FIFTEENTH KERALA LEGISLATIVE ASSEMBLY

COMMITTEE

ON

PUBLIC UNDERTAKINGS
(2023-2026)

EIGHTIETH REPORT

(Presented on 4th February, 2026)

SECRETARIAT OF THE KERALA LEGISLATURE

THIRUVANANTHAPURAM

2026

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KERALA STATE ELECTRICITY BOARD LIMITED

(Based on the Report of the Comptroller and Auditor General of India for the year ended 31st March, 2018)

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COMMITTEE ON PUBLIC UNDERTAKINGS
(2023-2026)

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INTRODUCTION

I, the Chairperson, Committee on Public Undertakings (2023-2026) having been authorised by the Committee to present the Report on its behalf, present this 80th Report on Kerala State Electricity Board Limited based on the Report of the Comptroller and Auditor General of India for the year ended 31st March, 2018 relating to the Public Sector Undertakings of the State of Kerala.

The aforesaid Report of the Comptroller and Auditor General of India was laid on the Table of the House on 24.08.2020. The consideration of the audit paragraphs included in this Report and the examination of the departmental witness in connection thereto were made by the Committee on Public Undertakings (2023-2026) at its meeting held on 21.11.2024.

This Report was considered and approved by the Committee (2023-2026) at its meeting held on 03.02.2026.

The Committee place on record its appreciation for the assistance rendered to them by the Accountant General (Audit), Kerala in the examination of the Audit paragraphs included in this Report.

The Committee wishes to express thanks to the officials of the Finance and Power Department of the Secretariat, Kerala State Electricity Board Limited for placing the materials and information solicited in connection with the examination of the subject. The Committee also wishes to thank in particular the Secretaries to Government, Finance, Power Department and the officials of Kerala State Electricity Board Limited who appeared for evidence and assisted the Committee by placing their views before the Committee.

E. CHANDRASEKHARAN,
Chairperson,
Committee on Public Undertakings.

Thiruvananthapuram,
4th February, 2026.

REPORT
ON
KERALA STATE ELECTRICITY BOARD LIMITED

Audit Paragraph (2017-18)

Implementation of Small Hydro Electric Projects by Kerala State Electricity Board Limited

Introduction

2.1 Small Hydro Electric Projects[1] (SHEPs) are benign and clean source of energy. Therefore, Governments give more importance to SHEPs through various financial supports and policy initiatives. As of March 2012, there were 19 SHEPs in the State with an installed capacity of 145.65 MW. The Small Hydro Power Policy, 2012 announced by the Government of Kerala (GoK) anticipated additional capacity of 390 MW including 150 MW through private participation by the end of March 2017.

Kerala State Electricity Board Limited[2] (KSEBL) identified 151 potential sites and envisaged implementing 22 SHEPs with total capacity of 148 MW during the twelfth five-year plan (2012-17) as shown in Appendix 2. Against this target, KSEBL commissioned seven SHEPs with capacity of 39.35 MW, while six SHEPs with total capacity of 66.50 MW were in progress as of March 2018. In respect of the remaining nine SHEPs with capacity of 45 MW, no work was taken up as of March 2018.

In order to ascertain whether the planning and implementation of SHEPs was in accordance with relevant Acts, rules, notifications etc. and to evaluate the

1 Hydro electric projects with station installed capacity of less than 25 mega-watt.
2 Erstwhile Kerala State Electricity Board.

performance of the commissioned SHEPs, Audit selected[3] three SHEPs each from the completed[4]. and the on-going projects [5].

Audit findings

2.2 Audit findings on the implementation of six selected SHEPs are discussed in the succeeding paragraphs.

Planning for implementation of projects

Deficient Detailed Project Reports

2.3 SHEPs are eligible for financial assistance from Ministry of New and Renewable Energy (MNRE) at the rate of ₹3.50 crore per MW limited to ₹20 crore per project. KSEBL took up all the SHEPs with MNRE assistance. In order to be eligible for the financial assistance, the implementing agency has to follow the guidelines prescribed by MNRE. According to the guidelines, a Detailed Project Report (DPR) shall be prepared based on detailed surveys and investigation to assess the technical and financial feasibility of the project before its execution. Audit observations on preparation of DPR are discussed in Paragraph 2.3.1 and 2.3.2.

Defective financial appraisal

2.3.1 As per the guidelines issued by the MNRE, the financial viability of a SHEP was to be assessed by computing the Payback Period (PBP)[6] , Net Present Value (NPV)[7] , Internal Rate of Return (IRR)[8] or Debt Service Coverage Ratio. For considering a project financially feasible, the NPV should be positive and the IRR

3 Selection was based on the expenditure incurred for implementation. Sample was chosen from SHEPs commissioned and on-going during 2015-16 to 2017-18.

4 Perunthenaruvi, Barapole and Adyanpara

5 Bhoothathankettu, Poringalkuthu and Kakkayam.

6 Payback period is the period within which the investor would recover his cost.

7 NPV is the difference between present value of cash inflow during project life and total investment.

8 IRR is the discount rate at which present value of benefits becomes equal to the present value of project investment.

should not be less than the cost of capital. As per the DPR, the cost of capital was 10 *per cent.*

Audit observed that by adopting incorrect criteria and methodology, four financially unviable projects were selected for execution as detailed in Table 2.1:

Table 2.1: Details of defects in financial appraisal of SHEPs

Name of the SHEP	Defects in financial appraisal
Barapole	• For calculating the IRR, equity capital alone was considered instead of the total estimated project cost (TPC), while the NPV was not calculated. • Based on the TPC, the NPV would become negative i.e., ₹ (-)15.23 crore and; • The IRR (8.75 per cent) would fall below the cost of capital.
Kakkayam	• The cash inflows for assessing NPV/IRR were worked out based on the power purchase cost of KSEBL (₹5.50 per unit) which was higher than the average realisation of ₹3.80 per unit at the time of preparation of DPR. • Based on the average realisation (for the year 2008), the NPV of the SHEP would be ₹(-)5.35 crore. • Similarly, IRR of the SHEP would become 8 per cent which was less than the cost of capital.
Adyanpara	• Financial viability was assessed based on PBP alone by adopting levelised tariff[9] (₹3.83 per unit) without evaluating the NPV and IRR. • Audit noticed that the NPV of the project based on average realisation (₹3.38 per unit) was ₹(-)13.87 crore. • Similarly, IRR (4.36 per cent) of the project was also less than the cost of capital.
Perunthenaruvi	• Financial viability of the SHEP was based on PBP alone by adopting levelised tariff (₹3.17 per unit) without evaluating the NPV and IRR. • Audit noticed that the NPV of the project based on

9 Net present value of the unit-cost of electricity over the lifetime of SHEP.

	average realisation (₹3.25 per unit) was ₹(-)21.40 crore. • Similarly, IRR (6.45 per cent) of the project was also less than the cost of capital.

The Management replied (November 2018) that financial analysis was done in accordance with the guidelines issued by the State Electricity Regulatory Commission (SERC) and Central Electricity Regulatory Commission (CERC) using different financial tools like IRR, NPV, PBP etc. Other factors like operational flexibility, Renewable Purchase Obligation, socio-economic benefits were also considered while approving the projects.

The Management reply was not acceptable because as per the guidelines issued by SERC and CERC, the SHEPs were to be financially viable. But KSEBL assessed the financial viability of SHEPs using incorrect criteria and thereby financial tools like IRR, NPV etc. were made out to be attractive.

Non-assurance of water availability

2.3.2 As per the guidelines issued (March 2004/ July 2008) by the Central Electricity Authority/MNRE, the water availability studies for SHEPs shall be based on the water availability of 90 per cent dependable year. The 90 per cent dependable year[10] is the year in which the annual generation has the probability of being equal to or exceeding 90 per cent of the expected period of operation of the scheme.

Audit observed that:

- Out of the six selected projects, water availability of Bhoothathankettu SHEP only was assessed based on 90 per cent dependable year. The

10 For determination of 90 per cent dependable year, the total energy generation in all the years for which hydrological data is available is arranged in descending order and the (N+1) x 0.9 th year would represent the 90 per cent dependable year.

water availability of Kakkayam SHEP was assessed based on water discharge of Kuttiyadi Additional Extension Scheme. The water availability of the remaining four SHEPs was assessed based on the average potential of available water data. Based on the water availability of 90 per cent dependable year, two SHEPs (Poringalkuthu and Adyanpara) did not pay back during the expected life time of 35 years.

The Management stated (November 2018) that the guidelines were not to be complied statutorily. KSEBL was duty-bound and had the authority to conceive the projects considering various aspects judiciously to safeguard the interests of the State.

The reply was not acceptable as KSEBL did not formulate any guideline/manual for implementation of SHEPs specific to Kerala. Hence, the criteria for analysing the project feasibility were derived from the guidelines issued by MNRE. Moreover, in the case of Bhoothathankettu SHEP, KSEBL followed the 90 percent dependable year criteria suggested by MNRE.

- The weir of Perunthenaruvi SHEP was constructed just above an existing pumping station of Kerala Water Authority (KWA). For ensuring the water requirement for drinking water, KSEBL was to release 96,739 cubic metre of water per day from the weir. The impact of sharing of water with KWA was, however, not considered at the time of preparation of DPR. After commencing the operation of the project in July 2017, power generation was interrupted from September 2017 due to low water level. Considering the water discharge for KWA, generation loss from September 2017 to May 2018 (9 months) was 1.08

million units (MUs) valuing ₹0.56 crore at the rate of ₹5.15 per unit[11] . The generation loss worked out to 4.19 per cent of the expected annual generation and this loss is likely to recur every year.

The Management stated (November 2018) that the sharing of water with KWA was factored in the DPR and accordingly, the installed capacity of the project was reduced from 9 MW to 6 MW. Further, Perunthenaruvi SHEP planned to utilise water during the monsoon season when the water requirement of KWA was negligible.

The reply was not acceptable as the DPR anticipated that the existing water pumping scheme of KWA would be affected by the project and suggested to relocate the intake of the pumping station to the reservoir. This was not acted upon and hence KWA demanded release of sufficient water for the drinking water purpose. Further, the Perunthenaruvi SHEP envisaged generation of power during non-monsoon season as well. Had the expected generation been limited to the monsoon seasons, the Perunthenaruvi SHEP would have been financially unviable.

Award of work

2.4 KSEBL invited separate tenders for civil works and electro-mechanical (E&M) works in the six SHEPs except in Adyanpara SHEP. According to the guidelines issued (November 2008) by the Central Vigilance Commission (CVC), tenders shall be finalised and contracts awarded in a time bound manner within the original validity of the tender.

11 Average rate for the period 2012-17.

There was delay in finalising the tender for civil work and electro-mechanical works of all the selected SHEPs, except Kakkayam, ranging from 13 days to 520 days. The major reasons for the delay were rectification of incomplete prequalification documents, change in the estimates due to change in the scope of work, design of power houses as per change in E&M equipment etc. as shown in Appendix 3. The delay in finalisation of the tender resulted in corresponding delay in implementation of the project.

Audit noticed the following irregularities in the selection of contractors:

Undue favour to the bidders by relaxing prequalification criteria

2.4.1 As per the guidelines issued (July 2003) by the CVC, criteria for selection of bidders should be spelt out at the time of inviting tenders so that the basic concept of transparency and the interests of equity and fairness are ensured. The acceptance or rejection of any bid should be based on laid down specifications.

Audit observed that:

- One of the eligibility criteria of bidders for Kakkayam SHEP was the completion of similar works of value not less than ₹11.75 crore as a prime contractor/developer during the last seven years as on the date of notice inviting bid. Out of seven bidders, only Paulose George Construction Company Private Limited (PGCCL) met the criterion. Though the value of similar work done by KK Engineering Company and Steel Industrials Kerala Limited was ₹5.36 crore and ₹4.61 crore respectively, KSEBL prequalified both the bidders along with PGCCL. KK Engineering Company became the lowest bidder and bagged the contract.

- One of the eligibility criteria of bidders for Perunthenaruvi and Barapole SHEPs was total annual turnover above ₹23.25 crore and ₹41.62 crore respectively. Two (out of seven) and three (out of eight) bidders respectively met the prequalification criterion. Annual turnover of one of the bidders, PGCCL, ranged between ₹15.22 crore and ₹21.69 crore. KSEBL prequalified the bidder in both the tenders. PGCCL turned out to be the lowest bidder on price bid opening and both the contracts were awarded to PGCCL.

Thus, relaxation of pre-qualification criteria during evaluation resulted in undue benefit to the ineligible bidders, who were finally awarded the works.

The Management stated (November 2018) that KK Engineering Company was prequalified for the implementation of Kakkayam SHEP in order to ensure better competition, as a special case. In the case of Perunthenaruvi SHEP, the tender clause regarding turnover could be interpreted as either annual turnover for each of the last three years or the total of the annual turnover for the last three years. Therefore, based on the directions of the Board of Directors, the total turnover of the last three years was considered as qualification criteria.

The reply of the Management was not acceptable as the CVC guidelines stipulated that evaluation/exclusion criteria should be made explicit at the time of inviting the tender. Therefore, relaxation of the criteria after opening of the technical bid lacked transparency.

Execution of work

2.5 The six selected SHEPs were scheduled for commissioning between January 2012 and March 2016 at a projected cost of ₹667.85 crore. Against this, three SHEPs were commissioned between September 2015 and October

2017 after delays ranging from 3 years and 4 months to 3 years and 7 months. The three ongoing SHEPs were delayed for periods ranging from 2 years and 1 month to 3 years and 6 months as of March 2018[12] . The cost incurred for the six SHEPs was ₹549.29 crore up to March 2018.

The reasons for the delay in completion of the SHEPs were as described below:

Delay in diversion of forest land

2.5.1 As per the General Conditions of Contract, KSEBL was to hand over land to the contractors within one month of award of work. The implementation of the six selected projects required forest land, government land and private land. As per Section 2 of the Forest Conservation Act, 1980, forest land can be used for non-forest purposes only with the approval of the Central Government which shall be given in two stages. Providing land for Compensatory Afforestation (CA) or certificate by Chief Secretary to the Government regarding non-availability of alternate land for CA in the State and funds for raising compensatory afforestation thereof, a certificate from State Government as to the compliance of the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 (FRA) etc. were mandatory requirements for diversion of forest land.

Three SHEPs selected for scrutiny required forest land for their implementation. Audit noticed that in all the three cases, there were delays in handing over forest land as shown in Table 2.2 below:

12 These three projects were not commissioned as of December 2018 but, the delay in months has been worked out up to 31 March 2018.

Table 2.2: Details of delay in handing over forest land to contractors

Sl. No.	Name of SHEP	Date of issue of work order	Date of handing over forest land	Reason for delay
1	Perunthenaruvi	November 2010	December 2011	Acquisition of original land identified (2006) for Compensatory Afforestation (CA) was cancelled as there was increase in the cost of land due to delay in acquisition. Alternate land required for CA could be acquired only in February 2011.
2	Bhoothathankettu	February 2014	January 2016	The proposal for diversion of forest land was submitted in January 2012. But KSEBL submitted the mandatory compliance report on Scheduled tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, only in January 2014. The final approval of Ministry of Environment and Forests (MoEF) was received in April 2015. But there was further delay in clearing the site by removing the standing trees.
3	Poringalkuthu	August 2011	March 2014	KSEBL submitted a proposal to the MoEF in November 2011 without the required certificates regarding non- availability of non-forest land by Chief Secretary of Kerala. This was submitted later (April 2012). MoEF accorded final approval in March 2014 after KSEBL complied with the conditions of in principle approval given (July 2013).

Thus, there were delays ranging from 13 months to 31 months in handing over forest land to the contractor from the date of award of work.

Delay in acquiring private land

2.5.2 According to the modified guidelines issued (June 2005) by GoK for acquiring land for fast track projects, the revenue authorities were empowered to take advance possession of land under Section 17 of the Land Acquisition Act, 1894 (LA Act) after giving 15 days' notice to the land owners, if the land owners were not willing to enter into a direct sale deed or where direct purchase could not be effected for any other specific reasons.

Audit observed that there were delays in acquiring private land from the due date of taking possession in three SHEPS[13]examined in audit as discussed in **Table 2.3**:

Sl. No.	SHEP	Month of award of civil work	Month of sanction by GoK for acquiring land under Section 17(4)	Month of notice	Due date of taking advance possession	Actual month of taking possession	Delay
a	**b**	**c**	**d**	**e**	**f**	**g**	**h=g-f**
1	Perunthenaruvi (1.35 hectares)	November 2010	August 2013	December 2013	15/01/2014	June 2016	2 years and 5 months
2	Kakkayam (0.41 hectares)	March 2011	August 2011	November 2012	01/12/2012	October 2013	10 months
3	Barapole (8.07 hectares)	August 2010	March 2008	December 2009	25/12/2009	September 2011	1 year and 8 months

As a result of cascading effect of delay in handing over of land, KSEBL amended (December 2015) the General Conditions of Contract and paid price escalation of ₹ 3.59 crore to the contractor of civil works in Poringalkuthu SHEP. In the case of Barapole and Perunthenaruvi SHEPs also, KSEBL sanctioned payment of price variation of ₹ 1.25 crore and ₹0.58 crore respectively to the contractors which was yet to be released.

13 No private land was required for Bhoothathankettu and Poringalkuthu SHEPs and the land required for Adyanpara SHEP was already in possession before tendering.

Due to the delay in acquiring private land for Kakkayam SHEP, validity of contract awarded (March 2011) for civil works expired (March 2013) and the contractor refused to carry out the remaining work at the same rate and hence, the contract was foreclosed. Subsequently, the balance work was retendered and awarded in October 2014 with an additional cost of ₹2.34 crore due to revision of rate.

The Management stated (November 2018) that the process of land acquisition through negotiated purchase or under Land Acquisition Act could be carried out through the Revenue Department only. In respect of Perunthenaruvi SHEP, the Management also stated that the delay was due to ownership dispute between the family members. The Management further replied that it was not practical to commence any project after acquiring full land. In case of Barapole SHEP, if the work was tendered after acquiring the whole land i.e., after April 2013, the work would not have been completed by January 2016. Thus, early tendering has contributed towards early generation from the project.

The reply was not acceptable because the GoK sanctioned taking advance possession of land by invoking Section 17 of LA Act well ahead of the tendering of the work. Further, the guidelines followed by KSEBL and the terms of contract also required that the land shall be in possession before awarding the work. During the Exit Meeting (November 2018), Joint Secretary, Power Department, GoK assured that a Joint Mechanism consisting of various stakeholder departments would be put in place to speed up land acquisition for hydel projects.

Delay in implementation due to defective DPR

2.5.3 As per the Manual on Planning and Design of Small Hydroelectric Schemes published (2001) by the Central Board of Irrigation and Power (CBIP), in areas where slope of the hill is steep and where there is a history of landslides, tunnels are to be constructed for water conductor systems[14] .

The DPR of Adyanpara SHEP proposed an open channel for the water conductor system although the area was mountainous and had a history of landslides. Civil work involving construction of the open channel was awarded to Kirloskar Brothers Limited-Aryacon Contractors and Engineers Limited (KBL-AECL) Consortium at a cost of ₹8.10 crore.

During execution of work, the open channel was found unfeasible and hence, the same was replaced (September 2008) by a tunnel with revision of estimate to ₹10.50 crore. KSEBL's attempt to execute the tunnel works separately through another tender was not accepted by KBL-AECL and also refused (January 2008) to execute the tunnel work at their quoted rate of 49.80 per cent above Schedule of Rates (SOR) 2004. Therefore, KSEBL terminated (August 2009) the contract at the risk and cost of KBL-AECL. In the retender also (July 2010), KBL-AECL turned out to be the L1. However, the party did not turn up to execute the agreement as the Letter of Acceptance issued in December 2011 included a specific clause as to the recovery of risk and cost of the earlier contract. Yet, KSEBL neither cancelled the work nor re-floated the tender. Meanwhile, the Hon'ble High Court of Kerala dismissed the Writ Appeal (May 2012) filed by KBL- AECL against the cancellation of the

14 Water conductor system is used to draw water from the intake pool to the generating station. It may include open channel, forebay and penstock or tunnel, surge shaft, pressure shaft and penstock.

original work order in favour of KSEBL. Despite this, KSEBL waived the assessed risk and cost liability of ₹ 1.10 crore in favour of KBL-AECL.

Audit observed that the lapse of KSEBL in opting for open channel for water conductor system in the DPR resulted in change of the water conductor system during execution of the work and subsequent termination of the contract. Further, the decision of KSEBL to continue with the same delinquent contractor resulted in avoidable delay of 28 months with loss of potential generation of 21.02 MUs of power worth ₹10.83 crore at the rate of ₹5.15 per unit and also risk and cost liability.

The Management replied (November 2018) that the cost increase occurred because of the stoppage of work by the contractor, subsequent termination of the contract and retendering of the work.

Since the stoppage of work by the contractor was due to the change in scope of work, the reply of the Management was not acceptable.

Delay due to non-synchronisation of Civil and Electrical & Mechanical works

2.5.4 Construction of the Power House (PH) building under civil work was dependent on finalisation of the design of the E&M equipment under E&M work. The foundation work for the E&M equipment could be carried out by the civil contractor only on receipt of the approved drawings from the E&M contractor. Since KSEBL selected separate contractors for the civil and E&M works, adherence to the timelines and proper synchronisation of both the works was essential for timely commissioning of the SHEPs.

For synchronisation of project works, the Management formed a Project Management Unit for each project and a Project Monitoring Cell for monitoring the progress of all the projects. In addition, for overall monitoring of the projects, a Project Monitoring Committee including Chief Engineers was also formed. Audit noticed synchronisation issues in respect of three projects where multiple contractors were engaged for electrical & mechanical and civil works. Meanwhile, no synchronisation issues were noticed in the project where a single contractor was engaged. This indicated that the monitoring mechanism put in place by KSEBL was ineffective in addressing the synchronisation issues which eventually led to avoidable delays up to 25 months and cost overruns. Delays in completing the projects is shown in **Table 2.4**:

Table 2.4: Details of synchronisation of Civil and Electrical & Mechanical works

Sl. No	SHEP	Date of providing design of PH		Supply of E&M equipment	Completion of construction of PH		Delay in completion of PH building (months)
		Schedule	Actual		Schedule	Actual	
a	**b**	**c**	**d**	**e**	**f**	**g**	**h = g - f**
1	Perunthenaruvi	September 2011	October 2012	April 2013 to August 2015	March 2014	April 2016	25
2	Bhoothathankettu	February 2015	December 2015	November 2016 to June 2018	February 2016	Ongoing	25 (up to March 2018)
3	Barapole	October 2012	October 2013	May 2014	February 2013	October 2014	20

In the case of Perunthenaruvi SHEP:

- There was delay of 13 months in providing the approved design and layout for PH building due to delay in submission (August 2012) of the

design and layout by the E&M contractor and its approval (October 2012) by KSEBL.

As per the schedule, the construction of the PH building was to be completed in two years from October 2012[15] . However, due to non-mobilisation of adequate men and machinery by the contractor (PGCCL) who was awarded the work relaxing prequalification criteria as discussed in Paragraph 2.4.1, the work could not be completed within the scheduled time (October 2014). In order to complete the construction of the PH by March 2016, PGCCL proposed (September 2015) to replace the concrete building with a pre-engineered building (PEB). Even though, the life span of the PEB was only 20 years as against 40 years for the concrete structure and this entailed extra expenditure of ₹0.31 crore, KSEBL accepted the proposal so as to commission the project in June 2016 and to utilise the monsoon season of 2016 for generation. The contractor completed the civil works in April 2016 and handed over the site to the E&M contractor for the erection of Electric Overhead Travelling (EOT) crane.

Due to the delay, the E&M equipment supplied during April 2013 to August 2015 could not be commissioned and its quality deteriorated. The E&M contractor took 15 months to complete (July 2017) the E&M work due to removal of rust and replacement of necessary equipment.

Thus, in spite of unfruitful additional expenditure of ₹0.31 crore and compromising the life span of the structure by 50 per cent, the project could be commissioned only in October 2017.

15 Revised schedule as per the actual date of providing design and layout.

The Management reply (November 2018) did not address the issue of delay in providing design and layout to the contractor and delay in construction of PH building by the contractor due to non-mobilisation of adequate men and machinery.

In the case of B hoothathankettu SHEP:

- Even after providing the design and layout (December 2015) and land (January 2016), the contractor for civil works could not complete the civil work and handover the site to E&M contractor for erection of E&M equipment as envisaged due to the lapses in mobilising material and financial problems. As a result, E&M equipment worth ₹51.59 crore supplied (November 2016 to June 2018) by the E&M contractor remained idle.

  The Management stated (November 2018) that erection work of E&M equipment could only be commenced after the PH was handed over to the E&M contractor. As the supply of E&M equipment was staggered from November 2016 to June 2018 in accordance with the progress of the civil work, there was no idling of E&M equipment.

  The reply, however, did not specify the reasons for delay in the civil work. Moreover, equipment worth ₹51.59 crore supplied by the E&M contractor remained idle as there was delay in handing over the PH to the E&M contractor.

In the case of Barapole SHEP:

- Though, the land for the construction of the PH building was handed over to the contractor for civil works in September 2010, the work order for E&M works was issued only in September 2012 due to change in

specification after floating tender (November 2010). Hence, the PH design was finalised only in October 2013 leading to delay in commencement of PH civil works. The PH building was handed over to the E&M contractor for erection of equipment in October 2014. The erection was completed only in February 2016 due to change in power evacuation system and delay in supply of Main Inlet Valves, cooling water pumps, control panels etc.

The Management replied (November 2018) that the design for the PH was received from the E&M contractor on 01/10/2013 and same was issued to the contractor for civil work on 11/10/2013. Hence there was no delay in issuing drawings of the PH.

The reply was not acceptable as there was inordinate delay in awarding E&M works even after handing over of the site (November 2010) for the construction of the PH building. There was further delay of one year in submission of design, for the PH building by the E&M contractor.

Irregular payment of mobilisation advance

2.5.5 As per the guidelines issued (June 2004) by the Central Vigilance Commission, mobilisation advance can be given only if it is expressly stated in the tender document, including the amount, rate of interest etc. General Conditions of Contract for the civil work of Poringalkuthu SHEP provided that under special circumstances, advance to the extent of five per cent of the contract price or 90 per cent of the value of the material/equipment brought to the site, whichever is less can be granted on the security of such material/equipment to be adjusted in the contract contingent bill with interest.

KSEBL sanctioned mobilisation advance of ₹ 4.58 crore equal to five per cent of the tender amount of ₹ 91.61 crore.

Audit observed that as the contractor did not make any supplies as on the date of request for mobilisation advance, the contractor was not eligible for any advance. As such, the sanctioning of mobilisation advance was an undue favour to the contractor and inconsistent with the CVC guidelines.

Audit also observed that the tunneling of low pressure pipe could not be completed within the scheduled period (April 2016) due to non-availability of plant and machinery required for tunneling of inclined pressure shaft. Further, out of 1,925 MT steel plates required for lining of tunnel, only 800 MT was procured and fabricated up to March 2018.Thus, despite providing mobilisation advance, contrary to the provisions of the tender, the contractor did not complete the work within the agreed time.

The Management replied (November 2018) that the advance was granted on the presumption that it would give an impetus to the contractor to keep up the momentum and complete the project at the earliest. It was also stated that while sanctioning the advance, Adit[16] and Horizontal Pressure Shaft driving were progressing ahead of schedule. Moreover, the contractor had brought several machineries for the excavation/drilling purpose at that time to carry out the work in three shifts.

The reply was not acceptable as no documentary evidence was available for the supply of material/equipment at site and the value thereof was also not considered while sanctioning the advance as required by the terms of contract. Further the value of work done during the four months up to July 2014 was

16 Adit is an opening in the face of a dam or tunnel to access the operating chamber.

₹0.86 crore only which was less than one per cent of the probable amount of contract (PAC). The reply was also silent on the observation regarding the delay even after sanctioning the advance.

Non-imposition of liquidated damages

2.6 Clause 5.3.11 of the General Conditions of the Contract provides for levy of liquidated damages for delay in completion of work at the rate of 0.05 per cent of the accepted contract value per day of delay subject to a maximum of 10 per cent of the contract value.

The contractors of six SHEPs were given extension of completion time due to delays in land acquisition, geological surprises etc. In two[17] out of three commissioned SHEPs, the contractors, however, failed to complete the work even within the extended time warranting imposition of liquidated damages. Despite suffering loss of potential generation of power, KSEBL did not impose liquidated damages amounting to ₹3.77 crore in respect of these two SHEPs.

[The Management replied (November 2018) that liquidated damages for delay in completion of work were not imposed as the reasons for delay were beyond the control of the contractors.

The reply was not acceptable in view of the fact that the contractors failed to complete the works even after being granted extension of time for delay in acquisition of land, geological surprises etc.

Lack of supervision

2.7 KSEBL constituted (May 2011) Project Monitoring Committees (PMC) under the chairmanship of the Chief Engineer concerned (Civil Construction –

17 Peruthenaruvi and Barapole SHEPs

South/North/Central). The Project Manager was the convener of the PMC. The PMC was to closely monitor the progress of the implementation by meeting at site at least once in two months to tackle various issues that affected the project execution.

Audit observed that as against the required 215 meetings in respect of the six selected, SHEPs, actual number of meetings was only 40. Further, except the PMC of Barapole SHEP, the first PMC meeting of other SHEPs was convened after delays[18] ranging from 516 days to 1,604 days. This was despite the delays in acquisition of land and slow progress of works.

Similarly, KSEBL formed (August 2013) another Project Monitoring Cell independent of the project implementation wing under the control of the Chief Engineer (Project, Electrical and Design) to visit all the project sites every month and to report the progress of the implementation of all the projects to the Board of Directors (BoD) of KSBEL through Director (Generation-Civil). This monitoring was not carried out as no separate staff was deployed to conduct the site visit. Thus, the supervision by the higher level management was almost absent and not effective.

The Management replied (November 2018) that as there was no meaning in convening the PMC meeting before the commencement of actual construction works, the first PMC meeting was convened after achieving a considerable progress in the construction works. The PMC was convened only for specific purposes, such as sanctioning extra item, excess quantities etc. The non-conduct of the PMC every two months, did not affect the progress of work.

18 Calculated with reference to award of work or May 2011,whichever is later.

The reply was not acceptable as the very purpose of the constitution of the PMC was to regularly review the progress and ensure that the projects were completed in a time bound manner. However, the delay in acquisition of land and finalisation of E&M contracts was not taken as a serious issue affecting the implementation of projects. The role of PMC was relegated to the sanctioning of the excess quantities/extra items, extension of time of completion and cost escalations.

Impact of delay in completion

2.8 The Kerala State Electricity Regulatory Commission (Renewable Purchase Obligation and its Compliance) Regulations 2010[19] made it obligatory for all distribution licensees to purchase not less than three[20] per cent (0.25 per cent from solar and 2.75 per cent from non-solar sources) of their consumption of energy from renewable sources. Shortfall, if any, was to be met through purchase of Renewable Energy Certificates (REC).

Audit observed that:

- As a result of delay in commissioning the six selected SHEPs within the scheduled time due to delay in diversion of forest land/ acquisition of private land, non-synchronisation of civil and E&M work, there was loss of generation of 608.93 MUs of energy valuing ₹313.59 crore. Audit also observed that the shortfall in non-solar Renewable Purchase Obligation (RPO) for the period 2011- 17 was 978 MUs. In order to meet the shortfall in RPO, as directed (March 2016) by KSERC, KSEBL purchased (April 2016) one lakh RECs equivalent to 100 MUs for ₹15 crore. The commissioning of the six selected SHEPs within the

19 Notified on 23/11/2010.

20 Enhanced to not less than 4.50 per cent (0.36 per cent from solar and 4.14 per cent from non-solar sources) from the year 2015-16 with an annual increase of 0.50 percentage per year until it reaches 10 percentage of the total supply, as modified by KSERC (Renewable Energy) Regulations, 2015.

scheduled time would have enabled KSEBL to meet RPO to an extent of 608.93 MUs against the shortfall of 978 MUs [21] .

The Management accepted (November 2018) that the delay in commissioning SHEPs ultimately led to shortfall in meeting RPO with consequent additional financial burden on KSEBL in purchasing RECs to meet RPO shortfall.

- Delay in completion of the project resulted in corresponding retention of the Project Implementing Units at the project site and additional interest burden leading to cost overrun to the extent of ₹58.23 crore in respect of three[22] commissioned SHEPs.

  The Management replied (November 2018) that the implementation of the project was delayed due to delay in getting forest clearance. Bare minimum staff were posted at the project site and that the project team had attended to other project works also, namely, preparation of drawing and construction of office buildings, establishment of solar projects etc.

  The reply was not acceptable as the delay in obtaining forest clearances was avoidable. Moreover, there were further delays in completion of work due to delay in acquisition of private land and absence of proper synchronisation of works.

Low generation of power from commissioned SHEPs

2.9 The three commissioned SHEPs projected generation of 116.65 MUs. Against this, the actual generation was 83.28 MUs due to the following:

21 200 MUs plus 878 MUs as reduced by 100 MUs for which RECs were purchased.
22 Perunthenaruvi (₹ 17.91 crore), Adyanpara (₹19.52 crore) and Barapole (₹ 20.80 crore).

- Terms of contract and technical specifications of E&M equipment provides that before taking over the plant, pre-commissioning tests of continuous operation of 72 hours and load rejection test at 110 per cent capacity shall be successfully completed. The E&M contractors should guarantee the performance of equipment for a period of three years from the date of taking over of the equipment.

  Even though, Perunthenaruvi SHEP and Barapole SHEP were commissioned and started generating power, KSEBL was yet to take over these projects as the contractors did not complete all the work.

  In respect of Perunthenaruvi SHEP, though there were interruptions lasting 2 hours 37 minutes (in six instances) in Unit I and 3 hours 51 minutes (in 18 instances) in Unit II in the pre-commissioning test, KSEBL accepted the test run results. During July 2017 to March 2018, there was loss of generation of 7.08 MUs valuing ₹3.64 crore[23] for 4,579 hours due to mechanical failure/repair.

  In respect of Barapole SHEP, 72 hours continuous test run and load rejection tests at 110 per cent output were not conducted till June 2018. The three units of Barapole SHEP were synchronised with the grid in June/July 2016. Immediately after synchronisation of Unit-I, mechanical faults were found in the machine and generation was stopped, leading to loss of generation of six MUs[24] valuing ₹3.09 crore. The unit was put back in to operation in December 2016 only.

  As there was no mechanism to ensure early takeover of the project after commissioning, KSEBL did not penalise the contractors for loss of

23 Worked out at the rate of ₹5.15 per unit.
24 Estimated generation per unit 12 MU/12 months x 6 months (June 2016 to November 2016).

generation during the intervening period of commissioning and takeover of the project.

The Management replied (November 2018) that the contractor of Barapole SHEP was being continuously persuaded to commission the units along with all the other pending works as required in the contract. An amount of ₹5.36 crore was due to the contractor which would be released only after assessing the due penalty/generation loss. In respect of Perunthenaruvi SHEP, the Management stated that the operation of the station at the initial period of commissioning was very critical and had to be stopped even for minor issues noticed. The contractor has to clear all punch points observed during initial period and hence a lot of fine tuning was necessary to make the system in a stable condition.

The reply of the Management was partially correct to the extent that the final bills were not yet released and lot of fine tuning would be required before taking over the project. However, there was no specific time period fixed to be considered as initial period of operation. Both the stations were not taken over even after the test run and one year of operation.

- According to the guidelines issued (February 2008) by MNRE, to prevent the entry of debris into power channel/ tunnel, a trash rack with 14 degree inclination shall be placed at the entry to the power channel/ tunnel.

  Audit noticed that the trash rack at Adyanpara SHEP was placed in vertical position resulting in accumulation of trash reducing flow of water into the power channel and non-operation of power house at its

full capacity of 3.50 MW. Exact generation loss due to this could not be quantified by Audit.

The Management replied (November 2018) that a new trash rack having inclination was constructed at Adyanpara SHEP.

- During the construction stage of Adyanpara SHEP, landslides occurred at the tunnel portal (opening at tunnel) on several occasions and proposals were submitted for providing protective measures. However, the proposals were not attended to and the project was commissioned in September 2015. During September 2017, landslides occurred resulting in stoppage of generation for 49 days. Another landslide occurred on 13 June 2018 and heavy mass of earth and boulders fell on the tunnel portal obstructing the flow of water requiring three months for rectification. The generation loss due to landslides worked out to 11.68 MUs on the two occasions (4.12 MU [25] + 7.56 MU [26]) valuing ₹6.02 crore[27].

Conclusion

Against the envisaged capacity addition of 148 MW through commissioning of 22 SHEPs during the twelfth five-year plan period (2012-17), actual capacity addition was 39.35 MW by commissioning seven SHEPs as of March 2018. Detailed Project Reports were prepared without considering water availability based on 90 per cent dependable year and realistic financial viability indicators. Delay in diversion of forest land and acquisition of private land, defective DPR and non-synchronisation of civil and E&M works led to extension of completion time and resultant loss of generation of 608.93 MUs of energy valuing ₹313.59 crore. Further, KSEBL

25 3.50 MW x 1000 x 24 Hrs x 49 days = 4.12 MU.
26 3.50 MW x 1000 x 24 Hrs x 90 days = 7.56 MU.
27 11.68 MU x `5.15/unit = `6.02 crore.

sustained avoidable liability to purchase 6.09 lakh Renewable Energy Certificates to meet Renewable Purchase Obligation. Performance of the commissioned units did not match the projections due to failure of equipment, obstructions in the free flow of water to the water conductor system etc.

Audit observation is based on our analysis on sample cases only. Since there is a possibility of more such cases occurring in other projects, KSEBL may examine the projects not covered in audit and take suitable corrective action.

[The Audit paragraph 2.1 to 2.9 contained in the report of the C &AG for the year ended 31 March 2018.]

The notes furnished by the Government on the audit paragraph are given in Appendix II.

Discussion and findings of the committee

2.1 Introduction

2.2 Audit Findings

2.3 Planning for implementation of projects

Deficient Detailed Project Reports

2.3.1 Defective financial appraisal

The Chairman & Managing Director of KSEBL, in response to the Committee's query regarding the audit paragraph, stated that he fully concurs with the audit findings based on the Detailed Project Report (DPR) prepared for MNRE approval. He emphasized that MNRE assistance is contingent upon

a positive Net Present Value (NPV) of the project. The witness highlighted the challenges associated with initiating hydroelectric projects in Kerala, citing the Athirappilly projects as an example, where KSEBL faced difficulties due to unexpected geological surprises. The Shenkulam Augmentation Scheme was cited as a specific instance, which faced significant setbacks due to adverse geological conditions despite obtaining necessary clearances from the Forest Department and other authorities in 2013. He acknowledged that such unforeseen challenges, coupled with delays within KSEBL, resulted in project delay.

The witness further stated that among the four small hydroelectric projects, namely Adyanpara, Barapole, Kakkayam, and Peruthenaruvi, the Adyanpara project with an investment of ₹23.81 crore generated 58.56 million units of electricity, earning ₹30.16 crore at a rate of ₹5.15 per unit. The Barapole project, initially planned for 21 MW at a cost of ₹156 crore, faced challenges due to public opposition and other factors, generated only 15 MW of electricity. During the year 2018-19, as a result of floods, a phenomenon called piping occurred at the base of the dam, causing overflow of water to nearby homes and agricultural land, and KSEBL had to pay ₹45,000 as compensation.

Although the Barapole project generated more electricity than its initial investment of around ₹144 crore, the Kakkayam project, started in 2018-19, has not yielded return on investment. The Peruthenaruvi project, initiated in 2017-18, is facing issues due to soil accumulation and requires engineering modifications. The witness emphasized that despite these challenges, KSEBL cannot abandon these projects, anticipating Kerala's rising electricity consumption, which reached 5797 MW as of May 2024, making it difficult to

manage peak demand even with the power generated from small hydroelectric projects. The witness stated that the hydropower projects generates only about 1700 MW and Kerala's interstate transmission capacity is reported to be about 4280 MW, but it is expected that it will increase up to 4700 MW with the implementation of the Edamon project.

The witness informed that the cost of electricity required for summer would be around ₹14,000-15,000 crore, which would be covered by revenue from the existing electricity tariff. He added that the Board had received only ₹94.4 crore as government aid over the past 10 years, and that the Board is moving on with hydroelectric projects without capital investment since 1997. Under the rooftop solar power projects, 35 MW of electricity is being generated every month. The Witness explained that there was a loss in this category due to the lack of methods for utilizing solar energy generated during the day, which was being surrendered at a fixed cost.

The Witness informed the Committee that KSEBL is focusing to divert water to the existing hydroelectric plants so that they can generate electricity for at least four hours in the evening throughout the year. The Witness further added that KSEBL had decided to move forward with stalled projects despite opposition, so as to meet the power requirement of the state.

The Committee expressed dissatisfaction with the reply furnished, noting that it primarily addressed general situations and problems faced by KSEBL, whereas the audit report specifically highlighted the changes brought about in the guidelines of the project and the action taken according to the direction of the Board. The Committee observed that the finalization of the criteria was delayed due to the delay in obtaining land from the Forest Department. The

Committee observed that the delay in obtaining the land and the negligence on the part of the officials lead to the undue delay in completing the projects in time.

Observations / Recommendations of the Committee

1. ***The Committee observes that KSEBL adopted incorrect criteria and methodology for the selection of the four small hydroelectric projects and have made the financial tools like IRR and NPV attractive. The Committee criticizes the officials of the Board for the selection of incorrect criteria and for the undue delay in completing the projects on time.***

2.3.2 Non-assurance of water availability

The Senior Audit Officer pointed out that the water availability studies for SHEPs shall be based on the water availability of 90% dependable year. But this criteria was followed in the case of only one project, whereas the same guideline was not followed in the case of rest of the projects. He also pointed out that the feasibility of projects should have been assessed based on a recognized standard or guidelines for water availability approved by the Central or State Government. Additionally, he suggested that if the existing standard is found to be not suitable for specific conditions of Kerala, then a new standard should have been established, and the criteria for project evaluation should have also been fixed accordingly.

The Deputy Chief Engineer, KSEBL informed the Committee that large storage projects, such as Idukki is based on 90% usable year water availability, whereas small hydroelectric projects have no storage capacity. Ministry of New and Renewable Energy (MNRE) had granted funds for all these projects. He added that implementing projects based on a 90% water

availability assumption would lead to significant water wastage as there is much decrease in rainy days in Kerala. He further explained that when the Forest Conservation Act of 1980 came into effect, the Government focused to promote hydel projects since large-scale projects like Pooyamkutty, Silent Valley and Athirappally became infeasible due to environmental regulations.

The Witness further explained that since MNRE/CBIP guidelines were not statutorily mandatory for Kerala, the State Government did not mandate its adherence. Consequently, these projects were undertaken with a trial-and-error approach, aiming to maximize power generation from the available water resources. He added that the Board is now implementing projects strictly following the rules of Regulatory Commission.

The Director (Finance) KSEBL, clarified that the four projects highlighted in the audit reference are run-of-the-river schemes without storage capacity and hence making comparison with storage schemes is not appropriate. He further explained that at the time of implementation, financial analysis for Adyanppara and Peruthenaruvi projects was done calculating its costs as ₹3.38 and ₹3.25 per unit, respectively. However, from 2017-18 onwards, KSEBL's power purchase costs ranged from ₹4.02 to ₹5 per unit, and the selling price exceeded these costs. The Director continued that if these projects had not been implemented, KSEBL would have had to procure a significant amounts of power from outside sources and considering the life period of these projects, which began in 2009-10, they were deemed profitable.

To a query about formulating KSEBL guidelines according to Kerala’s conditions, the Deputy Chief Engineer, KSEBL replied that KSEBL is now implementing projects according to the rules of Regulatory Commission.

The engineer further added that at present the Regulatory Commission has provided two types of guidelines. Firstly, projects generating a specific megawatt of electricity are to be implemented at fixed costs, and if the expenditure is exceeding this cost it will not be approved. Secondly, the installed machines must utilize at least 30% of their capacity.

The Senior Audit Officer informed the Committee that there were no rules at the time of the audit in 2018. However, he acknowledged that now there are rules and opined that if these projects had not been implemented, a significant amount of water would have been lost.

The Committee inquired about the large hydroelectric projects currently stalled and the reasons for their non-implementation. The MD stated that numerous projects, including the Idukki Golden Jubilee Extension Project, Athirappally Project, and Patrakadav Project are currently being stalled. He explained that the Forest Department enforces extremely stringent rules regarding the allocation of forest land and even prohibits investigative studies.

The Committee strongly criticized KSEBL for not completing a single project on time in the last decade, particularly in comparison to neighbouring state of Tamilnadu which successfully implemented numerous small projects. The MD explained that Tamilnadu utilizes small turbines in projects like Bhoothathankettu in the Bhavani sector to generate electricity from flowing water but this method is not yet adopted in Kerala. He also stated that KSEBL will now focus on large-scale projects and aims to encourage private investment in smaller projects. The MD emphasized that the timely completion of large-scale projects is much needed in Kerala.

The Committee accepted the reply. Hence no remarks.

2.4 Award of Work

2.4.1 Undue favour to the bidders by relaxing prequalification criteria

The Senior Audit Officer explained that KSEBL deviated from CVC guidelines by relaxing pre-qualification criteria during the evaluation process, resulting in undue benefits to ineligible bidders who were ultimately awarded the works. He further stated that if the tender had been issued with relaxed conditions at the outset, more participants would have taken part in the tender process. He emphasized the importance of having crystal-clear tender conditions at the time of issuance, which would eliminate the chance for interpretation at later stages. However, it was noted that KSEBL had pre-qualified bidders in both tenders and awarded works to unqualified bidders which was contrary to the recommended guidelines.

The Director (Finance), KSEBL, informed the Committee that irregularities had occurred in two projects. Specifically, in the Kakkayam project, tenders were invited in 2010 in which 12 parties purchased tender forms, but only seven of them submitted bids. He explained that both technical and financial criteria were examined for pre qualification. One of the key conditions for technical capability was that the bidder should have work experience in at least 75% of the work, similar to dams or such other projects undertaken by KSEBL. The Witness testified that during the evaluation of tenders, it was found that M/s KK Engineering Company possessed a substantial track record of undertaking projects such as bridges, canals, and aqueducts. Furthermore, they demonstrated significant experience in the construction of breakwaters and tsunami rehabilitation works, with project values exceeding the tender amount. Due to ambiguity about the company's qualification, the matter was presented to the Board and a request was

formally submitted to grant relaxation to this company. Based on this request, the Board deliberated and subsequently decided to include M/s KK Engineering Company in the tender process. He admitted that the decision was not legal.

The Chairman and MD, KSEBL, further stated that the main challenge of the Board is the scarcity of contractors willing to undertake small hydroelectric projects. He informed that currently, only four contractors are available to take such projects, and they undertake the projects alternatively. He informed the Committee about the need for a provision to terminate or foreclose contractors who are unable or unwilling to fulfill their obligations. In response to these challenges, KSEBL has decided to appoint SBICAPS as the tender authority, entrusting them with the responsibility of managing the tender process.

The Committee inquired whether KSEBL had taken any disciplinary action against officials who had committed violations over the past ten years. The Managing Director replied that in certain cases, Vigilance had registered cases against the erring officials.

The Committee directed the Department and the Board to discuss the matter in the presence of the Hon'ble Minister for Power and to take action to strengthen the codal provision incorporating the risk and cost clauses for the implementation of small and large Hydro electric Projects.

Observations / Recommendations of the Committee

2. The Committee is convinced of the need for a provision to terminate or foreclose contractors who are unable or unwilling to fulfill their

obligation. So the Committee directs the Department and the Board to convene a meeting, in the presence of the Hon'ble Minister for Power to discuss the matter and to take action to strengthen the statutory provisions incorporating the risk and cost clauses for the implementation of small and large Hydro electric Projects.

2.5 Execution of work

2.5.1 Delay in diversion of forest land

The Committee inquired whether there is land bank with KSEBL to provide land in lieu of land acquired for projects. The Witness informed the Committee that majority of the land owned by KSEBL is leased from the Forest Department. He further added that in projects such as Kakkayam, lands registered in the name of KSEBL have been subsequently cancelled by the Forest Department through a formal notification. Therefore, KSEBL could not give alternative land for the acquired land.

In response to a query of the Committee regarding project implementation in Tamil Nadu, the MD stated that in Kerala, any relaxation granted by the Forest Department would likely be immediately challenged in court, resulting in a stay order.

The Committee observed that public awareness campaigns are much needed to address this issue. Furthermore, the Committee emphasized the importance of effectively demonstrating the legality of all project-related matters to the court. The MD informed the Committee that the Forest Department will issue clearance certificate for the Pathrakadav project only after the completion of study which is being conducted by the Wildlife Institute of India, Dehradun.

The Committee suggested that KSEBL should conduct a study on the factors which contributes to Tamil Nadu's efficiency in the power generation sector. The MD agreed to undertake the study.

2.5.2 Delay in acquiring private land

The Senior Audit Officer informed the Committee that the audit observation highlighted delays in acquiring private land for hydroelectric projects. This cascading effect resulted in the denial of permission to the contractor to commence civil work for over two years. Consequently, the contractor incurred price escalation costs. He also informed that the Joint Secretary of the Power Department had assured the audit team during the exit meeting that a joint mechanism involving relevant Departments would be established to expedite land acquisition for such projects. He inquired whether this mechanism has been established.

The Director (Finance), KSEBL, explained that the geographical peculiarities and land scarcity in Kerala have posed significant challenges in land acquisition for the projects of KSEBL. He pointed out that contractors have faced difficulties in acquiring land on time, leading to delays and complications. The Director further stated that land acquisition processes are often hindered by suits filed by affected parties or the lack of title deeds for outlying lands. Additionally, he mentioned that in areas like Puzhapurampokk, where people reside with government permission, land acquisition cannot be facilitated through monetary compensation. In light of these challenges, KSEBL has decided to adopt a new approach, wherein contracts for new projects will only be awarded after successful land acquisition.

The Committee inquired why the availability of land was not ensured before signing the contract. The MD replied that, in most projects, the contract is awarded before ensuring land resulting in delay of four to five years in project implementation. The Committee strongly criticized KSEBL for prioritizing contractors' interests over those of the public and the Government, and for assigning works to contractors with land that KSEBL does not own. The Committee noted that KSEBL's actions are not in accordance with the law, and that if legal action is taken, KSEBL will be held liable; furthermore, the contractor may also file a claim for compensation as per the contract.

From the above discussion the Committee directed KSEBL to ensure the availability and ownership of land before assigning work to contractors.

Observations / Recommendations of the Committee

3. ***The Committee observes that KSEBL had awarded the contracts for civil works before ensuring ownership of land for SHEP which resulted in delay of four to five years in implementation. The Committee opines that the actions of KSEBL is not in accordance with law which leads to liability to the Board.The Committee strongly criticizes KSEBL for prioritizing the interests of contractors over those of the public and the Government, and for assigning works to contractors without ensuring the ownership of the land. The Committee recommends KSEBL to ensure the availability and ownership of land before assigning work to contractors.***

2.5.3 Delay in implementation due to defective DPR

The Committee enquired about the audit observation that the lapse of KSEBL in opting open channel for water conductor system in the DPR

resulted in replacement of the channel by a tunnel in execution with revised estimate which lead to termination of this contract. The MD admitted that there was lack of professional expertise in the preparation of Detailed Project Report (DPR). Then the Committee observed that the preparation of DPR without conducting proper field study resulted in the termination of the contract and recommended to find out the responsible official and to fix responsibility accordingly.

Observations / Recommendations of the Committee

4. The Committee observes that the preparation of DPR of Adyanpara SHEP without conducting proper field study resulted in the termination of the contract and therefore the Committee recommends usage of professional expertise in DPR preparation and to find out the responsible official and to fix responsibility accordingly.

2.5.4 Delay due to non-synchronization of Civil & E&M Works

The Senior Audit Officer informed the Committee that project delays were occured due to a lack of co-ordination between civil and electro mechanical works. This resulted in delays in starting civil works for three projects and subsequent power generation losses.

The Director (Finance), KSEBL, explained that while civil contractors for small hydro-electric projects (SHEPs) are readily available in Kerala, E&M equipment suppliers are scarce, even within India. This scarcity discourages E&M contractors from forming consortia with civil contractors, hindering project progress. To mitigate this, KSEBL has implemented a policy of awarding civil work to contractors only after land acquisition, aiming to minimize project delays

The MD acknowledged that project execution was very poor owing to the transfer of employees in power generation and distribution section. However, under the leadership of the new Deputy Chief Engineer, KSEBL has initiated several actions, including expedited clearances and increased field inspections.

To a query of the audit officer regarding the current position of the idled equipments for Bhoothahtankettu SHEP worth ₹51.59 crore, the MD stated that the equipments related to this project worth ₹169 crore is now sold by a Chinese company. The MD added that the project has been stopped now. The Committee seriously looked into the problems of non synchronization of civil and E&M works and recommended that KSEBL should be more vigilant in synchronizing the civil and E&M works while executing the projects.

Observations / Recommendations of the Committee

5. The Committee recommends that KSEBL should be more vigilant in synchronizing the civil and E&M works while executing the projects.

2.5.5 Irregular payment of mobilization advance

2.6 Non-imposition of liquidated damages

In response to the Committee's query regarding these audit paragraphs, the Deputy Chief Engineer (Civil) (Hydel), KSEBL, informed the Committee that, as per the contract, liquidated damages are recovered at a rate of 0.05% of the expected contract value per day of delay, subject to a maximum of 10% of the contract value.The Director (Finance), KSEBL, added that liquidated damages amounting to ₹2.44 crore have been recovered, as per the agreement, in the Barapole project, and this has been clarified in KSEBL's reply.

The Senior Audit Officer noted that this information was stated in the report which was submitted two days before the meeting.

The Committee accepted the reply. Hence no remarks.

2.7 Lack of Supervision

The Committee sought clarification regarding the audit observation that the Project Monitoring Committee constituted by KSEBL held only 40 meetings against the required frequency of 215 meetings. The Director (Finance), KSEBL explained that a project manager is appointed for each project, supported by subordinate engineers and meetings are convened only when necessary.

The Committee strongly criticized KSEBL for the negligence attributing the shortcomings on the part of the higher officials who are responsible for overseeing the monitoring committee emphasizing that the PMC's purpose is to facilitate land acquisition, equipment procurement, and intervention. The Committee noted that inadequate monitoring contributed to project implementation shortcomings.

The Committee opined that the concerned higher officials responsible for conducting monitoring committee meetings made a serious lapse in visiting project sites and that affected the implementation of the project. So the Committee recommended that the monitoring Committee meetings and visits should be held at regular intervals to review the progress of project and should identify the barriers which hinder the implementation of the project and should rectify them timely in future.

Observations / Recommendations of the Committee

6. The Committee opines that the concerned higher officials responsible for conducting monitoring committee meetings made a serious lapse **in visiting project sites and that** ***affected the implementation of the project. Hence the Committee recommends that the monitoring committee meetings and visit at project sites should be held at regular intervals to review the progress of project and should identify the barriers which hinder the implementation of the project and should rectify them timely in future.***

2.8 Impact of delay in completion

2.9 Low generation of power from commissioned SHEPs

The audit objection highlighted a loss of 608.93 million units of power generation valued at ₹315 crore and an additional cost of ₹58 crore incurred due to the appointment of staff and extra payments to contractors. The Managing Director, KSEBL, remarked that the audit understated the issue, citing a loss of ₹35 crore over three years for the Pazhassi Sagar project alone and ₹34 crore annually for the Shenkulam augmentation. The Senior Audit Officer informed that the audit analysed only sample cases. The MD, KSEBL stated that the situation is dire, with large quantities of electricity being purchased and industrialization not progressing, and informed that industrial establishments are seeking permission to purchase electricity from outside sources.

The Committee recommended KSEBL to conduct a comparative study with the project implementation of Taminadu and to carry out a discussion with Hon'ble Minister for Power to solve the issues being faced during project implementation.

Observations / Recommendations of the Committee

7. The Committee recommends KSEBL to conduct a comparative study with the Small Hydro Electric project implementation of Taminadu and to carry out a discussion with Hon'ble Minister for Power, Kerala to solve the issues being faced during project implementation.

E.Chandrasekharan,
Chairperson,
Committee on Public Undertakings.

Thiruvananthapuram
4th February, 2026.

APPENDIX-I SUMMARY OF MAIN CONCLUSIONS/RECOMMENDATIONS			
Sl No.	Para No.	Department Concerned	Conclusions/Recommendations
(1)	(2)	(3)	(4)
1	1	Power	*The Committee observes that KSEBL adopted incorrect criteria and methodology for the selection of the four small hydroelectric projects and have made the financial tools like IRR and NPV attractive. The Committee criticizes the officials of the Board for the selection of incorrect criteria and for the undue delay in completing the projects on time.*
2	2	Power	*The Committee is convinced of the need for a provision to terminate or foreclose contractors who are unable or unwilling to fulfill their obligation. So the Committee directs the Department and the Board to convene a meeting, in the presence of the Hon'ble Minister for Power to discuss the matter a nd to take action to strengthen the statutory provisions incorporating the risk and cost clauses for the implementation of small and large Hydro electric Projects.*
3	3	Power	*The Committee observes that KSEBL had awarded the contracts for civil works before ensuring ownership of land for SHEP which resulted in delay of four to five years in implementation. The Committee opines that the actions of KSEBL is not in accordance with law which leads to liability to the Board.The Committee strongly criticizes KSEBL for prioritizing the interests of contractors over those of the public and the Government, and for assigning works to contractors without ensuring the ownership of the land. The Committee recommends KSEBL to ensure the availability and ownership of land before assigning work to*

			contractors.
4	4	Power	The Committee observes that the preparation of DPR of Adyanpara SHEP without conducting proper field study resulted in the termination of the contract and therefore the Committee recommends usage of professional expertise in DPR preparation and to find out the responsible official and to fix responsibility accordingly.
5	5	Power	*The Committee recommends that KSEBL should be more vigilant in synchronizing the civil and E&M works while executing the projects.*
6	6	Power	*The Committee opines that the concerned higher officials responsible for conducting monitoring committee meetings made a serious lapse* in visiting project sites and that *affected the implementation of the project. Hence the Committee recommends that the monitoring committee meetings and visit at project sites should be held at regular intervals to review the progress of project and should identify the barriers which hinder the implementation of the project and should rectify them timely in future.*
7	7	Power	*The Committee recommends KSEBL to conduct a comparative study with the Small Hydro Electric project implementation of Taminadu and to carry out a discussion with Hon'ble Minister for Power, Kerala to solve the issues being faced during project implementation.*

STATEMENT OF ACTION TAKEN ON THE RECOMMENDATIONS OF REPORT OF THE COMPTROLLER AND AUDITOR GENERAL OF INDIA ON PUBLIC SECTOR UNDERTAKINGS FOR THE YEAR ENDED 31 MARCH 2018.

Sl No	Para No	Recommendation	Action Taken by Government
1	2.1	**Introduction** Small Hydro Electric Projects (SHEPs) are benign and clean source of energy. Therefore, Governments give more importance to SHEPs through various financial supports and policy initiatives. As of March 2012, there were 19 SHEPs in the State with an installed capacity of 145.65 MW. The Small Hydro Power Policy, 2012 announced by the Government of Kerala (GoK) anticipated additional capacity of 390 MW including 150 MW through private participation by the end of March 2017. Kerala State Electricity Board Limited (KSEBL) identified 151 potential sites and envisaged implementing 22 SHEPs with total capacity of 148 MW during the twelfth five-year plan (2012-17) as shown in *Appendix 2*. Against this target, KSEBL commissioned seven SHEPs with capacity of 39.35 MW, while six SHEPs with total capacity of 66.50 MW were in progress as of March 2018.In respect of the remaining nine SHEPs with capacity of 45 MW, no work was taken up as of March 2018.	

		In order to ascertain whether the planning and implementation of SHEPs was in accordance with relevant Acts, rules, notifications *etc.* and to evaluate the performance of the commissioned SHEPs, Audit selected three SHEPs each from the completed and the on-going projects.	
2	2.2	**Audit findings** Audit findings on the implementation of six selected SHEPs are discussed in the succeeding paragraphs.	
3	2.3	**Planning for implementation of projects** **Deficient Detailed Project Reports** SHEPs are eligible for financial assistance from Ministry of New and Renewal Energy (MNRE) at the rate of Rs.3.50 crore per MW limited to Rs.20 crore per project. KSEBL took up all the SHEPs with MNRE assistance. In order to be eligible for the financial assistance, the implementing agency has to follow the guidelines prescribed by MNRE. According to the guidelines, a Detailed Project Report (DPR) shall be prepared based on detailed surveys and investigation to assess the technical and financial feasibility of the project before its execution. Audit observations on preparation of DPR are discussed in *Paragraph 2.3.1 and 2.3.2.*	

4 | 2.3.1 | **Defective financial appraisal**

As per the guidelines issued by the MNRE, the financial viability of an SHEP was to be assessed by computing the Payback Period (PBP), Net Present Value (NPV), Internal Rate of Return (IRR) or Debt Service Coverage Ratio. For considering a project financially feasible, the NPV should be positive and the IRR should not be less than the cost of capital. As per the DPR, the cost of capital was 10 *per cent.*

Audit observed that by adopting incorrect criteria and methodology, four financially unviable projects were selected for execution as detailed in Table 2.1:

Table 2.1: Details of defects in financial appraisal of SHEPs

Name of the SHEP	Defects in financial appraisal
Barapole	• For calculating the IRR, equity capital alone was considered instead of the total estimated project cost (TPC), while the NPV was not calculated. • Based on the TPC, the NPV would become negative

KSEBL has an obligation to supply uninterrupted power for domestic, irrigation and industrial purposes. The state is facing acute shortage of internal generation. The increase in electricity consumption has led to a sharp increase in energy demand. To address this issue, Government of India had announced various incentives for promotion of hydro electric generation in the country.

If the projects mentioned in the audit para would not have been implemented citing the non-viability, based on certain financial tools, we cannot harness the gift of nature which otherwise would have ended up in Arabian Sea as unutilized. Technical viability parameters such as E/C ratio, Plant Load Factor may have outweighed the financial parameters while evaluating the viability of a hydro electric project for implementation. Even though the financial parameters are not that much attractive it was felt, wise

to go ahead with the project in terms of good values of E/c ratio and PLF. Therefore the hydel projects have to be assessed not only based on viability but based on the performance also.

Barapole SHEP

The Project was commissioned in 2016 and could generate 20MU in 2016-17 water year though generation commenced late after erection works. In 2017-18 the KSEBL could harness 40 MU which is more than envisaged generation.

The IRR is calculated based on the equity and the IRR obtained is 25.6%. Viability of the project was also checked by

	i.e., Rs. (-)15.23 crore and; • The IRR (8.75 *per cent*) would fall below the cost of capital	levellised tariff and payback period. The project was taken up as Clean Development Mechanism (CDM) project to make it viable as mentioned in the order for according Administrative Sanction. MNRE grant of Rs.8.1 Crore out of which Rs.7.29 Crore has been received which is not considered in financial analysis. By considering this MNRE grant and CDM benefit, the project would have been financially viable also. So it can be concluded that Barapole is viable in all respects.
Kakkayam	• The cash inflows for assessing NPV/IRR were worked out based on the power purchase cost of KSEBL (Rs.5.50 per unit) which was higher than the average realisation of Rs.3.80 per unit at the time of preparation of DPR. • Based on the average realisation (for the year 2008), the NPV of the SHEP would be Rs.(-)5.35 crore. • Similarly, IRR of the SHEP would become 8 *per cent* which was less than the cost of capital.	**Kakkayam SHEP** This project had generated 9.15 MU in 2020-21 and 9.90 MU in 2021-22, which itself depicts that the project was viable from the operational point of view. The generation data in support of the same is appended as Annexure.
Adyanpara	• Financial viability was assessed based on PBP alone by adopting levelised tariff (Rs.3.83 per unit) without evaluating the NPV and IRR. • Audit noticed that the NPV of the project based on average realisation (Rs.3.38 per unit) was Rs.(-)13.87 crore.	**Adyanpara SHEP** Revised DPR of Adyanpara SHEP was prepared in October 2010. As per the DPR, Cost of energy is worked out as Rs.4.22/Unit and the entire amount for the project with interest will be paid back in 15th year of operation. Payback Period (PBP) method is also one of the method for checking financial viability. In this case the payback is only 15 years. Again yearly increase in tariff and MNRE grant of Rs.3.15 Crore received are also not considered. By adopting yearly increase in tariff and also considering the MNRE grant received the project would have given better IRR and NPV.

		• Similarly, IRR (4.36 *per cent*) of the project was also less than the cost of capital.	However the DPR was approved based on the Payback Period. MNRE loan of Rs.3.5 Cr has been availed for the project and this is not considered while preparing the DPR. Revenue is arrived at based on tariff of Rs.3.83/Unit, without considering yearly increase in tariff. Considering the benefits of implementing small HE schemes in addition to the financial parameters, the Project was selected for execution. The project has been commissioned on 03.09.2015 and is functioning satisfactorily. **<u>Perunthenaruvi Small Hydro Electric Project</u>** The DPRs of SHEPs are prepared based on various guidelines prevailing such as CEA, SERC, CERC & MNRE and CBIP Manual. The DPR of Perunthenaruvi Small Hydro Electric Project had been revised in January 2010. The financial viability was assessed based on payback period. In the revised DPR of 2010 benefit of MNRE grant was also taken into account for calculation of IDC. The financial parameters such as IRR, NPV, Pay Back period, levellised tariff etc were worked out. The total cost including IDC is Rs.65.92 Crore with MNRE grant of Rs.4.5 Crore and debt equity ratio of 75:25. Interest on loan is 12%. The lvellised tariff is Rs.3.31/Kwhr. The IRR is 18.84%, which is greater than the interest on cost of capital and NPV is 43.31 which is positive as prescribed by the guidelines by MNRE. Hydro Power Projects (Large & Small) are capital investment for the long run. Hence, it could be well established that what
	Perunthenaruvi	• Financial viability of the SHEP was based on PBP alone by adopting levelised tariff (Rs.3.17 per unit) without evaluating the NPV and IRR. • Audit noticed that the NPV of the project based on average realisation (Rs.3.25 per unit) was Rs.(-)21.40 crore. • Similarly, IRR (6.45 *per cent*) of the project was also less than the cost of capital.	
		The Management replied (November 2018) that financial analysis was done in accordance with the guidelines issued by the State Electricity Regulatory Commission (SERC) and Central Electricity Regulatory Commission (CERC) using different financial tools like IRR, NPV, PBP *etc*. Other factors like operational flexibility, Renewable Purchase Obligation, socio-economic benefits were also considered while approving the projects. The Management reply was not acceptable because as per the guidelines issued by SERC and CERC, the SHEPs were to be financially viable. But KSEBL assessed the financial viability of SHEPs using incorrect	

		criteria and thereby financial tools like IRR, NPV *etc.* were made out to be attractive.	MNRE and other institutions have published is only a "Guideline", where various parameters differ from State to State. Not all what is stated in the guidelines apply to every hydro power project. The costs and benefits that are at hand and quantifiable should be included in the economic analysis to capture the largest possible context. Some projects can produce substantial macroeconomic benefits. Hence a holistic view has to be taken. Moreover, MNRE has extended Central Financial Assistance (CFA) for Perumthenaruvi SHEP, Adyanpara SHEP and Barapole SHEP. If it was on the other way round, the Detailed Project Reports submitted by KSEBL for seeking CFA could have been rejected or directed to be modified. So it can be concluded that the subject projects have proved to be viable in terms of their actual performance. The financial viability of SHEPs were done based on genuine, accurate and applicable criteria and hence the calculation of IRR and NPV were also correct. Moreover Hydro Power is renewable, emission free and improve the social and economic condition of the region. In addition to financial aspects, these factors may have also to be considered while implementing Hydro Electric projects. Most of Small Hydro Projects are found to be maintenance free and their life normally extend more than 50 years. Also maintenance cost is very less. The raw materials for any hydel power generation are cost free and are financially advisable in

			long run. In general all the hydel projects whether major or small are proven to be financially and technically viable in long run. It is not advisable to give up a hydel project citing the financial viability because it generates clean energy having a long life. In the history of KSEBL, no Hydel schemes (including the 4 Nos. cited in the audit Para) implemented had been a loss to the Company. These projects are proven to be a success in the operational phase.
5	2.3.2	**<u>Non assurance of water availability:</u>** As per the guidelines issued (March 2004/ July 2008) by the Central Electricity Authority/MNRE, the water availability studies for SHEPs shall be based on the water availability of 90 *per cent* dependable year. The 90 *per cent* dependable year is the year in which the annual generation has the probability of being equal to or exceeding 90 *per cent* of the expected period of operation of the scheme. Audit observed that: • Out of the six selected projects, water availability of Bhoothathankettu SHEP only was assessed based on 90 *per cent* dependable year. The water availability of Kakkayam SHEP was assessed based on water discharge of Kuttiyadi Additional Extension Scheme. The water availability of the remaining four SHEPs was assessed based on the	As per the CBIP manual (Publication No 280) inflow of 75 % dependable year may be used for optimization of the machine capacities. If 90 % dependable year is selected, major portion of the inflow available can't be utilised for power generation in a normal monsoon period there by defeating the very purpose of establishing the Scheme itself. Average energy considered for obtaining the financial parameters could be reasonably assured during the long duration of the project also which is definitely more than the reckoned life of 35 years. It is also worthwhile to note that Small Hydro Power Projects other than tail race schemes can only be operated during monsoon period. So 90 % dependable year will lead to selection of a lower capacity machine which is not advantageous for a run of the river project as well as effective utilization of natural resources in an environmentally benign way. In short 90% dependability can only be considered for projects with appreciable storage.

		average potential of available water data. Based on the water availability of 90 *per cent* dependable year, two SHEPs (Poringalkuthu and Adyanpara) did not pay back during the expected life time of 35 years. • The Management stated (November 2018) that the guidelines were not to be complied statutorily. KSEBL was duty-bound and had the authority to conceive the projects considering various aspects judiciously to safeguard the interests of the State. • The reply was not acceptable as KSEBL did not formulate any guideline/manual for implementation of SHEPs specific to Kerala. Hence, the criteria for analysing the project feasibility were derived from the guidelines issued by MNRE. Moreover, in the case of Bhoothathankettu SHEP, KSEBL followed the 90*per cent* dependable year criteria suggested by MNRE. • The weir of Perunthenaruvi SHEP was constructed just above an existing pumping station of Kerala Water Authority (KWA). For ensuring the water requirement for drinking water, KSEBL was to release 96,739 cubic metre of water per day from the weir. The impact of sharing of water with KWA was, however, not considered at the time of preparation of DPR. After commencing the oper-	While planning a Hydro Electric project due consideration needs to be given regarding the availability of other alternatives for power generation. In lieu of the proposed scheme, under consideration as everybody is aware, we have only limited other natural resources for power generation. Hence the planning of these SHEPs are undertaken duly weighing the merit and advantage of proposed Scheme considering the specific scenario of the State, in relation to other alternative options of power generation and various other considerations stated above. Central Financial Assistance has been extended by MNRE to the Projects referred therein. Hence any error in the methodology of the assessment of water availability could also have been pointed out by MNRE.

ation of the project in July 2017, power generation was interrupted from September 2017 due to low water level. Considering the water discharge for KWA, generation loss from September 2017 to May 2018 (9 months) was 1.08 million units (MUs) valuing ₹0.56 crore at the rate of ₹5.15 per unit. The generation loss worked out to 4.19 *per cent* of the expected annual generation and this loss is likely to recur every year.

The Management stated (November 2018) that the sharing of water with KWA was factored in the DPR and accordingly, the installed capacity of the project was reduced from 9 MW to 6 MW. Further, Perunthenaruvi SHEP planned to utilise water during the monsoon season when the water requirement of KWA was negligible.

The reply was not acceptable as the DPR anticipated that the existing water pumping scheme of KWA would be affected by the project and suggested to relocate the intake of the pumping station to the reservoir. This was not acted upon and hence KWA demanded release of sufficient water for the drinking water purpose. Further, the Perunthenaruvi SHEP envisaged generation of power during non-monsoon season as well. Had the expected generation been limited to the monsoon seasons, the Perunthenaruvi

		SHEP would have been financially unviable.	
6	2.4	**Award of Work** KSEBL invited separate tenders for civil works and electro-mechanical (E&M) works in the six SHEPs except in Adyanpara SHEP. According to the guidelines issued (November 2008) by the Central Vigilance Commission (CVC), tenders shall be finalised and contracts awarded in a time bound manner within the original validity of the tender. There was delay in finalising the tender for civil work and electro-mechanical works of all the selected SHEPs, except Kakkayam, ranging from 13 days to 520 days. The major reasons for the delay were rectification of incomplete prequalification documents, change in the estimates due to change in the scope of work, design of power houses as per change in E&M equipment *etc.* as shown in ***Appendix3***. The delay in finalisation of the tender resulted in corresponding delay in implementation of the project.	
7	2.4.1	Audit noticed the following irregularities in the selection of contractors: **Undue favour to the bidders by relaxing prequalification criteria** As per the guidelines issued (July 2003) by the CVC, criteria for selection of bidders should be spelt out at the	**Kakkayam SHEP;** Tender was invited vide CECCN/06/2010-11 dated 23.07.2010 with PAC of 1566 lakh by giving wide publicity as per norms prevailing in KSE Board. 12 tender forms were sold out and 7 of them received back. Accordingly the PQ bids submitted by the 7 bidders were evaluated. Based on the

		time of inviting tenders so that the basic concept of transparency and the interests of equity and fairness are ensured. The acceptance or rejection of any bid should be based on laid down specifications. Audit observed that: • One of the eligibility criteria of bidders for Kakkayam SHEP was the completion of similar works of value not less than ₹11.75 crore as a prime contractor/developer during the last seven years as on the date of notice inviting bid. Out of seven bidders, only Paulose George Construction Company Private Limited (PGCCL) met the criterion. Though the value of similar work done by KK Engineering Company and Steel Industrials Kerala Limited was ₹5.36 crore and ₹4.61 crore respectively, KSEBL prequalified both the bidders along with PGCCL. KK Engineering Company became the lowest bidder and bagged the contract. • One of the eligibility criteria of bidders for Perunthenaruvi and Barapole SHEPs was total annual turnover above Rs.23.25 crore and Rs.41.62 crore respectively. Two (out of seven) and three (out of eight) bidders respectively met the prequalification criterion. Annual turnover of one of the bidders, PGCCL, ranged between	evaluation criteria given in PQ document and submitted to the PQ committee for a decision. As per clause 29 - Qualification criteria for Technical capability of PQ bid, the bidder should have satisfactorily completed similar works of value not less than 75% of PAC (for a maximum of 4 works combined) of the project, as a prime contractor/developer during the last 7 years as on the date of notice inviting bid. In this case 75% of PAC comes to Rs.11.75 crores. M/s K K Engineering Company furnished the experience certificate issued by the Superintending Engineer, Project Circle, Piravam for the work of Construction of main canal including Aqueduct with PAC of Rs.5.36 Crores. Further as per the certificates produced by them, they had sufficient experience in the construction of break water and Tsunami Rehabilitation works with value greater than the amount of Rs.11.75 crores, which was not in line with the criteria for technical capability as per the bid documents. The firm had the required financial capability as specified in the bid documents. In the light of the above, the PQ committee decided to recommend the Board to relax the criteria for technical capability for qualifying M/s K K Engineering Company as a special case, so as to get more competition in the bids for this work. Similarly M/s Steel Industrials Kerala Limited, Thrissur had completed the civil works of Kuttiyadi Tail Race Scheme of KSE Board with PAC of Rs.4.61 crores and in addition to this,

		Rs.15.22 crore and Rs.21.69 crore. KSEBL prequalified the bidder in both the tenders. PGCCL turned out to be the lowest bidder on price bid opening and both the contracts were awarded to PGCCL. Thus, relaxation of pre-qualification criteria during evaluation resulted in undue benefit to the ineligible bidders, who were finally awarded the works. The Management stated (November 2018) that KK Engineering Company was pre-qualified for the implementation of Kakkayam SHEP in order to ensure better competition, as a special case. In the case of Perunthenaruvi SHEP, the tender clause regarding turnover could be interpreted as either annual turnover for each of the last three years or the total of the annual turnover for the last three years. Therefore, based on the directions of the Board of Directors, the total turnover of the last three years was considered as qualification criteria. The reply of the Management was not acceptable as the CVC guidelines stipulated that evaluation/exclusion criteria should be made explicit at the time of inviting the tender. Therefore, relaxation of the criteria after opening of the technical bid lacked transparency.	they had sufficient experience in building works as per the certificates produced by them which was not in line with the criteria for technical capability as per the bid documents. Also M/s SILK is a Government of Kerala undertaking. In the light of the above, the PQ committee decided to recommend the Board to relax the criteria for technical capability for qualifying M/s SILK as a special case, for ensuring better competition in the bids for this work. During the Pre-Qualification committee meeting held on 23.12.2010, it was decided to qualify M/s KK Engineering company and M/s SILK for the implementation of Kakkayam SHEP by relaxing the criteria for technical capability specified in the tender conditions in order to ensure better competition, as a special case and Board order issued accordingly as per BO(FM)No: 69/2011 (GPCI/224/08) dated Thiruvananthapuram 06.01.2011. The Board also ordered to qualify M/s Paulose George Construction Co. Ltd., Kochi as the firm satisfies both technical and financial criteria. The price bid of the above pre-qualified bidders were opened on 21-01-2011 and M/s KK Engineering company was the lowest bidder and Board ordered to award the civil works for the execution of Kakkayam SHEP (3MW) to M/s KK Engineering company, Moovattupuzha at their quoted rate of 4.3% above estimate rate. The other 2 pre-qualified bidders had quoted the rate of 14.10% and 45% above estimate rate. Board had not

given any undue advantage to M/s KK Engineering Company, Moovattupuzha in awarding the work.

Perunthenaruvi SHEP

One of the criteria for assessing the financial capability for the pre- qualification of a bidder, as per the pre-qualification document for implementation of Hydro Electric Projects approved by the Board vide order B.O. (FB) No.1468/2007 (M(T&D)/ Gen/07) dated 23.06.2007, is "*The bidder should have a total annual turn over of not less than 75% of Probable Amount of Contract (PAC) of the project bid for the last three financial years. In the case of joint ventures, all partners combined shall meet the requirement. Hence, the lead member shall have a total annual turn over during the last three years of not less than 30% of Probable Amount of Contract".*

This criteria was included in the pre-qualification bid for Perunthenaruvi SHEP. It is clear that, the clause implies that, the total turnover for the last three years is the total for the 3 years itself and not for each of the last three years. Only a clarification was obtained from the Board and no relaxation in eligibility criteria of pre qualification conditions was made.

The annual turn over for M/s.Paulose George Construction Company Pvt. Ltd. for the three consecutive years from 2006-2009 was Rs.15.22 crore, Rs.20.35 crore and Rs.21.69 crore. The total turn over was Rs.57.26 crore which was greater than 75% of the PAC. Hence M/s. Paulose George Construction Company Pvt. Ltd. was pre-qualified for the execution of the

			subject work. Hence there was no relaxation of pre-qualification criteria during evaluation and there was no undue benefit to the bidders . The work was awarded after fully observing the pre-qualification criteria for selection of bidders. **Barapole SHEP;** At the time of PQ evaluation process, M/s. PGCC was the contractor for Poozhithode SHEP (4.8MW) and Vilangad SHEP (7.5MW). The PQ Committee evaluated their performance where work was in progress and decided to follow the same criteria adopted for Vilangad and Chathankottunada II SHEPs. The PQ committee discussed the issue of turnover and noted that in the case of Vilangad SHEP and Chathankottunada II SHEPs, KSEB, vide B.O (FM)No.3170/2009(GPCI/159/05) dated 15.12.2009 had clarified that total of the annual turnover for the last three years was to be considered and not for each of the last three years for pre-qualification of bidders. The Board had clarified as per B.O.(FM) No.1794/2010 (TC5/38/2000) dated 13.07.2010 that the annual turnover was not to be considered for the last three individual years but last three years taken together for prequalifying the bidder for Barapole SHEP. Total Annual turnover of M/s. PGCC for the last three completed financial years was; 2006-2007 – Rs.15.22Cr 2007-2008 – Rs.20.35Cr

			2008-2009 – Rs.21.69Cr TOTAL – Rs. 57.26Cr. Thus the total turnover is more than 75% of the PAC (Rs.55.55Cr). M/s. PGCC was having vast experience in executing Board's Small Hydro Electric Projects viz Chembukadavu stage – II, Urumi SHEP Stage – II, Poozhithode SHEP and Vilangad SHEP. At the time of opening of PQ bid it was not known that they would become the lowest. In the later stage it was seen that the Board's decision to prequalify the firm was right and they came to be the lowest in price bid evaluation and completed the work in reasonable time. The performance of contractor was satisfactory in their previous completed projects Chembukadavu II, Urumi – II and Poozhithode SHEP and no undue time delay in execution. The decision of PQ committee proved to be right. In spite of delay in land acquisition, geological surprise, complexity of land terrain, public protest from different corners for rock blasting, contractor had successfully completed the task within reasonable time. The project was dedicated to the nation on 29.10.2016.
8	2.5	**Execution of work** The six selected SHEPs were scheduled for commissioning between January 2012 and March 2016	

		at a projected cost of ₹667.85 crore. Against this, three SHEPs were commissioned between September 2015 and October 2017 after delays ranging from 3 years and 4 months to 3 years and 7 months. The three ongoing SHEPs were delayed for periods ranging from 2 years and 1 month to 3 years and 6 months as of March 2018. The cost incurred for the six SHEPs was ₹549.29 crore up to March 2018.	
9	2.5.1	The reasons for the delay in completion of the SHEPs were as described below: **Delay in diversion of forest land** As per the General Conditions of Contract, KSEBL was to hand over land to the contractors within one month of award of work. The implementation of the six selected projects required forest land, government land and private land. As per Section 2 of the Forest Conservation Act, 1980, forest land can be used for non-forest purposes only with the approval of the Central Government which shall be given in two stages. Providing land for Compensatory Afforestation (CA) or certificate by Chief Secretary to the Government regarding non-availability of alternate land for CA in the State and funds for raising compensatory afforestation thereof, a certificate from State Government as to the compliance of the Scheduled Tribes and Other Traditional Forest Dwellers	Diversion of forest land in the country is governed by provisions laid down under the Forest (Conservation) Act, 1980 and subsequent rules and guidelines issued by MoEF&CC from time to time. **Perunthenaruvi SHEP** As per the provisions of the Act, the User Agency who submits the proposal for diversion of forest land has to identify equivalent extent of non- forest land for undertaking compensatory afforestation at the cost of user agency. In a land dearth state like Kerala, identification of non-forest land is a difficult task. Subsequent to handing over of non- forest land by KSEBL, suitable changes has to be made in the revenue records which include site inspection by Revenue Authorities. Subsequently Gazette Notification has to be issued by Forest Department notifying it as Reserve Forests only. On completion of the above process forest land can be finally transferred to the User

(Recognition of Forest Rights) Act, 2006 (FRA)*etc.*were mandatory requirements for diversion of forest land.

Three SHEPs selected for scrutiny required forest land for their implementation. Audit noticed that in all the three cases, there were delays in handing over forest land as shown in ***Table 2.2*** below:

Table 2.2: Details of delay in handing over forest land to contractors

Sl. No.	Name of SHEP	Date of issue of work order	Date of handing over forest land	Reason for delay
1	Perunthenaruvi	November 2010	December 2011	Acquisition of original land identified (2006) for Compensatory Afforestation (CA) was cancelled as there was increase in the cost of land due to delay in acquisition. Alternate land re-

Agency for implementation. The process involves different department and consumes time beyond the control of KSEBL.

During the consideration of the proposal, an amendment was issued by MoEF&CC with respect to Scheduled tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, in January 2014 which needs to be complied. A close scrutiny of documents would reveal that all earnest efforts were taken for expedition of the completion of all formalities as laid down in the amendment by MoEF&CC, SC/ST Tribal Department & KSEBL.

Bhoothankethu SHEP

Regarding the diversion of forest land for the project, the proposal was entangled in litigation with an Independent Project Developer for years. The forest clearance for the proposal was already in place. By the time the litigation was settled in favour of KSEBL by the Apex Court of the Country, and steps for revival of the scheme was initiated by KSEBL, it was seen that the Independent Developer had defaulted on payment of lease rent in lieu of forest land diverted for the project. KSEBL had fulfilled the said condition. When the project was on the verge of implementation, the forest department informed that the validity of lease of forest land had expired and hence renewal of forest clearance was a pre-requisite for diversion of forest land for implementation of the project.

Compliance of report on Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 was made mandatory by MoEF&CC prior to according

				quired for CA could be acquired only in February 2011.	final diversion only during early 2012-2013. Further the preparation of report involves convening of Grama Sabha, formulation of minutes /report etc which involves two departments other than the User
2	Bhoothathankettu	February 2014	January 2016	The proposal for diversion of forest land was submitted in January 2012. But KSEBL submitted the mandatory compliance report on Scheduled tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, only in January 2014. The final approval of Ministry of Environment and Forests	Agency. The delay on account attributed to sourcing of report on Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006. **Poringalkuthu SHEP** The forest land required for the project forms part of the large extent of forest land handed over to Electricity Department as early as 1950. When the proposal for Poringalkuthu Left bank Extension (16MW) was implemented , forest department did not insist that KSEBL should seek fresh clearance from MoEF&CC for diversion of forest land for the project viz Poringalkuthu Left Bank Extension (16MW) which was commissioned and now in operational. In line with the above, when the proposal for implementation of Poringalkuthu SHEP was mooted by KSEBL, similar approach was adopted. The High Level Committee Meeting chaired by the Chief Secretary of the State had decided that the land devoid of secondary tree growth be handed over to KSEBL for the implementation of the project at the earliest. Meanwhile as directed by Regional Office, MoEF&CC, it was directed that the state should submit fresh proposal for diversion of forest land for the Poringalkuthu SHEP and existing Poringalkuthu Left Bank Extension Scheme for which diversion had already

					(MoEF) was received in April 2015. But there was further delay in clearing the site by removing the standing trees.	undertaken without the concurrence of Central Government. The Ministry was of the view that the forest land in possession of KSEBL since early 1950's was for Poringalkuthu HEP & before the enactment of Forest (Conservation) Act, 1980 and hence fresh diversion had to be obtained. From the above, the delay was attributed to the different stand adopted by forest department based on the report of officers at respective divisions from time to time.
		3	Poringalkuthu	August 2011	March 2014	KSEBL submitted a proposal to the MoEF in November 2011 without the required certificates regarding non-availability of non-forest land by Chief Secretary of Kerala. This was submitted later (April 2012).MoEF accorded final	

		approval in March 2014 after KSEBL complied with the conditions of in principle approval given (July 2013). Thus, there were delays ranging from 13 months to 31 months in handing over forest land to the contractor from the date of award of work.	
10.	2.5.2	**Delay in acquiring private land** According to the modified guidelines issued (June 2005) by GoK for acquiring land for fast track projects, the revenue authorities were empowered to take advance possession of land under Section 17 of the Land Acquisition Act, 1894 (LA Act) after giving 15 days' notice to the land owners, if the land owners were not willing to enter into a direct sale deed or where direct purchase could not be effected for any other specific reasons. Audit observed that there were delays in acquiring private land from the due date of taking possession in three SHEPS examined in audit as discussed in ***Table 2.3***:	**Perunthenaruvi SHEP** Perunthenaruvi SHEP required 2.5762 ha. of private land for which KSE Board had started its effort to get the private land in 2005 itself. KSE Board accorded sanction for acquisition of 2.5762 Ha of private land owned by 33 individuals through negotiated purchase. As per the request of KSEB, Government of Kerala vide order No. G.O (Rt) 463/05/PD dated 15.12.2005, sanctioned purchase of 2.5762 Ha of land for the execution of the project through negotiated purchase. The District Collector, Pathanamthitta constituted Negotiated Purchase Committee (NPC) on 25.01.2006 and the first meeting was held on 20.02.2006. As per the decisions taken in the meeting, land acquisition wing of revenue department and Survey department prepared sketches of plots and identified 1.91 Ha of patta land from 33 land owners and 14 Nos. of non-patta land (Attu Puramboke). In the NPC meeting held on 20.10.2009, 25 Nos.

Table 2.3: Details of acquisition of private land

Sl. No.	SHEP	Month of award of civil work	Month of sanction by GoK for acquiring land under Section 17(4)	Month of notice	Due date of taking advance possession	Actual month of taking possession	Delay
a	b	c	d	e	f	g	h=g-f
1	Perunthenaruvi (1.35 hectares)	November 2010	August 2013	December 2013	15.01.2014	June 2016	2 years and 5 months
2	Kakkayam (0.41 hectares)	March 2011	August 2011	November 2012	01.12.2012	October 2013	10 months
3	Barapole (8.07 hectares)	August 2010	March 2008	December 2009	25.12.2009	September 2011	1 year and 8 months

As a result of cascading effect of delay in handing over of land, KSEBL amended (December 2015) the General Conditions of Contract and paid price escalation of₹3.59

crore to the contractor of civil works in Poringalkuthu of land owners agreed to the land value of Rs.20,000/cent and one for Rs.22,000/cent. Registration of 1.22 Ha belonging to 25 persons completed in November 2011.

Registration of balance land could not be carried out as the land owners did not agree with the price fixed earlier. In this situation KSE Board requested sanction for the purchase of balance land by invoking the urgency clause (Section 27) of Land Acquisition Act 1894 for execution of the project. Government of Kerala vide GO(MS) No.26/2011/PD dated 27.09.2011 included land acquisition of all small hydro projects under fast track scheme. As per this, notification has to be issued under section 4(1) of the land acquisition act 1894 and land price has to be determined by District Level Purchase Committee (DLPC). The price determined shall be submitted to the state level empowered committee for approval. On approval of the price by the empowered committee, the land acquisition officer shall proceed with the registration of land. As per the request of KSE Board, Government vide order No. GO (Rt) No. 5867/12/RD dated 15.10.2012 accorded sanction for acquisition of the balance extent of 1.2387 Ha of land. Gazette notification was published on 28.12.2013 and the same was published in news paper in January 2014 and public notice issued by Special Tahasildar, LA, Pathanamthitta in 28.02.2014. By this time the LA act 1894 was repealed by the RFCT LARR Act 2013. One of the land owners challenged the notification in the Hon'ble High Court citing repeal of the old act but the court denied it. But

SHEP. In the case of Barapole and Perunthenaruvi SHEPs also, KSEBL sanctioned payment of price variation of ₹1.25 crore and ₹0.58 crore respectively to the contractors which was yet to be released.

Due to the delay in acquiring private land for Kakkayam SHEP, validity of contract awarded (March 2011) for civil works expired (March 2013) and the contractor refused to carry out the remaining work at the same rate and hence, the contract was foreclosed. Subsequently, the balance work was retendered and awarded in October 2014 with an additional cost of ₹2.34 crore due to revision of rate.

The Management stated (November 2018) that the process of land acquisition through negotiated purchase or under Land Acquisition Act could be carried out through the Revenue Department only. In respect of Perunthenaruvi SHEP, the Management also stated that the delay was due to ownership dispute between the family members. The Management further replied that it was not practical to commence any project after acquiring full land. In case of Barapole SHEP, if the work was tendered after acquiring the whole land *i.e.*, after April 2013, the work would not have been completed by January 2016. Thus, early tendering has contributed towards early generation from the project.

The reply was not acceptable because the GoK sanctioned taking advance possession of land by the acquisition process was stopped by the Land Acquisition Wing of Revenue Department. Also acquisition under the new Act could not be proceeded as rules for implementing the same were not framed in Kerala. So KSEB Ltd. decided to try negotiated purchase route again. With the help of Ranni MLA, a consensus in the price was arrived in the meeting on 19.12.2014. In the DLPC meeting on 30.03.2015 price of all the balance land was fixed and proceedings issued on 23.06.2015. Two of the balance land were registered on 08.02.2016 with exemption in registration charges and stamp duty which was granted for the project as per Government order in 2011.

But the land required for the right abutment and right bank approach road was not obtained even though the legal heirs agreed for a price fixed in the District Level Purchase Committee meeting on 30.03.2015. There was an ownership dispute on the land between the legal heirs which led to an injunction from Munsiff Court Ranni in OS No.98/2014 barring transfer of land. In the meanwhile two of the legal heirs of the land filed WPC No. 15870/16 before the Hon'ble High Court praying to direct KSEB Ltd. to deposit the fair compensation fixed by the Negotiated Purchase Committee in a Nationalised Bank. The WPC No.15870/2016 was disposed off by the Hon'ble High Court vide judgement dated 14.06.2016 where in KSEB Ltd. was directed to remit the land value in Munsiff Court, Ranni and take over the land for construction. It was also directed that the legal heirs were to execute sale deed in favour of KSE Board. Accordingly, KSEB Ltd remitted Rs

		invoking Section 17 of LA Act well ahead of the tendering of the work. Further, the guidelines followed by KSEBL and the terms of contract also required that the land shall be in possession before awarding the work. During the Exit Meeting (November 2018), Joint Secretary, Power Department, GoK assured that a Joint Mechanism consisting of various stakeholder departments would be put in place to speed up land acquisition for hydel projects.	30,91,380/- being the value of 30.48 Are of patta land and 1.2 Are of non-patta land in Munsiff Court, Ranni on 28.06.2016 vide receipt No.09/16217 dated 28.06.2016 and took over the land and handed over for construction on 29.06.2016. As such no delay had been occurred from the part of KSEB Ltd. for acquiring private land as stated in the Audit Report. The main reasons for delay in the acquisition of private land were Court Cases in connection with dispute regarding the ownership of land, Repeal of LA Act 1894 by new Act 2013, lack of proper land documents, lack of proper survey sketches etc. **Kakkayam SHEP;** The total land required for the project is 4.359 ha. In addition to the KSEB's own land, project required only 1.177ha. of private land from 3 land owners and 0.182ha. of government land including 0.012ha. of puramboke land. Sanction was accorded from the Board for acquisition of 1.177ha. of private land by invoking urgency clause and for the temporary transfer of 0.182ha. of government land required for the implementation of KSHEP vide the BO dated 20.11.2009. Land acquisition process cannot be executed directly by KSE Board, but only through the Revenue department, whether the acquisition is by negotiated purchase/ LA Act. As per the schedule of implementation of activities upto award of work planned by Board, the completion of Government sanction and Land acquisition were 31.10.2009 and 30.06.2010 respectively. It had been already requested to Government for obtaining sanction from the Revenue department for the acquisition of

			1.177ha. of private land invoking urgency clause under section 17(4) of LA act and for temporary transfer of 0.182ha. of government land as per letter No: GPCI/224/2008/60 dated 13.01.2010 of the Secretary KSE Board. But the government had accorded Administrative sanction for the project vide GO (MS) No: 11/2010/PD dated 05.06.2010 and sanction for the purchase of 1.177ha. of private land accorded only during 08/2011 vide GO (Rt.) No: 196/2011/PD Dated Thiruvananthapuram 19.08.2011. Since the extent of private land required was very less compared to the total required land and the major component structures were coming in the Board's own land, the tendering procedures were initiated during 07/2010 in the best interest of KSE Board that, the KSHEP with installed capacity of 3MW when completed would add 10.39 Mu to the grid annually, which would add to meet the growing energy needs of the state. Also the project caused no threat/impact on environment and ecology of the area. The requisition for acquisition of land along with site plan had already been submitted by the Project Manager to the District Collector during 03/2011. During 04/2011, the District Collector Kozhikode appointed special Tahsildar LA Koyilandy as the Land Acquisition officer and Requisition form and connected documents were forwarded to LA Tahsildar. But the Special Tahsildar LA Koyilandy visited the site and informed the Project Manager that government letter regarding sanction of land acquisition was not sufficient for acquiring the land by

			invoking urgency clause and exclusively a Government order must be obtained in this regard. Such Government order was obtained only on 19.08.2011. Government of Kerala as per order GO(MS) No: 36/2011/PD dated Thiruvananthapuram 27-09-2011 declared that SHEPs undertaken by KSEB will be treated as fast track projects by the District Collectors as far as land acquisition for implementation of SHPs is concerned. As per the request of the District Collector, Kozhikode the Commissioner Land Revenue as per proceedings No: LR(C4) - 36965/2012 dated 29.01.2012 accorded sanction for revoking the provision for hearing of objection under section 5A of LA act for the acquisition of an extent of 0.81ha. of land. On enquiry with the office of the Commissioner Land revenue, it was informed that the above sanction would not apply for the 0.367ha. of land as the land was not having pattayam. As the 0.367ha. of land was very essential, it was discussed in the meeting conducted by the Chairman and Chairman directed to look into the possibility of taking over the land through negotiation and to send the proposal in this regard. As per BO(FM) No: 2520/2012 (GPCI/224/08) Dated Thiruvananthapuram 24.12.2012, KSE Board accorded sanction for negotiated purchase of 0.367ha. of private land subject to the condition that the compensation payable should be comparable to the amount paid under LA proceedings and sought Government sanction for the same. Government had accorded sanction for the purchase of 0.367ha. of private land in 817 A (part) vide GO(Rt) No: 300/2013/PD dated Thiruvananthapuram

			19.11.2013. Out of the 0.81ha. of private land, an extent of 0.3998 ha. was excluded from the acquisition based on the request of the land owner and with the consent of KSE Board in order to avoid the acquisition of his house. Accordingly Board had accorded sanction for acquiring an extent of 0.4102ha. of patta land and 0.367ha. of non patta land required for the project. After conducting DLPC meeting by the District Collector with the land owners for a arriving a negotiated price, it had been decided to acquire the patta land of 0.4102 ha @ Rs.1 lakh/ cent with additional amount for structural value of building and Rs.90,000/cent for the non patta land of 0.367ha. Accordingly Special Tahsildar (LA) Koyilandy and Revenue Inspector had taken possession of 0.4102 ha. of patta land and handed over to KSE Board on 01.10.2013. Government had accorded sanction for the purchase of 0.367ha. of private land in survey No: 817 (A) vide GO (Rt) No: 300/2013/PD dated Thiruvananthapuram 19.11.2013. As per the above GO, the non-patta land of 0.34011ha. was purchased by registration on 24.01.2014. Accordingly all the private land required for the project to an extent of 0.75031ha. (0.4102+0.3401) was acquired by 01/2014. The contract for the execution of Civil works of KSHEP was awarded to M/s KK Engineering Co., Moovattupuzha with an agreed PAC of Rs.16,33,09,769/- with 24 months duration from 18.03.2011. The contractor had commenced the work on 19.03.2011 in the land already available with the Board. But the land acquisition process could not be progressed as planned

and the land could not be handed over to the contractor even after expiry of the contract period after completing all the procedures of land acquisition connected with Revenue department. Due to the non availability of land, the contractor could not commence the work related to Power house, Tail race channel, Penstock, Switch yard etc. and the contractor demanded for rate revision of PWD SOR 2012+30% excess for the balance work, or otherwise to foreclose the agreement. Regarding the demand of contractor, the

amount for balance work as per the agreement executed would come to Rs.1442 Lakhs (PWD SOR 2012+30%excess) in addition to Rs.709 Lakhs (Work done by the contractor).Hence Board had taken the decision to foreclose the contract with M/s KK Engineering Co. and permitting them to complete the work under the land already available at the existing contract rates by 15.01.2014 and to re-arrange the balance works by inviting fresh tenders. The contractor completed the works in land handed over within the extended time of 15.01.2014.

Subsequently after land acquisition, Execution of balance civil works of Kakkayam SHEP was awarded to M/s NCPL for an amount of Rs.11,61,48,845/- with period of completion 22.01.2014 to 21.01.2016. Due to various reasons, work could not be progressed as programmed and entire work of balance civil works of Kakkayam SHEP completed in all respects by 15-07-2018 for an amount of Rs.1084 lakh. Accordingly the total civil works of Kakkayam SHEP by the 2 contracts completed with an amount of Rs.1793 lakh. Hence there is no

			loss occurred to the Board due to foreclosure of earlier contract and arranging the balance work of Kakkayam SHEP by inviting fresh tenders. In the case of Kakkayam SHEP no forest land is involved. Even though the land acquisition formalities were started before the award of work as per earlier contract, the process could not be completed by the Board as planned due to the reasons beyond the control of Board. Also there is a benefit that the work in the Board's available land has been completed before completing acquisition proceedings of private land. **Barapole SHEP;** Land acquisition process cannot be executed by KSE Board directly, but only through Revenue Department, whether it is through negotiated purchase/Land Acquisition Act etc. From the initial step of the process viz. preparing Basis Value Report (BVR), Negotiation and LA Act procedure will take approximately 1.5 to 2 years or more. The present practice of land acquisition takes years and we may be getting land as piece-meal. The method of tendering the work if sufficient land is in custody seems to be a better way to tackle the situation rather than to wait years to get all pieces/plots of land under custody. The work, tendered during 01/2010 with estimate based on SOR 2009, got a competitive rate of 28.50% above estimate rate. If, it was tendered after April 2013, i.e. after receiving the last piece of land the estimate was to be revised according to the prevailing SOR/DSR of that time.

While tendering the work it was expected that the land required for the project could be handed over as the work progresses. 8.154 ha. of land was in possession of KSEB Ltd when the agreement was executed. If the work was tendered after acquiring the whole land i.e., after April 2013, the work wouldn't have been completed by Jan 2016 (The present completion date). Even though the time of completion was 3 years, more time was necessitated mainly due to geological surprises met with during execution. Thus early tendering has contributed towards early generation from the project. Consequent to court case & judgment, changes in project components were also necessitated leading to additional requirement of land.

In this circumstances, tendering and proceeding with the work was of at most urgency due to reliable information that the project would be stalled owing to public protest. Hence the project was tendered with the available work front.

Price variation clause was made applicable to Barapole SHEP not based solely for delay in handing over of land. Decision to tender the work before acquiring the entire stretch of land was in possession was taken based on the facts and circumstances detailed above. The Government of Kerala approved the price variation proposal vide order No.G.O.(MS) No.7/2016/PD Thiruvananthapuram dated 04.03.2016. Accordingly Board issued orders vide B.O.(DB) No.1640/2016 (DGC/ AEEVI/GGCP/2014) dated 06.06.2016.

Price variation clause is prevailing where ever the time of

			completion of work is long. Application of price variation is based on the cost indices published by Govt. agencies. If the works was tendered after 100% land acquisition, the DSR applicable at that time would have been the base of estimate. In other words, Capital Cost of the project would vary considerably based on the estimate revision undertaken based on revision in DSR. Procurement Manual of Ministry of Finance also stipulates that work could be commenced once 90% land acquisition is completed. The project was tendered before completing the acquisition of 100 % private land in the perspective to save time by harnessing energy at an earlier date.
11	2.5.3	**Delay in implementation due to defective DPR:** As per the Manual on Planning and Design of Small Hydroelectric Schemes published (2001) by the Central Board of Irrigation and Power (CBIP), in areas where slope of the hill is steep and where there is a history of landslides, tunnels are to be constructed for water conductor systems. The DPR of Adyanpara SHEP proposed an open channel for the water conductor system although the area was mountainous and had a history of landslides. Civil work involving construction of the open channel was awarded to Kirloskar Brothers Limited-Aryacon Contractors and Engineers Limited (KBL-AECL) Consortium at a cost of ₹8.10 crore. During execution of work, the open channel was found	**Adyanpara SHEP** As per the original DPR of the Adyanpara Small H.E. Project, the Project consists of components such as Weir, Power Channel, Surplus Channel, Forebay, Penstock, Power House, Switchyard and allied works of Access Road. The general concept of small/mini/micro HEP itself is a diversion weir, water conducting system comprising of open channel, forebay tank and penstock, considering the easiness and economy in construction. Whereas, construction of tunnel was costly as well as time consuming due to lack of sophisticated machineries until recent years. In fact DPR for this project was also prepared in the same traditional manner. Accordingly the tender was invited on 04.02.2006 and the work was awarded to M/s.Kirloskar Brothers Ltd, Pune and M/s.Aryacon Contractors and Engineers, Perumbavoor with agreed PAC of Rs.21,32,91,479/- in which Rs.8.10 Crore was for Civil works. The civil contractor M/s.Aryacon Contractors and Engineers

		unfeasible and hence, the same was replaced (September 2008) by a tunnel with revision of estimate to ₹10.50 crore. KSEBL's attempt to execute the tunnel works separately through another tender was not accepted by KBL-AECL and also refused (January 2008) to execute the tunnel work at their quoted rate of 49.80*per cent* above Schedule of Rates(SOR) 2004. Therefore, KSEBL terminated (August 2009) the contract at the risk and cost of KBL-AECL. In the retender also (July 2010), KBL-AECL turned out to be the L1. However, the party didnot turn up to execute the agreement as the Letter of Acceptance issued in December 2011 included a specific clause as to the recovery of risk and cost of the earlier contract. Yet,KSEBL neither cancelled the work nor re-floated the tender. Meanwhile, the Hon'ble High Court of Kerala dismissed the Writ Appeal (May 2012) filed by KBL-AECL against the cancellation of the original work order in favour of KSEBL. Despite this, KSEBL waived the assessed risk and cost liability of ₹1.10 crore in favour of KBL-AECL. Audit observed that the lapse of KSEBL in opting for open channel for water conductor system in the DPR resulted in change of the water conductor system during execution of the work and subsequent termination of the	commenced the work on 10.10.2007. But during actual execution as per the latest design drawings and due to site conditions, certain items found to be exceeding. In order to regularize this excess, the estimate for civil works was recast enhancing the amount to Rs.11.40 Crores which came around 15% over the agreed PAC. The contractor should have completed the work with this excess amount. But work was halted on 11.01.2008. However considering this excess, as well as the difficulty pointed out by the contractor in open blasting along steep slopes of rock for open channel including the availability of sophisticated machineries for driving tunnel, proposal for substituting water conductor system with tunnel & surge shaft came up from the field itself. Consequently the Board appointed an expert committee to study and report the feasibility of replacing the water conductor system viz penstock with tunnel .Since driving tunnel is now easy and economical with modern technologies,the committee also recommended tunnel as the water conductor system and accordingly Board decided to revise the water conductor system with tunnel and surge shaft. Accordingly the estimate for civil works was revised using the same SOR 2004, it was assessed that there was a net saving of Rs.90 lakhs. Hence it may be concluded that mere replacement of Power

		contract. Further, the decision of KSEBL to continue with the same delinquent contractor resulted in avoidable delay of 28 months with loss of potential generation of 21.02 MUs of power worth ₹10.83 crore at the rate of ₹5.15 per unit and also risk and cost liability. The Management replied (November 2018) that the cost increase occurred because of the stoppage of work by the contractor, subsequent termination of the contract and retendering of the work. Since the stoppage of work by the contractor was due to the change in scope of work, the reply of the Management was not acceptable.	channel and fore bay proposal of original DPR with tunnel and surge shaft has not resulted in cost overrun. The cost increase merely occurred due to the slippage of work attributed to the contractor, subsequent termination of contract and finally re-tendering of the balance work. After revising the estimate based on SOR 2009 which was earlier estimate at SOR 2004.
12	2.5.4	**Delay due to non-synchronization of Civil & E&M Works:** Construction of the Power House (PH) building under civil work was dependent on finalisation of the design of the E&M equipment under E&M work. The foundation work for the E&M equipment could be carried out by the civil contractor only on receipt of the approved drawings from the E&M contractor. Since KSEBL selected separate contractors for the civil and E&M works, adherence to the timelines and proper synchronisation of both the works was essential for timely commissioning of the SHEPs.	In the earlier stages, the civil works and E&M works of projects were tendered separately. The civil and E&M works of project were tendered and contract awarded in a single package, in order to synchronize both civil and E&M works and to reduce the co-ordination issues and completion time. In this method, the intention was fulfilled to a major extent. In the market there are so many civil contractors to execute civil works and a few E&M contractors to execute the E&M works of SHEP in the country. Many E&M contractors with excellent track record could not succeed in making joint ventures with respective Civil Contractors for reasons un known. In the case

For synchronisation of project works, the Management formed a Project Management Unit for each project and a Project Monitoring Cell for monitoring the progress of all the projects. In addition, for overall monitoring of the projects, a Project Monitoring Committee including Chief Engineers was also formed. Audit noticed synchronisation issues in respect of three projects where multiple contractors were engaged for electrical & mechanical and civil works. Meanwhile, no synchronisation issues were noticed in the project where a single contractor was engaged. This indicated that the monitoring mechanism put in place by KSEBL was ineffective in addressing the synchronisation issues which eventually led to avoidable delays up to 25 months and cost overruns. Delays in completing the projects is shown in ***Table 2.4***:

Table 2.4: Details of synchronisation of Civil and Electrical & Mechanical works

of single package (Civil & E&M works) only limited numbers of joint ventures are available to participate in the bids. But in the case of projects in which Civil and Electro Mechanical works were tendered separately, competitive offers could be received from contractors with excellent track record, which seems beneficial to the Board as per past experience even though certain delays in coordinating both E&M work with civil works has been noticed.

Perunthenaruvi SHEP

The civil work was awarded to M/s. Paulose George Construction Company Pvt. Ltd., Kochi on 22.02.2011. But the forest land required for the construction of the project components including Power House could be handed over to the contractor on 31.05.2012 by complying all the formalities by Forest Department. The tender for Electro Mechanical works were floated by Chief Engineer (Projects – Electrical Designs) and the work awarded to M/s Flovel Energy Pvt. Ltd on 22.08.2011.

The design and layout for Power House building were submitted by the E&M contractor on August 2012 it was approved by KSEBL in October 2012.

Power House layout can be approved based on the requirement of various machines to be installed in the Power House, positioning of electro mechanical equipment size in control

Sl. No	SHEP	Date of providing design of PH		Supply of E&M equipment	Completion of construction of PH		Delay in completion of PH building (months)
		Schedule	Actual		Schedule	Actual	
a	b	c	d	e	f	g	h = g - f
1	Perunthenaruvi	September 2011	October 2012	April 2013 to August 2015	March 2014	April 2016	25
2	Bhoothathankettu	February 2015	December 2015	November 2016 to June 2018	February 2016	On going	25 (up to March 2018)
3	Barapole	October 2012	October 2013	May 2014	February 2013	October 2014	20

In the case of Perunthenaruvi SHEP:

- There was delay of 13 months in providing the approved design and layout for PH building due to delay in submission (August 2012) of the design and layout by the E&M contractor and its approval (October 2012) by KSEBL.

room etc. The size of Power House as per tender is 20mx18m. Where as M/s.Flovel Engineering Limited furnished the size of Power House as 28m x 22.5m. The increase in size of Power House proposed by the firm led to exorbitant hike in the cost of construction of the project.

KSEBL vide letter dated 12.01.2012 requested the firm to submit revised layout. But the firm vide letter dated 24.02.2012, informed that they had received the sizing of major equipment like turbine, generator, gear boxes during detailed engineering and informed that they could not reduce size further. A meeting was convened with design experts of M/s.Flovel Engineering Limited on 22.06.2012. In the meeting it was decided to change the service bay from the left to right, extending the draft tube steel liners upto the end of generator assembly and also to limit the Power House size to the size given in the tender drawing. Also the firm to reduce the size of the Power House by providing the control room at service bay level and switch gear room to the back side of the control room. Thus the firm agreed to submit the revised Power House layout on 21.07.2012. After verification of the revised lay out some modifications were made. The meeting held on 04.08.2012 discussed the matter in detail to reduce the size of overall dimension of the Power House layout. Hence for reducing the civil cost it was suggested to the firm to look into the possibility of reducing the size of Power House layout. The firm furnished revised layout by incorporating the suggestions and the same was approved on 04.09.2012. Hence the delay occurred for finalising the layout is to reduce the cost of the

As per the schedule, the construction of the PH building was to be completed in two years from October 2012. However, due to non-mobilisation of adequate men and machinery by the contractor (PGCCL) who was awarded

the work relaxing prequalification criteria as discussed in ***Paragraph 2.4.1***, the work could not be completed within the scheduled time (October 2014). In order to complete the construction of the PH by March 2016, PGCCL proposed (September 2015) to replace the concrete building with a pre-engineered building (PEB). Even though, the life span of the PEB was only 20 years as against 40 years for the concrete structure and this entailed extra expenditure of ₹0.31 crore, KSEBL accepted the proposal so as to commission the project in June 2016 and to utilise the monsoon season of 2016 for generation. The contractor completed the civil works in April 2016 and handed over the site to the E&M contractor for the erection of Electric Overhead Travelling (EOT) crane.

Due to the delay, the E&M equipment supplied during April 2013 to August 2015 could not be commissioned and its quality deteriorated. The E&M contractor took 15 months to complete (July 2017) the E&M work due to removal of rust and replacement of necessary equipment.
Thus, in spite of unfruitful additional expenditure of Power House and it was done with a good intention so as to obtain benefit to the Board.

Bhoothathankettu SHEP

The civil work was awarded to M/s Sree Saravana Engineering

Bhavani Pvt. Ltd. & RPP Infra Projects Ltd JV on 07.02.2014. The work was commenced on 15.02.2014. Official date of completion of civil works was on 14.02.2016. The forest land could be handed over to the contractor after a lapse of 23 months, i.e. only on 18.01.2016 after cutting and removing the trees. Major project components such as Power house, tail race, switch yard, intake pool etc. are located in 1.96 Ha of forest land on lease. Due to this delay, power house construction, the critical activity of the project was seriously affected.

Due to the delay in handing over of forest land, time extension was granted up to 17.01.2018 i.e. 2 years from the date of handing over of the forest land. Also delay was occurred due to nature of rock profile, increase in size of power house, flooding occurred on certain occasions, the extension of contract period of civil works was further extended upto 31.12.2018. Also the progress of works badly affected from July 2018 due to the heavy monsoon and unprecedented flood in August 2018 and material shortage. Also the progress of the work was affected considerably due to frequent flooding of Power House area by river water during rainy seasons as the major portion of Power House is below the river bed level.

		₹0.31 crore and compromising the life span of the structure by 50 *per cent*, the project could be commissioned only in October 2017. The Management reply (November 2018) did not address the issue of delay in providing design and layout to the contractor and delay in construction of PH building by the contractor due to non-mobilisation of adequate men and machinery. In the case of Bhoothathankettu SHEP: • Even after providing the design and layout (December 2015) and land (January 2016),the contractor for civil works could not complete the civil work and handover the site to E&M contractor for erection of E&M equipment as envisaged due to the lapses in mobilising material and financial problems. As a result, E&M equipment worth ₹51.59 crore supplied (November 2016 to June 2018) by the E&M contractor remained idle. The Management stated (November 2018) that erection work of E&M equipment could only be commenced after the PH was handed over to the E&M contractor. As the supply of E&M equipment was staggered from November 2016 to June 2018 in accordance with the progress of the civil work, there was no idling of E&M equipment.	Similarly, the tender for E&M works was floated in 2014 and the work was awarded to M/s. Sree Saravana Engineering Bhavani Pvt Ltd,- Hunan Zhaoyang Generating Equipment Co. Ltd. – Consortium, 367 A, Mettur Main Road, Bhavani-638301, Erode District, Tamil Nadu on 06.01.2015. GA Drawing was approved on 05.12.2015 and Model test report was approved on 23.03.2016. The dimensions of the machines and their erection levels could be finalised only based on the model study report. The time of completion was extended up to 31.12.2018. As per Agreement for E&M works, work orders for supply and erection/ commissioning were issued separately. 80% payment for the supply was to be effected against the supply of the materials at site. Electro Mechanical equipment worth Rs.50.02 crore was supplied (supplied between November 2016 to June 2018) by the contractor and KSE Board Ltd. had made a payment of Rs 40.43 crore till June 2018 as per the terms of the agreement. The contractor is bound to supply the whole items within the contract period and penalties will be imposed on delay in effecting the supply/works. For this project, E&M activities are delayed due to non completion of Civil works due to delay in transfer of forest land. In this context, KSE Board Ltd. cannot restrict the contractor from supplying the materials. Otherwise KSE Board Ltd. will have to bear the additional

The reply, however, did not specify the reasons for delay in the civil work. Moreover, equipment worth ₹51.59 crore supplied by the E&M contractor remained idle as there was delay in handing over the PH to the E&M contractor.

In the case of **Barapole** SHEP:

Though, the land for the construction of the PH building was handedover to the contractor for civil works in September 2010,the work order for E&M works was issued only in September 2012 due to change in specification after floating tender (November 2010). Hence, the PH design was finalised only in October 2013 leading to delay in commencement of PH civil works. The PH building was handed over to the E&M contractor for erection of equipment in October 2014. The erection was completed only in February 2016 due to change in power evacuation system and delay in supply of Main Inlet Valves, cooling water pumps, control panels *etc*.

The Management replied (November 2018) that the design for the PH was received from the E&M contractor on

01/10/2013 and same was issued to the contractor for civil work on 11/10/2013. Hence there was no delay in cost for supplying these materials at a later stage due to cost escalation. A part of the equipment like earth mat, draft tube liner etc were already erected and other equipments supplied are being erected according to the progress of civil works.

In SHEP works which does not have major dam construction, it is a general practice that the Civil and E & M works are awarded simultaneously. The scope of work of E & M works includes design, engineering, supply and erection, testing and commisisioning. For the finalisation of the PH building and site levelling of switchyard, the finalisation of E & M works is necessary. The erection work of E & M equipment can only be commenced once the Civil works are completed to a certain level and the PH is handed over to the E & M contractor. Hence the E & M works and Civil works of a PH can only be carried out in a successive procedure. In the case of Bhoothathankettu SHEP, the supply of the E & M equipment was staggered from November 2016 to June 2018 and the E & M contractor supplied E & M equipment in accordance with the progress of the Civil works. The erection work of the E & M equipment is also under progress. Hence no E & M equipment supplied by the contractor remained idle.

Barapole SHEP;

In the case of Barapole SHEP, the tender was initially proposed for an installed capacity of 21 MW. The civil and E & M works for project was tendered as a single tender on 09.12.2005. Since no bidders could be pre-qualified, the work was re

		issuing drawings of the PH. The reply was not acceptable as there was inordinate delay in awarding E&M works even after handing over of the site (November 2010) for the construction of the PH building. There was further delay of one year in submission of design for the PH building by the E&M contractor.	tendered on 04.07.2007 and the Board had to cancel the tenders due on technical grounds and mismatch in design. Subsequently the DPR was revised and Board accorded sanction for a reduced capacity of 15 MW on 20.11.2009. Based on the Board order vide B.O (FM) No 2768/2009 (GPC1/128/2004) dated 29.10.2009, the Civil works and E & M works of all the SHEP projects was tendered separately. Accordingly, the Civil works and E & M works of Barapole SHEP was tendered on 18.01.2010 and on 04.11.2010 respectively for proper synchronization with the Civil work. • However, before the construction inauguration programme scheduled on 20.11.2010, the issue of public demand for supplying part of electricity generated from the project locally came up, it was decided to incorporate a 10 MVA 110 /11kV Power transformer for local distribution and accordingly the E & M estimate was revised. Some alterations were to be done in the switch yard layout due to the space constraints. Hence Board accorded sanction vide B.O(FB)No:52/2011/(GPC4/ Barapole/91/2007) dated 05.01.2011 to alter the switch yard layout with the following modifications and to issue the changes as an addendum to tender documents viz. • (3 Nos) 7.5MVA 11/110kV Generator transformers changed to (2 Nos) 12.5MVA 11/110kV Generator transformers. • 110kV double bus-2 Nos feeder bay changed to 110kV

			single bus – one feeder bay. • Included 11kV panel (6 Nos) with bus coupler & inbuilt CT & PT units. • Included 1 No 10MVA 110 /11kV power transformer for local distribution. Accordingly date of bid opening had to be extended so as to enable the prospective bidders to offer their competitive offers. Later the work order was issued on 13.09.2012 and agreement was signed with the contractor M/s KBL on 27/09/2012 with a scheduled completion period of 24 months. However, as the E & M works were progressing, the power evacuation in Barapole using 110kV Single circuit was forced to be changed to 33kV Underground cable due to the strong protest from the local people who had formed a group named "Barapole Peeditha Karshaka Munnani" and objected to stringing of 110kV lines claiming exorbitant tree cutting compensation and compensation for land based on the market value. Considering the fact that the compensation cases may lead to prolonged litigations which will adversely affect the timely completion of the project, Board accorded sanction as per B.O (FTD) No 1025/2014(D (D& GE)/G3/Barapole/2013-14) dated 25.03.2014 for changing the power evacuation scheme from 110kV SC to 33kV UG with 3 Nos of 8 MVA 11/33kV GT and one 5 MVA 33/11kV Distribution transformer. Due to the

			demand by KSEBL for change in power evacuation scheme at a very late stage, resulting in increased number of transformers, number of bays and other related switch yard items etc, the original project time schedules had to be extended for enabling the contractor for proper planning, re-engineering and for revised design to accommodate the changes necessitated. Accordingly the time extension for E & M work was sanctioned vide B.O (FTD) No 207/2015(D(SCM & GE)/G2/ Barapole/2014-15) dated 28.01.2015 till 30.09.2015, without any financial implications to KSEBL. The change in voltage level of power evacuation from 110kV to 33kV necessitated at an advanced stage of works played havoc on the entire commissioning schedule. The requirement of adopting 33kV was thrust upon due to factors beyond the control of Board. Similarly, the contractor also could not be held responsible for this. Due to this change the entire process of drawing approval for 33kV system, design memo, QAP, vendor approval etc had to be undertaken again and this in turn resulted in the delay of the construction of Power House building under civil works. Due to strike at Mumbai Port, delivery of MIV which was sourced from China was delayed as the ship was temporarily diverted to Colombo due to strike at Mumbai and it took longer than expected for the delivery at site. The long Dusserah holidays during October 2015 in North India also

			caused delays in the delivery and execution. Based on these circumstances time extension was granted without any additional financial implications to the Board. After 30.06.2016, no extension was granted since there has been delay in commissioning partly due to contractor as well as due to non availability of sufficient water and unexpected mechanical snag on one of the units. It was decided that once the contractor demonstrates the performance of all the three units as per the contract condition, the units will be taken over and the further time extension will be proposed with due penalty considering various aspects like availability of water, reasonable time for repair of unit 1 etc. In case of Barapole SHEP, the civil contractor has quoted a competitive rate of 28.5% above estimate rate in SoR 2009. The E&M contractor has quoted Rs.24.4 crores against estimate amount of Rs.54 crores which is highly beneficial to the board comparing the market rate prevailing in that point of time. The delay in submission of design for the PH building by the contractor was due to the change in the power evacuation plan owing to public agitation which was beyond the control of project authorities.
13	2.5.5	**Irregular payment of mobilization advance** As per the guidelines issued (June 2004) by the Central Vigilance Commission, mobilization advance can be given only if it is expressly stated in the tender	The contractor had commenced the actual construction of the work on 01.04.2014. As per the request of the contractor, Board accorded sanction to release an amount of Rs.4.58 Crore to the contractor as advance vide Board Order dated 29.08.2014, 4

		document, including the amount, rate of interest *etc.* General Conditions of Contract for the civil work of Poringalkuthu SHEP provided that under special circumstances, advance to the extent of five *per cent* of the contract price or 90 *per cent* of the value of the material/equipment brought to the site, whichever is less can be granted on the security of such material/equipment to be adjusted in the contract contingent bill with interest. KSEBL sanctioned mobilization advance of ₹4.58 crore equal to five *per cent* of the tender amount of ₹91.61 crore. Audit observed that as the contractor did not make any supplies as on the date of request for mobilization advance, the contractor was not eligible for any advance. As such, the sanctioning of mobilization advance was an undue favour to the contractor and inconsistent with the CVC guidelines. Audit also observed that the tunneling of low pressure pipe could not be completed within the scheduled period (April 2016) due to non-availability of plant and machinery required for tunneling of inclined pressure shaft. Further, out of 1,925 MT steel plates required for lining of tunnel, only 800 MT was procured and fabricated up to March 2018.Thus, despite providing mobilization advance, contrary to the provisions of the tender, the contractor did not complete the work within the agreed time.	months after the commencement of the actual execution. Clause 5.5.14 of the agreement generally states that no advance of any kind will be given to the contractor. But there is provision for giving advance if the Board feels that it is advantageous, under special circumstances considering the merits of the work and based on the written request of the contractor. Even though the contractor requested for 10% of PAC as advance, KSEBL sanctioned the advance of Rs.4.58 Crore equal to 5% of the PAC only as per clause 5.5.14 of the agreement. At that time, ADIT and Horizontal Pressure Shaft driving were progressing ahead of schedule. Moreover, the contractor had brought several machineries for the excavation/drilling purpose at that time to carryout the work at all 3 work fronts in 3 shifts. Hence it was felt that if an advance is granted, it would give an impetus to the contractor to mobilize more men, materials and machinery to keep up the momentum and complete the project at the earliest. The advance was granted with interest at the rate of PLR fixed by SBI at the time of repayment plus 2%. The present recovery rate for the advance given is 15.7% which is much higher than the normal buying rate of loans of KSEBL. The Board's good intention to complete the work in time by giving advance after 4 months of actual commencement of work, with a high interest rate and without any financial loss to KSEBL cannot be treated as an undue favour to the contractor. Further, the amount was

		The Management replied (November 2018) that the advance was granted on the presumption that it would give an impetus to the contractor to keep up the momentum and complete the project at the earliest. It was also stated that while sanctioning the advance, Adit and Horizontal Pressure Shaft driving were progressing ahead of schedule. Moreover, the contractor had brought several machineries for the excavation/drilling purpose at that time to carry out the work in three shifts. The reply was not acceptable as no documentary evidence was available for the supply of material/equipment at site and the value thereof was also not considered while sanctioning the advance as required by the terms of contract. Further the value of work done during the four months up to July 2014 was ₹0.86 crore only which was less than one *per cent* of the probable amount of contract (PAC). The reply was also silent on the observation regarding the delay even after sanctioning the advance.	released against the strength of a Bank Guarantee for an equivalent amount.
14	2.6	**Non-imposition of liquidated damages** Clause 5.3.11 of the General Conditions of the Contract provides for levy of liquidated damages for delay in completion of work at the rate of 0.05 *per cent* of the accepted contract value per day of delay subject to a maximum of 10 *per cent* of the contract value.	Time extensions are granted due to delay in acquisition of land, Geological surprises, public protest, etc. which are beyond the control of KSEBL and contractor. Hence time extensions are granted without any financial commitment on either side. Considering this liquidated damages due to delay in completion of work are not imposed.

		The contractors of six SHEPs were given extension of completion time due to delays in land acquisition, geological surprises *etc.* In two out of three commissioned SHEPs, the contractors, however, failed to complete the work even within the extended time warranting imposition of liquidated damages. Despite suffering loss of potential generation of power, KSEBL did not impose liquidated damages amounting to ₹3.77 crore in respects of these two SHEPs. The Management replied (November 2018) that liquidated damages for delay in completion of work were not imposed as the reasons for delay were beyond the control of the contractors. The reply was not acceptable in view of the fact that the contractors failed to complete the works even after being granted extension of time for delay in acquisition of land, geological surprises *etc.*	For the civil works of Kakkayam, there was no delay due to the fault from contractors, and hence Liquidated Damages were not imposed. Regarding electro-mechanical works contracted with M/s.KBL, there was a recommendation for 1% penalty for the works carried out after 27.03.2018, till the synchronization with the grid. But later it was decided not to impose LD related to delay in carrying out the works of KSHEP, considering the willingness of the contractor to withdraw the escalation claim of Rs.1,50,57,269/-(vide B.O. (FTD) No.292/2019/ DGE/G2/Kakkayam/2018-19, Tvpm dated 30.03.2019). Liquidated damages were not imposed to Barapole SHEP civil contractor because the delay occurred mainly due to delay in acquisition and handing over of land and in handing over of construction drawings to the contractor, Geological surprise, land slide which affected the design of components, change in power evacuation system from 110kV to 33kV due to public protest. In the case of Electro Mechanical works, KSEBL has imposed liquidated damages to the contractor for an amount of Rs.2,44,34,773/- 10% of the accepted amount of contract. All the civil works of the Perunthenaruvi SHEP were completed within the extended time period of 31.03.2017 and hence no liquidated damages had been imposed on the contractor.
15	2.7	**Lack of supervision** KSEBL constituted (May 2011) Project Monitoring Committees (PMC) under the chairmanship of the Chief Engineer concerned (Civil Construction –South/North/	The progress of the work was being reviewed in the review meetings convened at various levels i.e., Honorable Minister for Power, Chairman and Managing Director, Director (Generation-Civil) and Chief Engineers regularly further to the

		Central).The Project Manager was the convener of the PMC. The PMC was to closely monitor the progress of the implementation by meeting at site at least once in two months to tackle various issues that affected the project execution. Audit observed that as against the required 215 meetings in respect of the six selected SHEPs, actual number of meetings was only 40. Further, except the PMC of Barapole SHEP, the first PMC meeting of other SHEPs was convened after delays ranging from 516 days to 1,604 days. This was despite the delays in acquisition of land and slow progress of works. Similarly, KSEBL formed (August 2013) another Project Monitoring Cell independent of the project implementation wing under the control of the Chief Engineer (Project, Electrical and Design) to visit all the project sites every month and to report the progress of the implementation of all the projects to the Board of Directors (BoD) of KSBEL through Director (Generation-Civil).This monitoring was not carried out as no separate staff was deployed to conduct the site visit. Thus, the supervision by the higher level management was almost absent and not effective. The Management replied (November 2018) that as there	scheduled progress review meetings at the office or site. Also the above mentioned dignitaries used to visit the site frequently to monitor the progress of the work. Under these circumstances, PMC was being convened only for specific purposes, such as sanctioning extra item, excess quantities etc. But it's a fact that PMC should have a role of Project Management Office too. Shortage of PMC scheduled in every two months, did not affect the progress of work.

		was no meaning in convening the PMC meeting before the commencement of actual construction works, the first PMC meeting was convened after achieving a considerable progress in the construction works. The PMC was convened only for specific purposes, such as sanctioning extra item, excess quantities *etc*. The non-conduct of the PMC every two months, did not affect the progress of work. The reply was not acceptable as the very purpose of the constitution of the PMC was to regularly review the progress and ensure that the projects were completed in a time bound manner. However, the delay in acquisition of land and finalisation of E&M contracts was not taken as a serious issue affecting the implementation of projects. The role of PMC was relegated to the sanctioning of the excess quantities/extra items, extension of time of completion and cost escalations	
16	2.8	**Impact of delay in completion** The Kerala State Electricity Regulatory Commission (Renewable Purchase Obligation and its Compliance) Regulations 2010 made it obligatory for all distribution licensees to purchase not less than three *per cent*(0.25 *per cent* from solar and 2.75 *per cent* from non-solar sources)of their consumption of energy from renewable sources. Shortfall, if any, was to be met through purchase of Renewable Energy Certificates (REC). Audit observed that:	**I. Renewable Purchase Obligation and its Compliance:** Delay in commissioning the projects were due to reasons beyond the control of KSEBL. **II. Others:** **1) Kakkayam SHEP** It is true that there was delay in commissioning of KSHEP, Kakkayam beyond the control of KSEBL **2) Adyanpara SHEP** The entire cost of establishment right from the starting of the office on 29.10.2005 to December 2016 is booked under this project. In fact during the idling period of this project, the

		• As a result of delay in commissioning the six selected SHEPs within the scheduled time due to delay in diversion of forest land/ acquisition of private land, non-synchronisation of civil and E&M work, there was loss of generation of 608.93 MUs of energy valuing Rs.313.59 crore. Audit also observed that the shortfall in non-solar Renewable Purchase Obligation(RPO)for the period 2011-17 was 978 MUs. In order to meet the shortfall in RPO, as directed (March 2016) by KSERC, KSEBL purchased (April 2016) one lakh RECs equivalent to 100 MUs for ₹15crore. The commissioning of the six selected SHEPs within the scheduled time would have enabled KSEBL to meet RPO to an extent of 608.93 MUs against the shortfall of 978 MUs. The Management accepted (November 2018) that the delay in commissioning SHEPs ultimately led to short fall in meeting RPO with consequent additional financial burden on KSEBL in purchasing RECs to meet RPO shortfall. • Delay in completion of the project resulted in corresponding retention of the Project Implementing Units at the project site and additional interest burden leading to cost overrun to the extent of ₹58.23 crore in respect of three commissioned SHEPs.	following works were carried out by the project team. Hence the following charges can be offloaded from this project. 1) Construction of 2nd floor to the existing Vydyuthi Bhavanam at Tirur including its electrification works during December 2009 to July 2011. 2) Construction of new Vydyuthi Bhavanam at Nilambur including its electrification works during February 2010 to February 2013. 3) Preparation of drawings and estimate for the new Vydhyuthi Bhavanam at Shornur. 4) Though the project was commissioned on 03.09.2015 and started generation from that date, the project was handed over to the Generation wing on 05.12.2016 only. So the operation charges of the Power House for 15 months can be exempted from the establishment charge of this project. 5) The project team of Adyanpara SHEP was entrusted to commence the work of Valanthode SHEP as per B.O dated 08.02.2016. Accordingly the preliminary/ pre construction works were started. Hence at least from 01.04.2016 onwards the establishment cost was that utilized for Valanthode project. **3) Barapole SHEP** The office of the Project Manager for the implementation of Barapole SHEP (21MW) has been functioning since Dec 2005. The tender for civil work for implementing Barapole SHEP was

		The Management replied (November 2018) that the implementation of the project was delayed due to delay in getting forest clearance. Bare minimum staff were posted at the project site and that the project team had attended to other project works also, namely, preparation of drawing and construction of office buildings, establishment of solar projects *etc.* The reply was not acceptable as the delay in obtaining forest clearances was avoidable. Moreover, there were further delays in completion of work due to delay in acquisition of private land and absence of proper synchronisation of works.	floated during 2008. Consequent to court case & judgment, changes in project components were also necessitated leading to additional requirement of land and additional financial commitment. The project was down sized from 21MW to 15 MW to satisfy the conditions stipulated by the Empowered Committee under MoEF&CC. The DPR was also revised accordingly. The land acquisition process cannot be executed by KSEBL directly, but only through Revenue Department, whether it is through negotiated purchase or Land Acquisition Act. The Revenue Department took a long time to acquire all the land as per existing rules and procedures. The last piece of land was acquired during April 2013 only. During 2012 a new Sub Division for conducting pre construction works of Pazhassi Sagar SHEP was formed. The establishment charges of this newly formed Sub division was being charged to head of Barapole SHEP till a new Division for the implementation of Pazhassi Sagar SHEP was created during February 2017. After completion of the Barapole SHEP, this Division was entrusted with supervision of the implementation of 3 MW Canal top and 1MW Canal bank solar project and the establishment cost includes that of 4 MW solar power project also. The total establishment charges incurred for Barapole SHEP is for the period from December 2005 to January 2017 including pre construction work of Pazhassi Sagar SHEP(7.5 MW) and

			the same establishment was utilized for the supervision of 4 MW solar project.
17	2.9	**Low generation of power from commissioned SHEPs** The three commissioned SHEPs projected generation of 116.65 MUs. Against this, the actual generation was 83.28 MUs due to the following: • Terms of contract and technical specifications of E&M equipment provides that before taking over the plant, pre-commissioning tests of continuous operation of 72 hours and load rejection test at 110 *per cent* capacity shall be successfully completed. The E&M contractors should guarantee the performance of equipment for a period of three years from the date of taking over of the equipment. Even though, Perunthenaruvi SHEP and Barapole SHEP were commissioned and started generating power, KSEBL was yet to take over these projects as the contractors did not complete all the work. In respect of Perunthenaruvi SHEP, though there were interruptions lasting 2 hours 37 minutes (in six instances) in Unit I and 3 hours 51 minutes (in 18 instances) in Unit II in the pre-commissioning test,	**<u>Perunthenaruvi SHEP</u>** The commissioning of the Perunthenaruvi project was completed on 12.06.2017 and both the units were synchronized to the grid by 12.06.2017. But the commercial operation date of Perunthenaruvi SHEP was on 18.07.2017 after successfully completing 72 hrs trial run of both the units. Following are the interruption for power generation except low water level. 1. Grid Failure for 21hr 26 minutes It was reported that there is 33kV connectivity from Perunthenaruvi SHEP to 110kV Ranni Substation and 33kV Ranni- Perunad Substation. A 33kV OH Line was drawn from 110kV Ranni Substation to Mukkam having a length of 10.2km and UG Cable having a length of 12.1km from Mukkam to 33kV Ranni- Perunad Substation with a change over facility at Mukkam. The line was commissioned during March 2017. Since it was a newly constructed feeder, certain initial problems persisted which has since now been stabilized. Majority of the unscheduled interruptions were because of the changeover of supply. The evacuation lines were handed over to the Assistant Engineer, Electrical Section, Ranni-Perunad on 14.02.2018. In view of the above, reported grid failure of 43hrs 16 minutes

		KSEBL accepted the test run results. During July 2017 to March 2018, there was loss of generation of 7.08 MUs valuing ₹3.64 crore for 4,579 hours due to mechanical failure/repair. In respect of Barapole SHEP, 72 hours continuous test run and load rejection tests at 110 *per cent* output were not conducted till June 2018. The three units of Barapole SHEP were synchronised with the grid in June/July 2016. Immediately after synchronisation of Unit-I, mechanical faults were found in the machine and generation was stopped, leading to loss of generation of six MUs valuing ₹3.09 crore. The unit was put back in to operation in December 2016 only. As there was no mechanism to ensure early takeover of the project after commissioning, KSEBL did not penalise the contractors for loss of generation during the intervening period of commissioning and takeover of the project. The Management replied (November 2018) that the contractor of Barapole SHEP was being continuously persuaded to commission the units along with all the other pending works as required in the contract. An amount of ₹5.36 crore was due to the contractor which would be released only after assessing the due penalty/ generation loss. In respect of Perunthenaruvi SHEP, the Management stated that the operation of the station at	need not be considered as major problem for generation of power since the reasons are not solely attributable to KSEBL. 2.Tripping for 77hr 40 min In addition to the above, frequent tripping may occur even for a minor fault, which is inevitable till the machine gets stabilized. 3. Guide vane and OPU Pressure Fluctuation for 166hr 59 min Both the units were synchronized to the grid by 12.06.2017. Usually, in connection with commissioning of new SHEP or HEP, there will be chances of interruptions/defects during trial run and the same will be rectified in due course. In this case also defects noticed during 30 days trial run had been rectified by the contractor in time bound manner as per clause 1.28.3 of Volume III of contract agreement. The 72 hours continuous test run for both machines were successfully completed and commercial production started on 18.07.2017. During the initial operation of the plant, teething problems still persisted including frequent interruption of the power evacuation feeders. Accordingly a 33KV substation was commissioned at Perunthenaruvi and the grid failure minimized. 4. Stopped on request of Flovel Permit work for 200hr 23 min As the final alignment of turbine and generator is a high precision activity and is critical factor for trouble free operation

		the initial period of commissioning was very critical and had to be stopped even for minor issues noticed. The contractor has to clear all punch points observed during initial period and hence a lot of fine tuning was necessary to make the system in a stable condition. The reply of the Management was partially correct to the extent that the final bills were not yet released and lot of fine tuning would be required before taking over the project. However, there was no specific time period fixed to be considered as initial period of operation. Both the stations were not taken over even after the test run and one year of operation. • According to the guidelines issued (February 2008) by MNRE, to prevent the entry of debris into power channel/ tunnel, a trash rack with 14 degree inclination shall be placed at the entry to the power channel/ tunnel. Audit noticed that the trash rack at Adyanpara SHEP was placed in vertical position resulting in accumulation of trash reducing flow of water into the power channel and non-operation of power house at its full capacity of 3.5 MW. Exact generation loss due to this could not be quantified by Audit. The Management replied (November 2018) that a new trash rack having inclination was constructed at Adyan-	of the unit after commissioning, it took more time than scheduled. For doing the rectification works in a safe and hassle free manner, the E&M Contractor, M/s Flovel requested permit work and KSEBL had permitted the same for the trouble free operation of the units. As submitted in earlier paragraphs, the first few months of operation after commissioning is very critical and challenging. Since this period needs great attention, generation has to be stopped for even if during minor operational hurdles. All projects often face some sort of challenges and difficulties at the initial period of operation. The contractor is bound to clear all punch points observed during initial period and subsequent fine tuning is necessary to make the system in stable condition. Setting of so many parameters in the operational level is required in each operation, so the generation interruption during that period cannot be accounted as generation loss. The generation loss can be effectively assessed after the initial operation period and for a complete water year. **Barapole**

		para SHEP. • During the construction stage of Adyanpara SHEP, landslides occurred at the tunnel portal (opening at tunnel) on several occasions and proposals were submitted for providing protective measures. However, the proposals were not attended to and the project was commissioned in September 2015. During September 2017, landslides occurred resulting in stoppage of generation for 49 days. Another landslide occurred on 13 June 2018 and heavy mass of earth and boulders fell on the tunnel portal obstructing the flow of water requiring three months for rectification. The generation loss due to landslides worked out to 11.68 MUs on the two occasions (4.12 MU+ 7.56 MU) valuing ₹6.02 crore.	
			The Annual Generation for Barapole SHEP is 36 MU as per approved DPR and the Water Year for project is from May to December. Heavy rain from middle of May to September during S-W monsoon, Heavy rain from October to December during N-E monsoon and Dry weather from end of December to middle of May. **<u>As on date Generation Details</u>**

Sl. No.	Generation Year	Generation (MU)
1	2015-16	0.0006
2	2016-17	19
3	2017-18	40.50
4	2018-19	0.95
5	2019-20	20.95
6	2020-21	28.69
7	2021-22	49.84

Hence, the year wise generation report of all the units are as follows:

1. June 2015 to May 2016

No Units were operated from June 2015 to May 2016 as the civil work of the project was completed only at the end of January 2016 and Unit 1 was synchronized only by 29.02.2016 and water was not available for synchronizing balance two units. Hence there was no generation from June 2015- May 2016.

2. June 2016 to May 2017

On availability of water in June end, on 26.06.2016, the Unit No 1 was commissioned, but on 28.06.2016, the Unit No 1 became faulty as the runner of turbine got stuck against head liner of the turbine and was jammed. Subsequently on 14.07.2016 and 25.07.2016 Unit 2 and Unit 3 were commissioned. However, the contractor could not demonstrate

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the output as per the GTP. The output achieved for Unit No 2 was 4.57 MW and Unit No 3 was 4.7 MW. The Contractor could only dismantle Unit No 1 on 13.11.2016 and the unit was put back on service by 14.12.2016. However, the output achieved was 4.97 MW subsequent to rectification of Unit No 1.Hence during the water year 2016-17 i.e June 2016- May 2017, as per the yearly generation report from the field, Unit No.1 generated 0.13 MU after the rectification and Unit 2 and Unit 3 generated 9.13 MU and 9.8 MU respectively (with total generation of 19 MU) with reduced output. It is to be pointed out that no machines could achieve the rated output of 5MW and 10% COL. For the output improvement, the servomotor of Unit 2 was removed for rectification on 23.12.2016 when the water availability was low and put back in service by 02.04.2017. However no major improvement was noticed. Hence, Unit No.1 was not operational from 28.06.2016 to 14.12.2016 and Unit No.2 and 3 was not operational from June end to 14.07.2016 and June end to 25.07.2016 respectively despite water availability.

3. <u>June 2017 to May 2018</u>

However , in the water year 2017-18 i.e June 2017-May 2018, as per the yearly generation report, rectified Unit No.1 generated 9.95 MU and Unit 2 and Unit 3 generated 15.73 MU and 14.82 MU respectively (with total generation of 40.5 MU) with reduced output. The contractor confirmed on 19.03.2018 that they would manufacture and provide new 3 D printed runner for Unit 2 for output improvement.

4. <u>June 2018 to May 2019</u>

In the water year 2018-19 i.e June 2018- May 2019, certain issues occurred resulting in loss of generation at Barapole such as flood in Coorg on 12.06.2018 followed by the natural calamity in Kerala in the mid August 2018 due to which all the machines were under shutdown. The annual generation was 0.95 MU. In the intervening period, the inlet case pipe of Unit No.2 failed on 17.06.2018 and the same was replaced on 27.10.2018. As part of output improvement, the contractor replaced the runner of Unit No.2 of

Barapole SHEP with new 3D printed runner on 02.11.2018. However, required water was not available for conducting the 72 hours trial run test for Unit 2. The contractor also informed that once the new 3D printed runner is successful, they would manufacture the new runners for balance two units.

After the natural calamity, certain issues in the water conducting system of Barapole was noticed. The water level in the canal was not able to be maintained above 2 m which resulted in severe water leakage towards a private property. The issue commenced after the natural calamity occurred in August 2018 and was noticed on 19.11.2018 when the water conductor system was filled and Unit No 1 was synchronized. Hence, first trial run for capacity demonstration for Unit No.2 was able to be carried out by the contractor only on 21.01.2019. However, 10% overload could not be demonstrated by the contractor as a result of the severe

leakage of water into nearby premises. Due to the issue only controlled generation is possible at Barapole. The Board had formed a committee to resolve the leakage issue in water canal system and as per the draft report submitted by the committee.

5. <u>June 2019 to May 2020</u>

On availability of required water, the 72 hours trial run test for Unit 2 was carried out by the contractor from 27.08.2019 to 30.08.2019 under the supervision of KSEBL field staff and achieved generation at rated output (i.e 5 MW). The overload test run was carried out by contractor on 29/09/2019 on Unit 2 and output at 10% overload (i.e 5.5MW) was achieved. The performance test of Unit No 2 was carried out on 19.10.2019.
The balance two new runners manufactured by 3D printing process were delivered to site by the E &M contractor on 10.11.2019 and the same were installed on 19.11.2019. On trial run, both the units attained output at 10% overload. However, there were some balance E & M works to be completed by the

contractor including major work like installation SCADA instead of redundant PLC. Once the same was complete, the project was taken over by KSEBL on 17.01.2020. The annual generation was 20.95 MU.

6. June 2020- May 2021

The Generation for this year was 28.69 MU

7. June 2021-May 2022

All machines are operative and the generation for this water year was 49.84 MU

In case of Barapole SHEP, certain tests stipulated in the contract for E&M works such as 72 hrs test were not completed then and did not hand over the machineries to the Board till 15.01.2020. 72hours COL tests were conducted during October 2019 and plant was handed over to KSEBL on 16.01.2020. The E&M contractor is bound for provide performance guarantee and defect liability period for three years from 16.01.2020. Even though the plant was not handed over to KSEBL, the generation was made since 2016 till the date of handing over. So KSEBL was generating revenue from the plant.

Adyanpara SHEP (Trash rack);

3.5MW project is a runoff river scheme and is proposed to operate for a period of 8 months from June to January in every financial year, as per DPR. The generation of this project purely depends on the monsoon availability as there is no storage dam associated with this project. The total expected generation as per DPR is 9.01 MU/Year, and it cannot be split up in to a monthly average as the intensity of rain is high in the June-July months and there will be a reduction in the water availability towards the end of the season.

The trash rack provided in this project also is in the same way as the case of many projects under KSEB Limited. The cleaning works of trash rack are carried out as per the site conditions of the project. Mechanical cleaning is not economical for small hydro electric projects and not practical. Hence periodical cleaning manually is only feasible in the case of small hydro electric projects.

The Project was commissioned on 03.09.2015, and the test & trial runs were conducted from July 2015 onwards, utilizing the water available during the period from June to August. And from September to December, the available water was utilized. During June 2016, even though the water was available to run the three units simultaneously, due to the frequent clogging of intake Trash rack, there were interruptions in the operation.

During July 2016, the trash rack and desilting chamber were cleaned and some additional meshing arrangements were provided for avoiding the trash rack clogging. But July to October, water was available only to run two machines at a time and November to December water was available to run only one Unit (0.5MW) at reduced loads only. During the same season, from September 8 onwards the unit#3 was under breakdown, but the same had no affect with respect to the utilization of available water, as water was not even sufficient to run the other two units at full load, due to the weak monsoon throughout Kerala. And from January 2016 onwards all the three machines could not be operated due to the non availability of sufficient water. During July 2016, the trash rack and desilting chamber were cleaned and some additional meshing arrangements were provided for avoiding the trash rack clogging.

Heavy unexpected flash flood occurred all over Kerala in 2017 and 2018 and subsequent landslides occurred in the Adyanpara project area also and caused interruption in Generation of energy

from the project. In June 2018, a big boulder fell on the trash rack slab and the entire trash rack was damaged. A new trash rack having inclination was constructed at Adyanpara behind the wings wall of weir which enhanced the easier access and cleaning of the trash rack. The trash rack design was done as per IS 9761 and the spacing of trash bar is 11mm.

The Details of Generation are given.

Year	Generation in MU
2015-16	2.3
2016-17	5
2017-18	3.7
2018-19	0.32
2019-20	2.4
2020-21	6.5

PREETHY C S
PEN: 101031
Joint Secretary
Power Department
Govt. Secretariat
Thiruvananthapuram

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GENERATION DETAILS FOR THE LAST 10 YEARS (MU)

Stations	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
Kuttiyadi+KE	766.0193	501.2339	842.0999	738.3169	575.8822	465.4436	600.579	692.4026	693.0953	755.0257	750.1197
Sholayar	220.3599	209.2728	233.6291	237.9325	210.2189	167.1071	204.2718	202.3911	216.39445	238.4179	262.408859
Poring	269.2817	228.3947	236.8545	258.4763	277.1984	194.9435	233.6478	192.6311	209.33	239.8848	194.727231
PLBE											114.60125
Pattivasal	231.4545	169.6072	215.5303	211.6913	218.5982	166.0090	188.3882	185.2614	142.1093	132.2138	144.5253
Sengulam	162.2723	107.2948	141.8032	151.3506	160.9112	115.5837	144.8903	122.9815	150.7106	117.5165	182.6177
Panniar	184.4771	90.1079	168.6696	154.6522	173.9305	62.1679	129.4574	114.6014	138.69982	181.2484	213.2023
Neriamangalam+NES	360.5332	231.7106	365.7574	348.2970	352.0698	196.2475	310.6043	377.8414	314.65091	355.3895	445.07
Idamalayar	348.9892	249.6275	385.9925	372.5697	275.7588	171.9628	256.2696	345.474	250.64119	289.9911	381.14554
Idukki	3041.7100	1562.7107	2741.8750	2492.5800	2373.2700	1379.0460	1609.768	2920.257	1630.317	2529.3970	3709.675
Sabarigiri	1434.7100	862.3432	1535.4446	1224.8424	1168.9526	797.8255	869.4635	1516.4106	1112.5326	1228.1432	2046.3948
Kallada	65.6268	21.8177	67.7664	68.9919	44.8084	44.3635	32.496	68.2588	33.453145	49.8886	59.8796
Peppara	8.1963	3.6912	7.5991	5.1284	4.7115	3.9465	5.2138	7.9731	5.802917	8.5946	10.136214
Madupetty	1.2187	2.4469	6.0184	3.5650	4.2920	2.2945	3.2504	1.7245	3.367557	4.7279	7.144857
Kakkad	231.5304	140.4631	247.6484	192.8292	183.6372	130.6281	159.8724	221.8727	176.2633	184.8412	272.5348
Lower Periyar	648.8480	356.4948	600.7486	577.5040	510.9688	308.2160	507.886	524.056	426.96	537.9760	811.904
Malampuzha	2.7650	1.9031	4.3617	5.1891	2.0318	0.8343	1.3962	4.3003	4.148123	2.5022	4.0347
Chembukadav	11.9937	9.3588	12.2873	10.9463	9.0354	8.6407	10.6387	6.8857	7.368944	9.3518	12.830384
Urumi	13.2681	10.6081	13.7461	12.9839	9.3041	9.0329	11.1846	8.6327	12.311438	11.8117	15.34694
Malankara	31.9448	26.4758	30.3932	34.1521	32.4333	24.7386	31.1875	33.229	27.95926	31.4284	28.0716771
Lower Meenmutty	4.8631	2.1595	5.4185	4.7399	5.5590	2.4815	5.0516	6.0794	4.834328	6.1690	6.6905925
Kuttiady Tail Race	8.5696	7.8713	7.8659	7.9206	8.0467	6.3489	8.2482	8.409	5.977621	7.8851	7.473026
Poozhithode	9.3623	10.6702	11.9690	11.3290	8.6152	10.4485	11.8168	7.5634	6.69681	8.1213	13.0571
Ranni-Perinadu	0.2141	6.1547	9.0983	7.3517	7.6553	5.8538	8.3053	3.8331	7.029607	7.7162	10.209066
Peechi		0.2638	3.2843	1.9242	1.4259	0.3997	1.1177	2.4199	2.409753	0.4833	0
Vilangad				1.0579	12.7457	15.7759	15.3234	7.8300	14.4245	15.0882	19.2116274
Chimony					4.5875	1.5584	3.3330	6.6173	6.4042	7.8877	7.698192
Adyanpara					2.3597	5.0099	3.6799	0.3078	2.3946	6.7028	11.8108
Barapole						19.3211	41.0253	1.2070	20.8813	28.0099	48.79708679
Vellathuval SHEP						1.7382	4.5210	5.1433	0.0651	0.0000	8.99755
Pemthoneruvi							3.1214	7.6173	12.2981	13.0430	7.127027012
Kakkayam SHEP										9.1579	9.904431
Kanjikode(Wind)	2.0333	1.7630	1.8019	0.9592	1.3818	1.7134	1.4655	1.3013	1.2232	1.1402	1.26
Kanjikode (Solar)					0.8109	0.8741	1.1339	1.0430	1.2029	0.9880	1.22
Solar KSEB(Edayar)						1.1339	1.6541	1.0809	1.1446	1.2588	1.88

Stations	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	20 22
Solar KSEB(Vengode)						0.7608	1.5256	1.4115	1.5108	1.3770	1.22
Solar 1MW Barapole Canal Bank						0.5028	2.9273	3.3670	2.7445	3.0410	1.35
Solar 1MW Barapole Canal Top						0.7233					1.15
Solar KSEB(Polhencode)								1.7475	2.6903	1.9085	2.57
Solar KSEB(Muvattupuzha)								1.0102	1.5183	1.5547	1.47
Solar KSEB(Below 1MW)										11.3135	
BDPP,Brahmapuram	57.1177	80.2491	28.9818	8.4308	13.2536	6.5353	0.4587	0.2942	0.0986	0.0000	0
KDPP,Nallalam	233.8704	438.7051	191.8446	199.2732	137.3802	38.0098	1.3920	3.7986	10.7371	7.8380	0
TOTAL	8351.0296	5333.3993	8218.5893	7343.3833	5781.8447	4367.0220	5524.4622	7617.0686	5770.4022	7048.8142	9829.6717

Appendix 3
Statement showing delay in award of civil and electromechanical works
(*Referred to in Paragraph 2.4*)

Sl. No.	Project	Scheduled date of award of work	Actual date of award of work	Delay (days)	Name of the contractor	Awarded cost (₹ in crore)	Reasons for delay
Civil works							
1	Perunthenaruvi	25/03/2010	11/11/2010	231	Paulose George Construction Company Pvt. Ltd.	34.83	Rectification of defects and shortfall in prequalification bid and delay in decision making for relaxing the prequalification criteria to open the price bid of unqualified bidders.
2	Bhoothathankettu	24/01/2014	07/02/2014	13	Sree Saravan Engg Bhavni (P) Ltd.-RPP Infra Projects	86.81	No substantial delay.
3	Poringalkuthu	30/05/2011	19/08/2011	112	GVR-GMW JV	91.61	Rectification of defects and shortfall in prequalification bid.
4	Adyanpara[115] (Tender invited on 02/07/2010)	Not Specified#	06/01/2012	402	KBL-ACEL Consortium	27.10	Delay in decision making as to the eligibility of the defaulted party in the original contract to participate in the retender at the risk and cost of the same party. Further delay in obtaining government approval to issue the work order to the defaulted contractor being the L1 in the retender.
5	Barapole (Tender invited on 18/01/2010)	Not Specified#	28/08/2010	71	PGCCL	73.95	Rectification of defects and shortfall in prequalification bid and delay in decision making for relaxing the prequalification criteria to open the price bid of unqualified bidders.
6	Kakkayam (Tender invited on 23/07/2010)	Not specified#	03/03/2011	70	K K Engineering Company	16.33	Reasons were not furnished.
Electromechanical works							
1	Perunthenaruvi	15/10/2010	27/07/2011	285	Flovel Energy (P) Ltd	13.33	Rectification of defects and shortfall in prequalification bid. After opening price bid, delay in finalising the L1 party due to deliberations for deciding the additional cost of civil work and technical and commercial deviation and negotiation with the party.

[115] Civil and electrical works were tendered and awarded as a single package.

2	Bhoothathankettu	07/04/2014	06/01/2015	274	SSEB-Hunan Zhaoyang Consortium	80.58	Rectification of defects and shortfall in prequalification bid and price bid. Deciding on complaint from one of the bidders and negotiation with L1.
3	Poringalkuthu	02/05/2013	04/10/2014	520	Allonward-SSIPL Consortium	41.10	Change in specifications and inviting price bid for two types of turbines from all the bidders. Rectification of defects and shortfall in prequalification bid and price bid.
4	Barapole (tender invited on 04/11/2010)	Not Specified#	05/09/2012	519	Kirloskar Brothers Ltd.	24.43	Bid documents were incomplete and deficient and sought clarifications/ corrections from the bidders. Discussions/correspondences with L1 after opening of price bid as there were deviations in technical specifications with that of KSEBL.
5	Kakkayam (tender invited on 20/12/2010)	Not Specified#	03/10/2012	895	Kirloskar Brothers Ltd.	9.75	Reasons were not furnished.

 # Considering the normal time of five months taken for awarding the contract in other cases.