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Report of the Comptroller and Auditor General of India on Kudankulam Nuclear Power Project, Units I and II

Union Government
Department of Atomic Energy
Report No. 38 of 2017
(Performance Audit)

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for the year ended March 2017

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Preface

Nuclear Power Corporation of India Limited (NPCIL), a Public Sector Enterprise was formed on 17 September 1987 under the administrative control of the Department of Atomic Energy (DAE), Government of India (GOI). It is responsible for design, construction, commissioning and operation of nuclear power reactors in India. Kudankulam Nuclear Power Project (KKNPP) is being implemented by NPCIL at Kudankulam, Thirunelveli district, Tamil Nadu. Under KKNPP it was planned to set up six units of 1,000 Megawatt (MW) each, in phases, in collaboration with the Russian Federation. In the first phase, it was planned to construct Units I and II.

The performance audit of the KKNPP Units I and II was conducted to assess whether NPCIL exercised prudent financial management in the construction/commissioning of Units I and II and implemented the project in an efficient manner.

This Report highlights a number of deficiencies in the execution and commissioning of Units I and II of KKNPP such as avoidable payment of interest on borrowings, non-transparency in availing loans, lapses in tariff fixation process, extending undue benefits to overseas collaborating partner, non-assessment of required manpower with consequent avoidable expenditure, inadequate monitoring and start of commercial operation before getting the required licence to operate from the competent authority. These, resultantly, ended up in significant escalation in cost of the project and substantial delays in commissioning of the Units.

The Audit Report has been prepared in accordance with the Performance Auditing Guidelines, 2014 and Regulations on Audit and Accounts, 2007 of the Comptroller and Auditor General of India.

Executive Summary

Why did we select this subject for Audit?

The installed capacity of nuclear power plants in India was 6,780 MW as on March 2017. As per Draft Electricity Plan released (December 2016) by Central Electricity Authority, Ministry of Power, Government of India (GoI), nuclear power projects capacity would be enhanced by 2,800 MW during 2017-2022 and by another 4,800 MW during 2022-2027. Thus, GoI estimates addition of 7,600 MW of nuclear power by end of 2027, an increase of 112 *per cent* over the present installed capacity. This indicates significance attached to nuclear power in fulfilling the energy needs of the country. At present Nuclear Power Corporation of India Limited is the only company producing nuclear power in India. The Company with Russian collaboration is setting up nuclear power plant at Kudankulam in a phased manner. Units I and II have already started operations and in remaining four units either work is in progress (Units III and IV) or yet to start (Units V and VI).

The initial estimated cost of the Kudankulam Nuclear Power Project (KKNPP) Units I and II was ₹ 13,171 crore in 2001 which gradually rose to ₹ 22,462 crore in 2014. There were major delays in start of commercial operations of Units I and II by 86 and 101 months respectively due to delayed supply of equipment/working documents by overseas collaborating partner, changes in design, additional works, erection delays etc. These factors not only delayed commercial operations of the units but also increased cost of the KKNPP. There were also concerns regarding financial management, compliance of safety parameters, tariff fixation process etc. Accordingly, this Performance Audit was conducted to examine the above issues.

What were our audit objectives?

The performance audit was conducted to assess whether:

- NPCIL exercised prudent financial management during implementation of KKNPP.
- The tariff was fixed in accordance with applicable Regulatory Rules and Act.
- The project was implemented in an economic and efficient manner.

What did our performance audit reveal?

The major observations pertaining to this performance audit are as below:

Financial Management

The scheduled date of completion was postponed from 30 October 2007 to 31 December 2011 for Unit I and 30 October 2008 to 31 December 2012 for Unit II, *inter alia* due to delayed completion of different activities, of which many were attributable to the M/s Atomstroyexport (ASE), a company responsible for undertaking the Russian scope of work. However, there was no revision of schedule of repayment of the Russian credit. This resulted in start of repayment of Russian credit, before revenue generation, causing an additional interest burden on NPCIL to the tune of ₹ 449.42 crore.

(Para 2.1)

NPCIL had to resort to external borrowings at a higher interest rate due to non- provisioning for erection reserve supply contracts while availing Russian credit, which was available at a cheaper rate. This resulted in additional interest cost amounting to ₹ 76.02 crore.

(Para 2.2)

NPCIL availed term loan of ₹ 1,000 crore from HDFC Bank Limited in violation of CVC's guidelines on tendering.

(Para 2.4)

Tariff and Revenue Generation

NPCIL, while fixing tariff for power, did not consider two components, i.e., 'interest on foreign debt' and 'interest on domestic borrowings', though these were actually incurred and paid. This resulted in short realization of revenue to the tune of ₹ 90.63 crore during pre-commercialization period.

(Para 3.1)

NPCIL did not include a component of 1.5 paisa per KWh in tariff towards Self Insurance Fund of Hot Zone Assets of Atomic Power Plants in respect of electricity generated during pre-commercialization period and sold to State Electricity Board and had to forego revenue to the tune of ₹ 7.04 crore.

(Para 3.2)

Unit I of KKNPP was shut down from 24 June 2015 to 31 January 2016 for 222 days as against the planned period of 60 days. This was due to decision of NPCIL to shut down the plant and execute the refuelling work on its own without evaluating its technical competency. The extended shutdown resulted in revenue loss of ₹ 947.99 crore to the NPCIL.

(Para 3.4)

Project Implementation

Unit I and Unit II of KKNPP started commercial operation after a delay of 86 months and 101 months respectively. The delays were primarily due to shifting of work from Russian scope to Indian scope; in execution of work and in submission of working documents/supply of equipment/materials by ASE; delays due to design changes; erection delays and additional works. The delay in completion have also resulted in cost overruns. NPCIL did not initiate any claim for recovery of additional expenses of ₹ 264.79 crore which were caused due to delayed completion of works by ASE.

(Paras 4.1.1 and 4.1.2)

Russian Scope of Work

As against the original value of USD 29 million (₹ 131.66 crore), NPCIL incurred an amount of USD 50.91 million (₹ 231.13 crore) for supply of same equipment in a rearranged contract leading to extra expenditure of ₹ 99.47 crore.

(Para 4.2.1)

No claim was raised by NPCIL, on ASE, for turbine of Unit I which was damaged due to manufacturing defects and ₹ 12.76 crore was incurred on repairs and replacement of turbine rotors. It also resulted in non- generation of electricity and consequently loss of revenue amounting to ₹ 53.73 crore.

(Para 4.2.3)

NPCIL neither assessed the extra payment/loss due to non supply/defective supply of materials by ASE nor did it initiate any action for recovery/adjustments for the same.

(Para 4.2.4)

NPCIL did not raise/pursue claims for liquidated damages worth ₹ 463.08 crore from ASE even though during the same time, it was borrowing funds and paying interest to discharge debt obligations including from ASE.

(Para 4.2.5 (a))

Indian Scope of Work

The work of erection and commissioning of Nuclear Steam Supply System and Turbo Generator was shifted from the Russian scope to the Indian scope for achieving the stated purpose of optimization of man power cost by way of reduction in man-months of Russian specialist for supervision at the site. This was done without any cost-benefit analysis, which not only resulted in delays in completion of the project but also ended up in NPCIL incurring an extra expenditure of ₹ 706.87 crore for the work.

(Para 4.3.1)

NPCIL incurred an extra amount of ₹ 8.37 crore towards shipment charges calculated on the basis of improper assumption.

NPCIL compensated a sea route transporter by reimbursing wharfage charges and additional handling charges amounting to ₹ 7.08 crore, which was unjustified as the terms of contract provided for such charges to be incurred by transporter himself.

NPCIL failed to provide the minimum stipulated inducement quantity to the transporter for shipment and incurred an avoidable amount of ₹ 11.72 crore towards dead freight.

{Paras 4.3.2 (a), (b) and (c)}

NPCIL did not ensure reasonability of the rates of third party supplies {worth USD 191 million (₹ 899.95 crore)}, made by ASE, for the plant. Further, an amount of USD 19 million (₹ 92.04 crore) towards 10 *per cent* interest free advance was paid by NPCIL to ASE for the third country supplies without ascertaining the existence of similar provisions in the sub-contracts entered by ASE with third country suppliers.

(Paras 4.4.1 and 4.4.2)

NPCIL, on 31 December 2014, declared commercial operation of the Unit I of KKNPP which was six months before receiving the license from AERB for regular operation of the plant.

(Para 4.6)

What do we recommend?

Financial Management

1) In all cases of rescheduling of commissioning dates, the repayment schedule for Russian credit may also be revised accordingly.
2) Loans from banks may be availed in a transparent and documented manner following the extant rules and regulations.
3) NPCIL should have effective monitoring/ feedback mechanism to monitor issues like long pending insurance claims.

Tariff and Revenue Generation

4) All cases of infirm tariff fixation may be processed by NPCIL according to prefixed criteria to avoid discretionary adhocism in decision making for the same.
5) For all future planned shutdowns NPCIL may do a competency analysis by mapping with a structured breakdown analysis, to take timely decision, if required, for engaging external consultants to avoid prolonged shutdown and consequential revenue loss.

Russian Scope of Work

6) Future delays should be avoided by sequencing the supplies with the various stages of production.
7) Interest of NPCIL should be protected in all contract renegotiations by ascertaining the quantitative benefits flowing out of such negotiations.
8) NPCIL should take timely action for recovery/ adjustment for non/defective supply of material by ASE.
9) Liquidated damages should be claimed in an accurate and timely fashion.

Indian Scope of Work

10) Cost benefit analysis should be invariably conducted before agreeing to a shift in scope of work from Russian side to Indian side and *vice versa*.
11) Work orders should not be awarded on a single tender basis unless they qualify for the same as per NPCIL manual and CVC guidelines.

12) NPCIL should award work to existing contractors after proper rate analysis to obtain competitive rates.
13) Agreements for execution of work order should invariably be entered into by NPCIL with the contractor before award of the contracts.
14) NPCIL should prepare schedule of rates, at least, for the works of routine nature like construction of pump house, tunnel, chlorination plant etc with a view to have better estimation of rates for awarding contracts.

Third Country Contracts

15) With regard to the contracts for supply of equipment by third country, NPCIL should consider participating in joint evaluation of bids, with a view to ensure price reasonability of the contract(s).

Chapter - I
Introduction

Nuclear energy is fast emerging as an important source to serve India's growing energy needs. Nuclear power production in the country began in 1969 and has grown from an installed capacity of 320 Mega Watt (MW) in 1969 to 6,780 MW in 2017 and planned to be 9,580 MW by end of 2022 and 14,380 MW by end of 2027[1]. Important organizations related to regulation, generation and distribution of nuclear energy in India are the Department of Atomic Energy, Atomic Energy Regulatory Board and Nuclear Power Corporation of India. A brief of these three organisations is given below:

The Department of Atomic Energy (DAE) was set up on 3 August 1954 and is engaged in the design, construction and operation of nuclear power/research reactors and supporting nuclear fuel cycle technologies covering exploration, mining and processing of nuclear minerals, production of heavy water, nuclear fuel fabrication[2], fuel reprocessing and nuclear waste management.

Atomic Energy Regulatory Board (AERB) was constituted on 15 November 1983 and entrusted with the responsibility for laying down safety standards and framing rules and regulations covering regulatory and safety functions envisaged under the Atomic Energy Act, 1962. AERB has developed safety standards for nuclear and radiation facilities, covering aspects such as siting[3], design, construction, operation, quality assurance and decommissioning.

Nuclear Power Corporation of India Limited (NPCIL) is a central Public Sector Enterprise formed on 17 September 1987 under the administrative control of the Department of Atomic Energy (DAE), Government of India (GoI). It is responsible for design, construction, commissioning and operation of nuclear power reactors. NPCIL is presently operating 22 nuclear power plants, (twenty one owned by NPCIL and one owned by DAE[4]), with an installed capacity of 6,780 MW. The reactor fleet comprises of two Boiling Water Reactors (BWRs), 18 Pressurized Heavy Water Reactors (PHWRs) and two 1,000 Mega Watt VVER (*Voda Voda Energo Reactor*- water cooled and water moderated reactor) at Kudankulam. In addition, NPCIL has six nuclear power projects under various stages of construction/commissioning aggregating 4,800 MW capacity. The details are given in ***Annexure I***.

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[1] *As per draft National Electricity Plan (December 2016) released by Central Electricity Authority,GoI.*

[2] *Nuclear Fuel fabrication is the last step in the process of turning uranium into nuclear fuel rods.*

[3] *The process of selecting a suitable site for a facility including appropriate assessment and definition of the related design bases.*

[4] *Rajasthan Atomic Power Station, Rajasthan Unit 1.*

1.1 Kudankulam Nuclear Power Project (KKNPP)

KKNPP is being implemented at Kudankulam situated in Thirunelveli district, Tamil Nadu. Under the KKNPP project, it was planned to set up six nuclear power plants each of 1,000 MW, in phases with Pressurized Water Reactor (*Voda Voda Energo Reactor*) technology. In the first phase, it was planned to construct Units I and II. The project is being implemented in technical collaboration with Government of Russian Federation (Russian Federation). An Inter-Governmental Agreement (IGA) was signed between the GoI and the erstwhile Union of Soviet Socialist Republics (USSR) in the year 1988 to implement the project.

However, due to internal development in the erstwhile USSR, the project implementation could not progress. After resuming negotiations with the Russian Federation, supplementary agreement to IGA, was signed in the year 1998 between the Russian Federation and the GoI to implement the project. M/s Atomstroyexport (ASE), a Joint Stock Company under the Ministry of Russian Federation for Atomic Energy (Rosatom), represented the Russian side for setting up the Nuclear Power Station (NPS) at Kudankulam. Indian side was represented by NPCIL in execution and implementation of KKNPP. The scope of work of the respective sides was as follows:

- The Russian scope of work included project engineering and design, supply of equipment, special materials/spare parts from Russian Federation, training of operations/maintenance personnel of Indian side, associated services like project management activities, quality assurance / quality control (QA/QC) activities, designer's supervision at all stages of project implementation etc.
- The Indian scope of work included civil construction works, preparation of detailed erection procedures, erection of all mechanical, electrical and Instrumentation & Control (I&C) system equipment/ components, commissioning of the plant under technical assistance of Russian side personnel and operation of the NPS units etc.
- The third countries supplies were partly in Indian Scope and partly in Russian Scope.

KKNPP is based on technology of pressurized water reactor, cooled and moderated by light water[5]. Its core containing the nuclear fuel is located inside a pressure vessel. The reactor is located inside an airtight primary containment building which is surrounded by a secondary containment. The reactor has steam generators in each loop. Each Unit of KKNPP i.e. Unit I (1,000 MW) and Unit II (1,000 MW) consists of four Primary Coolant System loops transferring the heat energy from the reactor to the Steam Generators (SGs). The steam produced in the SGs is fed to the Turbine Generator to generate electricity.

1.2 Status of the project

As against scheduled completion date of 30 October 2007 for KKNPP Unit I and 30 October 2008 for KKNPP Unit II, the Unit I started commercial operation on 31 December 2014 and the Unit II started commercial operation on 31 March 2017.

[5] *Water containing the normal proportion (or less) of deuterium oxide, i.e. about 0.02 per cent especially to distinguish it from heavy water.*

The KKNPP Units III, IV, V and VI are also being implemented with cooperation from Russian Federation. General Framework Agreement (GFA) for Units III and IV was signed on 10 April 2014. Works for KKNPP Units III and IV started in February 2016 and as on date are in progress. GFA for Units V and VI was signed on 1 June 2017 and work is yet to commence (31 July 2017).

1.3 Cost of the Project

The cost of the project comprising Units I and II was initially estimated / approved for ₹ 13,171 crore in 2001 which was revised to ₹ 17,270 crore in 2013 and later to ₹ 22,462 crore in 2014.

The capitalized project cost[6] incurred till 31 March 2017 was ₹ 11,523 crore and ₹ 10,212 crore for Unit I and Unit II respectively.

Photograph 1.1 Kudankulam Nuclear Power Plant- Units I and II

Since start of commercial operation of Unit I on 31 December 2014, 10,573.55 million KWh units of nuclear energy were generated, out of which 9,699.74 million KWh were exported[7] at ₹ 3,844.24 crore. There is also an installed capacity of wind power for 10 MW (8 units of 1.25 MW each) at the KKNPP site, under which 50.09 million KWh were generated out of which 49.22 million KWh were exported at a value of ₹ 9.35 crore.

Site Director heads the KKNPP assisted by a team comprising of Station Director, Chief Superintendent, Technical Service Superintendent, Deputy General Manager (Finance) and other executives and officials. As on 31 March 2017, the sanctioned strength[8] of KKNPP was 1,886, against which men-in-position was 1,010.

[6] *Capitalized Project cost includes all capital and revenue expenditure incurred for the project till start of commercial operation of the plant.*

[7] *Electricity sold to State Electricity Boards.*

[8] *Represent permissible strength for KKNPP Units I, II, III and IV.*

1.4 Audit Objectives

The performance audit was conducted to assess whether:

- NPCIL exercised prudent financial management during implementation of KKNPP.
- The tariff was fixed in accordance with applicable Regulatory Rules and Act.
- The project was implemented in an economic and efficient manner.

1.5 Scope and Methodology

The scope of the audit was to examine project implementation of KKNPP Units I and II along with financial implications. 37 Russian contracts (valuing ₹ 10,188.95 crore), out of 171 contracts (valuing ₹ 10,482.52 crore) were selected and in respect of Indian Contracts, 106 (valuing ₹ 1,511.73 crore) out of 1,842 contracts (valuing ₹ 2,212.92 crore) were selected on the basis of Stratified Random sampling[9].

An Entry Conference was held on 3 June 2016 with the Management of NPCIL wherein the scope, objectives and methodology of audit were discussed and the audit criteria were agreed upon. The records pertaining to June 1998 to October 2016 were test checked during performance audit; matter relating to the period upto March 2017 have also been included, wherever necessary. Field audit was conducted at Kudankulam plant, Tamil Nadu and the corporate office of NPCIL at Mumbai, Maharashtra. Relevant records pertaining to project initiation, implementation and commissioning were test checked. Both the Units of KKNPP viz. Units I and II were selected.

Inspite of various reminders, Audit was not provided records pertaining to dates of completion of final safety review and submission date to AERB and details of items damaged during commissioning of Unit I. In absence of these information, the scope of audit was limited as it could not review issues relating to these records.

The draft Report was issued to the DAE and NPCIL on 25 May 2017. NPCIL communicated its response vide letter dated 28 June 2017. The DAE's reply to the draft Report is awaited (August 2017).

An Exit Conference was held with DAE and NPCIL on 7 July 2017 wherein Audit shared its findings and recommendations with them. The audit observations including recommendations, after suitably incorporating the replies of NPCIL on Financial Management, Tariff and Revenue Generation and Project Implementation and deliberations which had taken place in Exit Conference, are given in subsequent chapters.

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[9] *Stratified random sampling is a method of sampling that involves the division of a population into smaller groups known as strata. In stratified random sampling, the strata are formed based on members' shared attributes or characteristics. These subsets of the strata are then pooled to form a random sample.*

1.6 Audit criteria

The audit was conducted with criteria drawn from the following:

- Inter Government Agreement between Government of India (GoI) and erstwhile USSR and supplementary Agreement between the Government of India and Federation of Russia.
- Relevant policy decisions of the GoI and Russian Federation
- Decisions of the Board of Directors of NPCIL
- General Framework Agreement (GFA)/ Draft Project Report
- Program Evaluation and Review Technique Chart / Integrated Action Plan Network
- Site Inspection Reports and related environmental reports

1.7 Acknowledgement

Audit acknowledges the co-operation and assistance extended by the Management of NPCIL at various stages of the performance audit.

Chapter - II
Financial Management

Under the financial arrangement agreed between the Government of India and the Government of Russian Federation in supplement (June 1998) to Inter Governmental Agreement (IGA) for funding of the KKNPP project, the Russian Government was to extend a State credit upto United States Dollar (USD) 2,600 million (₹ 10,972 crore[10]) for Units I and II. The State credit was given at an interest rate of 4 *per cent per annum* to cover 85 *per cent* of the cost of Russian scope of works including cost of nuclear fuel. The balance 15 *per cent* of cost of the Russian scope of work as well as the remaining Indian cost of the project was to be financed by NPCIL as equity.

The GoI conveyed (7 December 2001) financial sanction for the project for ₹ 13,171 crore (USD 2,804 million) with equity funding of ₹ 6,755 crore and Russian credit of ₹ 6,416 crore with further option of raising domestic debt as means of part funding to be explored at an appropriate stage.

The funds for KKNPP Project were raised from three sources viz. equity/ internal surplus of NPCIL, Russian credit and market borrowing. The original and revised funding for KKNPP is depicted in the following table:

Table 2.1: Sources of funds for KKNPP

(₹ in crore)

Particulars	Initial Project Cost (December 2001)	Revised Project Cost (August 2014)
Equity/Internal Surplus	6,755	11,231
Russian Credit	6,416	6,481
Market Borrowing	0	4,750
Total	**13,171**	**22,462**

As is evident from Table 2.1, initially there was no provision for market borrowing as the repayment of Russian credit was planned to be done from revenue generated by sale of power after commissioning of the Units. However, due to delays in commissioning of the Units, NPCIL resorted to market borrowings to meet its funds requirement.

The cost of the project was revised to ₹ 17,270 crore in 2013 and later to ₹ 22,462 crore in 2014 due to escalation in expenses towards Interest During Construction (IDC), manpower costs, establishment costs and deputation of Russian specialists at Kudankulam. Russian credit pay back for Units I and II is scheduled to be completed on 30 June 2021 and 30 June 2022 respectively. Expenditure *vis-à-vis* the original cost on account of various heads is depicted in the Table 2.2:

[10] *Converted on USD –Indian ₹ exchange rate on date of signing supplement.*

Table 2.2: Original cost *vis-à-vis* Revised cost of KKNPP

(₹ in crore)

Particulars	Initial Project Cost (December 2001)	Revised Project Cost (August 2014)
Russian Scope of Work	8,508	9,692
Indian Scope of Work	3,910	7,734
Interest During Construction	753	3,286
Foreign Exchange Rate Variation	0	1,750
Total	**13,171**	**22,462**

As can be seen from the Table 2.2, there was a significant increase of ₹ 2,533 crore (336 *per cent*) in revised interest cost during construction as compared to its initial estimates. Moreover, an amount of ₹ 1,750 crore was incurred towards foreign exchange rate variation whereas in the initial costing, it was estimated at nil. For Indian scope of work, the revised cost was ₹ 7,734 crore as against the initial estimates of ₹ 3,910 crore, an increase of 98 *per cent*. The revised cost under Russian scope of work amounting to ₹ 9,692 crore showed an increase of 14 *per cent* against the initial estimate of ₹ 8,508 crore.

Due to delays in completion of KKNPP and increase in the cost of the project, NPCIL had to meet (2010 onwards) its enhanced funds requirement through term loans (₹ 3,032 crore), bonds (₹ 4,618 crore) and External Commercial Borrowings (₹ 476 crore). Out of ₹ 6,401 crore of Russian credit utilized, ₹ 4,776 crore has been repaid till 31 March 2017.

Audit observations relating to financial management of the project are discussed in succeeding paragraphs:

2.1 Avoidable additional interest cost of ₹ 449.42 crore on account of non-concomitant adjustment of repayments schedule

As per Article 7 of the supplement to the IGA, the amount of Russian credit utilized for the payment of expenses of the Russian organizations except the expenses related to delivery of nuclear fuel and control assemblies shall be repaid by NPCIL in fourteen equal annual installments. The annual installments were to start 12 months after the scheduled dates of the commissioning of the first and second power units of the project (i.e. KKNPP) respectively. Fifty *per cent* of the interest accrued was to be paid within the first quarter of each year following the year for which it has accrued and the remaining 50 *per cent* was to be capitalized and repaid together with the repayment of the respective principal amount in fourteen installments, as the case may be. As per the initial projections, the repayments were to be made from the operational revenue of the Plant generated through sale of electricity.

As per Article 7 of the supplement agreement to the IGA, the scheduled dates of commissioning of KKNPP Units I and II, were to be agreed upon by ASE and NPCIL. ASE and NPCIL entered (6 November 2001) into a General Framework Agreement (GFA) which stipulated that provisional takeover of first and second Unit of KKNPP will be completed within 68 months and 80 months starting from the Zero Date[11] (30 March 2002) of the project. The Provisional takeover, therefore, worked out to 30 October 2007 for Unit I and 30 October 2008 for Unit II. Accordingly, in pursuance of Article 7 of the Supplement to the IGA[12], the Russian credit utilized for supply and services was to be repaid in 14 installments commencing for Units 1 and II from 30 October 2008 and 30 October 2009 respectively.

However, the original projected schedule date for provisional takeover of Units I and II could not be achieved and ASE and NPCIL revised (10 April 2009) the Master Control Network of Time Schedule and signed Amendment No. 1 to the GFA, revising the provisional takeover of Units I and II to 31 December 2011 and 31 December 2012 respectively. It was noticed in audit that no approval was taken from the Board of NPCIL for this major revision of completion schedules. Eventually, Unit I started commercial operation on 31 December 2014 and Unit II on 31 March 2017.

Audit observed that though the Amendment 1 to GFA, revising the scheduled date of commissioning, was signed on 10 April 2009, the schedule for repayment of the Russian credit and interest capitalized was not revised. As a result, the repayments promptly started from October 2008 for Unit I and from October 2009 for Unit II, much before any revenue could be generated as the units were far from being commissioned. Audit found that due to delayed start of revenue generation, NPCIL had to borrow funds from the market amounting to ₹ 4,126.58 crore to repay the Russian credit apart from ₹ 649.69 crore paid from internal resources.

On 17 April 2009 the Controller of Aid, Accounts and Audit (CAA&A), Ministry of Finance, GoI did take up the matter with Vnesheconombank[13], Russia for rescheduling of repayments to which the Russian bank stated that the Ministry of Finance of the Russian Federation has not authorized it to accept the proposal for revision of the schedules of payment. Thereafter, there was no evidence on records that rigorous follow up by NPCIL was done for revision of schedule of repayment even though there were delays, many of which were attributable to the Russian side (as brought out in Chapter 4 of this report).

An amount of ₹ 2,631.65 crore in respect of Unit I and ₹ 2,144.63 crore in respect of Unit II was repaid to Government of Russian Federation till 2016-17. It resulted in additional expenditure on account of interest on market borrowing for repayment of Russian credit to the tune of ₹ 449.42 crore, thereby also increasing the project cost.

The Management in its reply (28 June 2017) stated that repayments were not to be made from operational revenue of the Plant generated through sale of electricity as the same was not a fact mentioned in IGA/GFA. It also stated that in an international treaty, the agreement and

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[11] *The date on which the first pour of the raft (base foundation plate)concreting of the Reactor Building for the Unit I have been started.*

[12] *Read with clause 3.2.3 of GFA.*

[13] *Vnesheconombank is the Russian bank which on behalf of GoI and on behalf of the Government of Russia developed the technical procedure for keeping record and for affecting repayment of Russian credit availed.*

adherence to the time lines mentioned in the agreement is sacrosanct and legally binding, hence, to maintain international goodwill relation, the repayment of loans on due date was unavoidable for compliance of agreement signed between two democratic governments. The Management further stated that due to foreign exchange rate fluctuation, NPCIL gained to the tune of ₹ 12.92 per USD which resulted in huge saving which offset any additional borrowing cost and also that proportionate increase in repayment period would have had a financial implication of increased interest.

The reply of the Management is not tenable as it was stated in GFA that the repayment of Russian credit was to start 12 months from scheduled date of commissioning i.e. repayment of Russian credit was to start after revenue generation. Audit examination revealed that there were no records to indicate that the impact of foreign exchange fluctuations was analysed by NPCIL to keep the repayment schedule, as originally planned, even after delay in commissioning of the Unit I and Unit II. The justification regarding gain to the tune of ₹ 12.92 per USD is apparently an afterthought in response to the audit observation.

As the revision of schedule date of commissioning had a direct bearing on repayment of Russian credit, NPCIL should have taken up the matter vigorously with the proper Authority to take advantage of low interest rate of four *per cent* available on Russian credit. There was no evidence on record that NPCIL conducted detailed analysis to link the payment schedule to dollar/rupee exchange rate after taking into account the cost of borrowings. Moreover, no risk mitigating measures against foreign exchange rate fluctuations, such as hedging was resorted to by NPCIL.

Audit Recommendation No. 1	DAE's reply to the Audit Recommendation
In all cases of rescheduling of commissioning dates, the repayment schedule for Russian credit may also be revised accordingly.	The Department accepted the recommendation and informed that the repayment of Russian credit has been revised to date of commissioning in the case of ongoing KKNPP Units III and IV and also in KKNPP Units V and VI.

2.2 Non inclusion of provision for erection reserve under Russian credit resulting in additional interest cost of ₹ 76.02 crore

As per supplement to IGA, Russian credit at 4 *per cent* was available for covering 85 *per cent* of the expenses relating to design, deliveries (including fuel cost) and services of the Russian organizations. Later, in a High level meeting held during 20-26 August 2001, it was decided to change the scope of obligations specified in the Techno Commercial Offer (TCO) and the revised scope was agreed to by both the parties. According to the revised scope, the erection and commissioning works were shifted from Russian scope to Indian scope.

It was noticed by Audit that in case of the existing Pressurised Heavy Water Reactor Plants (PHWR) under NPCIL, five to ten *per cent* of wholesome spare quantities (erection reserve) were procured to take care of various contingencies like damages, replacements etc. However, in the case of KKNPP no such provision was included in the supply contracts entered with ASE. There was no explanation on record as to why this deviation regarding procurement of erection reserve spares, from the standard practice was done in case of KKNPP.

Later NPCIL procured erection reserve of spares worth USD 112.36 million i.e. ₹ 649.60 crore (₹ 58 per USD) from ASE during 2009-10 to 2015-16. However, no Russian credit (at 4 *per cent* interest) was available for the same as it was not part of supply contracts entered as per GFA and the procurement had to be done from the funds raised by NPCIL through loans, with interest rates ranging from 7.94 *per cent* to 10.69 *per cent*. This led to an additional interest burden of ₹ 76.02 crore on NPCIL.

The Management replied (28 June 2017) that once TCO was finalized, the amount of credit available for Project was fixed from Russian side for Supply and that the issue of utilization of balance credit for supply of spares was taken up with the Russians which was not accepted by them.

The reply of the Management is not tenable in view of the fact that if the five to ten *per cent* of wholesome spare quantities to take care of various contingencies had been considered for inclusion in the supply contracts as is being done for PHWR plant, it would have formed an integral part of GFA and thus eligible for funding from Russian credit at a cheaper interest rate. It would have enabled NPCIL to avail the then available cheaper Russian credit to the tune of USD 95.51 million (85 *per cent* of USD 112.36 million) i.e. ₹ 553.96 crore at four *per cent* interest rate. However, it was not done and NPCIL had to resort to borrowings at much higher interest rate resulting in additional interest cost of ₹ 76.02 crore for procuring the erection reserve for KKNPP.

2.3 Avoidable payment of interest of ₹ 13.22 crore due to delay in shifting outstanding loan amount

NPCIL availed ₹ 3,000 crore term loans from banks {Bank of India (BoI) - ₹ 1,500 crore, State Bank of India (SBI) - ₹ 1,250 crore and Dena Bank - ₹ 250 crore)} between 31 May 2010 and 29 June 2010 linked with Benchmark Prime Lending Rate[14] (PLR).

On 23 September 2010, SBI suggested to NPCIL for shifting from the existing SBI PLR linked interest rate to Base Rate [15]system as it would be beneficial for NPCIL in the long run as PLR linked interest rate would be higher than the Base Rate. Further SBI Base rate is expected to be minimum in the long run as compared to Other Banks Base Rate.

NPCIL estimated (22 October 2010) that in view of prevailing interest rates, no saving or gain would accrue to NPCIL in migrating from PLR to Base Rate (in the first year). It also

[14] *Benchmark Prime Lending Rate (BPLR), is the reference interest rate based on which a bank lends to its credit worthy borrowers. As per RBI Guidelines the practice of loan linked to BPLR is discontinued w.e.f. 30 June 2010 and new concept of base rate was introduced.*

[15] *Base rate is the minimum rate set by the RBI below which banks are not allowed to lend to its customers. Base rate system was introduced in July 2010.*

presumed that after the end of one year, if substantial increase took place in the loan interest rates then NPCIL would have an option of extinguishing existing loans by fresh borrowing at the prevailing revised rates from other banks.

However, this matter was not reviewed at the end of one year and subsequently the matter was taken up and discussed only after a period of three years in the 145th Board of Directors meeting held on 5 July 2013. In the meeting, it was noted that total loans amounting to ₹ 4,500 crore (₹ 3,000 crore taken in 2010-11 jointly for KKNPP and other projects and ₹ 1,500 crore in 2009-10 (SBI - ₹ 750 crore, BoI - ₹ 500 crore and Dena Bank- ₹ 250 crore) for projects other than KKNPP) were linked with PLR of the concerned banks. The average interest rate of these loans was in the range of 10.65 *per cent per annum* which was stated to be "very high in the present scenario". As the offered rates for resetting the interest rates of the term loans from existing lenders i.e. BoI and Dena Bank were not found attractive, NPCIL approached SBI - the main banker to offer its best rates. SBI had offered interest rate of 9.80 *per cent* for both their existing loans as well as for the loans to be taken over from Dena Bank and the BoI. The revised rates were to be applicable from the date of acceptance of their offer for the existing SBI loans and the date of disbursement for loan takeover. NPCIL decided for taking over loans of BoI (₹ 2,000 crore) and Dena Bank (₹ 500 crore) by SBI and reset SBI existing loans of ₹ 2,000 crore to a Base Rate linked interest regime.

As the concessional rate of interest 7.94 *per cent* was available only for the first year, NPCIL should have shifted loans from BPLR to Base Rate immediately after completion of one year as no other rate could have been lower than the base rate in view of the applicable RBI guidelines. The inordinate delay in shifting the loan from the existing BPLR linked interest rate to Base Rate Structure resulted in avoidable interest expenditure of ₹ 25.41 crore. The avoidable expenditure on interest for KKNPP based on its proportionate share (₹ 1,560 crore) in loan amount (₹ 3,000 crore taken jointly for KKNPP and other projects) works out to ₹ 13.22 crore.

The Management replied (28 June 2017) that initially the offer was made by SBI at the Base rate plus premium of 0.45 per cent which was negotiated over the period of time and the premium was brought down to 0.10 per cent in July 2013. Thus negotiation resulted in saving of 0.35 per cent per annum for balance tenure of loan which offsets the projected loss of ₹ 13.22 crore.

The reply of the Management is not tenable as NPCIL could not produce any documentary evidence in support of its contentions about efforts made to move to the Base rate. Moreover, the delay was inexplicable as the offer was made *suo moto* by the lending bank itself and was not a part of any loan restructuring deal. Eventually NPCIL did move belatedly to the base rate but by then it had lost the opportunity to avail the benefit of lower base rate on the loan from SBI for the intervening period of July 2010 to June 2013.

2.4 Availing term loan in violation of CVC's guidelines

The Board of Directors (BOD) of NPCIL approved (August 2014) availing term loan of ₹1,000 crore for a tenure of 15 years with staggered repayment of five equal yearly installments and also authorized the Chairman and Managing Director (CMD) and Director (Finance) to do all such acts, deeds, things, matter and incur expenditure as may be necessary for the proposed borrowing and also to sub delegate any or all activities to principal officers.

NPCIL called bids (15 December 2014) from its empanelled Banks (25 Public Sector Undertaking Banks and 12 Private Sector Banks). The Notice stated that bidders may indicate any other terms and conditions associated with their offer like foreclosure levy/ pre-payment charges, conversion charges for changing to fixed rate from floating rate and vice versa and processing documentation charges, if any, and other terms and conditions; whereas Central Vigilance Commission (CVC) guidelines (9 July 2003) stipulates that whatever pre-qualification, evaluation/exclusion criteria, etc. the organization wants to adopt should be made explicit at the time of inviting tenders so that basic concept of transparency and interests of equity and fairness are satisfied.

Sealed bids received from thirteen banks were opened on 22 December 2014 in the presence of representatives of Kotak Mahindra Bank (KMB) and Housing Development Finance Corporation (HDFC) Bank. Ten bids were rejected due to high rate of interest offered ranging between 10.15 *per cent* and 11.20 *per cent*. One bid (Ist lowest) received from KMB for Term loan for 10 years tenure at 10 *per cent* was rejected as the tender was for Term loans with 15 years tenure. One bid from State Bank of India which was the next lowest bid was rejected stating that the offer was conditional and the impact of the condition was indeterminable due to submission of two options by SBI viz.

a) "Presently 10 *per cent per annum* with monthly rates, with right of reset after every five years or in the event of any dip in Earning Credit Rate (ECR)[16] (presently AAA[17])".

b) 10.10 *per cent per annum* with monthly rates, with right to reset on any dip in ECR (presently AAA).

NPCIL accepted the offer of HDFC Bank of 10.09 *per cent per annum* (third lowest) and after negotiation (12 January 2015), the Bank reduced the rate to 10.06 *per cent*. The loan of ₹ 1,000 crore taken from HDFC Bank was to be utilized for KKNPP Units I and II.

Audit noticed the following deficiencies in the tendering process:

(i) Limited tender was invited instead of open tender, in violation of CVC guidelines. Moreover, the date and time of opening of tender was not indicated in the tender document. Further, communications relating to date and timing of opening of tender were not available in the records of NPCIL and full documentation relating to the tending process were also not provided by NPCIL to Audit. Hence it was not clear how representatives from only two banks i.e. HDFC Bank and Kotak Mahindra Bank were present for the tender opening on 22 December 2014.

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[16] *A daily calculation of interest paid on idle funds that reduce bank service charges. A calculated amount is then used to pay for banking fees. Therefore, customers with larger deposits and balances tend to pay lower bank fees for their accounts.*

[17] *'AAA' is a credit rating of highest safety which has been given by credit rating agency i.e. CRISIL for NPCIL Bonds.*

(ii) The rate quoted by SBI at 10 *per cent per annum* (option-I) was less than the rate (10.09 *per cent per annum*) quoted by HDFC bank. However, NPCIL rejected the offer stating that the offer of SBI is conditional and the impact of the condition is indeterminable. However, it was noticed in audit that the Notice Inviting Bids clearly allowed for "Conversion charges (if applicable) for changing to fixed interest rate from floating rate and vice versa and also allowed the tenderer to quote any other terms and condition." Since the option of migrating from fixed rate to floating rate of interest and vice versa and quoting of any other terms and condition was allowed in the Notice Inviting Bids, the outright rejection of the lower bid offered by SBI simply on the ground that its impact was indeterminable without making an effort to obtain any clarification from SBI was unwarranted as per *ibid* CVC orders. Hence the decision of the Company, to out rightly reject lower bid of SBI, was clearly against the criteria mentioned in the NIT.

The Management replied (28 June 2017) that the bids were invited from all Public sector Banks (25 Banks) and leading Private Indian Banks (12 Banks) and NPCIL received most competitive rates in the intent spirit of CVC guidelines. Further regarding presence of representative of only two Banks during opening of bids against thirteen bids received, the Management stated that as the bids by the two banks were submitted at the closing time of bid submission, their representative were available at the time of opening of the bids. With respect of rejection of bid submitted by SBI, it stated that the offer given by SBI under option 1 was for five years which is not as per tender condition, hence was not considered for evaluation.

The reply of the Management is not acceptable in view of the following:

i) Since only limited tender was invited, it cannot be said that rates received were most competitive.

ii) The opening of tender was not in compliance with CVC guidelines dated 8 June 2004 which mandates that tenders after receipt should be opened on the pre determined stipulated date and time in the presence of bidders.

iii) Regarding bid submitted by SBI, the offer received was for 15 years tenure with right to reset the interest rate after five years and this was also indicated in the comparative statement prepared for analysis of the bid. Further interest rate offered by HDFC was also not fixed at it was offered at Base rate (fully floating) plus premium of 0.09 *per cent*. Thus any change in HDFC base rate would result in change in applicable HDFC's interest rate to NPCIL.

Thus, the tender process lacked transparency and was against the prescribed procedures under the extant CVC instructions.

Audit Recommendation No. 2	DAE's reply to the Audit Recommendation
Loans from banks may be availed in a transparent and documented manner following the extant rules and regulations.	The Department accepted the recommendation and in turn stressed for compliance of the same to Director (Finance), NPCIL. The Director (Finance) NPCIL informed that public tendering from scheduled commercial banks is being implemented.

2.5 Avoidable payment on insurance premium - ₹ 3.03 crore

The Board of Directors of NPCIL accorded permission (2 December 2004) to KKNPP Unit to cover its erection risk by way of an Erection All Risk (EAR) policy from M/s. United India Insurance Company (UIIC). As per the terms and conditions of the policy, the EAR Policy was to cover the risk only up to the date of loading of fuel in the reactor for all nuclear and non-nuclear zones. However, from the commencement of fuel loading, cover was to cease within the nuclear zone. This indicated that the risk for KKNPP project was to be clearly demarcated into Nuclear and Non-Nuclear Zone from the date of loading of fuel in the reactor.

The policy covered the risk associated with the erection of KKNPP Units I and II Reactors for a period of 54 months (including testing) at a total insured sum of ₹ 7,358 crore and for a total premium of ₹ 23.43 crore (all inclusive). Accordingly an EAR policy was taken from UIIC for the period 5 February 2005 to 4 August 2009 (including 4 months testing for individual Units). Since the Project was delayed, the EAR policy was renewed periodically.

The EAR policy was renewed from 19 January 2012 to 18 January 2013 covering both Units I and II. The premium paid was ₹ 19.30 crore. NPCIL loaded nuclear fuel in Unit I reactor on 19 September 2012. According to terms and condition of EAR policy, insurance cover for nuclear zone assets (₹ 3,474 crore) of Unit I ceased from 19 September 2012 though company had already paid the premium upto 18 January 2013. This resulted in avoidable payment of insurance premium amounting to ₹ 3.03 crore for period between 19 September 2012 and 18 January 2013.

The Management replied (28 June 2017) that all equipment and systems of KKNPP Units I and II were segregated into Nuclear and Non- Nuclear zone, building wise. This was considered during the operation and extension of EAR policy as well as Operational Policy. It further stated that during the period 13 October 2011 to 19 March 2012, KKNPP was undergoing impasse period when all site works were under hold. It was very difficult to predict the date of re-opening of the project works and achievement of subsequent milestones. Hence while renewing the policy on 19 January 2012, extension of the policy for one year was sought for full sum insured value as Nuclear Fuel was not installed in Reactor core and the policy was extended up to 18 January 2013. After impasse period, KKNPP plant *re-opened for construction work in March-2012 and first Fuel loading in Unit I was started in September 2012. Subsequent to 18 January 2013, policy was extended with reduced sum insured to the extent of Unit 1 non-nuclear zone items only and Unit II (as there was no nuclear fuel installed in Unit II). The Management also stated that extension of EAR policy was sought for Unit I non-nuclear zone up to 21 May 2014 and for Unit II up to 11 March 2015. Standard Fire and Special Perils (SFSP) policy was taken for Unit I Non-nuclear zone items only from 19 September 2014, after expiry of EAR policy. Nuclear zone items of Unit I were neither considered in SFSP policy nor in EAR policy. EAR policy was extended only for Unit II items because there was no nuclear fuel installed in Unit II and it was under construction phase. As such there was no excess payment from NPCIL side for insurance premium.*

The reply of the Management is not tenable as Audit observed that the company had already planned for the fuel loading and criticality for Unit I during 2012-13 as it had completed hot run in July 2011. Hence, NPCIL was aware that after hot run, the next stage would be fuel loading due to which the company renewed the EAR policy twice for short period of 10 days (05 December 2011 to 14 December 2011) and one month (15 December 2011 to 14 December 2012). Hence pending fuel loading, the company should have continued to renew the policy for shorter period to take the advantage of reduced insurance premium in the event of fuel loading in Unit I and consequently out of insurance coverage. This would have avoided the payment of insurance premium ₹ 3.03 crore for nuclear zone assets which was not covered under the policy.

2.6 Long pending insurance claims

NPCIL takes insurance to cover its assets against any accidental risk. Two main types of policies taken are Standard Fire and Special Perils (SFSP) Policy and Erection All Risk (EAR) policy. As on 31 March 2017, NPCIL was having eight such policies, for which it had paid a premium of ₹ 33.97 crore during the year 2016-17. During review of insurance claims, Audit noticed following deficiencies:

a) NPCIL had taken insurance from United India Insurance Company (UIIC) under the EAR Policy for Units I and II of KKNPP. In May 2010, there was a fire accident in the warehouse of Central Workshop Building at KKNPP. NPCIL raised (31 May 2014) a fire claim of ₹ 55.08 crore on UIIC. UIIC agreed to settle the claim (September 2013) for ₹ 43.89 crore after making deductions on account of under-insurance, reinstatement premium, salvage and policy excess.

NPCIL represented (May 2014) to the UIIC stating that as per the policy in vogue during the period of the incident, the settlement of claim was to be made considering full reinstatement value of damaged items and actual amount paid of the items was to be reimbursed. However, the matter was not resolved till date and the amount of ₹ 11.19 crore is still pending for recovery from United India Insurance Company.

The Management replied (28 June 2017) that based on conditions of the insurance policy, an amount of ₹ 43.89 crore was paid by UIIC and a part of the claim amounting to

₹ 11.19 crore has been disallowed in spite of best efforts put by NPCIL including engaging a consultant for this purpose.

The reply of the Management is not satisfactory as no further progress has been made towards the realization of unrealized insurance claims.

b) Audit noticed that in respect of 43 cases, covered under the EAR Policy of United India Insurance Company, there was non-recovery of Insurance claims for the period from 2004 to 2010 due to non-ascertainment of cost of damages by NPCIL. Further there were 23 transit[18] Insurance claims for the period 2005 to 2014 amounting to ₹ 2.27 crore which remained pending from New India Insurance Company.

Such under recovery of the reimbursable amount from insurance companies and high number of pending insurance claims indicated absence of proactive approach by the Management to address insurance claim related issues.

The Management replied (28 June 2017) that recently claim amounting to ₹ one crore (approximately) has been settled with New India Insurance company and efforts are on to realize balance claims.

The reply from Management needs to be viewed *vis-a-vis* the position that even after receipt of ₹ one crore, an amount of ₹ 1.27 crore still remain unrecoverable from insurance companies.

Audit Recommendation No. 3	**DAE's reply to the Audit Recommendation**
NPCIL should have effective monitoring/ feedback mechanism to monitor issues like long pending insurance claims.	DAE noted and accepted the recommendation.

Conclusion

NPCIL failed to proactively pursue with ASE to postpone the repayment schedule for Russian credit concomitantly with the rescheduling of the Commissioning date for Units I and II. As a result, the repayment of Russian credit started much before the Units could generate revenue through the sale of electricity. NPCIL had to procure loans from the market for the repayment of Russian credit, thus increasing the cost of the project. There were deficiencies such as avoidable payment of interest on borrowings and non-transparency in availing loan from banks.

[18] *Insurance covering supplies during transit from Russian/ third country port upto erection point including transit storage at KKNPP site.*

Chapter - III
Tariff and Revenue generation

Unit I of KKNPP started commercial operation on 31 December 2014. The power generated before the date of commissioning of the plant is termed "infirm power" and the power generated after the start of commercial operation is termed as "firm power". The tariff for selling the power generated by the Nuclear Power Stations was to be fixed by the Department of Atomic Energy (DAE). Pending fixation of tariff by DAE, provisional tariff was arrived at by NPCIL which was stated to be as per the DAE Notifications dated 8 December 2010 and 23 May 2013.

The operational performance of KKNPP for the last four years ending 31 March 2017 was as follows:-

Table 3.1: Operational performance of the KKNPP

Electricity	Particulars	Nuclear energy	
		Infirm power (Units I and II)	**Firm power** (Unit I)
Generation (Units in million KWh)	For the year ended 31.03.2014	1,105.62	--
	For the year ended 31.03.2015	2,242.59	2,087.37
	For the year ended 31.03.2016	--	2,261.22
	For the year ended 31.03.2017	2,326.57	6,224.96
Total		**5,674.78**	**10,573.55**
Net export[19] (Units in million KWh)	For the year ended 31.03.2014	776.96	--
	For the year ended 31.03.2015	1,837.92	1,917.12
	For the year ended 31.03.2016	--	2,056.53
	For the year ended 31.03.2017	2,083.31	5,726.09
Total		**4,698.19**	**9,699.74**
Net export (Amount in ₹ crore)	For the year ended 31.03.2014	95.94	--
	For the year ended 31.03.2015	234.77	740.03
	For the year ended 31.03.2016	--	801.87
	For the year ended 31.03.2017	255.43	2,302.34
		586.14	**3,844.24**

It may be seen from the Table 3.1 that during 2013-14 to 2016-17, 5,674.78 million KWh units of infirm power were generated out of which 4,698.19 million KWh units were exported at a value of ₹ 586.14 crore. Further, 10,573.55 million KWh units of firm power were generated out of which 9,699.74 million KWh units were exported at a value of ₹ 3,844.24 crore.

[19] *Represents electricity sold to State Electricity Board.*

3.1 Ad-hoc fixation of tariff resulting in short revenue realisation - ₹ 90.63 crore

The tariff for sale of electricity (firm power) by Atomic Power station to the State Electricity Board was to be fixed based on norms prescribed in the tariff notification of DAE (8 December 2010) which prescribed components to be considered while fixing tariff for power to be sold by nuclear power plants. The prescribed components are return on equity, interest on debt, depreciation, operation and maintenance cost, foreign exchange rate revision and hedging costs, fuel consumption, interest on working capital, annual fuel recovery, provision for taxation and decommissioning levy.

Audit observed that NPCIL, while fixing tariff for infirm power, deliberated (July 2013) that the DAE notification of 8 December 2010 was silent on the rate to be charged on infirm power generated by nuclear reactors. It was proposed by NPCIL (July 2013) for fixation of infirm tariff at 61.15 paisa per kilowatt hour (KWh) considering the Operation and Maintenance charges and fuel cost as was the practice in vogue in the case of other units of NPCIL. Considering the rate 61.15 paisa per KWh to be too low, two additional components of interest on working capital and depreciation were considered for working out the infirm tariff on the ground that these two expenditures were incurred between 22 October 2013 and 31 December 2014. After including these components, the rate of infirm power was fixed (November 2013) at 122.37 paisa per KWh.

During the review of tariff fixation process for infirm power, Audit observed that NPCIL did not adopt uniform criteria for inclusion of components for tariff fixation. While it considered two additional components *i.e.,* interest on working capital and depreciation on the ground that these components did get incurred, but NPCIL did not consider two other similar components *i.e.*, interest on foreign debt and interest on domestic borrowings which were also incurred during the same period between 22 October 2013 and 31 December 2014 and involved outflow of funds in the form of interest payments. There were no justifiable reasons recorded for non-consideration of these two components in the tariff fixation for infirm power.

Non-consideration of interest on foreign debt (19.89 paisa per KWh) and interest on domestic borrowings (14.77 paisa per KWh) in tariff fixation for infirm power generated (2614.88 million KWh) resulted in short realisation of revenue to the tune of ₹ 90.63 crore for the period between 22 October 2013 and 31 December 2014.

The Management replied (28 June 2017) that there are no fixed components of tariff for the infirm power. Moreover, there is no short realisation or loss to the corporation, as all the expenditure till the date of commercial operations (COD) is capitalised and is recovered through tariff of the firm power. Any expenditure which does not get reflected in the tariff gets capitalised and is recovered subsequently, along with cost of funds, through the sale of firm power after COD.

The reply of the Management is not relevant as the audit observation is not about the treatment of sales receipts i.e. whether to consider as revenue receipt or as reduction in capital expenditure. The issue is about non-consideration of two components of expenditures (i.e. interest of foreign debt and domestic borrowings which involves outflow of funds) - while fixing tariff for infirm power, on which the reply is silent. The method adopted for fixation of infirm tariff was indicative of the fact that tariff related decision having impact on revenue was taken by NPCIL in an *ad hoc* and discretionary manner and there was no fully structured exercise and prefixed criteria for the same.

Audit Recommendation No. 4	DAE's reply to the Audit Recommendation
All cases of infirm tariff fixation may be processed by NPCIL according to prefixed criteria to avoid discretionary adhocism in decision making for the same.	DAE informed that presently no formula has been fixed by GoI for arriving at infirm tariff rate and that infirm power sales realization is adjusted against project cost. Hence only variable cost is being taken as per policy. Due to considering two additional items of cost, than that being considered as per practice, has given rise to the audit observation. DAE accepted the audit recommendation and confirmed need for consistency in formula adopted.

3.2 Non recovery of notified additional component of tariff on sale of power - ₹ 7.04 crore

DAE, vide its notification dated 23 May 2013, levied an additional component of 1.5 paisa per KWh in tariff on sale of power from the existing and future atomic power stations, towards Self Insurance Fund[20] of Hot Zone Assets [21]of Atomic Power Plants. As per the notification, these charges were fixed and were payable with immediate effect till further notification. The charges were applicable for sale of power from all the atomic power stations irrespective of any revision or re-notification of the base tariff.

It was observed in audit that while fixing tariff for infirm power, NPCIL did not include the additional component of 1.5 paisa per KWh in tariff fixed for power generated from its Unit 1 of KKNPP. The infirm power generated from Unit I (2,614.88 million units) and from Unit II (2,083.31 million units) was sold to State Electricity Boards. NPCIL levied the component of 1.5 paisa in tariff only from the date of commercial operation of Units I and II. NPCIL sold 4,698.19 Million KWh of infirm power during October 2013 to March 2017 to the State Electricity Boards on which an amount of ₹ 7.04 crore was forgone due to non inclusion of levy for self insurance fund in the tariff.

[20] *The Self-Insurance fund is being collected on the concept of building a self corpus to mitigate the risks not covered under the general insurance policies.*

[21] *Radiation and Nuclear reactors*

The Management replied that the atomic power project upon declaration of commercial operation is treated as a station and other levies such as decommissioning levies are not charged during the infirm power period. It further stated that even as per the accounting treatment, during the period from criticality of the plant to commencement of commercial operation, all the revenue earned from sale of power (infirm) is treated as reduction of capital cost of the project and all the expenditures including interest on the loan, are capitalised.

The reply is not acceptable as the audit observation is not on the accounting treatment of receipt on sale of infirm power. The observation was on non-inclusion of additional component mandated by DAE for self insurance fund in the fixation of tariff of infirm power resulting in under recovery and consequently loss of revenue on which the reply is silent.

3.3 Non-recovery/ adjustment of energy charges from Tamil Nadu Generation and Distribution Corporation Limited on account of wheeling

NPCIL installed (2007) eight number of wind mills of 1250 KW capacity each at its Kudankulam premises. The wind power generated by five out of eight units installed were used for captive consumption and the power generated from the remaining three units were sold to Tamil Nadu Generation and Distribution Corporation Limited[22] (TANGEDCO) for which necessary agreements were entered (January 2007) between NPCIL and TANGEDCO. The arrangement was revised in October 2009 which also provided for wheeling[23] and banking[24] of the surplus wind energy, if any generated. The electricity (wind energy) was being sold to TANGEDCO at ₹ 2.90 per unit with effect from March 2009. As per the agreement, the change of utilization of wind energy for captive to sale was permissible. Further, the unutilized portion of banked energy, if any, available at the end of banking period i.e., 31 March every year was deemed to have been purchased by TANGEDCO at the rate of 75 *per cent* of the normal purchase rate of ₹ 2.90 per unit i.e., ₹ 2.175 per unit.

Audit noticed that TANGEDCO raised bills at High Tension connection rates of ₹ 9.50 for Site and ₹ 4.50 for township against these connections for the months of July and August 2012 without adjusting the wind energy generated and the bills were paid by NPCIL at higher rates. This resulted in excess payment of ₹ 2.09 crore to TANGEDCO.

The Management replied that the non adjustment of Wind Energy Generation against the consumption in HT 131 and HT 132 as in agreement had already been taken by the company vide letter dated 14 August 2012. Further, letter was also written to TNEB by on 27 June 2015; however response is awaited.

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[22] *Tamil Nadu Electricity Board (TNEB) was restructured on 1 November 2010 into TNEB Limited, Tamil Nadu Generation and Distribution Corporation Limited (TANGEDCO) and Tamil Nadu Transmission Corporation Limited (TANTRANSCO)*

[23] *Wheeling refers to the transfer of electrical power through transmission and distribution lines from one utility's service area to another's.*

[24] *Banking means residual electrical energy after utilization for captive consumption out of the injected energy in a month into the transmission/ distribution system which will be utilized later for its own use or for wheeling.*

Even though Tamil Nadu Generation and Distribution Corporation Limited disallowed the benefit for the bills of July and August 2012 and matter has been pursued regularly with company, the amount still stands unadjusted. This indicates absence of effective monitoring system which is necessary to ensure that payments to TANGEDCO are made after verification and as per agreed terms.

3.4 Avoidable delay in restart after refuelling of Unit I leading to abnormal extended shutdown and consequent revenue loss of ₹ 947.99 crore

NPCIL had planned to undertake the refueling work of Unit I by the departmental manpower as well as the Indian contractor's manpower to be engaged by it. Accordingly the planned shutdown of Unit I was for 60 days from last week of May 2015 to third week of July 2015. However, Audit noticed that NPCIL belatedly realised (July 2015) that the experience of departmental manpower as well as Indian vendors on various equipments supplied was limited and the technical assistance/advice from manufacturer specialist or other specialists from Russian as well as third countries was required during refuelling outage.

NPCIL therefore decided to enter a new contract with ASE for deputation of specialists from Russia or third countries during refueling outage and for subsequent operation in case of exigencies. Accordingly, a new contract was signed between NPCIL and ASE on 24 August 2015 for engaging Russian Specialists for 95 man months at a contract value of USD 1.88 million (plus applicable taxes) at the rate of USD 19,800 per man month for rendering consultancy services at KKNPP Unit I during refueling outage.

It was observed that the cost of the contract awarded to ASE for engaging Russian specialist in August 2015 was 76 *per cent* more than NPCIL's own estimated cost of USD 1.06 million for the same. Moreover as against USD 11,220 per man month paid earlier to the Russian specialists, the amount agreed to be paid to the Russian specialist in connection with refuelling connected work was USD 19,800 per man month *i.e.*, 76 *per cent* higher. As the engagement of Russian specialists was considered after the shutdown, owing to NPCIL's incorrect assessment about its own capabilities relating to carrying out the refuelling work on its own, it had no option but to accept the higher rate without any scope of significant negotiation in view of the stated time constraint.

It was further noticed that as against the planned shutdown of 60 days, Unit I was actually shut down for 222 days from 24 June 2015 to 31 January 2016. This extended shutdown continued despite the engagement of Russian scientists for carrying out the refuelling related works. NPCIL took 162 days more than the estimated 60 days for restarting of Unit I. NPCIL's initial decision to shut down the plant and execute the refuelling work on its own without evaluating and ensuring its technical competency for the same, before the shutdown, was not prudent.

The extended delay in restarting the reactor caused non generation of power for a long period of time and had adverse consequences on revenue generation. This resulted in revenue loss amounting to ₹ 947.99 crore to NPCIL on account of non-generation of electricity for sale for the subject period.

The Management replied (28 June 2017) that the requirement of technical assistance from specialist from Russia and third countries was realised well in advance and that the higher rates quoted by ASE was justified as the estimate prepared was based on contract entered with ASE in July 2013. It further stated that the scope of work required deputation of highly qualified specialist and NPCIL had no option but to accept the negotiated rate as ASE was only capable of executing the work. The Management also stated that refuelling shut down consumed more time than expected due to unanticipated maintenance jobs like replacement of failed rope, dismantling the main mast, TV mast cable and camera, RFM with new rope, leak detection of 163 fuel assemblies, overhauling of four reactor coolant pump as against one planned etc.

The reply of the Management clearly indicates that NPCIL did not properly assess the level of expertise required for refuelling before shutting down Unit I in June 2015 for the same. Moreover, the 1,500 activities planned were to be carried out by departmental labour and contract manpower engaged through Indian firms and the purpose of Technical assistance/ advice from the Specialists was primarily to enhance the progress of 1,500 activities planned. Further, the rate finalised in contract entered in July 2013 was applicable upto 2016, hence the increase in rate by 76 *per cent* in the contract for deputation entered in August 2015 was not justified. Even though NPCIL claimed that delay in restarting the plant was due to time taken for repairing various equipment, the fact remains that though the equipment were designed and supplied by ASE and despite Russian manpower presence at site, NPCIL took 162 more days for restarting the Unit I which resulted in revenue loss to the tune of ₹ 947.99 crore.

Audit Recommendation No. 5	DAE's reply to the Audit Recommendation
For all future planned shutdowns, NPCIL may do a competency analysis by mapping with a structured breakdown analysis, to take timely decision, if required, for engaging external consultants to avoid prolonged shutdown and consequential revenue loss.	DAE informed that shutdown for refueling are mandatory and planned. In the present case, the unplanned shut down was for compliance of regulatory requirements of AERB. DAE noted the recommendations for future compliance.

Conclusion

NPCIL did not have in place a firm pre fixed criteria to avoid discretion/adhocism in tariff fixation of infirm power, and to ensure that relevant cost components are considered in the light of applicable Regulatory Rules/Orders and principles of cost recovery in infirm power tariff fixation process. The shutdown activity for refueling of plant also lacked proper planning and assessment by the NPCIL which resulted in closure of Unit I of KKNPP for a longer time than estimated, resulting in substantial revenue loss.

Chapter - IV
Project Implementation

In accordance with the provisions of supplement to the Inter-Governmental Agreement (IGA), NPCIL and ASE entered (November 2001) into a General Framework Agreement (GFA). The GFA was signed to record the principal terms of understanding arrived at in relation to the Project, indicating the scope of obligations of ASE and NPCIL respectively. As per GFA, the total project base cost was USD 2,587 million {excluding the cost of Detailed Project Report (DPR), Interest during Construction (IDC) and fuel}. The GFA also contained details and price ceilings of contracts to be entered with ASE for fulfillment of Russian scope amounting to USD 1,535 million and for third countries supplies amounting to USD 220 million. The details are given as under:

Table 4.1 Cost of works under scope of India, Russia and third countries

Sl. No	Component	Price submitted in the Initial TCO – July 2001		Price after negotiation and agreed in GFA – November 2001	
		(Million USD)	(₹ in crore)	(Million USD)	(₹ in crore)
1	Russian scope of supplies and services	2,293	10,777	1,535	7,217
2	Supplies and services from the third countries	220	1,034	220	1,034
Sub total		**2,513**	**11,811**	**1,755**	**8,251**
3	Indian scope of works with transportation	867	4,075	832	3,910
Total base cost		**3,380**	**15,886**	**2,587**	**12,161**

GoI accorded (December 2001) financial sanction for a total project cost of USD 2,804 million (including cost of DPR of USD 57 million and IDC on Russian credit of USD 160 million). The financial sanction in Indian currency comes to ₹ 13,171 crore.

Russian Scope of Work

The Russian scope included project engineering and design, supply of equipment, special materials/spare parts from Russian Federation, procurement of some equipment from third countries, training of operations/maintenance personnel of Indian side, associated services like project management activities, quality assurance / quality control (QA/QC) activities, designer's supervision at all stages of project implementation etc. Following were the contracts agreed under Russian scope as agreed under the GFA:

Table 4.2: Contracts agreed by NPCIL with ASE under Russian Scope of Work

(In million USD)

Sl. No.	Name of the Contract	Cost
1	Elaboration of the working documentation	122
2	Delivery of equipment with long manufacturing cycle and first priority equipment and materials	538
3	Equipment and materials to be supplied from Russian federation	755
4	Training of NPCIL's operation and Maintenance personnel	15
5	Deputation of contract specialists to KKNPP site	105
	Total	**1,535**

Indian Scope of work

The Indian scope was to include civil construction works, preparation of detailed erection procedures, erection of all mechanical, electrical and Instrumentation & Control (I&C) system equipment/ components, participation in procurement of equipment from third countries, commissioning of the plant under technical assistance of ASE's personnel and operation of the nuclear power station (NPS) units. NPCIL was also to carry out the overall Project Management including the implementation of planning and monitoring procedures by the parties and their sub-contractors under technical assistance of the ASE. Following works were under the Indian scope as agreed under the GFA:

Table 4.3: Cost break up for Indian scope of work in KKNPP

(₹ in crore)

Sl. No.	Details of work	Original sanction December 2001
1	Main plant civil building (Material and construction), cooling water intake and outfall system (Material and construction), breakwater dykes, shore reinforcement	1,554
2	Erection and Commissioning of Nuclear system auxiliaries, Turbine Generator auxiliaries, miscellaneous mechanical erection, transportation and transportation insurance, water desalination plant	440
3	Employees salary and overheads	724
4	Working capital margin	237
5	Site improvement, communication and computer facilities, maintenance, contingencies and insurance etc.	955
	Total	**3,910**

Third Country Contracts

As per TCO and negotiations carried out, the third country supply of materials was included partly in Indian Scope and partly in Russian Scope. The total value of supplies under third country contracts was limited to USD 220 million. All the third country contracts were entered in by the Russian side (ASE).

4.1 Time and cost overrun

4.1.1 Delay in achievement of milestones

Annexure IV of the GFA dated 6 November 2001 provided milestones for various stages of KKNPP Units I and II, as agreed between NPCIL and ASE. The scheduled completion of KKNPP Unit I and II and actual achievement are as under:

Table 4.4: Delay in commercial operation in respect of Units I and II

Final milestone	Scheduled Date	Actual Date	Delay
Start of Commercial operation (Unit I)	30.10.2007	31.12.2014	86 months
Start of Commercial operation (Unit II)	30.10.2008	31.03.2017	101 months

The finally achieved milestones against schedule dates of completion of various stages under KKNPP Units I and II are indicated in the ***Annexure II***.

An analysis of scheduled dates of completion and actual dates of completion of various stages in Unit I of KKNPP revealed that delays ranging from 202 days to 2,619 days took place, for Unit I, in the following activities:

Table 4.5: Delays in completion of various stages in Unit I

Sl. No.	Activity	Scheduled completion	Actual completion	Delay in days
1.	Construction of primary containment of Reactor Building walls upto 43.9 metre	31.10.2004	21.05.2005	202
2.	Construction of turbine building up to 36.5 metre including crane beam	31.12.2004	31.08.2005	243
3.	Commissioning of polar crane	31.03.2005	April 2007	730
4.	Erection of Nuclear Steam Supply System equipment and pipelines	30.06.2006	29.07.2008	760
5.	Erection of Turbine Generator	30.06.2006	30.09.2008	824
6.	Commissioning of 220 KV Gas Installed Switchgear	31.01.2005	14.11.2008	1,384
7.	Pre-stressing of Reactor Building Inner Containment Dome	30.09.2005	18.11.2009	1,449
8.	Commissioning of Compressors	31.12.2005	December 2010	1,795
9.	Attainment of first criticality	30.04.2007	13.07.2013	2,266
10.	Start of commercial operation	30.10.2007	31.12.2014	2,619

Similarly, delays ranging between 95 and 3,083 days were noticed in case of Unit II. These are depicted as under:

Table 4.6: Delays in completion of various stages in Unit II

Sl. No.	Item of work	Scheduled completion	Actual completion	Delay in days
1.	First pour of concrete	31.03.2002	04.07.2002	95
2.	Construction of turbine building	31.12.2005	31.01.2007	396
3.	Construction of emergency power supply and control Building	30.04.2006	30.09.2008	884
4.	Charging of Reserve Power Supply System	31.05.2005	01.09.2011	2,284
5.	Attainment of first criticality	31.01.2008	10.07.2016	3,083
6.	Start of commercial operations	30.10.2008	31.03.2017	3,076

Scrutiny of major contracts entered by NPCIL under Indian scope of works/contracts with ASE showed major reasons for delays were as follows:

- **Delay in supply**-Non-sequential supplies and interfacing problems with the manufacturers led to delays in the construction and erection works.
- **Design changes**- Engineering changes/ modifications suggested by the Russian designers needed reworking in many areas which also affected the schedule.
- **Delays due to extra /additional works**- the initial bill of quantities of Kudankulam Units I and II provided by the Russian side was based on the Russian reference plant data. However, during elaboration of the Indian specific design several additional safety features were incorporated and the bills of quantities underwent upward revision, increasing the scope of the supplies/ works.
- **Erection delays**- Delays in execution of work in 62 cases out of selected 106 works involving civil, mechanical, electrical and instrumentation works which were ancillary to the main project.

The delays ranged from 7 to 2,041 days in supply of materials, from 11 to 387 days in change in design by the Russian Federation, and from 8 to 1,564 days in mismatch of material with the drawing specification supplied by the Russian Federation/execution of additional work due to improper assessment at preliminary stage.

The Management in its reply (28 June 2017) stated that major delays were due to delay in supply of materials, working documents, change in design etc. by ASE. Delays contributed by

NPCIL were due to delay in providing inputs for finalization of design and agitation by local people for some period of time.

The Management acknowledged the reasons for delay. However, no efforts were made by NPCIL to revise the repayment schedule in consonance with the revised date of commissioning even though the Russian side contributed significantly to the delays in commercialization of the plant (as already discussed in Chapter-2). These not only delayed commercial operations of the KKNPP but also increased the cost of the project as discussed in succeeding paragraph.

Audit Recommendation No. 6	DAE's reply to the Audit Recommendation
Future delays should be avoided by sequencing the supplies with the various stages of production.	DAE noted and accepted the recommendation.

4.1.2 Increase in cost due to delay in completion and non-recovery from Atomstroyexport (ASE)

In order to complete the commissioning of the project within the target date, it was necessary to ensure timely completion of all the ancillary works which were associated with the main project. However, during execution of work, the cost underwent significant upward revision, the details of which are given as under:

Table 4.7: Increase in cost of work in respect of Units I and II

(₹ in crore)

Sl. No.	Components	Original cost (December 2001)	Revised cost (August 2014)	Increase in cost
1	Russian Scope of work	8,508	9,692	1,184
2	Indian Scope of work	3,910	7,734	3,824
3	Interest During Construction	753	3,286	2,533
4	Foreign Exchange rate variation	-	1,750	1,750
Total		**13,171**	**22,462**	**9,291**

a) Analysis of the increase in the cost of the project indicated that while the Russian scope of work was increased by ₹ 1,184 crore (14 *per cent*), Indian scope of work was increased by ₹ 3,824 crore (98 *per cent*). Moreover, increase in IDC due to delays were to the extent of 336 *per cent* (₹ 2,533 crore) and foreign exchange variation amounted to ₹ 1,750 crore further adding to the cost of the project. The increase in Russian scope was mainly attributable to additional manpower requirement at the plant site and increase in supplies from Russian side. The major contributor for the increase in Indian scope of work was salary of employees and administrative overheads. Further, there was an increase in erection and commissioning expenses of Nuclear Steam Supply System (NSSS) and Turbine Generator (TG) due to shifting of scope from Russian side to Indian side. The other factors responsible for cost escalation were execution of additional works, payment of escalation/ under-utilisation charges to the Indian contractors etc. The details of increase in cost under Indian scope of work are given in ***Annexure III***.

b) Audit noticed delays in execution of work in 62 (valuing ₹ 1,422.79 crore) out of 106 works (valuing ₹ 1,511.73 crore) (94 *per cent*) test checked, involving civil, mechanical, electrical and Instrumentation work which were ancillary to the main project. This led to consequential delays such as non-providing of work front by NPCIL in time to the contractors[25]. Consequently NPCIL was compelled to incur additional expenditure towards the payment of escalation charges amounting to ₹ 184.40 crore to the contractors. Further, under-utilization charges amounting to ₹ 39.34 crore were claimed by the contractors due to delay in work for reasons such as supply of material/ work front/ design specification. Moreover, additional expenses were incurred during the extended period on Service tax, insurance premium, bank guarantee commission and additional expenditure on Plant & Machinery, Staff & site etc. amounting to ₹ 41.05 crore.

As per Clause 1.10.2 of Technical and Commercial Offer and Article 12 of General conditions of the contract, in case the delay in project schedule was due to ASE, it would bear the responsibility for consequences of delays, such as all additional expenses caused by the delay, including direct costs proved to be reasonably incurred by the Customer due to such delay as mutually agreed upon. However, no claim was initiated by NPCIL on ASE for recovery of the additional amount of ₹ 264.79 crore (₹ 184.40 crore + ₹ 39.34 crore + ₹ 41.05 crore).

[25] *Bharat Heavy Electricals Ltd, Larsen & Toubro Ltd, Hindustan Construction Corporation etc.*

The Management replied (28 June 2017) that since all works related to Erection and Commissioning were undertaken by Indian side, ASE was reduced to the role of supplier only. Application of Article 12 of GCC would have been tantamount to recovery of consequential losses which was not the intention of the parties as per IGA since it not likely to be sustained as per international contract conditions.

The reply of the Management is untenable as the delay in supply of equipments/materials and working documents by ASE had resulted in consequential delays in completion of linked works by the Indian contractors. Hence the additional expenditure incurred by NPCIL on account of additional payments by the Indian contractors from NPCIL is to be covered under the said general conditions of contracts clause and has to be recovered from ASE.

Audit observations on Russian scope, Indian scope and Third Countries contracts are given in subsequent paragraphs.

4.2 Russian Scope of work

4.2.1 Undue benefit extended to ASE in contract for supply of equipment at higher value – ₹ 99.47 crore

As per GFA of November 2001, five contracts[26] were agreed to be entered between NPCIL and ASE for implementing the Russian scope of work for USD 1,535 million. In addition, there was an arrangement agreed between ASE and NPCIL for supplying equipment and services from third countries to the tune of USD 220 million.

However, after NPCIL observed that some of the equipment to be supplied by third countries could be procured within the Russian scope and that part of the obligations related with the deputation of the Russian Contract Specialists in India could also be carried out within the Russian Federation (RF), it signed (August 2002) a memorandum of understanding with ASE for a new contract valuing USD 94 million. This was done by reorganizing two contracts, *viz.*, 'Deputation of contract specialists to KKNPP site – USD 105 million' and 'supplying other equipment by third countries – USD 220 million' as indicated below:

[26] *Elaboration of the working documentation, delivery of equipment with long manufacturing cycle, equipment and materials to be supplied from Russian Federation, training of NPCIL's operation and maintenance personnel and deputation of Contract Specialists to Kudankulam site.*

Table 4.8: Contract wise revision in cost

(In million USD)

Sl. No.	Name of the Contract	Cost before organisation	Revised Cost	Increase(+)/ Decrease(-)
1	Contract for supply of equipment from third countries	220	191	(-) 29
2	Contract for deputation of Russian specialists to KKNPP site	105	40	(-) 65
3	Contract for supplies from Commonwealth Independent States (CIS) countries and functions to be performed by the Contractor for off-shore supplies (new contract from Commonwealth Independent States)	Not applicable	94*	+ 94
	Total	**325**	**325**	

* *USD 50.91 million for supplies and USD 43.09 million for services.*

It could be seen from the Table 4.8 that the procurement of equipment from third countries was revised to USD 191 million against its pre-revised value of USD 220 million. Therefore, the value of supply of the equipment that was to be bought from CIS countries in the new contract, by ASE, should have been only USD 29 million (USD 220 million *less* USD 191 million). However, Audit observed that the cost of the same equipment in the new contract was USD 50.91 million (₹ 231.13 crore) which was higher by USD 21.91 million (₹ 99.47 crore) over and above the original cost of USD 29 million (₹ 131.66 crore). The reasons for this increase in the value of supply of equipment by ASE were not found on the records of NPCIL. The Management stated that the equipment included in the new contract were same as in the earlier contract for supplies from third countries. This shows that an amount of USD 50.91 million was paid for the very same equipment- when bought by ASE from CIS countries as against originally agreed at USD 29 million in the pre-revised arrangement.

The Management replied (28 June 2017) that agreed value of Russian scope of work was fixed to USD 1,812 million including cost of third country contracts of USD 220 million and cost of detailed project report (DPR) of USD 57 million. Price of the contracts agreed was a notional price and amount could have been adjusted within the limit specified as per General Framework Agreement (GFA). The price of USD 220 million could have been revised only if some of the contracts for supplies from Third Countries were to be directly entered by NPCIL with Third Country suppliers. The contract for supplies from CIS Countries at contract value of USD 94 million had not affected the contract structure between NPCIL and ASE but had resulted in saving for NPCIL since 85 per cent of the value of this contract (USD 94 million) *could have been financed from soft loan available under Russian State credit which otherwise would have entirely been paid from internal resources of NPCIL.*

The reply of the Management is not acceptable as it was only the Russian scope of work valuing USD 1,535 million which was fixed as per GFA. The agreed price of USD 220 million for supplies from third countries was infact the upper limit. By procuring supplies valued at USD 29 million (old contract) at USD 50.91 million in the new contract, ASE breached the upper limit of USD 220 million of supplies as these amounted to USD 241.91 million and NPCIL extended undue benefit to ASE by making payment without raising an objection for the same. The Management's reply regarding availability of soft loan at the rate of four *per cent* is not tenable as ultimately NPCIL had to borrow at higher interest rates ranging from 7.94 *per cent* to 10.69 *per cent* to repay the Russian credit.

Audit Recommendation No. 7	DAE's reply to the Audit Recommendation
Interest of NPCIL should be protected in all contract renegotiations by ascertaining the quantitative benefits flowing out of such negotiations.	DAE noted and accepted the recommendation

4.2.2 Improper planning in utilisation of Russian specialists

Audit observations on payment for Russian manpower are given as under:

a) An onshore service contract (23 August 2002) was entered between NPCIL and ASE for USD 40 million for deputation of specialists (6,053 man months[27]) at site for Technical Assistance and guidance during construction, erection and commissioning of the plant. This price was full and final consideration for the provisions and fulfillment of the services and was not to be subject to any variation, whatsoever. As per Article 2.1 of the ibid contract, the year-wise break up of manpower deployment which was to be utilized during the period 2002-03 to 2008-09 could undergo adjustment depending upon the progress of work and schedule of completion within the overall limits of manpower input and agreed provisions.

The contract provided for 5,213 man-months on the basis of annual protocols and 840 man-months for commissioning and operation of the plant totaling 6,053 man-months. However, these 6,053 man-months were utilized in the ninth year (2010-11) itself notwithstanding the

[27] *One man month is equal to deployment of one specialist (man) multiplied by one month.*

fact that the commissioning of the Unit I and Unit II took place in December 2014 and March 2017 respectively.

Further scrutiny of records revealed that though the onshore service contract was a fixed price contract but due to deployment of extra manpower irrespective of the stage of construction of the plant, NPCIL had to increase the man-months utilized from 6,053 to 11,567 with subsequent increase in contract price from USD 40 million to USD 76.44 million. This was done by signing supplementary agreements with ASE between February 2010 and March 2016.

As the scheduled completion of the project was delayed, NPCIL should have taken timely action to rearrange the schedule of deputation of Russian Specialist as per the actual progress of work.

The Management replied (28 June 2017) that the requirement for deputation of manpower of ASE increased due to prolongation of project implementation period. Although deployment was always done judiciously, yet due to specialized nature of work, the overlapping activities that could have been carried out simultaneously got spread over due to prolongation of the project duration, resulting in increase in the manpower.

The Management's reply is not tenable because Article 2.1 of the contract clearly provided for adjustment in the deployment schedule depending upon the progress of work and schedule of completion. This option of re-organization of deployment schedule was not considered by the Management when the delays were evident in the attainment of major milestones of construction work. Moreover, since this was a fixed price contract, NPCIL should have utilized the man-months with prudence in accordance with the progress of work to avoid idling of manpower in the initial years rather than later having to resort to signing of supplementary agreements, by incurring additional cost, to complete the delayed work.

b) As per the GFA entered into between NPCIL and ASE, the work of erection and commissioning of KKNPP Units I and II was under the scope of NPCIL. As NPCIL did not have technical expertise for the work of commissioning of the primary system, specialized work including supply & erection of propriety equipment, devices, sensor/ instruments etc, it entered into contracts with ASE for deputation of technical specialists at site.

NPCIL awarded a fixed price contract to ASE (2 November 2010) at USD 1.02 million for engagement of specialists at site for 91 man-months at Unit I for commissioning of the primary system and specialized work including erection.

Scrutiny of records revealed that out of 91 man-months provided in the contract, only 39.1 man-months were utilized. However, full payment of USD 1.02 million was made to ASE. As there was no provision in the *ibid* contract for redeployment of Russian personnel from Unit I to Unit II, therefore, the remaining man months (valuing USD 0.58 million[28]) could not be made use of, by NPCIL for Unit II related works.

The Management replied (28 June 2017) that the Commissioning Measurement System (CMS) being a specialized commissioning activity required field and office/ desktop activities that were to be carried out by highly specialized Russian manpower including manpower from scientific institutions. Since price of the contract was fixed on completion basis, the contractor in order to optimize his own costs performed desktop activities in Russian Federation and there was a considerable reduction in man month deployed at Site. Therefore although estimation was on man month basis, the actual work was on lump sum basis at a fixed price.

The reply of the Management indicates that NPCIL did not have a consistent policy on payments towards contracts for engagement of Russian personnel. Whereas, in the first case the Russian side was made additional payment for completing the work on the ground that the original man months have been exhausted while on the other hand in the second case even when lesser man months were used, full payment was made even for the man months not utilized by stating that it was a fixed price contract. As both the contracts were fixed price, adopting different yardsticks for the two contracts eventually ended up benefitting ASE at the cost of increased expenditure by NPCIL. This was a control weakness whereby two different contracts for similar works were not compared to protect the financial interests of NPCIL.

4.2.3 Avoidable expenditure of ₹ 12.76 crore on repair of damaged Turbine under warranty period and consequential loss of revenue of ₹ 53.73 crore

As a part of Russian scope of work, HP Turbine rotor and stationary blades in the Unit I of KKNPP were supplied by M/s LMZ-Power machines, Russia and erected by NPCIL under the supervision of ASE. During operation of the plant (Unit I) in the month of September – October 2014, the HP Turbine experienced high thrust bearing temperature when the power

[28] *USD 0.58 Million=1.02/91*51.9*

was raised above 800 MW. As a result, the machine was stopped and inspection of turbine internals revealed damages to diaphragms and moving blades of rotor of first two stages on both the front and rear ends. It was declared as damaged on 11 October 2014. The damage was caused by impingement of metal plate that got detached from the bottom inner casing of the HP turbine. At that time Unit I had attained the stage of producing 100 *per cent* power and Unit II was ready to go for hot run.

Unit I was shut down due to suspected damaged rotor on 26 September 2014 and restarted on 7 December 2014 (73 days). As noted by the Management, the non-availability of the critical part of turbo machinery resulted in loss of electricity production from Unit I and caused a revenue loss of about ₹ eight crore per day. Consequently, it was decided to remove Unit II's HP turbine rotor and use it in Unit I to ensure power production from Unit I. The replacement was finally done on 27 October 2014. It was also decided to send the defective turbine rotor of Unit 1 to Bharat Heavy Electricals Limited (BHEL), Hyderabad for correcting the defects and using it in Unit II after rectification. The repair work was undertaken by BHEL, Hyderabad at a cost of ₹ 8.93 crore. In addition, an amount of ₹ 0.30 crore was incurred on transportation and packing cost and an amount of ₹ 3.53 crore was incurred towards replacement of Unit I turbine damaged components with Unit II and installation of repaired rotor in Unit II.

As the machines were damaged due to manufacturing defects within the warranty period, the repair and replacements/refitting costs of the Turbine was to be borne by ASE. However, no such claim was raised by NPCIL against ASE putting an additional burden of ₹ 12.76 crore on NPCIL for carrying out repairs and replacement of turbine rotors. The shutdown of 73 days also resulted in loss of electricity generation and consequently loss of revenue to the tune of ₹ 53.73 crore.

The Management stated that it had already estimated the amount of claim that was to be submitted to ASE for recovery on account of repair / replacement of defective components or on account of items procured by NPCIL on behalf of ASE. While agreeing for final takeover of KKNPP Unit I, a provision of ₹ 40.48 crore (USD 6.03 million at the exchange rate of ₹ 67.17 per USD) had been maintained in the Performance Bank Guarantee of ASE towards claims of NPCIL which included amount towards repair of Turbine Blades.

The Management's reply is unverifiable as NPCIL did not provide details of adjustments of ₹ 12.76 crore from the performance bank guarantee of ASE (July 2017). Moreover the reply is silent regarding the revenue loss as pointed out by the Audit.

4.2.4 No action initiated for recovery/adjustment for non/defective supply of material

During implementation, instances were noticed where NPCIL had to place new orders for certain materials due to non/defective supply of items which were included in ASE's scope. However, NPCIL neither assessed the extra payment/loss due to this non/defective supply nor did it initiate action for recovery/adjustments from ASE. The details are given in the following paragraphs:

a) After supply of valves was made by ASE at KKNPP, NPCIL noticed that the electric motors were of compact type and specialized rewinding contractors of NPCIL were not able to rewind or repair them. NPCIL then purchased spares for motorized valves compatible motors from M/s Tulaelectroprivod CC FZE, Russia for ₹ 19.20 crore (USD 3.11 million) in November 2014. Since the original electric motors did not comply with the specifications of NPCIL, it should have got them replaced from ASE without any cost. Thus purchasing compatible motors from M/s Tulaelectroprivod CC FZE, Russia instead of insisting on replacement of compact motors from ASE, led to avoidable expenditure of ₹ 19.20 crore.

The Management also confirmed that the subject electric motor, because of its compact type, could not be repaired/rewound by NPCIL contractor.

b) ASE supplied 'valve actuators[29]' which were found to be damaged/non functional and beyond instant repair. NPCIL placed an order (August 2014) for these items on M/s Tulaelectroprivod, Russia for ₹ 1.62 crore on a single tender basis. However, it did not assess the extra payment/loss and also did not initiate action for its recovery/adjustment from ASE.

c) According to the warranty/guarantee clause included in the supply contract entered with ASE as per GFA, the guarantee period for supplies for each unit under the contract was 12 months from the date of provisional takeover of the respective unit. Further, if the defect or failure of the component or system was caused by faulty design, the contractor would modify such design component or system in order to exclude the possibility of such defect and failure at his own cost. Techno Commercial offers (TCOs) received for requirements at

[29] *A valve actuator is the mechanical part for opening and closing a valve.*

site/ components /items, which became non functional during commissioning of Unit I and additional volume of instrumentation for Unit II, received from Russian side were negotiated and contracts were entered on 31 August 2011 and 10 September 2014 with ASE for USD 5.33 million (₹ 24.53 crore) and USD 5.75 million (₹ 34.98 crore).

Audit observed that majority of items under the above contracts were procured for replacement of damaged/ faulty items supplied under the supply contracts entered with ASE as per GFA. Since warranty/guarantee clause was included in the supply contracts, the damaged/ faulty items should have been rectified/ replaced by ASE at their own cost. The procurement of damaged / faulty items resulted in extra expenditure. However, the quantum of extra expenditure could not be quantified as no separate details related to faulty items were available in the records of NPCIL. The segregation of procurement of non-functional items and other items was not available on record. NPCIL neither provided details of comparison with the original rate of the equipment nor with the rate from Indian manufacturer despite repeated requisitions from Audit.

d) In another case NPCIL had to place order on M/s Integrated Engineers & Consultants Private Limited for supply of 'C Channels' and 'Brackets', though these items were in the scope of ASE but were not supplied by it. NPCIL had to incur an amount of ₹ 19.82 lakh on this account. No action was taken by NPCIL to recover this amount from ASE.

The Management replied (28 June 2017) that NPCIL had a system of recording deficiencies observed in the equipment while commissioning of systems/equipment wherein the agencies responsible for such deviations were also identified and recorded. The four instances mentioned in the audit report were items damaged during storage/erection/commissioning and hence were not in the purview of warranty/obligation of ASE.

The reply of the Management is not acceptable as in respect of the first three observations, the Management could not explain why the failure could not be attributed to ASE, especially as no documents were on record to indicate that NPCIL was responsible for the defect/damage of items.

Regarding the fourth observation, it relates to non supply of items. Hence the question of damage on account of NPCIL does not arise and the amount should have been recovered from ASE.

Audit Recommendation No. 8	DAE's reply to the Audit Recommendation
NPCIL should take timely action for recovery/ adjustment for non/defective supply of material by ASE.	The Department noted and accepted the recommendation.

4.2.5 Liquidated Damages

Liquidated Damages (LD) are levied by the NPCIL in case of non compliance of agreed terms and conditions by the Contractor (ASE). These have both a deterrent and compensatory effect and are important components of contracts.

a) Non recovery/short claim of LD - ₹ 463.08 crore

In accordance with the GFA, NPCIL entered into four supply contracts and one contract relating to elaboration of working documents falling under Russian scope.

As per Article 23.1.1 read with 23.1.2, the total of LD was to be levied at the rate of 0.03 *per cent* of value of each supply item or document package, restricted to five *per cent* or two *per cent* of the total price of the contract as the case may be. Audit observations on LD are given as under:

(i) LD claims above 0.03 *per cent* were limited to only two or five *per cent* of individual item though the contracted limit was two *per cent* or five *per cent* of the contract price. This resulted in short claim of LD in respect of five contracts to the tune of USD 19.54 million (₹ 126.74 crore).

(ii) In three contracts (including third Country supply contracts entered with ASE), the rate of Liquidated damages being applied by NPCIL or ASE was two *per cent* instead of five *per cent* as provided in TCO. The GFA signed in November 2001 provides that TCO of July 2001 and subsequently as agreed in Joint Coordination Committee (JCC) meeting held in July and August 2001 will collectively referred to as 'revised TCO'. A review of JCC meetings revealed that issue of reduction of LD rate from five *per cent* to two *per cent* was not deliberated in the meetings. Therefore, the reduction in maximum limit of LD from five *per cent* as per TCO to two *per cent* resulted in undue benefit to ASE to the extent of USD 29.24 million (₹ 186.65 crore) and consequent loss to NPCIL.

(iii) The schedule for submission of working documents under a contract (No.77-225/16200) for the year 2001-02 was mutually agreed. However, the packages were submitted with a delay ranging from 1 to 258 number of days (delay calculated beyond 30 calendar days from due date as per Article 23 for levy of LD) for which no claim for applicable LD worth USD 0.48 million (₹ 2.33 crore) was lodged by NPCIL.

(iv) Article 23.2.4 of the General Conditions of Contract (GCC) attached to the contract stated that if the LD claim is justified, the customer shall draw the invoice to the Contractor for the payment of LD subject to payment; the contractor shall pay the invoice within 30 days upon its receipt.

It was however noticed in audit that though claim letters were issued, invoice for recovery of LD as provided in the contract were not raised in respect of five contracts amounting to USD 22.72 million (₹ 147.36 crore). It was further seen from records that efforts to recover LD were put into abeyance as this project was stated to be implemented through international co-operation as per Inter Governmental Agreement (IGA) and a decision was taken that final adjustment will be carried out at the completion of the project. However, the contract clearly provided that if the claim is justified, the customer would draw the invoice to the Contractor for the payment of LD and the contractor shall pay the invoice within 30 days upon its receipt. Therefore, the decision of the Management to keep the recovery of LD from Russian side in abeyance even when the Company was resorting to borrowings for repayment of the Russian credit was against financial interest of NPCIL.

The Management replied that the works related to erection and commissioning of Nuclear Steam Supply System and Turbine Generator as well as operation of Nuclear Power Plant during guarantee was in ASE scope in the initial Techno Commercial Offer and on shifting of the same to NPCIL's scope, the scope of ASE was limited to that of a supplier only and LD were, therefore, calculated in line with any supply contract. Further, in respect of deferring the decision for realization of claims towards LD, the Management stated that the contracts provided that if at end of the project, it was established that the overall project had not been delayed on account of delay in delivery of equipment and materials by ASE, the amount of LD would be refunded back to ASE. The delay analysis was to be carried out at the end of the project after final takeover of KKNPP Unit II for settlement of claims.

The reply of the Management that on shifting of erection and commissioning of NSSS and TG from scope of ASE to NPCIL, the scope of ASE was limited to that of a supplier only and that LD were therefore calculated in line with any supply contract is not acceptable as the shifting of scope was agreed before entering into the supply contracts with ASE and as such the terms incorporated/ signed by both the parties were legally binding on both the parties. Further the decision for deferring the recovery of LD is also not acceptable as NPCIL was aware that the delay in supply of working documents/ equipment and material was affecting the Indian scope of work and would result in delay in completion of the Project. Hence the non recovery of LD till date (July 2017) even though Unit I and Unit II were delayed by seven and nine years respectively, is not acceptable. Further, Management has not furnished reply to observations raised by Audit at sub-paras (ii) and (iii).

b) Non recovery of LD in respect of Erection reserve contracts entered with ASE - ₹ 1.41 crore

Audit observed that LD valuing USD 2,18,098.30 could not be recovered due to reasons like not raising the invoices, no claim for LD recovery etc. in respect of Erection reserve procured. Details are given below:

Table 4.9: Non-recovery of Liquidated Damages

No. of cases	Contract number	Observation	Amount (USD)	Amount (₹)
2	111200 and 97400	Claim letter raised, however invoices not raised	1,04,776.60	67,95,810.28
1	90300	No clause for recovery of LD	32,850.47	21,30,681.48
2	1108700 and 1202700	Claim letter not raised	80,471.23	52,19,363.98
Total			**2,18,098.30**	**1,41,45,855.74 or ₹ 1.41 crore**

The Management replied (28 June 2017) that the contracts did not provide for direct deduction of LD from the invoices of the contractor and that NPCIL is in the process of raising debit notes for realizing LD claims.

Though the items have been delivered during the period 2009-10 to 2014-15, the debit note for realizing the LD is yet to be raised (July 2017) even after a lapse of considerable time ranging from two to eight years resulting in blocking of funds amounted to ₹ 1.41 crore.

Audit Recommendation No. 9	DAE's reply to the Audit Recommendation
Liquidated damages should be claimed in an accurate and timely fashion.	The Department accepted the recommendation and stated that the process of LD recovery has started.

4.3 Indian Scope

4.3.1 Shifting of Russian scope without proper cost-benefit analysis resulted in delays and extra expenditure of ₹ 706.87 crore

The Russian side (ASE) submitted, after acceptance of the DPR by NPCIL (Jan 2001), a Techno Commercial offer (TCO) (July 2001) for construction of Units I and II of Kudankulam project indicating Russian scope and Indian scope. For carrying out the Russian scope of work, ASE had initially indicated a total amount of USD 2,293 million excluding the estimated price of USD 220 million for supply from third countries. The TCO submitted by ASE was negotiated by a high-level Committee constituted by DAE and in the Joint Coordination Committee (JCC) meeting (July 2001), the price of the Russian scope was agreed to be reduced to a fixed price of USD 1,600 million. In this meeting, the Russian side also made an offer that the cost of the Russian scope may further decrease if the work of erection and commissioning of Nuclear Steam Supply System (NSSS) and Turbo Generator (TG) was shifted to the Indian scope. Thereafter, in the final negotiation (20-26 August 2001), the offer was accepted by NPCIL and, the cost of the project for Russian scope was reduced to a fixed price of USD 1,535 million (₹ 7,217 crore). This was to bring reduction to the tune of USD 65 million (₹ 305.50 crore) by way of decrease in the number of Russian personnel at site.

Audit found that NPCIL incurred expenditure of ₹ 1,012.37 crore towards erection and commissioning of the NSSS and TG as against ₹ 305.50 crore (USD 65 million) originally envisaged (Russian scope). Thus NPCIL incurred an extra amount of ₹ 706.87 crore as it did not conduct a cost benefit analysis before agreeing to the shifting of scope. Details are given below:

a) The Indian side had indicated that it would only be able to take any decision on shifting of responsibility after knowledge of cost allocated to these obligations by the Russian side. However, no cost-breakup was made available by ASE to NPCIL. Thus, even though the figure of USD 65 million remained unverified, NPCIL agreed to the shift in the scope of works.

b) NPCIL incurred an expenditure of ₹ 295.54 crore on work contracts for erection and commissioning of NSSS and TG. Scrutiny of records revealed that the responsibility of erection and commissioning of NSSS and TG was shifted to Indian side for the stated purpose of achieving optimization by reducing the number of Russian technical personnel at site. However, the total fixed Russian man-months provided in the original contract (August 2002) actually increased from 6,053 to 11,567 man-months and there was an increase in cost by USD 45.90 million (₹ 226.55 crore) for deputation of Russian technical specialists during erection and commissioning stage. This defeated the stated purpose of optimization desired to be achieved by shifting the erection and commissioning from Russian to India scope.

c) During erection and commissioning of Unit I, a considerable quantity of Electrical, Mechanical and Instrumentation and Control items and components were damaged or developed faults which were replaced by using corresponding items from Unit II, since no erection reserve was available. To source these equipment, NPCIL had to enter into various contracts with ASE for procurement of erection reserve equipment/ material costing USD 87.55 million (₹ 490.28 crore). This was done as and when requirement arose. Even though the TCO submitted in July 2001 indicated that the equipment/services for erection were to be procured by the Russians from the local markets in India but the same was procured from ASE without doing any comparative rate analysis.

Inspite of repeated enquiries/reminders, KKNPP Management/NPCIL did not provide list of equipment which got damaged or developed fault during erection/ commissioning of Unit I. In absence of this information, the scope of audit was limited as it could not examine whether the faults/ damages were avoidable and who was responsible for the same.

Shifting of the work of NSSS and TG to the Indian scope, without any cost-benefit analysis resulted in NPCIL incurring ₹1,012.37 crore (₹ 295.54 crore + ₹ 226.55 crore + ₹ 490.28 crore) on work contracts, Russian manpower costs and procurement of items respectively, thus leading to an additional expenditure of ₹ 706.87 crore. This was one of the major reasons for the escalations in cost of the project. The shifting of NSSS and TG to Indian scope also resulted in delays in erection of NSSS/TG (25 months and 22 months in respect of Unit I and Unit II respectively) which also contributed towards overall delay in commissioning and completion of project.

The Management replied (28 June 2017) that NSSS and TG form the core of Nuclear Power Plant and in order to learn the traits of the technology the same was also undertaken by the

Indian side and that the benefit of learning, which is not generally parted by foreign vendor, cannot be quantified in monetary terms. Further, the entire amount of additional expenditure due to increase in deputation of Russian Specialists and Procurement of Erection Reserves on account of commissioning works related to NSSS and TG, considered by Audit while calculating the additional financial implication is not correct as deputation of Russian specialist was required for supervision during the entire construction and erection works and erection reserves were purchased for entire plant as spares were not available for replacement of components found damaged during erection and commissioning..

The reply of the Management is not tenable. As per Clause 2.2.5.4 of the TCO submitted by Russian Federation, ASE (the contractor) was to provide for deputation at site its team of qualified personnel for commissioning of the plant and the operation and maintenance personnel were to be provided by NPCIL, who were to be trained by the contractor for taking up such jobs. Moreover, given the fact that the Russians continue to be engaged even in the commissioning process of Unit II (December 2016), the extra expenditure of ₹ 706.87 crore cannot be justified solely on the grounds of experience gained. As the entire technical support of Russian support upto commissioning was to be carried out with in the original deputation contract, the increase in Russian man months defeated the stated purpose of optimization desired to be achieved by shifting the erection and commissioning from Russian to India scope.

Regarding remaining part of Management's reply, as already stated above, NPCIL had to spend ₹ 490.28 crore towards procurement of equipment from ASE as erection reserve to replace damaged/faulty items during the erection/commissioning for the NSSS and TG. Despite repeated enquiries, the amount and details of materials consumed from erection reserve was not provided to Audit. In absence of this information, no assurance can be derived whether erection reserves were actually utilised.

Audit Recommendation No. 10	DAE's reply to the Audit Recommendation
Cost benefit analysis should be invariably conducted before agreeing to a shift in scope of work from Russian side to Indian side and *vice versa*.	DAE noted and accepted the recommendation.

4.3.2 Avoidable expenditure on Transportation of supplies from Sea port at Russia to KKNPP Site

NPCIL received considerable supplies through the sea routes. Related audit observations are as follows:

a) Avoidable expenditure of ₹ 8.37 crore

As per clause 3.2.2 of the supply contract, the contractor (ASE) shall advise the customer (NPCIL), by fax, the date of supply availability of dispatch at port, size dimension etc. The agreed rate for transportation was USD 75 per Freight Tons[30] (FRT). A notice of 45 days was to be given prior to each expected date of the vessel arrival for all consignments, except for over dimensional consignment for which notice period shall be 60 days prior to each expected date of the vessel arrival. As per clause 3.2, based on the above requirement, NPCIL shall freight the vessel and shall confirm timely arrival of the vessel at the port of shipment.

It was noticed in audit that M/s Lee & Muirhead Ltd (M/s L&M) raised (16 February 2005) the issue that actual height of packages varied between 10.180 meter and 14.645 meter as against maximum height of packages at eight meters plus-minus 10 *per cent.* Further M/s L&M stated (21 February 2005) that at the time of loading, substantial number of non-stackable packages were supplied by ASE, with substandard packing, incorrect recorded dimensions of the packages and cargo not being made available three days prior to arrival of the vessel at port to facilitate preparation of the proper stowage plan required to be submitted to Port Authorities. M/s L&M demanded compensation of USD 60 per FRT from NPCIL over the agreed rate of USD 75 per FRT for frequent changes in the stowage plan and wastage of space due to such non stackable cargo.

The proposal was put up to Board which approved the proposal stating that while tendering, these issues could not be foreseen and ASE is hardly in a position to exercise any control over stackability as it has to depend on numerous manufacturers spread over distant locations and also there was no provision in the contract between NPCIL and ASE to take care of last moment changes in the consignment being delivered at port for shipment by ASE. Accordingly, Amendment No. 6 (22 March 2005) to the contract was issued and the value of the contract was revised from ₹ 140.87 crore to ₹ 168.63 crore. NPCIL assumed an estimation of 60 *per cent* loss of cargo space. Accordingly initial rate of USD 75 per FRT

[30] *Gross Freight tons of Cargo*

was increased by 60 *per cent* and revised rate of USD 120 per FRT (USD 75 per FRT plus 60 *per cent* of USD 75 per FRT) was agreed upon.

However it was seen from the details submitted (16 February 2005) by M/s L&M in respect of seven vessels that loss of space range averaged out to only 43 *per cent* and therefore revised rate should be USD 107 per FRT (USD 75 per FRT plus 43 *per cent* of USD 75 per FRT). Adoption of higher percentage (60 *per cent*) of loss of space on an assumption basis during calculation of new rate resulted in extra expenditure of ₹ 8.37[31] crore. Moreover, no claim was raised on ASE for extra expenditure on account of non-stackable consignments.

The Management replied (28 June 2017) that the 43 per cent space lost due to non-stackable cargo was based on the calculations carried out for seven vessels which had more dense cargo transported for the Project. During later part of the logistic contract however, more diverse cargo was schedule to be transported which was bound to have higher non-stackability and hence average of 60 per cent non-stackability was agreed. It further stated that there was no linear correlation of rates with loss of cargo space due to non stackability. Rates were mutually agreed with space loss of 60 per cent to avoid issues in future.

The reply of the Management is not tenable as the actual average loss of space was only around 43 *per cent* based on seven vessels pertains to period 2003 to 2005 where loss of space ranges from 30 *per cent* to 57 *per cent*. The assumption of higher rate on the basis of remaining shipments was assumed without any documentary evidence. Resultantly, NPCIL incurred an extra payment of ₹ 8.37 crore to the contractor which remained to be recovered from ASE.

b) Payment of Inadmissible charges to transporters – ₹ 7.08 crore.

For KKKNP, the Equipment and Materials were being supplied by M/s Atomstroyexport (ASE) through Free on Board (FOB)[32] Sea Ports of Russian Federation (RF)/Third Countries (TC). As per the agreement between NPCIL and ASE, transportation of these supplies from Sea Ports of RF/TC to Tuticorin Port and to KKNPP Site was under NPCIL scope.

The work of Port handling, Shipping and Transportation of Heavy Lift (HL)/Over dimensional and normal consignments (Break Bulk cargo) of equipment and materials

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[31] *₹ 77.23 crore* (USD 120 per FRT – USD 107 per FRT)/ USD 120 per FRT where ₹ 77.23 crore represent amount paid to M/s L&M for transportation services.*

[32] *Supply of goods at the specified location as per agreement after which buyer takes responsibility of the goods.*

through Sea route/Air route (from Russian Ports/third countries ports to India and further inland transportation to KKNPP Site, Storage & Warehouse Management and further transport to erection point) was awarded (December 2002) on L1 basis to M/s Lee & Muirhead Ltd (L&M). The award was on turnkey basis for ₹ 140.87 crore. The rate quoted by the party was inclusive of all taxes, duties, port charges and any other levies including wharfage charges. Later, vide Amendment (22 March 2005) two additional items (shipment of super over dimensional consignments and shipment of non-stackable consignments) were added to the contract and the value of the contract was revised to ₹ 168.63 crore.

As per terms of the contract, if the mid-sea discharge (by anchoring the vessel mid-sea near KKNPP site) of Over Dimensional /HL cargo and other associated break bulk cargo was not possible at any occasion due to some reason or otherwise, the contractor was to transport such cargo by the suitable barge from Tuticorin port to KKNPP site at the same rates as quoted for transportation from mid-sea discharge point to KKNPP site by barge.

In February 2004 M/s L&M communicated to NPCIL that mid sea operations at Kudankulam were virtually impossible excepting few vessels when the wind conditions as well as the swell would be favorable for operations. M/s L&M also requested (11 February 2004) compensation for the additional wharfage charges stating that wharfage was included as part of the transportation cost in the quote while assuming that the quantities would be discharged as per the tender condition i.e. 40 *per cent* at Tuticorin and 60 *per cent* at KK anchorage with 10 *per cent* variation. The proposal for payment of differential cost of wharfage charges was put up to the Board of Directors of the company (April 2005). The Board while approving the proposal noted that the term for contract provided for mid-sea discharge of cargo during fair weather and advised that the matter be negotiated with the contractor so that the contractor shares part of the costs with NPCIL.

Based on negotiation, a rate of ₹ 575 per metric tonne (MT) for handling and transportation charges from Tuticorin Port to KKNPP Site to be borne by NPCIL was finally agreed upon (April 2005). Due to this revision, NPCIL had to incur an avoidable additional expenditure of ₹ 7.08 crore towards reimbursement of wharfage charges (₹ 6.10 crore) and additional handling charges (₹ 0.98 crore). This additional payment was unwarranted as the same was to be borne by the contractor as per terms of the contract.

The Management replied (28 June 2017) that the contractor was ready to unload the cargo through mid-sea discharge at KKNPP and at no point did he refuse to do so. Had any of the *consignment of long manufacturing cycle been lost due to such risky operation, schedule for completion of the Project would have been imperiled. NPCIL therefore instructed the Contractor that all consignments should be taken to Tuticorin Port and then brought to Site through Barge. The payment towards reimbursement of wharfage charges and additional handling charges amounting to ₹7.08 crore therefore was justified payment necessitated due to NPCIL requirement which was arrived through mutual agreement in line with contract conditions. Accordingly, approval of NPCIL Board was obtained.*

The reply of the Management is not tenable as the tender terms contract with M/s L&M stated that if mid sea discharge is not possible, for any reason, the contractor shall transport such cargo by suitable barge from Tuticorin port to KKNPP site without any extra payment by the NPCIL. For errors in assumptions made by the contractor at the time of bid submission, the extra costs cannot be borne by NPCIL. It was responsibility of contractor to familiarize itself with the terms and conditions given in tender and quote the price accordingly at the time of tendering. Hence the additional payment of ₹ 7.08 crore was not in order.

c) Avoidable expenditure of ₹ 11.72 crore on dead freight

As per Schedule A of schedule of items, quantities and rates of work order dated 2 December 2002, a quantity of 2.55 lakh FRT was to be transported from Russian Federation/Third Countries to Tuticorin Port/Mid-Sea discharge at KKNPP site. According to the terms and conditions of the contract minimum inducement on cargo volume of 2,000 MT equivalent of 5,000 FRT (higher of weight in MT volume in cubic meters) was required to be made available at the notified port for each break bulk shipment to M/s L&M who was awarded the contract in December 2002.

However, it was noticed in audit that NPCIL/ASE failed to provide the minimum inducement quantity i.e. 5,000 FRT in case of supplies from third countries. This resulted in payment of dead freight weight amounting to ₹ 11.72 crore to M/s L&M, as per the *ibid* provision of the contract; it being the difference between minimum inducement of cargo load and actual cargo load.

The Management replied (28 June 2017) that while providing inputs for formulation of Contract for Logistics Services for KKNPP Units I and II, ASE informed that they will be providing a cargo of 5,000 FRT for each Break Bulk Shipment and for obtaining competitive rates, a clause for minimum inducement therefore was accordingly built into the Contract.

Because of delay in delivery of supplies to the port by ASE, in some of the cases, the minimum induced quantity could not be provided and dead freight charges were paid to the Logistics Contractor. NPCIL could have waited for some more time for ASE to accumulate the cargo at port so that minimum induced quantity was available and would have attracted detention, port storage and demurrage charges. This would have also delayed all items already available at port. For delay in supplies, the contracts with ASE provide for LD and claim in this respect have already been raised.

The reply of the Management is not acceptable because NPCIL had claimed LD from ASE only in respect of delay in supplies of material and not for dead freight charges. Due to delay in delivery of supplies to the port by ASE, the minimum induced quantity could not be provided which resulted in avoidable expenditure of ₹ 11.72 crore on account of dead freight charges being paid to the Logistics Contractor which should have also been recovered from ASE.

4.3.3 Awarding work orders valuing ₹ 141.38 crore on single tender/nomination basis

According to NPCIL Works Construction Management Manual, single tender can be called only in the following cases:

a) Work of proprietary nature

b) There is only one source of Supply/Contractor

c) Replacements and addition to existing equipment/structure is of a proprietary nature

d) Work requiring equipment, plant or process for which only one party has been developed by DAE/NPCIL and that is only source available

e) Shutdown work / emergency work where normal course of tendering process will have an effect on overall plan performance / construction schedule.

f) Work of inescapable urgency which can directly affect the commissioning of the Power Plant and the party has already established equipment and necessary infrastructure at the project site, and the normal tendering process will cause time and cost overruns on project schedule.

Further, as per CVC guidelines, award of contract on nomination basis/single tender is to be resorted to only under exceptional circumstances such as natural calamities and emergencies or there were no bids to repeated tenders or where only one supplier has been licensed in respect of goods sought to be procured and PSUs are not exempted from the applicability of CVC guidelines.

Audit observed during test check that in six work orders valuing ₹ 141.38 crore, contract was awarded on single tender/nomination basis *ibid* criteria prescribed in the manual and CVC guidelines. Out of these, five work orders valuing ₹ 119.58 crore were given to three Public Sector Undertakings (PSUs)[33].

At the time of approval for single tender mode/nomination basis, it was stated by NPCIL that in view of urgency of the work and due to availability of experienced, familiar and skilled manpower competent to undertake such jobs, available with only the proposed single party, the work may be awarded on single tender/nomination basis.

However, Audit noticed that there were delays ranging from 3 to 9 months in awarding the work from the date of approval of work by the competent authority which contradicted the Management's stand about urgency. Further, there was no justification/comparison found on record that only the awardees had the requisite experience and competent manpower. In fact, even for works like annual maintenance contract single tender process was resorted to.

The Management replied (28 June 2017) that contract / work orders as pointed by in audit para for Erection Reserves were for procurement of such items and spares which were of proprietary nature, assorted type and required in small quantity. There was no alternative other than to procure these from ASE through single tender / nomination basis. It further stated that NPCIL has not violated any guidelines laid by CVC in this regard.

The Management reply is not relevant as the contracts referred here related to execution of work by Indian contractors under Indian scope of work and not to supply of material by ASE. The reason for awarding these jobs by single tender mode to Indian contractors has not been furnished by NPCIL (July 2017).

Thus, awarding contracts on single tender basis not only resulted in loss of opportunity on the part of Company to get the benefits of competitive prices but this also was in violation of the extant provisions of the Work contract manual of NPCIL and CVC guidelines.

Audit Recommendation No. 11	DAE's reply to the Audit Recommendation
Work orders should not be awarded on a single tender basis unless they qualify for the same as per NPCIL manual and CVC guidelines.	DAE noted and accepted the recommendation.

[33] *M/s BHEL, M/s ECIL and M/S Keltron*

4.3.4 Execution of additional item / quantum of works valuing ₹ 159 crore

For the work of erection and commissioning of KKNPP plants the Russian federation was to depute its specialist at site for overall monitoring and stage-wise supervision. However, despite involvement of Russian specialists and NPCIL's scientists since the stage of preparation of the DPR, NPCIL failed to identify certain civil, mechanical and instrumentation works which were required to be executed as part of this project at the planning stage. Resultantly, works had to be done additionally than what was envisaged in the approved project documents.

Out of 106 works, Audit noticed in eight cases where extra work amounting to ₹ 159 crore was executed beyond the limit of 25 *per cent*[34] over and above the contracted work. The works i.e. beyond 125 *per cent,* were not identified earlier and were awarded to the contractors at their quoted rates in the already executed contracts. It was noticed that the nature of extra work included welding work, erection and testing of smaller bore carbon steel pipes, supply and erection of high-density polyethylene pipes, fabrication of pipes, supply of single push button station etc. which should have been considered for inclusion at the time of planning in the preparatory stages. Details of extra work as percentage of original cost are given in ***Annexure IV***.

The Management replied (28 June 2017) that since many of the first of the kind system were there in the Nuclear Power Plant, the exact estimation of the work was not possible at the time of tendering. As and when the design evolved, the additional work wherever mandated had to be carried out through the existing contractors only.

The reply is not acceptable as even though the plant is first of its kind, however, similar civil, electrical and other works were done by NPCIL personnel in other Nuclear Power Plants. Justifying the additional works citing design changes while executing the works indicates lack of proper planning and coordination between ASE and NPCIL in assessing the site conditions / requirements before the start of execution of work.

Thus, allocation of additional work to the existing contractors without any rate analysis resulted not only in increase in the cost of the project by ₹ 159 crore but also in loss of opportunity to obtain competitive rates.

[34] *As was provided in general conditions of contract*

Audit Recommendation No. 12	DAE's reply to the Audit Recommendation
NPCIL should award work to existing contractors after proper rate analysis to obtain competitive rates.	DAE noted and accepted the recommendation.

4.3.5 Absence of agreement for work orders valuing ₹ 79.53 crore

Work orders were issued by NPCIL for execution of works, wherein both the parties – NPCIL and Contractor together were to execute an agreement for the respective works within the days specified in the work order.

In seven test checked cases, Audit noticed that work orders valuing ₹ 79.53 crore were issued without any agreement between the parties. Thus, formal agreement containing all the requisite documents which needed to be signed within a reasonable time, for each work order, to give the contract a legal sanctity, was not entered into in these cases.

The Management replied (28 June 2017) that the agreements with the contractors have invariably been entered into, sooner or later.

The reply is unacceptable as the agreements for the respective works were to be executed within the time period as specified in the work order and not at a later date. Further, in seven test checked cases, Audit noticed that these contracts worth ₹ 79.53 crore were issued without any agreement with the parties, which was in violation of terms and conditions of work orders. This lapse could create problems by way of NPCIL not having a defined time schedule for deliverables or a deterrent tool (like LD) to seek compensation in cases of delayed/unsatisfactory work done by the contractor(s). The interests of the company remained unprotected in these cases. There was no monitoring mechanism to ensure that an agreement should invariably be signed between NPCIL and contractor(s), as required under the respective work orders, before awarding the work.

Audit Recommendation No. 13	DAE's reply to the Audit Recommendation
Agreements for execution of work order should invariably be entered into by NPCIL with the contractor before award of the contracts.	DAE noted and accepted the recommendation.

4.3.6 Absence of Schedule of Rates for various works

According to Construction Management Manual of NPCIL, in order to facilitate the preparation of estimates, and also to serve as a guide in finalizing rates during the course of execution of contract, a Schedule of Rates (SORs) was to be maintained for each kind of work commonly executed in the units. Data base for working out rates for commonly executed items was to be as per norms stipulated by Central Public Works Department, GOI. Further, SORs were to be prepared on the basis of the rates prevailing in each unit and necessary analysis of the rates for each description of work and for varying conditions thereof should, so far as practicable, be recorded.

However, Audit noticed that SORs were not updated before preparation of estimates for various works of KKNPP. In all the test checked work files, Audit observed that in absence of SORs, estimates were prepared based on the work order rates available for other units of NPCIL like Tarapur Atomic Power Plant in Maharashtra and Kaiga Atomic Power plant in Karnataka or earlier approved rates for similar nature work at site.

Further, for preparation of estimates CVC guidelines state that the estimates should take into consideration all relevant factors based on the prevailing market price of various inputs such as labour, material, equipment etc. at the concerned locations to arrive at maximum accurate estimates. However, it was observed that for preparing estimates by NPCIL, work order rates were arrived by assessing the similar nature of work of units located at other places.

Moreover, as per the Manual, in cases where the items included in the tender are available in the current schedule of rates, the amount of tender to be accepted should not exceed more than 10 *per cent* of the amount worked out on the basis of the current schedule of rate plus (or minus) the enhancement (or decrease) on account of relevant cost index. However, in respect of 19 test checked cases, Audit noticed variation ranging from (-) 54 *per cent* to (-) 26 *per cent* between the value of work estimated and awarded.

Audit also noticed that due to non-preparation of SORs even for works of routine nature like construction of pump houses, tunnels, chlorination plants, sea water pipelines and discharge channels, the tenders awarded were for ₹ 348.93 crore as against the estimated value put to tender i.e., ₹ 588 crore, that is 41 *per cent* lower; this indicated that the estimation process at KKNPP, even for routine works was not done on a realistic basis.

The Management replied (28 June 2017) that the estimates for major Civil packages of KKNPP Units I and II were carried out by market rate analysis through an engineering consultant expert in the field. These estimates were adopted by NPCIL for preparation of respective tenders, obtaining technical sanction from competent authority including detailed estimates forming part of technical sanction.

Construction manual is a guide and not a mandatory document. This method of estimation is also used in NPCIL. KKNPP, being in a very early stage, was not having any Schedule of Rates at the point of time of preparation of referred tenders. Schedule of rates for all civil works were established later and are being used for all works as on date. This schedule of rates is being revised as per guidelines.

The Management accepted that the estimates during the initial period were prepared without SORs and on the basis of estimates of similar works executed in other projects. Though NPCIL stated that later SORs were prepared, till the completion of audit, neither SORs nor the estimates prepared on the basis of this SORs were produced to Audit.

Absence of SORs resulted in not having a control parameter to monitor preparation of budgetary estimates. Preparation of inflated estimates adversely affects the budgeting and funds arrangement processes and was avoidable.

Audit Recommendation No. 14	DAE's reply to the Audit Recommendation
NPCIL should prepare schedule of rates, at least, for the works of routine nature like construction of pump house, tunnel, chlorination plant etc with a view to have better estimation of rates for awarding contracts.	DAE noted and accepted the recommendation.

4.4 Third Country Contracts

4.4.1 Third country contracts made by ASE - Non reasonability of rates

A contract valuing USD 191 million (pre-revised USD 220 million) was entered into (August 2002) between NPCIL and ASE for supply of equipment and materials from third countries under Russian and Indian scope. Audit examination revealed the following:

a) As per Clause 2.2 of the contract, the prospective bidders' for third country supplies were to be shortlisted in consultation with NPCIL. Further, Clause 2.4 states that bids/offers received by ASE from the bidders of third countries were to be evaluated jointly by ASE with NPCIL and sub-contracts would be awarded by ASE with the approval/consent of NPCIL.

It was, however, noticed that entire purchase from third countries supply was assigned to Russian side (ASE) and NPCIL did not participate in any joint evaluation of bids/offers with ASE. Moreover, no consent/approval of NPCIL was obtained by ASE before finalizing the sub-contracts to third countries. Only a list of sub-contracts entered into by ASE with various third countries, which were un-priced, was provided by ASE to NPCIL.

b) As per clause 2.4.2.2 of the Techno Commercial Offer (TCO) entered into by NPCIL with ASE, the order of accounting the difference between the estimated and actual prices for the supply procured in third countries was to be detailed between the parties at the contract stage. However, no such clause was found included in the contract entered into by NPCIL with ASE for third country supplies. As a result ASE did not furnish to NPCIL the total value of all contracts executed with third countries and NPCIL had no way to ensure that the value of all such contracts was indeed to the tune of the agreed amount of USD 191 million (₹ 899.95 crore). It was also observed that an amount of USD 19 million (₹ 92.04 crore) towards 10 *per cent* interest free advance was paid by NPCIL to ASE for third country supplies without ascertaining whether similar provisions existed in the sub-contracts entered by ASE with third country suppliers.

NPCIL allowed ASE to make purchases without ensuring NPCIL's role as per terms and conditions of the contract. These issues were neither recorded nor brought to the notice of Senior Management which also did not have a monitoring system to ensure that the contract was being executed according to the extant terms and conditions.

The Management replied (28 June 2017) that the total price of USD 220 million (before agreed adjustment for CIS contract) was agreed as a fixed price in case all procurements from Third Countries were to be carried out through ASE and this price is a part of total price of all contracts as per agreed TCO. Reasonability of the rates within a fixed price therefore need not be ascertained. The price breakup carried out was a notional price/ rate mainly for custom clearance purpose. An amount of USD 19.05 million paid as advance under this Contract was in line with the contract drafted on the basis of Inter-Governmental Agreement (IGA) & General Framework Agreement (GFA).

The Management's reply that the price of ASE scope of supplies under third country contracts was a fixed price is not acceptable. As per clause 4.1 of GFA, the Russian scope of work was at fixed price while the supplies from third countries falling under Indian scope and Russian scope was not at fixed price but was only the upper limit of the escalated cost estimated on the basis of FOB supply terms. Clause 2.2.1.8 of GFA and contract clause 2.4 of Article 2 provided that ASE will invite quotations and select the vendors jointly with NPCIL. Hence the Management's contention that third country supply was included in Russian scope at fixed price, due to which reasonability of rates need not be ascertained, is not factually correct and is in violation of GFA and terms of the contract.

Audit Recommendation No. 15	DAE's reply to the Audit Recommendation
With regard to the contracts for supply of equipment by third country, NPCIL should consider participating in joint evaluation of bids, with a view to ensure price reasonability of the contract(s).	DAE noted and accepted the recommendation, in case order is placed by NPCIL directly on third Countries. DAE has partially accepted the recommendation. However, Audit is of the view that in order to ensure reasonability of rates of equipment procured, through ASE under third country contracts, NPCIL may devise a suitable mechanism for the same.

4.4.2 Discrepancies in payments made against supplies of equipment and materials

A contract was entered between NPCIL and ASE (August 2002) for an amount of USD 191 million for supply of equipment and materials from third countries. Following discrepancies were noticed during verification of payment procedures under the contract:

a) As per clause 6.2.1 of contract, NPCIL had to pay to ASE 15 *per cent* of the price of the contract for supplies and services amounting to USD 189.80 million within 3 months from the date of signing of the contract against submission of invoice along with signed copies of sub-contracts. Audit noticed that the sub-contracts submitted along with the invoice did not contain details like price of the sub-contract and terms of payment from the sub-contracts and payment of 15 *per cent* (USD 28.47 million) was released without verifying the details of its sub-contracts.

b) As per clause 3.4.3 of the NPCIL's standard general conditions of contract, governing supply of imported Stores, the contractor would submit performance Bond/ Bank Guarantee for an amount equal to 10 *per cent* of the total value of the contract as security for satisfactory performance. However, it was seen that NPCIL had not included this provision under a contract (Contract no. 22700, August 2002) entered with ASE for supply of equipment and materials under third country contracts. This was in violation of NPCIL's standard general conditions of contract.

The Management replied (28 June 2017) that there was no obligation of ASE to involve NPCIL in the commercial negotiations with suppliers from third countries. The price of ASE scope of supplies was a fixed price considering that all third country contracts were to be signed by ASE with third country supplier. There cannot be scope for bargain in a fixed price contract. The contract clauses clearly provided that only un-priced copy of sub contract shall be provided to NPCIL. The advance amount of 15 per cent was released after ASE fulfilled all the required conditions as per contract.

The Management's reply that the price of ASE scope of supplies under third country contracts was at fixed price is not acceptable. As per clause 4.1 of GFA, the supplies from third countries falling under Indian scope and Russian scope was not a fixed price but was only the upper limit of the escalated cost estimated on the basis of FOB supply terms. As per clause 6.2.1 of the contract for supply of equipment and materials from third countries, ASE was to provide a copy of the sub-contract to NPCIL. The said clause does not contain any provision about the supply of un-priced copy of sub contract. Hence, due to providing un-priced copy of sub-contract by ASE, the payment of 15 *per cent* without verifying the price and terms of payment of sub-contract, is therefore not in order.

4.5 Non transfer of land ownership in the company's name.

The Government of Tamil Nadu accorded sanction for acquisition of 1,225.16 hectares of land (February 1990) for KKNPP plant site and township. The land to the extent of 1,083.42 hectares towards plant site (929.52 hectares) and Township (153.90 hectares) is in the name of NPCIL. However, ownership for land to the extent of 141.735 hectares (Plant site-117.435 hectares and township-24.30 hectares) had still not been transferred in the name of NPCIL even after 27 years from the date of approval notwithstanding the fact that it was specified in the Government of Tamil Nadu order (February 1990) that NPCIL has to get the ownership of land transferred in its own name. No reasons were offered by the NPCIL for not getting the ownership transferred to its own name.

The Management replied (28 June 2017) that the land available at the plant site is sufficient for implementation of KKNPP Units I to VI including the facilities for spent fuel storage.

The Management's reply is not relevant as reasons for non - transfer of land in the name of NPCIL even after 27 years have not been addressed by the company.

4.6 Start of commercial operation of the KKNPP Unit I by NPCIL before getting the license

The Atomic Energy Regulatory Board (AERB) is responsible for the safety, supervision of Nuclear Power Projects and Plants (NPPs), which is done through an elaborate safety review mechanism and periodic regulatory inspections. All nuclear power projects have to undergo an elaborate in-depth safety review during the consenting stage which includes siting, construction and commissioning. Authorizations/ clearances for siting, construction, commissioning and operation at rated power for NPPs are to be issued in stages as per the AERB Safety Code on Regulation of Nuclear Facilities and procedure as described in AERB Safety Guide on Consenting Process for Nuclear Power Plants and Research Reactors. Based on NPCIL submissions related to various consenting stages as per AERB guide on consenting, AERB reviews the documents and application through in-house review groups, specialist groups and Advisory Committee for Project Safety Review (ACPSR).

During review process NPCIL submits various presentations, responses, justification/calculation notes and reports to AERB. On the same being in order and meeting the prescribed requirements, AERB issues clearance for the relevant stage of Nuclear Power Project (NPP) along with stipulations to be complied with (both for the current stage and next stage). On compliance of the stipulations, NPCIL is to submit compliance reports for the same.

Before authorization of commissioning/operation of the plant/project is granted, AERB needs to be satisfied by appropriate review of -

a) Final design analysis report prepared by the project plant;
b) Commissioning reports and results thereof; and
c) Proposed operating procedures and operational limits and conditions that the plant/project can be operated without undue risk to the operating personnel and the population.

The license to operate to any Nuclear Power Plant (NPP) is granted upon fulfillment of conditions as stated above at a), b) and c) above. After satisfactory review during project stage, AERB issues operating licence to a NPP for a period of up to five years. Further, AERB's guidelines also stipulated that Utility has to submit application for obtaining license for regular power operation along with final safety analysis report and detailed performance reports etc. which were reviewed at various stages of design or commissioning review process.

AERB granted, in August 2014, clearance to NPCIL for operation of KKNPP Unit I up to 100 *per cent* full power for limited duration (Phase C3[35] stage) till 31 December 2014; it later extended the date till 30 April 2015 subject to compliance with certain stipulations[36]. AERB granted the licence for regular operation of the plant on 10 July 2015. However, it was noticed in audit that NPCIL declared commercial operation of the Unit I of KKNPP on 31 December 2014 which was six months before receiving the license from AERB for regular operation of the plant. Moreover, the records pertaining to dates of completion of final safety review and its submission date to AERB were not produced to Audit despite repeated enquires. NPCIL also could not produce documents to substantiate whether it complied with the stipulations as mentioned in the AERB's sanction letter dated 30 August 2014. In absence of this information, it is not clear whether NPCIL had complied with all the stipulated safety and security conditions at the time of declaration of the commercial operation of the plant on 31 December 2014. In absence of such information, the fact that Unit I of KKNPP was put into commercial operation after duly fulfilling the operational safety and security of the plant, as required under AERB guidelines, remained unverifiable in audit.

[35] *Stage at which reactor power is raised upto 100 per cent full power*

[36] *Recommendation of ACPSR-LWR, Industrial and Fire Safety requirements as per Atomic Energy (Factories) Rules, 1996, All relevant recommendations with regard to Nuclear Security aspects.*

The Management replied that various stages during the process followed were submission of Preliminary Safety Analysis Report (PSAR) as per the framework guidelines of United States Nuclear Regulatory Commission which was mutually agreed between the Indian and Russian sides. AERB after carefully scrutinizing and reviewing these processes had given clearance to KKNPP Unit I for 100 per cent full power operation till April 2015 which was further extended till Refueling Shutdown (June 2015), as NPCIL complied with all the stipulations of AERB. The due process was followed in getting the approval from CMD, NPCIL for commercial operation declaration. Hence declaration of commercial operation is in no way violating the principles of regulatory stipulations which have been complied duly by NPCIL.

The Management's reply did not address to the specific audit observation as to how the commercial operation of KKNPP Unit I was started on 31 December 2014 which was six months before getting the license from AERB for regular operations on 10 July 2015.

4.7 Pre service inspection of Reactor Pressure Vessel

Reactor vessel is one of the most crucial components of Nuclear Plants, which houses the reactor core and other key reactor internals. To assure the reliability of safety related components of nuclear plant, Pre Service Inspection is essential.

Initially NPCIL awarded (January 2011) the Pre-Service Inspection work of Reactor Pressure Vessels reactor components of Unit I to a contractor - M/s VR Enterprises for an amount of ₹ 31.40 lakh. The work was to be carried out by the contractor as per the technical/expert advice and guidance of NPCIL officers and was to be completed by June 2011. The proposal for inspection by engaging Indian contractor was stated to be based on the previous experience of NPCIL in earlier Pressurized Heavy Water Reactors and was an attempt to reduce the cost. However, NPCIL could not guide and extend professional advice/expertise to the contractor for discharging its work due to its complexity and the work was short closed on 28 June 2011; ₹ 8.76 lakh was paid to the contractor for the part of work executed. Later the work was awarded to M/s HRID on 29 July 2011, a Croatian firm at a cost of Euro 0.79 million (₹ 5.01 crore[37]). The work was completed by M/s HRID on 31 July 2012.

Audit observed that NPCIL's initial decision to execute the Pre Service Inspection work through local Indian contractor and later awarding the work to a foreign firm owing to its lack of expertise in guiding the contractors in carrying out the work indicated deficient planning towards carrying out the pre-service inspection. Moreover, ASE had sourced the Reactor Pressure Vessel from M/s HRID, hence, NPCIL should have considered the pre-service inspection by an independent third party to ensure independent and objective evaluation.

[37] *Based on exchange rate of ₹ 63.10 per Euro on the date of contract.*

The Management stated that Pre-service inspection (PSI) is carried out for collection of base line data for monitoring health during service life of plant/ equipment by in-service inspection (ISI). HRID, being the Original Equipment Manufacturer were hired for conducting PSI, based on its experience with domestic vendor.

The reply of the Management is not satisfactory as the reactor vessel which houses the reactor core is of immense safety significance. Hence, the pre-service inspection of pressure vessel by an independent third party, other than the reactor pressure vessel manufacturer (M/s HRID) would have been appropriate.

4.8 Inadequate High level Monitoring

To ensure co operation and peaceful application of nuclear energy in all the applicable fields including power generation between Indian and Russian Federation, a high level co-ordination committee {also called Joint Coordination Committee (JCC)} was set up in the year 2000. Audit noticed that since its constitution till September 2010, the committee periodically met and reviewed the progress of the implementation of KKNPP project. The minutes of the meetings indicated that there were discussions on important issues relating to the implementation of the project and decisions were taken for expediting the implementation of the project. However as per the records produced to Audit, no such meetings of JCC were held after September 2010. Moreover, no specific reasons for not conducting such high level meetings since September 2010 were found on record. Major cases of disagreements on various issues like non-pursuance of Liquidated Damages (LDs), manpower adjustments, delays in supply items etc. could have been sorted out, had JCC held its regular meetings.

The Management replied (28 June 2017) that JCC was formed to resolve issues requiring high level intervention. By the year 2010, major issues were resolved and project was in final implementation stage with commissioning of the systems going on. The JCC meetings were therefore not held after 2010 although the concerned authorities were apprised of implementation of the project on regular basis. It further stated that in 2011, the local people agitation started and project got delayed. However this was to be tackled at the level of Indian Federal/ State Governments only.

The Management's reply is not acceptable as holding of regular meetings would have sorted out the difficulties / issues concerning delays, non-pursuance of LDs, manpower adjustments, delays in supply items etc which remained un-addressed and were not sorted out in a timely manner.

Conclusion

The commercial operation of Kudankulam Nuclear Power Project (KKNPP)'s Units I and II have been delayed substantially. The delays were primarily due to shifting of work from Russian scope to Indian scope; in execution of work and in submission of working documents/supply of equipment/materials by ASE; delays due to design changes; erection delays and additional works. The delay in completion have also resulted in cost overruns. The increase in cost was mainly due to additional Russian manpower requirement, increase in expenses on erection and commissioning of nuclear system auxiliaries, execution of additional works and payment of escalation/under utilization charges to the Indian contractors.

The project also suffered from various deficiencies such as commercialization before getting the required licence to operate from the competent authority, extending undue benefits to Russian agency, non-assessment of manpower with consequent avoidable expenditure and non recovery of liquidated damages.

A. Sharma

New Delhi
Dated : 11 August 2017

(ASHUTOSH SHARMA)
Principal Director of Commercial Audit and *ex-officio* Member, Audit Board-IV, New Delhi

Countersigned

New Delhi
Dated : 11 August 2017

(SHASHI KANT SHARMA)
Comptroller and Auditor General of India

Annexures

Annexure I

Details of operational Nuclear Power Plants in India

Sl. No.	Plant	Unit	Type	Capacity (MW)	Date of Commercial Operation
1.	Tarapur Atomic Power Station (TAPS), Maharashtra	I	BWR[38]	160	28 October 1969
2.	Tarapur Atomic Power Station (TAPS), Maharashtra	II	BWR	160	28 October 1969
3.	Rajasthan Atomic Power Station (RAPS), Rajasthan	I	PHWR[39]	100	16 December 1973
4.	Rajasthan Atomic Power Station (RAPS), Rajasthan	II	PHWR	200	1 April 1981
5.	Madras Atomic Power Station (MAPS), Tamil Nadu	I	PHWR	220	27 January 1984
6.	Madras Atomic Power Station (MAPS), Tamil Nadu	II	PHWR	220	21 March 1986
7.	Narora Atomic Power Station (NAPS), Uttar Pradesh	I	PHWR	220	1 January 1991
8.	Narora Atomic Power Station (NAPS), Uttar Pradesh	II	PHWR	220	1 July 1992
9.	Kakrapar Atomic Power Station (KAPS), Gujarat	I	PHWR	220	6 May 1993
10.	Kakrapar Atomic Power Station (KAPS), Gujarat	II	PHWR	220	1 September 1995
11.	Kaiga Generating Station (KGS), Karnataka	II	PHWR	220	16 March 2000
12.	Rajasthan Atomic Power Station (RAPS), Rajasthan	III	PHWR	220	1 June 2000
13.	Kaiga Generating Station (KGS), Karnataka	I	PHWR	220	16 November 2000
14.	Rajasthan Atomic Power Station (RAPS), Rajasthan	IV	PHWR	220	23 December 2000
15.	Tarapur Atomic Power Station (TAPS), Maharashtra	IV	PHWR	540	12 September 2005
16.	Tarapur Atomic Power Station (TAPS), Maharashtra	III	PHWR	540	18 August 2006
17.	Kaiga Generating Station (KGS), Karnataka	III	PHWR	220	6 May 2007
18.	Rajasthan Atomic Power Station (RAPS), Rajasthan	V	PHWR	220	4 February 2010
19.	Rajasthan Atomic Power Station (RAPS), Rajasthan	VI	PHWR	220	31 March 2010

[38] *Boiling Water Reactor (BWR) is a type of light water nuclear reactor used for the generation of electrical power*

[39] *Pressurized Heavy Water Reactor (PHWR) is a nuclear reactor, commonly using unenriched natural uranium as its fuel, that uses heavy water (deuterium oxide D_2O) as its coolant and neutron moderator.*

20.	Kaiga Generating Station (KGS), Karnataka	IV	PHWR	220	20 January 2011
21.	Kudankulam Nuclear Power Station (KKNPS), Tamil Nadu	I	VVER[40] - 1000 (PWR)	1,000	31 December 2014
22.	Kudankulam Nuclear Power Station (KKNPS), Tamil Nadu	II	VVER -1000 (PWR)	1,000	31 March 2017

Nuclear Power Projects under Construction in India

Project	Capacity (MW)	Expected Commercial Operation
Rajasthan Atomic Power Project	2 x 700	Unit VII – Under construction Unit VIII – Under construction
Kakrapar Atomic Power Project	2 x 700	Unit III – Under construction Unit IV – Under construction
Kudankulam Nuclear Power Plant	2x 1000	Unit III- Under construction Unit IV- Under construction

[40] *Voda Voda Energo Reactor- a water cooled and water moderated reactor.*

Annexure II

(Reference: Para 4.1.1)
Delay in achieving milestones

Major Milestones						
Activity	Stipulated		Actual		Delay (in days)	
	Unit I	Unit II	Unit I	Unit II	Unit I	Unit II
First Pour of Concrete	31.03.2002	31.03.2002	31.03.2002	04.07.2002	Nil	95
Construction up to Reactor Building + 5.4 Slab	30.09.2003	30.06.2004	30.09.2003	31.12.2003	Nil	Nil
Construction of Primary Containment of Reactor Building Wall upto 43.9 metre	31.10.2004	31.07.2005	21.05.2005	30.11.2005	202	122
Construction of Turbine Building up to 36.5 meter Including Crane beam.	31.12.2004	31.12.2005	31.08.2005	31.01.2007	243	396
Commissioning of 220 KV Gas Insulated Switchgears System	31.01.2005	31.01.2005	14.11.2008	14.11.2008	1,384	1,384
Commissioning of Polar Crane	31.03.2005	29.12.2005	April 2007	December 2007	730	701
Construction of Emergency Power Supply and Control Building	30.04.2005	30.04.2006	28.02.2006	30.09.2008	304	884
Charging of Reserve Power Supply System (RPSS)	31.05.2005	31.05.2005	01.01.2009	01.09.2011	1,311	2,284
Pre-stressing of Reactor Building Inner Containment (IC) Dome	30.09.2005	30.06.2006	18.09.2009	July-2009	1,449	1,096
Commissioning of Demineralisation Plant	31.12.2005	31.12.2005	April-2009	April-2009	1,185	1,185
Commissioning of Compressors	31.12.2005	NA	December 2010	December 2010	1,795	NA
Erection of NSSS (Nuclear Steam Supply System) Equipment & pipelines	30.06.2006	30.06.2007	29.07.2008	18.04.2009	760	658
Erection of Turbine Generator	30.06.2006	30.03.2007	30.09.2008	31.08.2010	824	1,251
Reactor Checkup and Assembly for Stage Hydraulic Test	30.09.2006	30.06.2007	31.08.2010	03.01.2014	1,431	2,378
Hydro test & circular flushing of primary circuit	31.10.2006	31.07.2007	27.12.2010	05.07.2014	1,518	2,531
Containment pressure boundary test (Phase A-2 Commissioning)	28.02.2007	30.11.2007	03.02.2011	10.02.2014	1,436	2,264
Attainment of First Criticality and Low Power Tests (Phase-B2 commissioning)	30.04.2007	31.01.2008	13.07.2013	10.07.2016	2,266	3,083
Start of Commercial Operation	30.10.2007	30.10.2008	31.12.2014	31.03.2017	2,619	3,076

Annexure III

(Reference: Para 4.1.2(a))

Project Cost break up of Indian scope of work Cost head-wise

(₹in crore)

Cost Heads	Original sanction (December 2001)	Revised (August 2014)	Increase/ decrease
Site preparation, facilities and infrastructure (Material & construction)	34.65	76.04	41.39
Main plant civil building (Material & construction), cooling water intake and outfall system (Material & construction), breakwater dykes, shore reinforcement	1,553.80	1,728.77	174.97
Nuclear system auxiliaries, Turbine Generator auxiliaries, miscellaneous mechanical erection, transportation and transportation insurance, water desalination plant	439.84	1,283.67	843.83
Electrical systems (supply & installation)	108.97	292.49	183.52
Controls and Instrumentation installation	52.84	160.76	107.92
Access roads, field office, social buildings, warehouses and workshops, equipment for warehouses, workshops, substation, office equipment, communication equipment etc.	108.61	43.15	(-)65.46
Engineering/design/Quality Assurance /project management services, expenses on transportation including strengthening of Tuticorin port and roads, construction power, maintenance charges for office buildings, warehouses, workshops and miscellaneous expenditure, staff training technology transfer and other services	124.80	221.94	97.14
Commissioning expenses (commissioning power and consumables)	58.67	769.28	710.61
Site Improvement (Housing, Hostels, Central Industrial Security Force (CISF) colony, Roads, drainage, Hospital, schools etc., Communication and computer facilities	154.02	170.38	16.36
Maintenance	125.64	429.40	303.76
Contingencies and Insurance	160.25	214.45	54.20
Employee's salaries, overheads, CISF salary, Foreign allowances, Moscow office expenses, expenditure on DPR review meeting, Mumbai office, Public awareness and welfare activities	723.95	1,851.50	1,127.55
Working capital margin	237.00	237.00	0
Expenses on Russian man power (services and income tax)	26.97	43.00	16.03
Fukushima related tank & piping	0	25.00	25.00
Tax on Russian contracts	0	187.00	187.00
Total	**3,910.01**	**7,733.83**	**3,823.82**

Annexure IV

(Reference: Para No. 4.3.4)

Details of execution of additional item of works due to improper planning

Sl. No.	Work order / Date	Name of the contractor	Name of the work	Contract awarded cost (₹ in crore)	Extra work executed beyond 125% of the awarded cost (₹ in crore)	Percentage of extra cost against the original cost
1.	200045 dated: 25/02/2002	M/s HCC Ltd, Mumbai	Construction of Reactor Buildings and Reactor auxiliary & main control room buildings for KKNPP Units I and II (C-III).	272.99	27.95	10
2.	400040 / 18.12.2004	M/s L & T Ltd	Handling, Transportation, Pre-fabrication, welding, erection, inspection & testing of piping, instrument tubing and erection of associated equipment along with accessories for Nuclear Steam Supply Systems and Nuclear Auxiliary Systems for KKNPP Units I and II (M -2 Package).	68.25	68.32	100
3.	400041 / 24.12.2004	M/s L &T Ltd, Chennai	Handling, Transportation, Pre-fabrication, welding, erection, inspection, testing of indoor and outdoor and equipment of common service systems for KKNPP Units I and II (M -5 Package).	43.04	12.54	29
4.	400046 / 30.12.2004	M/s PES Engineering Pvt. Ltd, Hyderabad	Handling, Transportation, Pre-fabrication, welding, Anti – Corrosive Painting, Insulation, Erection, Inspection & Testing ducting / piping, Instrument tubing and Associated Equipment along with accessories for Ventilation & Air conditioning systems for KKNPP Units I and II (M - 7 Package)	30.80	17.61	57
5.	600007 / 02.03.2005	M/s ECIL	Main Plant control and instrumentation works of KKNPP Units I and II (I-1 Package)	32.00	30.45	95
6.	400144 / 17.12.2009	M/s PSL Ltd, Chennai	Coating of pipeline with Coponhycote for UMA-1 and 2	1.27	0.57	45
7.	600030 / 04.02.2013	M/s L & T	Handling, Cleaning, fabrication, erection, welding and NDT and pneumatic / hydro testing of Process impulse piping jobs for Unit II Reactor and Auxiliary Buildings – regarding.	5.69	1.29	23
8.	800521 / 12.07.2013	M/s TatagariTerro Technologies Pvt. Ltd, Hyderabad	Operation and maintenance activities of Auxiliary Operating plant at plant site	1.36	0.27	20
			Total	**455.40**	**159.00**	

List of Abbreviations

List of Abbreviations

Sl. No.	Term used in Report	Description
1.	ACPSR	Advisory Committee for Project Safety Review
2.	AERB	Atomic Energy Regulatory Board
3.	ASE	Atomstroyexport
4.	BHEL	Bharat Heavy Electricals Limited
5.	BOD	Board of Directors
6.	BoI	Bank of India
7.	CAA&A	Controller of Aid, Accounts and Audit
8.	CIS	Commonwealth Independent States
9.	CMD	Chairman & Managing Director
10.	CVC	Central Vigilance Commission
11.	DAE	Department of Atomic Energy
12.	DPR	Detailed Project Report
13.	EAR	Erection All Risk
14.	FRT	Freight Tons
15.	GCC	General Conditions of Contract
16.	GFA	General Framework Agreement
17.	GoI	Government of India
18.	HDFC	Housing Development Finance Corporation
19.	IDC	Interest During Construction
20.	IGA	Inter-Governmental Agreement
21.	JCC	Joint Coordination Committee
22.	KKNPP	Kudankulam Nuclear Power Project
23.	KMB	Kotak Mahindra Bank
24.	KWh	Kilowatt hour
25.	LD	Liquidated Damages

26.	MT	Metric Ton
27.	MW	Mega Watt
28.	NPCIL	Nuclear Power Corporation of India Limited
29.	NPS	Nuclear Power Station
30.	NSSS	Nuclear Steam Supply System
31.	PHWR	Pressurized Heavy Water Reactor
32.	PLR	Prime Lending Rate
33.	QA	Quality Assurance
34.	QC	Quality Control
35.	RBI	Reserve Bank of India
36.	RF	Russian Federation
37.	SBAR	State Bank Approved Rate
38.	SBI	State Bank of India
39.	SFSP	Standard Fire and Special Perils
40.	SG	Steam Generator
41.	SOR	Schedule of Rates
42.	TANGEDCO	Tamil Nadu Generation and Distribution Corporation Limited
43.	TC	Third Countries
44.	TCO	Techno Commercial Offer
45.	TG	Turbo Generator
46.	TNEB	Tamil Nadu Electricity Board
47.	UIIC	United India Insurance Company
48.	USD	United States Dollar
49.	USSR	Union of Soviet Socialist Republics
50.	VVER	*Voda Voda Energo* Reactor