal to 6000MW at a later date)	Sep-17	3,000	699.13	1870	23.30	62.33
9	Transmission System of Vindhyachal-IV and Rihand-III (1000MW) Generation Projects	1) Satna-Gwalior 765 KV 2xSC line (CKT-I 360 KM, CKT II - 359 KM)	Feb-14	2,500	453.00	300.4	18.12	12.02
		2) Gwalior-Jaipur (RVPN) 765 kv sc line (300 KM)	Aug-15	3,000	571.00	571	19.03	19.03
10	Transmission System For Phase-I Generation Projects in Orissa (Part- C)	1) Jabalpur Pooling Station - Bina 765 KV DC line (238 KM)	Dec-13	2,500	295.03	583.58	11.80	23.34
		2) Bina - Gwalior 765 KV SC (3rd circuit) line (241 KM)	May-14	2,500	391.7	1038	15.67	41.52
		3) Gwalior - Jaipur 765 kv SC (2nd circuit) line (300 KM)	Aug-15	3,000	571.00	571	19.03	19.03
11	Transmission system for Phase I generation Projects in Jharkhand and West Bengal Part B	1) Varanasi - Kanpur 765 KV DC 362 KM line	Jul-16	2,500	361.23	597.8	14.45	23.91
12	Transmission System for Phase - I Generation Projects in Jharkhand and West Bengal - Part A2	1) Ranchi New (765/400kv substation) - Dharamjaygarh/near Korba 765 kv SC line (339 KM)	Dec-15	2,500	102.95	753	4.12	30.12
		2) Gaya - Varanasi 765 kv SC line (246 KM)	Apr-16	2,500	157.02	582.02	6.28	23.28

Sl. No.	Project Name	Transmission line	date of commissioning	Max loadability per ckt (MW)	Average power flow	Max power flow	% average power flow	% of max power flow w.r.t Max loadability
		3) Balia – Varanasi 765kV S/c line	Mar-16	2,500	131.48	627.29	5.26	25.09
13	Transmission System for Krishnapatnam UMPP -PART B	1) Sholapur - Pune 765 KV SC line - 269KM	Feb-15	2,500	358.37	1167	14.33	46.68
		2) Raichur-Sholapur 765 kV S/C line	Dec-13	2,750	799.56	1361.3	29.07	49.50
14	Inter Regional System Strengthening Scheme for NR and WR (Part-B)	1) Jabalpur Pooling station - Orai 765 kv dc line -361 km	Mar-18	3,000	264.18	892	8.81	29.73
		2) Orai - Aligarh 765 kv DC line - 300 km line I	Apr-18	2,500	1,285.23	1785.1	51.41	71.40
15	Wardha Hyderabad 765 kv link [Erstwhile Common Transmission Scheme Associated with ISGS Projects in Vemagiri Area of Andhra Pradesh - Part -B]	2) Wardha-Nizambad 765 kV D/C line I	Mar-17	2,500	2,109.88	2351.48	84.40	94.06
17	Green Energy Corridors: Inter State Transmission Scheme (ISTS) - Part - B	1) Banaskanta - Chittorgarh (New) 765 KV DC Line - I	Mar-19	3,000	203.80	361	6.79	12.03
		3) Chittorgarh - Ajmer (New) 765 KV DC Line - 199 KM line I	Dec-17	2,500	73.28	305.78	2.93	12.23
18	Green Energy Corridor: Transmission scheme for Renewable Generation Projects – Part C	1) Bhuj Pool - Banakskanta 765 kv DC line - 309 KM	Jan-19	2,500	77.50	766.34	3.10	30.65

Glossary of Technical Terms

Sl. No.	Technical Terms	Description
1	Area Clearing Price	Area Clearing Price is the clearing price for electricity transacted through power exchanges, for the respective bid areas.
2	Available Transfer Capability	Available Transfer Capability is equal to Total Transfer Capability minus transmission reliability margin fixed corridor-wise by National Load Despatch Center to ensure that the interconnected network is secure under a reasonable range of uncertainties in system conditions.
3	Central Transmission Utility	Clause 2(10) of the Electricity Act, 2003 defines Central Transmission Utility as any Government Company which the Central Government may notify under sub-section (1) of Section 38 of the Act. PGCIL has been notified by the Central Government as Central Transmission Utility.
4	Circuit kilometre	Product of the number of circuits forming part of a transmission line and the length of transmission line in kilometre.
5	Congestion	CERC Regulations define congestion as a situation where the demand for transmission capacity exceeds the available transfer capability.
6	Double Circuit	A double circuit transmission line has two circuits. A double circuit configuration has six conductors (three phases for each circuit).
7	Element	Any electric device with terminals that may be connected to other electric devices, such as generators, transformer, circuit, circuit breaker etc.
8	Feasibility Report	Feasibility Report is a document containing evaluation and analysis of the potential of proposed project based on extensive investigation and research to support the process of decision making.
9	Green Corridor	Green corridor is a transmission corridor planned and executed to evacuate power mainly from Renewable Sources like wind and solar energy.

10	High Voltage Direct Current system	High Voltage Direct Current system system comprises of point-to-point lines through which system operators can regulate flow of electricity
11	Indian Energy Exchange Limited	Indian Energy Exchange Limited is the largest energy exchange in India providing a nationwide, automated trading platform for physical delivery of electricity, Renewable Energy Certificates and Energy Saving Certificates. The exchange platform enables efficient price discovery and increases the accessibility and transparency of the power market in India while also enhancing the speed and efficiency of trade execution.
12	Infirm Power	Power generated by a power station prior to tis date of commercial operation
13	Inter-Regional Lines	Lines connecting two regions are called Inter Regional Lines
14	Loadability	Line loadability is defined as degree of line loading expressed in terms of percentage of SIL (Surge Impedance Loading), limited by thermal, voltage drop and stability limit.
15	Long Term Access	Long Term Access (LTA) means the right to sue the inter-state transmission system for a period exceeding 12 years but not exceeding 25 years.
16	Market Clearing Price	The Market Clearing Price (MCP) is the clearing price for cleared transactions in the whole country when there is no congestion.
17	Million Unit	Kilowatt-hour (kWh), i.e., one kilowatt of power expended for one hour of time, is called a 'Unit'. A collection of one million units is called 'MU'.
18	MVA	MVA, i.e., Mega Volt Ampere is a unit of measurement of apparent power in an electrical circuit. This unit of measurement can be used on in AC circuits. Transformers used in power transmission are rated in MVA.
19	Open Access	Open access means the non-discriminatory provision for the use of transmission lines or distribution system or associated facilities

		with such lines or system by any licensee or consumer or a person engaged in generation in accordance with the regulations specified by the Appropriate Commission.
20	Right of Way	Right of Way (ROW) with reference to transmission projects means right for placing of electric lines for transmission of electricity along the path through with such lines pass through.
21	Short Term Open Access	Access provided to a generator or seller of power for transmission of power for a short-term period (i.e., for a period up to one month at a time). POSOCO is the Nodal Agency for grant of Short-Term Open Access under CERC regulations.
22	Single Circuit	A single circuit transmission line has only one circuit. a single circuit configuration has three conductors for the three phases.
23	Spare Capacity	Spare Capacity is the project execution capacity.
24	Standing Committee for Power System Planning	Standing Committee for Power System Planning (SCPSP) for each region is constituted by CEA for carrying out its duties of integrated planning under Section 73 (a) of the Electricity Act, 2003. These committees are headed by Member CEA and have representative of Central Transmission Utilities, State Transmission Utilities, Central Generating Units (CGUs) etc. as members. SCPSP provides technical approval to the projects.
25	Surge Impedance Loading	Surge impedance loading (SIL) of a transmission line is the MW loading of a transmission line at which natural reactive power balance occurs.
26	System Operating Limit	System Operating Limit is defined as the value (such as MW, MVar, Amperes, Frequency or Volts) that satisfies the most limiting of the prescribed operating criteria for a transmission system configuration to ensure operation within acceptable reliability criteria.

27	Total Transfer Capacity	The amount of electric power that can be transferred reliably over the transmission system under a given set of operating conditions.
28	Transfer Capability	Transfer capability refers to the amount of electric power that can be passed through a transmission network from one place to another having regard to reliability considerations.
29	Transmission Capacity	Transmission Capacity is equal to summation of ratings of individual lines.
30	Transmission Corridor	An interconnected group of lines and associated equipment for movement or transfer of electric energy between points of supply and points at which it is transformed for delivery to customers or is delivered to other electric system.

List of abbreviations used in the Report

Sl. No.	Terms used in Report	Description
	A	
1	AC	Alternating Current
2	ACP	Area clearing Price
3	ATC	Available transfer Capability
4	ATN	Action Taken Note
	B	
5	BOD	Board of Directors
6	BOQ	Bill of Quantity
7	BPTA	Bulk Power Transmission Agreement
	C	
8	CAC	Central Advisory Committee
9	CTU	Central Transmission Utility
10	CEA	Central Electricity Authority
11	CERC	Central Electricity Regulatory Commission
12	Ckm	Circuit Kilometer
13	CMD	Chairman-cum-Managing Director
14	CMG	Corporate Monitoring Group
15	COPU	Committee on Public Undertakings
16	CPMU	Central Programme Monitoring Unit
17	CS	Contract Management
18	CVC	Central Vigilance Commission
	D	
19	DC	Double Circuit
20	DPR	Detailed Project Report
	E	
21	ED	Executive Director
22	ER	Eastern Region
23	ERP	Enterprise Resource Planning
24	ERLDC	Eastern Region Load Despatch Centre
	F	
25	FR	Feasibility Report
	G	
26	GEC	Green Energy Corridor
27	GOI	Government of India
	I	
28	IPPs	Independent Power Producers
29	ISTS	Inter State Transmission system
30	IR	Inter-Regional
31	IEX	Indian Energy Exchange
	K	
32	KPI	Key Performance Indicators
33	KV	Kilo Volt
34	KWh	Kilo Watt hour

	L	
35	LTA	Long Term Access
36	LD	Liquidity Damage
	M	
37	MAAT	Minimum Average Annual Turnover
38	MCP	Market Clearing Price
39	MIS	Management Information System
40	MTOA	Medium Term Open Access
41	MOEFCC	Ministry of Environment Forest and Climate Change
42	MoP	Ministry of Power
43	MPR	Monthly Progress Report
44	MVA	Mega Volt Ampere
45	MW	Mega Watt
	N	
46	NLDC	National Load Despatch Centre
47	NEP	National Electricity Plan
48	NER	North Eastern Region
49	NERLDC	North Eastern Region Load Despatch Centre
50	NIT	Notice Inviting Tender
	P	
51	PESM	Planning Environment & Social Management
52	PFA	Power for All
53	POSOCO	Power System Operation Corporation Limited
54	PRM	Project Review Meeting
	Q	
55	QR	Qualifying Requirement
56	QPR	Quarterly Progress Report
	R	
57	RE	Renewable Energy
58	RLDC	Regional Load Despatch Centre
59	RPC	Regional Power Committee
60	ROW	Right of Way
	S	
61	SCPSP	Standing Committee for Power System Planning
62	STUs	State Transmission Utilities
63	SR	Southern Region
64	SRLDC	Southern Region Load Despatch Centre
65	SC	Single Circuit
66	SOL	System Operating Limits
67	STOA	Short Term Open Access
	T	
68	TBCB	Tariff Based Competitive Bidding
69	TTC	Total Transfer Capacity
	W	
70	WR	Western Region
71	WRLDC	Western Region Load Despatch Centre
72	WPPP	Works & Procurement Policy and Procedure