

**KERALA STATE ELECTRICITY REGULATORY COMMISSION**  
**THIRUVANANTHAPURAM**

**Present: Sri T.K Jose, Chairman**  
**Adv A.J Wilson, Member**  
**Sri B Pradeep, Member**

**OP No 65/2023**

In the matter of : Petition for the approval of Capital Investment Plan for the period from FY 2022-23 to FY 2026-27 of Strategic Business Unit-Generation (SBU-G) of KSEB Limited

Petitioner : Kerala State Electricity Board Limited (KSEB Limited)

Petitioner represented by : 1) Rajan M.P, Dy CE, TRAC, KSEB Limited  
2) Ajithkumar K N, EE, TRAC, KSEB Limited

Date of hearing : 04.01.2024, 2.30 PM

Venue : Court Hall of the Commission (Hybrid Hearing Mode)

**ORDER DATED 21.10.2024**

- 1) Kerala State Electricity Board Limited (herein after called KSEB Limited or (Licensee) on 10.01.2022 filed a petition for the approval of Capital Investment Plan (CIP) of SBU-G, SBU-T& SLDC and SBU-D for the control period from 1<sup>st</sup> April 2022 to 31<sup>st</sup> March 2027 under Regulations 10,54,67 and 71 of KSERC (Terms and Conditions for determination of Tariff) Regulations, 2021.
- 2) The summary of the Capital Investment Plan (CIP) of each of the Strategic Business Units of KSEB Limited as per the petition is given in the table below

Capital Investment Plan of KSEB Ltd (Rs in Crores)

Table 2.1

Functional area	2022-23	2023-24	2024-25	2025-26	2026-27	Total
	(Rs. Cr)	(Rs. Cr)	(Rs. Cr)	(Rs. Cr)	(Rs. Cr)	(Rs. Cr)
<b>SBU-G</b>	512.75	798.11	1122.97	1483.83	1212.92	5130.58
<b>SBU-T</b>	1304.14	2027.39	1673.21	1033.60	517.73	6556.07
<b>SBU-D</b>	3492.95	5351.03	4953.18	1523.64	1412.23	16733.03
<b>Total</b>	5309.84	8176.53	7749.36	4041.07	3142.88	28419.68

- 3) The scheme wise year wise outlay for the CIP under SBU-G as per the petition is as follows

Table 3.1

<b>Project wise/Year wise outlay for CIP of SBU-Generation</b>						
<b>Particulars</b>	<b>2022-23</b>	<b>2023-24</b>	<b>2024-25</b>	<b>2025-26</b>	<b>2026-27</b>	<b>TOTAL</b>
	<b>(Rs. Cr)</b>	<b>(Rs. Cr)</b>	<b>(Rs. Cr)</b>	<b>(Rs. Cr)</b>	<b>(Rs. Cr)</b>	<b>(Rs. Cr)</b>
NEW HYDEL PROJECTS	198.55	540.38	977.63	1335.37	1057.41	4109.34
NEW SOLAR PROJECTS	24.787	16.5	2.75	0	0	44.04
NEW RENOVATION/ REPLACEMENT WORK (MAJOR WORK -5 CR AND ABOVE)	163.695	123.22	84.942	85.5	93	550.36
NEW RENOVATION/ REPLACEMENT WORK (LESS THAN 5 CR)	57.01	40.96	35.4	30.36	29.91	193.63
ADVANCED ENERGY STORAGE TECHNOLOGY	50	55	0	0	0	105.00
DAM REHABILITATION	18.70	22.05	22.55	32.60	32.60	128.50
<b>TOTAL (Rs. Crore)</b>	<b>512.746</b>	<b>798.11</b>	<b>1123.27</b>	<b>1483.83</b>	<b>1212.92</b>	<b>5130.87</b>

- 4) **New Hydrel Projects:** - KSEB Limited, vide submission dated 10-01-2022 had proposed 14 new hydel projects during the MYT period from 2022-23 to 2026-27 as detailed below. Of these projects, the year of completion of Idukki (Golden Jubilee Extension Scheme) is scheduled during 2028-29.

Table 4.1

<b>No</b>	<b>Name of Scheme</b>	<b>Commencement</b>	<b>Completion</b>	<b>Project Cost</b>	<b>Capacity</b>	
				<b>(Rs Cr)</b>	<b>MW</b>	<b>MU</b>
<b>A</b>	<b>NEW HYDEL PROJECTS</b>					
<b>1</b>	Upper Sengulam	2022-23	2025-26	316.00	24.00	53.22
<b>2</b>	Peechad	2022-23	2026-27	27.64	3.00	7.74
<b>3</b>	Western Kallar	2022-23	2026-27	51.24	5.00	17.40
<b>4</b>	Ladrum	2022-23	2026-27	48.81	3.50	12.13
<b>5</b>	Maramala SHEP	2022-23	2026-27	74.28	7.00	23.02
<b>6</b>	Pasukkadavu SHEP	2022-23	2026-27	51.00	4.00	10.34
<b>7</b>	Valanthode SHEP	2022-23	2026-27	69.11	7.50	17.36
<b>8</b>	Marippuzha SHEP	2022-23	2026-27	71.95	6.00	14.84
<b>9</b>	Chembukadavu III SHEP	2022-23	2026-27	64.11	7.50	16.65
<b>10</b>	Chathankottunada SHEP - Stage I	2022-23	2026-27	71.59	5.00	12.06
<b>11</b>	Olikkal SHEP	2022-23	2025-26	46.00	5.00	10.26
<b>12</b>	Poovaramthodu SHEP	2022-23	2025-26	46.00	3.00	5.88
<b>13</b>	Mankulam HE Project	2022-23	2026-27	750.00	40.00	102.85
<b>14</b>	Idukki (Golden Jubilee) Extension Scheme	2023-24	2028-29	3062.08	800.00	1301.00
	<b>Total</b>			<b>4749.81</b>	<b>920.50</b>	<b>1604.75</b>

The Commission after scrutinizing the Capital Investment Plan of KSEB Ltd sought certain additional documents/clarifications on the petition vide its letter No. 0297/D(T)/2022/KSERC dated 07.03.2022.

- 5) Later vide additional submission dated 08.03.2023, KSEB Limited proposed four more projects viz; Poringalkuthu Micro HEP, Kakkayam Pumping Scheme, Poringalkuthu SHEP Stage II and Keerithodu SHEP with project costs of 1.44 Cr, 25.72 Cr, 80.7 Cr and 141.92 Cr respectively. KSEB Limited informed that these projects are planned to commence and to commission during the present control period. Details of the projects included in the additional submission are given in the table below.

Table 5.1

Sl. No.	Name of Scheme	Commencement	Completion	(Rs Cr)	MW	MU
<b>NEW HYDEL PROJECTS (ADDITIONAL PROJECTS)</b>						
1	Poringalkuthu Micro HEP	31.10.2023	31.03.2024	1.44	0.036	0.25
2	Kakkayam Pumping Scheme	31.12.2023	30.11.2025	25.72	0	29.49
3	Poringalkuthu SHEP Stage II	31.12.2023	30.11.2025	80.7	24	53.85
4	Keerithodu SHEP	01.02.2024	31.01.2027	141.92	12	27.65
	<b>Total</b>			<b>249.78</b>	<b>36.04</b>	<b>111.24</b>

- 6) **New Solar Projects:** - The four new solar projects proposed by KSEB Ltd during the MYT period from 2022-23 to 2026-27 as per the petition is given in the table below.

Table 6.1

Sl. No	Name of Scheme	Commencement	Completion	Project Cost		Capacity	
				(Rs Cr)	Cost/MW (Rs Cr)	MW	MU
<b>NEW SOLAR PROJECTS</b>							
1	Ground mounted solar project at Ettumanoor	2022-23	2022-23	6.69	6.69	1.00	1.31
2	Ground mounted solar project at Nenmara	2022-23	2022-23	6.35	4.23	1.50	1.8
3	PM KUSUM -Component C (5 MW ground & 0.99 MW Roof)	2022-23	2023-24	22.75	3.80	5.99	7.87
4	Soura Kerala Model	2022-23	2024-25	8.25	2.75	3.00	4.99
	<b>Total</b>			<b>44.04</b>		<b>11.49</b>	<b>15.97</b>

- 7) **New renovation and replacement works (each costing 5 crore or more):** - KSEB Ltd proposed the following 24 schemes with capital outlay of Rs 5.00 crore or more under the above head.

Table 7.1

Sl No	Name of Scheme	Commencement	Completion	Project Cost	2022-23	2023-24	2024-25	2025-26	2026-27
				(Rs Cr)	(Rs. Cr)	(Rs Cr)	(Rs Cr)	(Rs Cr)	(Rs Cr)
<b>NEW RENOVATION/REPLACEMENT WORK (MAJOR WORK -5 Cr AND ABOVE)</b>									
1	Rectification/Replacement of Penstock, butterfly valves and allied works at Sengulam HEP	2023-24	2024-25	97.00			97.00		
2	Sabarigiri HEP stator winding replacement for Generators	2022-23	2025-26	110.50				110.50	
3	Sabarigiri HEP Shaft replacement	2022-23	2023-24	16.00		16.00			
4	Sabarigiri U#4 revamping	2022-23	2022-23	5.00	5.00				
5	Sabarigiri renovation of control system and runners	2025-26	2026-27	57.50					57.50
6	Moozhiyar Additional Power House - preliminary study and preliminary work	2022-23	2026-27	5.00					5.00
7	110kV feeder bay & Transformer replacement at Sabarigiri Power House	2025-26	2025-26	9.00				9.00	
8	Design, Engineering, Supply, Erection and Commissioning of 2 Nos of new Pressure Release Valve (PRVs) at Panniar HEP	2022-23	2022-23	8.81	8.81				
9	Renovation of Governor system at KAKKAD Power Station	2023-24	2023-24	6.00		6.00			
10	KDPP LNG Conversion - Preliminary study and preliminary works	2022-23	2026-27	5.00					5.00
11	110/220 kV GIS Switching station at KHEP	2026-27	2027-28	40.00					
12	Refurbishment of MIV of first stage machines at Idukki HEP	2022-23	2023-24	6.00		6.00			
13	Revamping of KSEBL colony Moolamattom by providing new housing complex with modern amenities Phase I & II	2022-23	2023-24	10.53		10.53			
14	RLA Study of II nd stage machines at Idukki Power Station	2022-23	2022-23	5.50	5.50				
15	Purchase of spare runner for Stage I Idukki HEP	2023-24	2023-24	14.00		14.00			
16	Purchase of new 6 nos of transformers at Idukki HEP	2025-26	2026-27	30.00					30.00
17	Updation of auto sequencer and implementation of SCADA system including SAS at LP	2022-23	2024-25	5.00			5.00		

18	Renovation of Governor system at LP	2022-23	2024-25	9.00			9.00		
19	Generator Transformer purchase at Sholayar Power House	2022-23	2024-25	7.50			7.50		
20	Replacement of butterfly valves (4 nos) at Porigalkuthu Power House	2022-23	2025-26	6.00				6.00	
21	Penstock renovation at Porigalkuthu Power House	2025-26	2025-26	9.00				9.00	
22	Pallivasal hydroelectric project Penstock replacement	2022-23	2023-24	47.67		47.67			
23	Construction of new wind farm at Kanjikode /Stage 1	2023-24	2024-25	34.85			34.85		
24	KTR strengthening of Canal work	2023-24	2023-24	5.50		5.50			
	<b>Total</b>			<b>550.36</b>	<b>19.31</b>	<b>105.7</b>	<b>153.35</b>	<b>134.5</b>	<b>97.50</b>

- 8) **New renovation and replacement works (each costing less than 5 Crore):-**  
KSEB Limited proposed a total outlay of Rs.193.63 crore for capital nature of works under renovation/ replacement (about 470 schemes/works) having scheme cost less than Rs.5.00 crore. The year wise outlays are given in the table below.

Table 8.1

KSEB Limited petition (Rs. Cr)						
Details of Works	2022-23	2023-24	2024-25	2025-26	2026-27	Total
New renovation / replacement work (less than Rs 5.00 Cr)	57.01	40.96	35.40	30.36	29.91	193.63

- 9) **Advanced Energy Storage Systems:** KSEB Ltd submitted that, a wide array of storage technologies had been developed so that the grid can meet everyday energy needs. Energy storage systems provide a wide array of technological approaches for managing the power supply in order to create a more resilient energy infrastructure and bring cost savings to utilities and consumers. The total capital outlay proposed by KSEB Limited under this head is given below.

Table 9.1

No	Name of Scheme	Commencement	Completion	Project Cost (Rs Cr)	Capacity	
					MW	MWH
<b>ADVANCED ENERGY STORAGE TECHNOLOGY</b>						
	Grid Scale Battery Storage System (BSES)	2022-23	2023-24	105.00	10	50

10) **Dam Rehabilitation Works:** - KSEB Limited submitted that the objective of Dam rehabilitation work is to improve the safety, operational performance and life extension of dams. KSEB Limited is executing work under DRIP project which is a Government of India project, with financial assistance from the World Bank. KSEB Ltd classified the works under the following five parts.

- (1) *Structural Rehabilitation Works* – It includes the strengthening of Dam, replacement of valves, etc. at various dam sites
- (2) *Non-Structural Measures* – it includes implementation of Integrated Reservoir Operation, Installation of Early Warning System, Installation of Automatic Weather Station etc. at various dam sites.
- (3) *Basic Facilities Enhancement* – It includes procurement of survey equipment, construction of access road etc.
- (4) *Instrumentation, SCADA, Surveillance System* – It includes procurement of Installation of accelerographs, Installation of Inflow forecasting & early warning system etc.
- (5) *Others* - It includes hydrographic study, geophysical investigation, site specific seismic parameter estimation, geological studies, other investigations etc.

The total capital outlay of Dam Rehabilitation works is given in the table below.

Table 10.1

No	Name of Scheme	Commencement	Completion	Project Cost
				(Rs Cr)
<b>DAM REHABILITATION</b>				
	Dam Safety work	2022-23	2026-27	<b>128.50</b>

**11) Provisional Approval for the CIP of SBU Generation:**

- 1) *New Hydel Projects:* While approving the ARR & ERC of KSEB Limited for the MYT period 2022-27 on 25<sup>th</sup> June 2022, the Commission considered the GFA addition of only two projects viz; Olikkal SHP (5MW) and Poovaramthodu SHP (3MW) which are scheduled for declaring COD in the year 2025-26, in the new projects category. As there is little chance for COD of the above projects in the year 2025-26, the Commission had considered the COD of the projects in the year 2026-27. GFA addition of 62.32 Crores (38.95 crores for Olikkal & 23.37 crores for Poovaranthodu) was allowed provisionally limiting the cost of construction to normative Capital Cost for SHEP's as per KSERC (Renewable Energy & Net Metering) Regulations, 2020.

- 2) *New Solar Projects*: Since the average project cost of solar projects proposed by KSEB Limited (Rs.3.83 crore per MW) is less than the normative capital cost of Rs 4.00 crore per MW as per KSERC (Renewable Energy & Net Metering) Regulations, 2020, the Commission provisionally considered the capital cost of new solar projects as proposed by KSEB Limited, while approving the ARR & ERC on 25<sup>th</sup> June 2022.
- 3) *New renovation and replacement works (each costing 5 crore or more)*: For the purposes of estimating the revenue requirement of the licensee, the Commission considered 80% of the total GFA addition proposed by KSEB Ltd (Rs 510.36 Cr) in the MYT period from 2022-23 to 2026-27 and provisionally approved Rs 408.29 Crores as GFA addition under the above head, while approving the ARR & ERC during June 2022.
- 4) *New renovation and replacement works (each costing less than 5 crore)*: Commission provisionally approved the proposed schemes/works while approving the ARR & ERC
- 5) *Advance Energy Storage Systems*: Since KSEB Ltd had not submitted the DPR of the project with its cost benefit analysis and further considering the fact that Kerala is having number of large storage hydro projects, the Commission had not considered the project while approving the ARR & ERC.
- 6) *Dam Rehabilitation works*: The Commission had provisionally approved the works proposed by KSEB Ltd under Dam Rehabilitation work while approving the ARR & ERC since the proposed works are for strengthening of the dam and allied works are required for smooth operation of the dam.

The Commission while approving the ARR & ERC of KSEB Limited clarified that GFA addition provisionally considered is only for estimating the ARR for SBU-G of KSEB Limited during the MYT period from 2022-23 to 2026-27. The Commission then ordered that, considering the huge capital investments proposed by KSEB Ltd, the Commission will approve the capital investments separately through public consultation process including public hearing. The GFA out of the capital investment so approved only finally be considered while truing up of accounts of KSEB Limited in each year of the control period.

- 12) In order to facilitate better understanding of the schemes and to analyse the schemes in detail, the Commission took a decision on 16/08/2023 to conduct detailed appraisal of the proposals for investment approval before the public consultation process. The Commission also decided to collaborate with the Electrical Engineering Department of College of Engineering, Thiruvananthapuram

and Institute of Management in Kerala and to obtain their academic inputs for appraisal of the Capital Investment Plan of KSEB Limited. Accordingly, KSEB Limited was directed to present the schemes in detail before the Commission on 11.09.2023 & 12.09.2023. Kerala State Electricity Board Limited presented the projects included in the Capital Investment Plan of SBU Generation before the Commission on the above dates. Dr R Vasanthagopal, Head of Department, Institute of Management in Kerala, University of Kerala and Dr R M Shereef, Professor, Department of Electrical Engineering, College of Engineering, Thiruvananthapuram and their expert faculty members were present in the meetings. Based on the presentation of KSEB Ltd, deliberations during the meeting and the suggestions from the expert faculty members, the Commission directed KSEB Limited vide its letter dated 4.10.2023 to make the following improvements in project management techniques for cost effective and timely completion of the projects and to submit certain additional information/documents to the Commission. The contents of letter dated 4.10.2023 to KSEB Limited is extracted here under.

**“1) i) New Generation Projects: -**

- a) *The Schedule of Rates (SoR) used for preparing estimates for generation projects varies from KPWD SoR 2008 to 2021 price levels which show that the cost estimates have no reflection in the current cost/real cost. The estimates for civil works as well as electro mechanical works have to be revised to the latest SoR applicable in the State.*
- b) *The land acquisition details furnished are very vague and non-specific. The current Right of Fair Compensation and transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (LARR Act 2013) gives very specific steps and time frames for completion of each stage of acquisition. The compensation paid to land owners is realistic under the new Act, and hence there would not be much delay in taking possession of land. The present stage of land acquisition for the projects is not clear from the details furnished. Clarification is also required on whether the cost of land acquisition is included in the estimates or not.*
- c) *PERT chart for each project indicating the weekly/fortnightly/monthly time frame for completion of each component of the project.*
- d) *The year in which decisions were taken by KSEB Limited for each of these projects with details such as date of Administrative Sanction,*

*Technical Sanction, date of tendering, date of awarding, scheduled date of completion and details of revised sanctions if any.*

- e) Completion of all the projects in the proposal depends on the capability, capacity and team works of the Project Team. The capability statement has to be provided for each of the projects. Capability statement should include the details of who-is-who in the Project Division with their qualification, expertise, experience, special training they have received and the major projects they have associated with in the past and the stage of the projects as on date.*
- f) The requirement of human power, materials, machinery required for completion of each project in time and any other infrastructure gaps felt now are to be clearly explained.*
- g) Modern project management technologies, tools, strategies and methods to be introduced in these projects for cost and time saving. Steps taken for co-ordination with different Government departments/agencies shall also be reported*
- h) Are there any incentives proposed for completion of the projects ahead of time and any penalty for delays?*
- i) For all the projects, how many of them need forest clearances and environmental clearances and the present stages of the clearances. The possibility of entrusting Social Impact Study and Environmental Impact Study to internal institutions in the State like Engineering Colleges and MSW Institutes shall be explored to speed up the process. Their services can also be used to educate the people living in the area to avoid/ reduce the possible resistance to projects on their part. Chief Engineers should constantly review the Land Acquisition progress with the Land Acquisition wing*
- j) The cost per MW of most of the hydro projects is higher than the benchmark cost as per KSERC (Renewable Energy and Net Metering) Regulations, 2020 and even higher than the benchmark cost fixed by Central Electricity Regulatory Commission. Project Design has to be optimized to bring down the costs and to optimize generation from the project. Financial prudence and viability shall be ensured for all the projects. Commission observed that it is not rational to take retail supply tariff for calculating payback period instead of cost of alternative power/average cost of power. The commission also observed that the levelized tariff calculation by KSEB Ltd is differing from that given in the*

*subordinate Regulation; KSERC (Renewable Energy and Net Metering) Regulations, 2020.*

- k) KSEB Ltd has to report the details of studies done for making projects cost effective, the outcome of the studies and how they will help in reducing the levelized tariff. The revised DPR for Keerithodu projects has to be submitted as agreed in the meeting.*
- l) As per the earlier national hydro power policy, priorities were given to Small Hydro Electric Projects (SHEP), but as per the latest policy, renewable energy status has been given to other Hydro Electric Projects as well and are treated at par with SHEPs. In such circumstance, the possibility of increasing the capacity of the projects now proposed as SHEP's shall be explored to make the projects viable.*

*Most of the SHEPs proposed are without any storage. As more extent of land is required for the projects, storage optimization by increasing storage volume has to be explored for making the projects viable. The possibility of installing solar plants in these locations are also to be explored.*

- m) For substantiating that argument of KSEB Limited that the cost per MW of the projects cannot be brought down to the national benchmark cost considering the peculiar situations in Kerala, KSEB Limited has to submit justification with split up of costs of different components of a project to the costs at the national level and explain the factors that are beyond the control of KSEB Limited in bringing down the costs.*
- n) Financial Analysis of multi stage projects have to be done taking all the stages of the project considered together.*
- o) Introduce Project Life Cycle Management for the initiation, planning, execution, monitoring, and closure of projects. Give scientific training to project officials, particularly in technical, managerial and financial areas*
- p) Special officers shall be engaged to liaison with forest and revenue officials to ensure timely forest/environmental clearances.*

**ii) Advance Energy Storage Systems: -**

- a) Instead of stand-alone systems, proposals for hybrid systems combining renewable energy sources as well as storage need to be explored*

- b) *Explore the possibility of third-party investments by a developer for the Battery Energy Storage Systems*
- c) *Examine and report the possibility of utilizing the Viability Gap Funding (VGF) recently announced by Government of India for Battery Energy Storage Systems to make the project financially viable*

**iii) Dam Rehabilitations Works: -**

- a) *Details of approvals for the Dam Rehabilitation and Improvement project received from World Bank/Government of India have to be furnished*
- b) *The time schedules for completing DRIP projects coming under phase II & phase III are on the higher side and the works are to be rescheduled to avoid cost overruns*

**2) Improvements in Project Management: -**

*The Commission has observed that there is ample scope for improving efficiency in project management. Accordingly, KSEB Limited shall report the possibility for bringing in the following improvements in project management techniques for cost effective and timely completion of the projects*

- a) *PERT chart for each project indicating the weekly/fortnightly/monthly time frame for completion of each component of the project shall be submitted.*
- b) *Completion of all the projects in the proposal depends on the capability, capacity and team works of the Project Team. The capability statement has to be provided for each of the projects. Capability statement should include the details of who-is-who in the Project Division with their qualification, expertise, experience, special training they have received and the major projects they have associated with in the past and the stage of the projects as on date.*
- c) *The requirement of human power, materials, machinery required for completion of each project in time and any other infrastructure gaps felt now are to be clearly explained.*
- d) *Modern project management technologies, tools, strategies and methods to be introduced in these projects for cost and time saving. Steps taken for co-ordination with different Government departments/agencies shall also be reported*
- e) *Are there any incentives proposed for completion of the projects ahead of time and any penalty for delays?*

- f) *The possibility of entrusting Social Impact Study and Environmental Impact Study to institutions within the State like Engineering Colleges and MSW Institutes shall be explored to speed up the process. Their services can also be used to educate the people living in the area to avoid/ reduce the possible resistance to projects on their part. Chief Engineers should constantly review the Land Acquisition progress with the Land Acquisition wing*
- g) *Introduce Project Life Cycle Management for the initiation, planning, execution, monitoring, and closure of projects. Give scientific training to project officials, particularly in technical, managerial and financial areas*
- h) *Special officers shall be engaged to liaison with forest and revenue officials to ensure timely forest/environmental clearances.”*

13) Based on the above observations and comments of the Commission, KSEB Limited submitted its reply on 28/12/2023. KSEB Limited also filed an additional submission on 03.01.2024. The reply furnished by KSEB Limited is extracted below.

- a) *“The revised estimates of civil works of all new hydel projects are being prepared based on DSR 2018 with latest cost index approved by the Chief Engineer, PWD. For E&M works, latest cost based on the budgetary offer received on each project is taken. On revising the estimate based on 2018 DSR with latest cost index, it is noted that the levelised tariff of most of the SHEPs are coming between Rs 6 to 7 per unit. The suggestion of the Hon’ble Commission to adopt cost effective measures to reduce the cost of the projects is being done in the SHEPs.*

*A team of Civil Engineers & Electrical Engineers from KSEBL has got trained from IIT, Roorkee, on "Cost effective design for Hydro Power Structures". A team headed by the Deputy Chief Engineer, Design & Consultancy, Kozhikode has conducted a study on cost effective methods to be adopted in SHPs by taking Chathankottunada SHEP Stage I as a pilot project. The Dy CE, Design & Consultancy has submitted the report to the Board on “Cost effective revision of DPR for Chathankottunada Stage-I SHEP” and observed that a reduction of cost of about **18.31%** could be attained by adopting various cost-effective modifications suggested in the report.*

*Presently, the design of components of the project are done based on Indian Standard Specifications. To reduce the cost of construction of large dams, the inner side of the dam is provided with lean mix and rich mix is provided*

*on the outer 1.5m thickness on each side of the non-overflow section. But, if the same standard is adopted in small diversion weir, the cost saving is very less as the dimension is less. The report suggests that this 1.5m thickness can be reduced to 0.5m thereby a considerable amount can be saved (Rs 24 Lakhs savings in Chathankottunada SHEP). Similarly, the reports suggest that considerable savings can be achieved by changing the water conductor system of power channel into pipe system. Through pipe system, the forebay tank can be replaced with surge tank, so that surplus channel can be avoided. The savings in water conductor system including intake and forebay and surplus channel is estimated as Rs 4.30 Cr. Similarly, by providing buried penstock instead of surface penstock, the cost of rocker support and anchor blocks can be saved. The savings noted in Chathankottunada Stage I SHEP is about Rs 95 Lakhs.*

*For Kakkayam Pumping Scheme, a cost reduction of about Rs 4 Cr can be achieved by providing semi-permanent weir of composite structure instead of conventional type concrete gravity weir and earthen leading channel by replacing the pipe conduit. This proposal is also under the consideration of the Board. Hence, the DPR of 9 SHEPs, are to be revised incorporating the cost-effective measures suitable for each project.*

- b) Of the projects included in the CAPEX (excluding Idukki Extension), land acquisition of 4 projects viz; Oilkkal, Poovaramthode, Mankulam and Upper Sengulam were completed. The land acquisition of Marmala SHEP is nearing completion. It is also clarified that cost of land acquisition is included in the project cost.*
- c) The details of year in which the sanctions were obtained are also furnished*
- d) The present stages of the forest and environmental clearances are also furnished in the project wise details attached.*
- e) Possibility for a quality cost effective measures are being considered for all the new projects/projects in pipe line.*

*KSERC (Renewable Energy and Net Metering) Regulations, 2020 provides determination of tariff of Small hydro projects of capacity below 5 MW. In the order dated 08.03.2023 in OP 65/2021, for determining the tariff of 4.5MW Arippara SHEP, the Hon'ble Commission has decided to adopt the norms and parameters specified by the Central Commission as specified in the CERC RE Regulations, 2020 for the determination of tariff of the electricity generated from the RE projects, until this Commission amend/modify the norms and parameters in the KSERC RE Regulations, 2020 in line with the*

*CERC RE Regulations, 2020. Hence, the levelised tariff of new hydel projects are calculated based on the parameters specified in the CERC RE Regulations, 2020. Based on the actual scenario, the following parameters were taken as detailed below.*

*(i) Debt : Equity ratio*

*The Debt: Equity ratio is taken as 100:0, since, the entire investments are proposed through loan and no equity is utilized. Regulation 13(1) of CERC RE Regulation 2020 permits actual equity if the equity actually deployed is less than 30% of the capital cost. Regulation 40(1) of KSERC Renewable Energy & Net metering Regulation 2020, also permit the same.*

*(ii) Interest on loan*

*For Peruvannamuzhy SHEP, and Upper Kallar SHEP, KSEBL has already availed loan from NABARD-RIDF with interest of 4.65%. For Upper Kallar SHEP RIDF loan of Rs 18.07 Cr was sanctioned. For Peruvannamuzhy, the Govt vide G.O(Ms) No. 28/2017/PD dated 29.12.2017 has accorded revised AS with a total financial outlay of Rs 77.53 Cr with RIDF loan of 49.85 Cr plus State Govt share of Rs 2.62 Cr as approved by NABARD RIDF Tranche XXIII 2017-18. KSEBL has already applied RIDF-NABARD loan for the ongoing Olikkal and Poovaramthode SHEPs and the loan approval is in progress. KSEBL also propose to apply RIDF-NABARD for ongoing Chinnar SHEP and for work awarded project Upper Sengulam SHEP. KSEBL shall make all efforts to avail NABARD-RIDF loan at lower interest for implementing the projects to the maximum extend.*

*But, for financial analysis, actual interest of loan sanctioned on RIDF NABARD loan will be taken for the projects having NABARD loan and for other projects normative interest as per CERC RE Regulation 2020 will be taken. All other parameters as per CERC RE Regulation 2020 is taken for the financial analysis.*

- f) The report on the “Cost Effective Revision of DPR for Chathankottunada Stage-I SHEP” is already been circulated among the Chief Engineers (Civil) of KSEBL and discussions are going on various cost-effective measures to be adopted for each project. The report is also under examination by the Board. The DPR of Keerithode is being revised for exploring the possibility of a pumped storage.*
- g) The possibility of increasing the capacity of Stage I project of Upper Sengulam SHEP has been explored. For projects above 25MW environmental clearance is required. As the project has already been tendered and work order is issued, the capacity of the project cannot be*

increased at this stage. The possibility of getting VGF from the Government of Kerala (GoK) will be explored.

Vide G.O(Rt) No. 105/2023/POWER dated 12.06.2023, the GoK has accorded Viability Gap Funds (VGF) for following new RE Projects.

Olikkal SHEP	- Rs 10 Cr.
Poovaramthode SHEP	- Rs 10 Cr.
Poringalkuthu Micro HEP	- Rs 1.4373 Cr
Sabarigiri Extension Scheme	- Rs 7.4227 Cr
Idukki Extension (Golden Jubilee)	- Rs 7 Cr

To drive Renewable Energy projects through KSEBL, Viability Gap Funds for new RE Projects is envisaged in the State Support Scheme "INNOVATION FUND AND ESCOT". An amount of Rs 34.86 Cr is provided in the Budget 2023-24 as State share for Innovation fund and ESCOT and VGF for RE Projects. Likewise, KSEBL shall take all efforts to get the VGF for RE Projects every year.

- h) *The storage volume of many of the SHEPs cannot be increased due to site constraints and also due to involvement of forest land. The diversion weir of many of the SHEPs are located in narrow stretches and the upstream side having slope. Hence, by increasing the height of weir, the increase in storage is marginal. However, project wise detailed study will be envisaged for each project to explore all the possibility of increasing storage volume. Storage in lengthy channel can also be considered for storing water for peak demand.*
- i) *The possibility of installing Solar power plants over the power channel and on the sides of canal embankment, vacant area in the project area and on the roof of Power house can be considered. In some project, 4 to 5 acres are available for installing solar plants. For 1MW solar plant, 1.48 acres of land is required. Hence, if 5 acres is available, 3.37MW of solar plant can be installed. Installing 1 MW of solar power plant cost about Rs 5 Cr. Hence, by converting HE Projects into hydro-solar hybrid project, per MW cost can be reduced, thereby reducing the levelized tariff.*
- j) *Due to peculiar nature of hills in the western Ghats in Kerala, the water conductor system especially power canal of some of the small HEPs for conveying water are lengthy to get the ideal site for forebay and powerhouse. In some SHPs like Ladrum, Marmala, Chembukadavu III and Pasukkadavu, tunnel is proposed due to rocky nature of area instead of power channel for conveying water to powerhouse, and hence project cost increases.*

- k) *Upper Sengulam Project and Mankulam HEP are being implemented in two stages. Upper Sengulam Stage I having installed capacity of 1x24MW will be implemented first. Thereafter, Stage II power house housing 1x24MW is constructed. The DPR of Stage II Upper Sengulam has not been prepared.*

*Similarly, Mankulam Hydro Electric Project with a total capacity of 80 MW is being implemented in two stages. Stage I of Mankulam HEP having a capacity of 1x40MW will be implemented first and the work is already progressing. The DPR of combined 80MW Mankulam HEP has also not been prepared”.*

KSEB Limited submitted an additional submission on 3/1/2024. The crux of the submission is as follows. *“Out of the 14 hydel projects initially proposed, the construction works of Olikkal SHEP (5 MW), Poovaranthode SHEP (3MW) and Mankulam HEP (40MW) are progressing. For Upper Sengulam SHEP (24 MW), Letter of Acceptance for civil and hydro mechanical works has been issued on 22.12.2023. The DPR preparation of Idukki (Golden Jubilee) Extension Scheme is progressing. Balance 9 new hydel projects are in the land acquisition stage and are to be tendered after completion of land acquisition. Out of the balance 9 new hydel projects, the revised AS after preparing detailed estimate is given only for Marippuzha SHEP. Revised Administrative Sanction for remaining 6 SHEPs in pipeline viz; Peechad, Western Kallar, Ladrums, Marmala, Valanthode and Chembukadavu III ((excluding Pasukkadavu & Chathankottunada Stage I) are to be issued. The field offices have revised the estimate based on DSR 2018 with latest cost index and the project cost is seen above the benchmark cost fixed by KSERC as well as CERC. Hence there exists the necessity to optimize the above 9 hydel projects for bringing down the cost”*

**In the submissions, KSEB Limited humbly requested the Commission to allow a time of 4 months to submit the revised DPR of 9 SHEPs included in the Capital Investment Plan by incorporating the inputs acquired from the training programme on ‘Cost effective design for hydro power structures’ organized by IIT, Roorkee and revised cost estimates based on latest DSR and relevant Cost Index.**

#### **14) Public Hearing on the Capital Investment Plan**

Public hearing on the Capital Investment Plan of SBU-Generation for the period from 2022-23 to 2026-27 was conducted in the Court Hall of the Commission on

04.01.2024 at 2.30 pm in hybrid mode after publishing the petition in the website of the Commission and also in the website of KSEB Ltd. List of stake holders who attended the hearing is attached as Annexure to this order. At the outset of the hearing, the Commission remarked that even though KSEB Limited had improved a lot in consumer services, the performance of the Licensee in project execution is not satisfactory resulting in cost and time overruns. In addition to this, there would be another loss to the utility attributable to the delay in delivery of products and services created from the projects as well as opportunity costs. KSEB Limited should devise proper plans for timely execution of projects. Periodic review of each and every project shall be conducted and if there are deviations from the schedule, remedial mechanisms are to be put in place to avoid delay in execution. The reasons for the delay and corrective measures taken are to be pro-actively published in the website of the Licensee for information to various stake holders and public along with names of officials involved in various stages of decision making. Involvement of finance wing for project monitoring, cost effective funding and to ensure uninterrupted cash flow shall be ensured. Effective liasoning mechanisms for co-ordination with different agencies and also for bringing issues including land acquisition that requires inter-departmental co-ordination at appropriate level of the Government shall also to be put in place. Status of all ongoing projects shall also to be published in the public domain for information to public. Academic Institutions in Kerala shall also be consulted for policy decisions at Board Level on project implementation. Commission also observed that more investments for viable projects should come in the SBU-Generation. KSEB Limited presented the CIP proposals in the hearing and requested for approval of four numbers of new hydel projects viz; Olikkal, Poovaranthodu, Upper Sengulam and Mankulam out of the 14 numbers of projects included in the initial submission for Capital Investment Plan. The DPR for Idukki Golden Jubilee Extension scheme is under preparation. The licensee requested four months' time for design optimization and submission of revised DPR's for the other 9 projects taking into account the directives of the Commission. The Commission during deliberations remarked that the per MW capital cost of the projects is much higher than the benchmarks costs as per CERC norms. For considering per MW capital cost above the benchmark costs, KSEB Limited has to submit sufficient justification with split up of costs of different components of a project to the costs at the national level and explain the factors that are beyond the control of KSEB Limited in bringing down the costs. Directions given by the Commission during the appraisal meeting

on 11.09.2023 & 12.09.2023 and in the public hearing is detailed in paragraph 12 & 19 of this order.

List of persons who attended in the meeting physically and through online mode is attached as *Annexure 1* of this Order.

**15) Comments/views expressed by the Stake holders during the public hearing**

The Commission received several comments and objections from the consumers and general public on the CIP petition of KSEB Ltd. HT/EHT industrial electricity consumers association furnished their written comments on the petition. Gist of comments/views expressed by stakeholders during the public hearing on 04.01.2024 relevant to the CIP of SBU Generation is detailed below.

- a) Shri. Sivaramakrishnan (KREEPA) pointed out that, the outlays of solar projects and battery energy storage systems are meagre in the Capital Investment Plan of KSEB Limited; only Rs.149 crores (2.9%) is allocated for them out of the total budget of Rs.5130 crores. This is inadequate to meet the requirements and requested the Commission to direct KSEB Limited to provide more investment in these areas, especially in solar, wind energy and battery energy storage systems.
- b) Shri. Dijo Kappen stated that even though KSEB Limited has much improved in customer services, the achievements in electricity generation in the state of Kerala is much lower compared to other States. He expressed reservation on considerable improvement in generation of electricity in the state, with the proposed Capital Investment Plan comprising of mostly of Small Hydro Electric Power Stations. He also informed the costs per MW of most of the projects are very high citing the example of Pasukkadavu SHEP where the capital cost per MW comes to Rs 13 crores. Citing various examples, he also raised concern regarding the inordinate delay in execution of generation projects resulting in delayed benefits to the public in addition to cost and time overruns. He requested the Commission to give approval only for projects that are viable and economically feasible. It shall be ensured that the projects are completed in time to avoid additional burden on the consumers. He also requested the Commission to direct KSEB Limited to explore the off shore wind energy potential in Kerala.
- c) Shri. Saji Mathew, MRF, Kottayam submitted that timely completion of projects should be ensured. He also requested to upgrade the machines in very old generating stations instead of spending huge amounts for maintenance purposes. He also requested to study the feasibility of Pumped Storage Systems.

- d) Shri. K. Radhakrishnan, HT & EHT Industrial Electricity Consumers Association also highlighted the importance of timely completion of projects in a cost-effective manner. The Association submitted that, the Hon'ble Commission had astutely recognized the unrealistic and grandiose projections in the CAPEX proposed by KSEBL, outlining major observations and an approach to the CAPEX proposal in the ARR order issued during June 2022. Regarding Idukki Golden Jubilee Extension scheme, the Association submitted that considering the magnitude of this project and its implications for the state's consumers, a comprehensive approach is necessary to evaluate its financial viability. It is crucial to consider all potential risks and scenarios, including opportunity loss on long-term power purchases, shifts in peak demand, changes in monsoon patterns, the possibility of a shift in storage profiles, and the potential entry of new distribution licensees in Kerala, along with changes in KSEBL's market share based on proposed amendments in the Electricity Act. Alternate studies and critical analyses are inevitable, and further discussions and deliberations are needed on this project after submitting a detailed project proposal as directed by the Commission. Of the remaining 13 projects, the Association has concurred with the views taken by the Commission while approving the ARR & ERC for the current MYT period and submitted that investment approval for Olikkal and Poovaramthodu may be considered and the status of Upper Sengulam may be reviewed.

Regarding Olikkal SHEP, the Association submitted that in order to achieve the envisaged 77.62 Mm<sup>3</sup> runoff from a catchment of 14.14 km<sup>2</sup>, the average rainfall required is calculated to be  $(77.62 \times 1000000) / (14.14 \times 1000 \times 1000) = 5.489$  meters or 5489 mm, assuming 100% rain yield. Considering normal rain yield is typically 65-70%, the actual rainfall required for the projected runoff will be higher. The projected plant load factor with the current yield is only 23.3%, emphasizing that the project's viability is highly dependent on water availability due to its small catchment. Poovaramthodu and Olikkal being cascade project, such variation if any will affect the viability of both the projects. This technical issue is to be reviewed critically. It is very much advisable to cross check the rainfall data with nearby rain gauge stations or IMD data in that case also. The Association also pointed out the discrepancies in installed capacities of machines described in various paragraphs and tables of the CIP. The Association also doubted the availability of MNRE grant for the projects. The Association recommended to verify all these details before granting final approval. For SHEPs, the capital cost per MW for the new hydel projects proposed by KSEBL for the control period is alarmingly high, ranging from Rs. 9 crore/MW to Rs. 19 crore/MW. These projects, being small run-off river projects with lower or moderate Plant Load Factors (PLF), could be more efficiently implemented by Independent Power Producers (IPP) through private investment, relieving KSEBL from

additional burdens on CAPEX and O&M cost per unit generated. A holistic approach by the Hon'ble Commission to expedite the utilization of natural resources and benefit the state's consumers is strongly recommended.

The Association further pointed out that the projected Capital Cost per MW for the new solar projects put forth by KSEBL for the Control Period appears to be on the higher end, specifically at Rs.6.7Crore/MW for Ettumanoor plant.

*KSEBL reply:* In reply to the comments of HT/EHT Association regarding the rainfall required for the annual yield of 77.62Mm<sup>3</sup> from the catchment area of 14.14 sq km, KSEBL reported vide its submission dated 07-02-2024, the average yearly rainfall data from the nearby Urumi rain gauge station of Chaliyar basin for the years from 2008-09 to 2022-2023. The rainfall details are shown in the table below.

Table 15.1

<b>Year</b>	<b>Rainfall (in mm)</b>
2008-2009	6321.60
2009-2010	7053.60
2010-2011	6736.20
2011-2012	6184.80
2012-2013	4868.60
2013-2014	8425.40
2014-2015	7519.00
2015-2016	5518.30
2016-2017	4218.20
2017-2018	5415.50
2018-2019	8105.00
2019-2020	6708.60
2020-2021	6721.20
2021-2022	6824.50
2022-2023	6057.40
<b>Average Rainfall</b>	<b>6445.19</b>

KSEB Limited clarified that the average annual yield from average rainfall of 6.445m from the catchment area of 14.14 sq km is 91.93 Mm<sup>3</sup> and the average yield in the river (water available as runoff) worked out from the rainfall-runoff correlation is 77.62Mm<sup>3</sup>. Since the terrain is very steep, 85% of the water reaches the river and the above yield corresponds to 85% of the total yield.

Regarding the 1 MW SPV Project at Ettumanoor, KSEB Limited submitted that the project is proposed in the 4.83 acres of land owned by KSEB Limited,

which is marshy in nature. Since the land cannot be utilized for other purposes, the SPV plant is proposed at the site. The increase proposed in investment is due to the higher cost of foundation required in marshy soil for installing the solar plant.

- e) Shri. Mohammed Rafeek, All Kerala Licensed Wiremen, Contractors & Supervisors Association requested for completion of all projects on a war footing and requested the Commission to give necessary directions to the KSEBL to submit a comprehensive report on the status of all ongoing projects with steps taken for timely completion of the projects.
- f) Shri. Nithin Das requested to give importance to pumped storage projects and implement waste to energy projects.
- g) Shri. Modi M.T representing KSEB Officers Association requested the Commission to give investment approval for the two storage projects viz; Upper Sengulam & Mankulam HEPs without delay. He also requested the Commission to give approval for the Olikkal & Poovaranthodu Small Hydro Electric Projects, which are in the construction stage. He also stated that the Western Kallar and Peechad Projects are cascading SHEPs found to be viable and stated that all Small Hydro Projects are to be completed on time.

During the hearing KSEB Limited submitted that many Pumped Storage Projects are on the anvil and proposals would be submitted to the Commission after conducting necessary feasibility studies.

- 16) Based on the comments/remarks during the deliberations of the public hearing on 04.01.2024, the licensee submitted certain additional details on 7/02/2024. The submission contained details of ongoing projects proposed in the Capital Investment Plan with their detailed construction/execution schedule (CPM/PERT chart), details of project execution team, remarks on the comments by various stake holders and details such as administrative/technical sanction, tendering details, present stage of the projects and physical/financial progress as on date of four ongoing hydel projects viz; Olikkal, Poovaranthodu, Mankulam and Upper Sengulam with CPM/PERT charts. The submission also contained details of spillover projects including delays, time/cost overruns and present progress of Pallivasal Extension Scheme, Pazhassi Sagar SHEP, Peruvavannamuzhi SHEP, Chinnar SHEP, Thottiar HEP, Bhoothathankettu SHEP and Sengulam Augmentation Scheme. The details of the four ongoing projects as per the submission are given in the table below.

Table 16.1

Name of the Project	AS amount (in Cr.) & date of AS	Physical/Financial progress as on Dec '23	Scheduled date of Commissioning	Remarks
Olikkal& Poovaranthodu	107.643/ 13.03.2020	Olikkal 30% Poovaranthodu 20.92%	September 2025	AS issued as a single package
Mankulam	600/ 16.11.2021	9.11/8.75%	December 2026	Installation Completion
Upper Sengulam	316/ 03.11.2020	-	February 2028	-

Later, vide submission dated 11/04/2024, the licensee informed that of the above projects, the Upper Sengulam HEP (48 MW, 79.72 MU) and Mankulam HEP (80 MW, 213.644 MU) are proposed to be executed as multistage projects.

#### 17) Analysis & Decision of the Commission:

1) The Commission after considering the petition filed by KSEB Limited for approval of Capital Investment Plan of SBU Generation, provisions of the Electricity Act 2003, provisions in the relevant Regulations notified by CERC and KSERC, deliberations during the public hearing, comments of various stake holders, additional submission of KSEB Limited and other documents and records decided as follows.

##### **(A) New Generation Projects:**

(i) KSEB Limited in the petition for Capital Investment Plan has proposed 14 hydel projects during the control period 2022-2027 as given in the table below.

Table 17.1

No	Name of Scheme	Commencement	Completion	Project Cost	Capacity	
				(Rs Cr)	MW	MU
<b>NEW HYDEL PROJECTS</b>						
1	Upper Sengulam	2022-23	2025-26	316.00	24.00	53.22
2	Peechad	2022-23	2026-27	27.64	3.00	7.74
3	Western Kallar	2022-23	2026-27	51.24	5.00	17.40
4	Ladrum	2022-23	2026-27	48.81	3.50	12.13
5	Maramala SHEP	2022-23	2026-27	74.28	7.00	23.02
6	Pasukkadavu SHEP	2022-23	2026-27	51.00	4.00	10.34
7	Valanthode SHEP	2022-23	2026-27	69.11	7.50	17.36
8	Marippuzha SHEP	2022-23	2026-27	71.95	6.00	14.84

9	Chembukadavu III SHEP	2022-23	2026-27	64.11	7.50	16.65
10	Chathankottunada SHEP - Stage I	2022-23	2026-27	71.59	5.00	12.06
11	Olikkal SHEP	2022-23	2025-26	46.00	5.00	10.26
12	Poovaramthodu SHEP	2022-23	2025-26	46.00	3.00	5.88
13	Mankulam HE Project	2022-23	2026-27	750.00	40.00	102.85
14	Idukki (Golden Jubilee) Extension Scheme	2023-24	2028-29	3062.08	800.00	1301.00

(ii) Later vide additional submission dated 08.03.2023, KSEB Limited has proposed four more new hydel projects for approval as given in the table below.

Table 17.2

No	Name of Scheme	Commencement	Completion	Project Cost	Capacity	
				(Rs Cr)	MW	MU
<b>NEW HYDEL PROJECTS- ADDL</b>						
1	Poringalkuthu Micro HEP	31.10.2023	31.03.2024	1.44	0.036	0.25
2	Kakkayam Pumping Scheme	31.12.2023	30.11.2025	25.72	0	29.49
3	Poringalkuthu SHEP Stage II	31.12.2023	30.11.2025	80.7	24	53.85
4	Keerithode SHEP	01.02.2024	31.01.2027	141.92	3.50	27.65

(iii) On detailed analysis of the new hydro-electric projects proposed by KSEB Limited, it can be observed that, most of the projects proposed by KSEB Limited are run-of-the-river small hydro electric projects. These plants operate only during rainy season, whenever the power demand is usually low. As per the earlier national policies, priorities were given to Small Hydro Electric Projects. The policies have been changed substantially and at present there is no specific promotion of Small Hydro Electric Projects. At the same time, there is concerted focus and promotion of hydro projects including large hydro projects. Govt of India has also introduced significant changes in the Renewable Purchase Obligation (RPO) for hydro electric plants. From FY 2022-23 onwards, the energy from all hydro electric plants will be considered as part of RPO. The HPO (Hydro Power Obligation) shall be met from energy produced by Large Hydro plants including Pumped Storage plants commissioned after 8<sup>th</sup> March 2019. All other Hydro Power Plants will be considered as part of 'other RPO'

The recent times have witnessed a tremendous increase in variable and renewable sources like solar and wind in the energy mix. The incorporation of significant amount of variable and intermittent renewable energy into the energy mix presents a challenge for maintaining grid stability and

uninterrupted power supply. Energy Storage Systems like Battery Energy Storage Systems and Pumped Storage Projects are also growing at a faster pace.

The recent initiative by Central Electricity Authority at the Central Government to formulate Resource Adequacy Plan by each state is expected to provide a comprehensive framework for ensuring sufficient power supply to meet the electricity demands round the clock and round the year. The plan needs to undertake a least cost generation optimization to fully meet the demand such that, it minimizes the overall system cost – including operations and maintenance cost, costs to procure spinning reserves etc. The optimization shall take into account all constraints related to power plant operations like ramp-up/ramp-down limits and their costs, generation limits, energy storage options, interconnections limits, renewable addition (RPO) targets, solar rooftop/distributed generation capacities, retirement schedules of existing generation plants, planning reserve margin etc.

As stated above, the energy landscape in the State is undergoing a monumental shift, and it is essential to move away from the conventional planning process to accommodate these changes. This necessitates the need for planning and development of generation projects after analyzing the present and future system requirements of Kerala through a proper Resource Adequacy plan, so as to ensure prudence of the investments. Accordingly, it is directed that, henceforth, the petition for approval of Capital Investment in generation shall invariably contain justification for the investment on the basis of Resource Adequacy Plan formulated for the State.

- (iv) In the submission dated 03.01.2024 and in the public hearing conducted on 4.01.2024, KSEB Limited requested to give approval for the CIP of 4 projects viz; Olikkal, Poovaranthodu, Upper Sengulam and Mankulam out of the 14 projects submitted for approval of Capital Investment Scheme on 10.01.2022. The licensee further informed that, land acquisition for the above 4 projects is over and construction works of Olikkal, Poovaranthodu and Mankulam have been commenced. For the Upper Sengulam HEP, there was a pending case regarding the award of contract and the case has been disposed of now. The DPR preparation of Idukki Golden Jubilee Extension scheme is under preparation. For the balance 9 projects, KSEB Limited requested the Commission to allow a time of 4 months for optimization of design of civil infrastructure and submission of the revised DPR's and revised cost estimates based on latest DSR.

(v) Regarding the 4 additional hydel projects submitted for approval of CIP on 8/3/2023, the licensee submitted that the DPR of Keerithode SHEP is being revised to explore the possibility of integrating pumped storage. For Kakkayam Pumping Scheme, the DPR revision is under consideration of the Board for design optimization. For Poringalkuthu Micro HEP, work order has been issued during December 2023. VGF of ₹1.4373 Crore is approved by the Government including in Innovation and ESCOT fund of the Government for the execution of the scheme vide G.O.(Rt)No.105/2023/POWER dated 12.06.2023. Poringalkuthu SHEP Stage II requires only construction of about 140m of penstock, valve house, power house & tail race channel. The cost of infrastructural facilities is the barest minimum and the land demarcated for the scheme is in possession of KSEBL taken on lease from Forest department. Considering the above, the Commission decided to give approval for CIP of the Poringalkuthu Micro HEP and Poringalkuthu SHEP Stage II, along with the 4 projects mentioned in sub paragraph 17 1 (A) (iv) above. Thus, the Commission decided to give approval for six new hydroelectric projects viz; Olikkal, Poovaranthodu, Upper Sengulam Mankulam, Poringalkuthu Micro HEP and Poringalkuthu SHEP Stage II.

a. The details of the above mentioned six projects along with its project cost & cost/ MW is given in the table below.

Table 17.3

No	Name of Scheme	Commencement	Completion	Project Cost	Capacity		Cost/ MW
				(Rs Cr)	MW	MU	(Rs. Cr/ MW)
NEW HYDEL PROJECTS							
1	Upper Sengulam	2022-23	2025-26	316.00	24.00	53.22	13.17
2	Olikkal SHEP	2022-23	2025-26	46.00	5.00	10.26	9.20
3	Poovaramthodu SHEP	2022-23	2025-26	46.00	3.00	5.88	15.33
4	Mankulam HE Project	2022-23	2026-27	696.06	40.00	102.85	17.40
5	Poringalkuthu Micro HEP	2023-24	2023-24	1.44	0.036	0.25	-
6	Poringalkuthu SHEP Stage II	2024-25	2026-27	80.7	24	53.85	3.36

Govt of Kerala has accorded Viability Gap Funds (VGF) of 10 Crore each for Olikkal SHEP and Poovaranthodu SHEP vide G.O(Rt) No. 105/2023/POWER dated 12.06.2023. Full project cost of 1.4373 Crore had been granted as VGF

for Poringalkuthu Micro HEP Project. On analysis of cost/MW of the above projects, it can be seen that cost/MW of Upper Sengulam, Poovaranthodu and Mankulam are higher than the benchmarks costs as per CERC norms. Even though the Commission, during the preliminary appraisal of the CIP of SBU-Generation of KSEB Limited and its letter dated 4.10.2023, directed KSEB limited to submit its justification for the higher cost per MW of projects above benchmarks costs as per CERC norms, with split up of costs of each major components of a project and explain the factors that are beyond the control of KSEB Limited, the licensee has not submitted proper justification for the same.

- b. The Commission on 7th February 2020 had notified the KSERC (Renewable Energy and Net Metering) Regulations, 2020 and it was published in the official Gazette on 5th of June 2020. As per Regulation 33 of the said Regulations, it is applicable for five years from 2019-20, i.e., up to 2023-24. Later the Commission extended the validity of the Regulation up to 2024-25 as per the KSERC (Renewable Energy & Net Metering) (Second Amendment) Regulations 2024. The Chapter-V of the RE Regulations 2020 deals with the technical and financial norms and other aspects and procedures for the determination of tariff. The second proviso to Regulation 32 of RE Regulations, 2020 specifies that, this Commission while formulating and notifying the principles and norms and parameters for determination of tariff of the RE projects was guided by the principles, norms and parameters specified by the Central Commission for the determination of tariff of the electricity generated from the Renewable Energy Projects. It is also specified in the RE Regulations 2020 that, until separate norms and parameters are specified by this Commission for the purpose of determination of tariff, the principles norms and parameters specified in the CERC (Terms and Conditions for Tariff Determination from Renewable Energy Sources) Regulations, 2017, as amended from time to time shall be adopted the Commission for determination of tariff under these regulations. KSERC vide its order dated 8.3.2023 on OP No 65/2023 (petition filed by CIAL Infrastructures Ltd for approval of PPA and to determine generic tariff applicable for small hydro projects having capacity below 5MW) decided to adopt the norms and parameters specified by the Central Commission as specified in the CERC RE Regulations, 2020 for the determination of tariff of the electricity generated from the RE projects, until this Commission amend/modify the norms and parameters in the KSERC RE Regulations, 2020 in line with the CERC RE Regulations, 2020. CERC has further amended the CERC RE Regulations, 2020 on 12<sup>th</sup> June 2024. As per regulation 27 of CERC (Terms and Conditions for Tariff Determination from Renewable Energy Sources) Regulations, 2024, the normative capital cost for small hydro projects having capacity below 5 MW is Rs 8.9 crore per MW and

for projects from 5 MW to 25 MW, it is Rs 10.27 crore per MW. This is the ceiling on capital cost specified for small hydro projects. Having considered the above, the Commission decided to adopt the above ceiling norms for approval of Capital Investment Plan of new hydroelectric projects of KSEB Limited as per the present petition.

- c. Olikkal SHEP (5 MW) and Poovaranthodu SHEP (3 MW) are two cascading run off river projects in the Chaliyar basin of Kozhikode District. KSEB Limited during the public hearing informed that for Olikkal & Poovaranthodu SHEPs, revised AS for Rs 107.643 was issued on 13.03.2020 bundling both the projects together as a single package. KSEB Limited further informed the details of proposed multi stage hydroelectric projects vide its additional submission on 11.04.2024. The details of two multi-stage projects as per the submission of KSEB Limited is given below.

(a) *Upper Sengulam HEP (48 MW, 79.72 MU)*: Upper Sengulam is proposed to be executed in two stages with 24 MW installed capacity in stage -I. After completing Stage-I, it is proposed to construct stage-II with additional capacity of 24 MW. Thus, the total capacity of the project will be 48 MW with expected annual energy of 79.72 MU. The capital cost of Upper Sengulam Hydro Electric Project (Stage I & Stage II combined) is estimated as Rs 418.96 crore including IDC.

(b) *Mankulam HEP (80 MW, 213.644 MU)*: Mankulam HEP is also proposed to be executed in two stages with 40 MW installed capacity in stage-I. Mankulam stage-I utilizes water from Melacherry river and the second stage of the project aims for utilizing the yield from the adjacent sub catchment of the Lower Rajamala Ar and Kadalar of the same Puyankutty basin. Total cost of the project is estimated as 793.3188 crore.

The first stage of multi-stage projects incurs higher construction costs due to significant investment in common infrastructure including land acquisition, construction of dams/weirs, power evacuation facilities, construction of roads/bridges etc. Additionally, most of the common facilities must be designed and implemented in the first stage of a project itself, taking into account the requirements for further stage(s) of the project also. Therefore, it is prudent to consider the total project cost of multi-stage projects for financial analysis as part of approval of Capital Investment Plan of such projects. However, KSEB Limited is yet to submit the DPRs and Administrative Sanction details of the combined stages of the Upper Sengulam and Mankulam hydroelectric projects.

- d. In consideration of the points described in paragraph 17 (1)(A) (iii) to (v) above, the Commission decided to approve the Capital Investment Plan of new hydel projects of SBU-Generation of KSEB Limited as given in the table 17.4 below. The capital cost of the projects is limited to the ceiling norms as per CERC (Terms and Conditions for Tariff Determination from Renewable Energy Sources) Regulations, 2024 or project cost as per Administrative Sanction, whichever is lower. For Olikkal & Poovaranthodu SHEPs, the Commission decided to give approval for the combined project, considering the fact that the projects are cascading projects and KSEB Limited decided to implement the projects as a single package bundled together. For Upper Sengulam and Mankulam hydro-electric projects, the Commission decided to give provisional approval for the first stage of the projects limiting the cost of the construction to the ceiling norms of CERC. Ceiling norms has not been applied to Poringalkuthu Micro HEP as the project is fully funded by the State Government.

Table 17.4

No	Name of Scheme	Commencement	Completion	Project Cost	Capacity		Approved
				(Rs Cr)	MW	MU	Capital Cost (In Cr)
NEW HYDEL PROJECTS							
1	Upper Sengulam	2022-23	2025-26	316.00	24.00	53.22	246.48*
2	Olikkal SHEP & Poovaramthodu SHEP	2022-23	2025-26	107.643	8	16.14	82.16
3							
4	Mankulam HE Project	2022-23	2026-27	696.06	40.00	102.8	410.8*
5	Poringalkuthu Micro HEP	2023-24	2023-24	1.44	0.036	0.25	1.44
6	Poringalkuthu SHEP Stage II	2024-25	2026-27	80.7	24	53.85	80.7
7	Total			1201.843			821.58
8	Less Escot & Innovation fund						1.44
9	<b>Net KSEB Limited Fund</b>						<b>820.14</b>

**Accordingly, the Commission decided to give provisional approval for a net amount of Rs 820.14 crore for projects under the category of “New Hydel Projects”.**

*\*The capital costs approved for the first stage of Upper Sengulam & Mankulam hydro-electric projects are provisional. For the multi stage hydroelectric projects,*

Commission will consider approval of the Capital Investment Plan for all the stages of the projects considered together, when KSEB Limited files a petition with Detailed Projects Report, details of Administrative Sanction, project schedule and financial analysis of the projects.

**(B) New Solar Projects:**

The new solar projects proposed by KSEB Limited for approval of Capital Investment Plan is detailed in the table below.

Table 17.5

SI No	New Solar Projects	Proposed year wise outlay (Rs. Cr)				Project Cost (Cr)
		2022-23	2023-24	2024-25	2025-26	
1	Ground mounted solar project at Ettumanoor- 1 MW		4.287	2.4		6.687
2	PM KUSUM- Component C feeder level solarisation -11 MW		30	27		57
3	Clubbed project of KSEBL Kanjikkode 1.25 MW		7.38			7.38
4	Ground mounted Solar Project at Nenmara	Not required (location included in 11MW PM KUSUM above)				
5	Soura Kerala Model	Nil	0.15	Nil		0.15

(i) In the public hearing on 04.01.2024, KSEB Limited informed that the capacity of PM KUSUM- Component C feeder solarization project has been increased to 11 MW and a new solar project at Kanjikkode with a capacity of 1.25 MW is also planned. KSEB Limited further informed that the ground mounted solar project at Nenmara is not required as the project is clubbed with PM KUSUM- Component C feeder level solarization project. Soura Kerala model project has been completed during 2023-24 with small capacity plants with an aggregate capacity of 192 KW.

(ii) As per KSERC (Renewable Energy & Net Metering) Regulations, 2020, the normative capital cost for Solar PV projects commissioned during the control period shall be limited to Rs 4.00 crore/ MW. Commission has revised the normative capital cost of Solar PV projects of capacity up to 500 KW in the KSERC (Renewable Energy & Net Metering) (First Amendment) Regulations, 2022. As per the existing CERC (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, only project specific tariff will be determined to Solar PV projects considering the prevailing market

conditions. For PM-KUSUM Component C, feeder level solarization program, central financial assistance of Rs 1.05 Cr/MW is available. Considering the above facts, the Commission decided to limit the cost per MW of solar projects at Rs 4 crore and give approval for the solar PV projects as given in the table below.

Table 17.6

Sl No	New Solar Projects	Commencement	Completion	Project Cost Cr)	Approved Cost (Cr)
1	Ground mounted solar project at Ettumanoor- 1 MW	2023-24	2024-25	6.687	4
2	PM KUSUM- Component C feeder level solarisation -11 MW	2023-24	2024-25	57	44
3	Clubbed project of KSEBL Kanjikode 1.25 MW	2023-24	2024-25	7.38	5
4	Ground mounted Solar Project at Nenmara	Not required (location included in 11MW PM KUSUM above)			
5	Soura Kerala Model	2023-24	2023-24	0.15	0.15
	<b>Total</b>				<b>53.15</b>

**Accordingly, the Commission decided to give approval for an amount of Rs. 53.15 crore for projects under the category of “New Solar Projects”**

***(C) New renovation and replacement works (each costing 5 crore or more): -***

KSEB Limited during the initial submission of CIP proposed 24 numbers of works amounting to 550.36 crores under the category. During the public hearing on 04.01.2024, the licensee informed that the proposal has been modified and 30 works are proposed under the category; 5 works under Generation Circle, Moolamattom, 12 works under Generation Circle, Moozhiyar, 3 works under Generation Circle, Meencut, 3 works under Generation Circle, Kothamangalam, 4 works under Generation Circle, Thrissur and 3 works under Generation Circle, Kozhikode. On detailed scrutiny of the proposal, it is noted that certain works have been cancelled and new works have been added. For 15 numbers of works, Administrative Sanction details and DPRs for projects costing more than 10 crores have not been submitted by the licensee. Considering the present status of works, the Commission decided to give approval for the following 15 projects as detailed in the table below.

Table 17.7

SI No	Name of Work	Commencement	Completion	Project Cost	Approved Cost	Remarks	
				(Rs Cr)	(Rs Cr)		
<b>C</b>	<b>NEW RENOVATION/REPLACEMENT WORK (MAJOR WORK -5 Cr AND ABOVE)</b>						
1	Rectification/Replacement of Penstock, butterfly valves and allied works at Sengulam HEP	2023-24	2024-25	97.00	97	98% completed	
2	Shaft replacement Unit#2 and refurbishment of stator winding of Sabarigiri HEP	2022-23	2023-24	20.5	20.5	Supply of shaft completed	
3	Design, Engineering, Supply, Erection and Commissioning of 2 Nos of new Pressure Release Valve (PRVs) at Panniar HEP	2023-24	2025-26	10.23	10.23	W.O issued	
4	Pallivasal hydroelectric project Penstock replacement	2022-23	2023-24	47.67	47.67	Work under progress	
5	Shaft replacement Unit#2 and refurbishment of stator winding of Sabarigiri HEP	2022-23	2023-24	20.5	20.5	Supply of shaft completed	
6	Unit#3 Stator and core repair work and condition monitoring work at Lower Periyar HEP	2023-24	2024-25	20	20	Tendering stage	
7	Generator Transformer purchase at Sholayar Power House	2022-23	2024-25	7.50	7.50	Tendering stage	
8	Replacement of butterfly valves (4 nos) at Porigalkuthu Power House	2022-23	2025-26	6.00	6.00	Tendering stage	
9	Penstock renovation at Porigalkuthu Power House	2025-26	2025-26	9.00	9.00		
10	Construction of new wind farm at Kanjikode /Stage 1	2023-24	2024-25	34.85	34.85	Tendering stage	
11	Revamping of KSEBL colony Moolamattom by providing new housing complex with modern amenities Phase I & II	2022-23	2023-24	10.53	10.53		
12	RLA Study of II nd stage machines at Idukki Power Station	2022-23	2022-23	3.88	3.88	Completed	
13	Refurbishment of MIV of first stage machines at Idukki HEP	2022-23	2023-24	6.00	6.00		
14	Purchase of 2 nos. spare runner for Stage I Idukki HEP	2024-25	2025-26	19.00	19.00	Purchase Order issued	
15	Purchase of new 6 nos of transformers at Idukki HEP	2022-23	2026-27	30.00	30.00	Procurement in progress	
	<b>Total</b>				<b>342.66</b>		

Accordingly, the Commission decided to give approval for an amount of **Rs.342.66 crore for works under the category of “New renovation/replacement work 5 crore and above”**. For the balance 15 numbers of projects, the licensee has to submit necessary Administrative Sanction orders and Detailed Projects Reports (for projects costing 10 crore or more) for investment approval.

**(D) New renovation and replacement works (each costing less than 5 crore):-**

KSEB Limited during the public hearing on 4.01.2024 submitted the latest status of works under the category “New renovation and replacement works (each costing less than 5 crore) requiring investment approval. Details are given in table 17.8. The total project outlay has been reduced to Rs.143.53 crores as against Rs.193.63 crores requested in the original petition.

Table 17.8

Year	2022-23	2023-24	2024-25	2025-26	2026-27	Total ( in Cr)
Rs. Cr	24.19	57.65	37.00	13.42	11.27	<b>143.53</b>

Commission after detailed scrutiny decided to give approval for an amount of **Rs 143.53 crores for works under the category of “New renovation/replacement works costing less than 5 crores.**

**(E) Advance Energy Storage Technology: -**

*For Advance Energy Storage Technology system, the licensee had not submitted DPR and Administrative Sanction for the project and hence the Commission decided not to consider the proposal.*

**(F) Dam Rehabilitation and Improvement Project (DRIP): -**

KSEB Limited in the public hearing on 4.01.2024 informed the phase I of the project is completed. The project duration for DRIP II project is 2021-27 and DRIP III project is 2025-31. The projects overlap during the last two years of the control period. The funding pattern to Kerala for DRIP Phase II is 70:30. 70% of Project cost will be co-financed by IBRD and AIIB and 30% will be the State Share. The licensee during the public hearing clarified that there is no grant component for the project. Since the works are proposed for strengthening of the dams and allied works required for the safe operation of the dams, the Commission decided to give investment approval for the works detailed in table 17.9 below.

Table 17.9

Sl. No.	Name of Project	2022-23	2023-24	2024-25	2025-26	2026-27	Total
		In Rs. crore					
1	DRIP (Ac. Head 14.40 & 14.30)	15.25	15.25	17.55	27.60	27.60	103.25
2	Dam Safety studies / works (Ac. Head 14.90)	6.25	6.25	5	5	5	27.7
	<b>Total</b>	<b>21.50</b>	<b>21.50</b>	<b>22.55</b>	<b>32.60</b>	<b>32.60</b>	<b>130.75</b>

The Commission, after detailed scrutiny, decided to give approval for an amount of Rs 130.75 crores for projects under the category of “Dam Rehabilitation and Improvement Project (DRIP)”.

**2) Approved Summary of Capital Investment Plan of SBU-Generation:**

The summary of Capital Investment Plan of SBU-Generation approved by the Commission with year wise outlays is given in the table below.

Table 17.10

Capital Investment Plan of SBU-Generation, KSEB Limited

Particulars	2022-23	2023-24	2024-25	2025-26	2026-27	TOTAL
	(Rs. Cr)	(Rs. Cr)	(Rs. Cr)	(Rs. Cr)	(Rs. Cr)	(Rs. Cr)
NEW HYDEL PROJECTS (SIX PROJECTS)	0	1.44	0	328.64	491.5	821.58*
NEW SOLAR PROJECTS	0	0.15	53	0	0	53.15
NEW RENOVATION/ REPLACEMENT WORK (MAJOR WORK -5 CR & ABOVE)	3.88	105.2	159.35	44.23	30	342.66
NEW RENOVATION/ REPLACEMENT WORK (LESS THAN 5 CR)	24.19	57.65	37	13.42	11.27	143.53
ADVANCED ENERGY STORAGE TECHNOLOGY	0	0	0	0	0	0
DAM REHABILITATION	21.5	21.5	22.55	32.60	32.60	130.75
<b>TOTAL (Rs. Crore)</b>	<b>49.57</b>	<b>185.94</b>	<b>271.9</b>	<b>418.89</b>	<b>565.37</b>	<b>1491.67</b>
Less Grants/ subsidies	0	1.44	0	0	0	1.44
<b>Net KSEB Limited Fund</b>	<b>49.57</b>	<b>184.5</b>	<b>271.9</b>	<b>418.89</b>	<b>565.37</b>	<b>1490.23</b>

\*Provisional approval in respect of multi stage projects.

## 18) Orders of the Commission

Duly considering the petition filed by KSEB Limited, additional submissions of KSEB Limited, provisions in the Electricity Act, 2003, Rules and Regulations made thereunder, provisions in CERC (Terms and Conditions for Tariff Determination from Renewable Energy Sources) Regulations, 2024, KSERC (Renewable Energy & Net Metering) Regulations 2020 and its amendments, KSERC (Terms and Conditions for Determination of Tariff) Regulations, 2021, the objections and comments of various stakeholders, the Commission hereby orders as follows.

- 1) To give approval for the **‘Capital Investment Plan for the SBU –Generation of KSEB Limited for the Control Period (2022-2027), for a net amount of 1490.23 crores**, as provided in the Table 17.10 of Paragraph 17 above. Accordingly, the provisionally approved amount for Asset addition/ Capital Investment for SBU –Generation vide Para 3.11 to 3.20 of the Order dated 25<sup>th</sup> June 2022 in Petition OP No. 11/ 2022 shall be deemed to be revised as approved above.
- 2) For the balance hydel projects included in the petition for approval of Capital Investment Plan, the Commission allows a time up to November 2024 for submission of petition for investment approval after design optimization of the projects, as part of petition for mid-term review during the control period. The petition shall contain all details including revised DPRs, details of Administrative Sanction and time schedules with PERT charts. Similarly, for the projects coming under the category, *“New Renovation/Replacement Work (major works -5 Cr and above)”* requiring investment approval, the licensee has to submit the necessary details including Administrative Sanction orders and Detailed Projects Reports (for projects costing 10 crore or more) along with the above petition.
- 3) New investments in generation projects shall be planned based on the system requirements of Kerala grid through a proper Resource Adequacy plan, as explained in paragraph 17(1)(A) (iii) of this order, so as to ensure prudence of the investments. The Commission will consider proposals for new investments only in cases where the proposed investments are part of the least cost investment trajectory identified through the Resource Adequacy Planning Process.

- 4) The licensee shall provide the complete source of funding, its interest and repayment terms for the proposal including the complete details of any Viability Gap Funding (VGF), grants, or similar financial support, including their terms and conditions and Commercial Operation Date (COD) of each project, during the truing up of accounts for the respective year.

## 19) Directives

**The following directives are issued by the Commission for strict compliance. This is addition to the directives issued by the Commission on 04.10.2023 detailed in paragraph 12 of this Order.**

1. The Commission has noted undue delays in project execution by KSEB Limited, resulting in time and cost overruns. The Commission will not permit cost escalation due to these delays to be passed through in tariffs. KSEB Limited must implement suitable mechanisms at the policy, strategic, and operational levels to prevent such delays in project implementation.
2. KSEB Limited is required to establish a monthly monitoring system to review the progress of works and take corrective actions as necessary. Timely decisions must be made to ensure that projects are completed in an optimal and cost-effective manner. Updates on all major capital works should be published in the public domain.
3. KSEB Limited must involve its finance wing in project execution to mobilize resources, secure cost-effective financing, and ensure uninterrupted cash flow.
4. KSEB Limited shall appoint special officers to liaise with forest and revenue officials to facilitate the timely acquisition of forest and environmental clearances.
5. KSEB Limited should explore the possibility of designing upcoming Hydro Plants to operate in a hybrid mode- operating mostly in generation mode during the monsoon season and as Pumped Storage Plants (PSPs) during lean periods. This approach, if feasible, can ensure year-round operation and support peak summer demand, thereby enhancing the viability of new hydro investments. KSEB Limited shall explore all possible means to improve viability

of projects, including measures like enhancing storage, reducing capital cost, utilization of project area for other forms of RE generation etc.

The portion of the petition for approval of the Capital Investment Plan for SBU-Generation of the original petition OP No 65/2023 is disposed of, as ordered above.

**Sd/-  
T K Jose  
Chairman**

**Sd/-  
Adv. A J Wilson  
Member**

**Sd/-  
B Pradeep  
Member**

Approved for issue

**Sd/-  
C R Satheesh Chandran  
Secretary**