

MINUTES OF THE 18TH MEETING OF THE EXPERT APPRAISAL COMMITTEE FOR RIVER VALLEY AND HYDROELECTRIC PROJECTS HELD ON 28TH OCTOBER, 2021 FROM 10:30 AM – 5:30 PM THROUGH VIDEO CONFERENCE.

The 18th meeting of the re-constituted EAC for River Valley & Hydro-electric Projects organized by the Ministry of Environment, Forest and Climate Change, Indira Paryavaran Bhawan, Jor Bagh Road, New Delhi, was held on 28th October 2021 through video conference, under the Chairmanship of Dr. K. Gopakumar. The list of Members present in the meeting is at **Annexure**.

Agenda No. 18.1

CONFIRMATION OF THE MINUTES OF 17TH EAC MEETING

The minutes of the 17th EAC (River Valley Hydroelectric Project) meeting held on 29th September, 2021 were confirmed.

Agenda No. 18.2

Kurukutti Pumped Storage Hydro-electric Project (1200MW), in an area of 638 Acres located at village Chemidipatipolam and Kurukutti, Tehsil Salur, District Vizianagaram, Andhra Pradesh by M/s New and Renewable Energy Development Corporation of Andhra Pradesh Ltd. (NREDCAP) – Terms of Reference - reg.

[Proposal No. IA/AP/RIV/233688/2021; F. No. J-12011/13/2021-IA. I (R)]

18.2.1 The proposal is for grant of Terms of Reference (ToR) to Kurukutti Pumped Storage Hydroelectric Project (1200MW), in an area of 638 Acres located at village Chemidipatipolam and Kurukutti, Tehsil Salur, District Vizianagaram, Andhra Pradesh by M/s New and Renewable Energy Development Corporation of Andhra Pradesh Ltd. (NREDCAP).

18.2.2 The details of the project submitted by project proponent and ascertained from the document submitted are mentioned below:

- i. The proposed project is pumped storage being develop by M/s New and Renewable Energy Development Corporation of Andhra Pradesh Limited (NREDCAP) is the State Nodal Agency for development of renewable power in the state of Andhra Pradesh.
- ii. Kurukutti Pumped Storage Hydroelectric Project located at village Chemidipatipolam and Kurukutti, Tehsil Salur, District Vizianagaram, Andhra Pradesh by M/s NREDCAP.
- iii. M/s NREDCAP has taken up the Kurukutti Pumped Storage Project located in Salur Taluka of Vizianagaram District, Andhra Pradesh. Proposed project is a standalone pumped storage scheme envisaged with an installed capacity of 1200 MW (8400 MWH storage capacity).
- iv. Project is proposed to utilize the head available between upper dam proposed across a minor nallah draining into Boduru Gedda river and lower dam proposed across Boduru Gedda river, a tributary of Suvarnamukhi river (Nagavali river basin).

- v. The upper dam is located near Chemidipatipolam village, Salur Taluka, Vizianagaram district of Andhra Pradesh state having a geographical latitude 18° 36' 52" N & longitude 83° 02' 40.4" E. The lower dam is located near Kurukutti village, Salur Taluka, Vizianagaram district of Andhra Pradesh with the geographical latitude 18° 36' 33.8" N and longitude 83° 04' 45.6" E located near Kurukutti village, Salur Taluka, Vizianagaram district of Andhra Pradesh with the geographical latitude 18° 36' 33.8" N and longitude 83° 04' 45.6" E.
- vi. The scheme envisages recycling of stored water between upper reservoir and lower reservoir (common for both Kurukutti and Karrivalasa PSPs) located across Boduru Gedda river, a tributary of Suvarnamukhi river in Nagavali river basin.
- vii. It utilizes available gross head of about 589 m and envisages non-consumptive utilization of 11.0 Mm³ (0.39 TMC) of water by recirculation between upper and lower reservoirs on a weekly basis.
- viii. The project will facilitate energy storage and balance variable power from renewable energy sources (predominantly large scale solar plants) available during day time effectively for meeting the energy requirement during peak hours and thereby ensuring grid balancing. Along with balancing on-peak and off-peak demands, a pumped storage scheme also helps in controlling electrical network frequency and stabilizing the operation of grid.
- ix. Major project components of the proposed Kurukutti PSP (5 x240 MW) are as follows:

Component	Project Parameters
Upper Dam	680 m long & 71 m high (Gross storage = 12.6 Mm ³)
Lower Dam	740 m long & 62 m high (Gross storage = 38.7 Mm ³)
Upper Intake / Outlet	Circular intake, 20.3 m dia., 12 nos. trashrack bays each with a size of 3.9 m (W) x 8.0 m (H)
Lower Intake / Outlet	Circular intake, 20.3 m dia., 12 nos. trashrack bays, each with a size of 3.9 m (W) x 7.0 m (H)
Headrace Tunnel	8 m dia. & 1010 m long. Horse-shoe shaped, concrete lined
Surge Shaft	10 m dia. & 105 m high, Restricted orifice type
Pressure Shaft	6.8 m dia. & 1800 m long, Steel lined
Powerhouse	Shaft type, Five (5) nos. of shafts, each of 29 m finished dia.
Tailrace Tunnel	8 m dia. & 530 m long. Horse-shoe shaped, concrete lined
Pothead Yard	280 m x 70 m (400 kV Switchyard)

- x. Power from Kurukutti PSP will be evacuated to / drawn from 400kV grid substation through 400kV single circuit line on multi circuit tower. 220/400kV Maradam substation is considered as grid station, which is approximately 40 km away from project site for evacuation / drawal of power for proposed PSP. The estimated average annual energy generation from the PSP is 2527 Mu and total energy required for pumping is 3308 Mu per annum. The overall cycle efficiency of the project works out to be about 76%.

- xi. **Project Cost:** The capital cost of the project is Rs. 4766 Crores at 2020-21 price level including Interest During Construction (IDC) of Rs. 538 Crores. The project is expected to be operational within a period of five (5) years from the date of award of civil works package.

The levelized cost of generation of the project has been found to be Rs 7.85/kWh considering cost of pumping @ Rs 3.00/kWh. Kurukutti pumped storage project is a technically feasible project and will be beneficial in meeting the peaking requirement of energy during evening/night in the beneficiary state i.e. Andhra Pradesh.

- xii. **Land requirements:** The total land required for the construction of various components including infrastructure facilities for Kurukutti PSP is estimated to be around 171.182 ha, out of which 146.182 ha is private land and 25 ha is forest land.

According to PFR submitted by PP, the total land required for the project components and related works has been estimated to be about 638 Acres, which includes 628 Acres of land that needs to be acquired and 10 Acres of land which needs to be taken on lease basis. In addition to the above, the extent of land involved for Right of Way (RoW) for underground works & transmission line has been estimated to be about 460 Acres. The land area apportioned to Kurukutti PSP works out to be about 433 Acres, which includes 423 Acres of land area which needs to be acquired and 10 Acres of land area which needs to be taken on lease.

As there was discrepancy in land requirements for the project, the Member secretary sought clarification from the PP vide email dated 1st November, 2021 and PP vide email dated 1st November, 2021 informed that following are the land requirement for Kurukutti Pump Storage HEP:

Sl. No.	Description / Project Component	Area (ha)	
		Private Land	Forest Land
1	Upper dam/reservoir (incl. upper intake)	58.275	
2	Powerhouse complex	6.071	
3	Lower dam/reservoir (including lower intake)	57.151	25.00
4	Approach road	1.214	
5	Offices & Colony	2.023	
6	Dumping Area	20.234	
7	Bay Extension	1.214	
Sub Total		146.182	25.00
Total		171.182	

Accordingly, submergence area will be about 137.65 ha including Upper reservoir (58.03 ha) and Lower Reservoir (79.62 ha).

Diversion of forest land for non-forest purpose will be involved for construction of Kurukutti project components. Therefore, Forest Clearance to be obtained under Forest Conservation Act.

- xiii. There is no Protected Area in the vicinity of the proposed project. Kambalakonda WLS, located about 85 Km from site, is the nearest protected area. All the components of the Kurukutti PSP are located within the administrative boundary of the state of Andhra Pradesh.
- xiv. **R&R:** The project prima facie involves submergence of agricultural lands in Chemidipatipolam village under the upper reservoir and Kurukutti village under the lower reservoir. Further, the project also involves submergence of existing habitations at Rampadu, Tadivalasa, Nerellivalasa and Kotha colony.

18.2.3 The EAC during deliberations noted the following:

EAC in the present meeting (18th meeting) deliberated on the information submitted (Form 1, PFR, etc.) and noted that the lower reservoir will be common for Kurukutti Pumped Storage Hydroelectric Project (1200MW) and Karrivalasa Pumped Storage Hydroelectric Project (1000MW). Total land requirement for the project is 171.182 ha, out of which 146.182 ha is private land and 25 ha is forest land. EAC further noted that No Ecological Sensitive Area, if any within 10 km of Project site (WLS/Tiger/elephant corridor/Critically polluted area etc.).

The Project will generate 1200 MW by utilizing available gross head of about 589 m and envisages non-consumptive utilization of 11.0 Mm³ (0.39 TMC) of water by recirculation between upper and lower reservoirs on a weekly basis.

18.2.4 *The EAC after detailed deliberation on the information submitted and as presented during the meeting recommended for grant of Standard ToR to Kurukutti Pumped Storage Hydroelectric Project (1200MW), in an area of 638 Acres located at village Chemidipatipolam and Kurukutti, Tehsil Salur, District Vizianagaram, Andhra Pradesh by M/s New and Renewable Energy Development Corporation of Andhra Pradesh Ltd. (NREDCAP) under the provisions of EIA Notification, 2006, as amended along with the following additional/specific ToR:*

- i. Three season (Pre-monsoon, Monsoon and winter season) baseline data of all the environmental attributes including biological environment as mentioned in the Standard ToR shall be collected for preparation of EIA/EMP report. Soil characteristics shall be studied at minimum 10 locations. The ground water level at 10 locations shall be measured in project area in all three seasons.*
- ii. Scope of watershed development in the 10 km radius of the project shall be studied in consultation with Indian Council of Agriculture Research (ICAR) and accordingly a detailed Water Shed development Plan shall be prepared and incorporated in EIA/EMP report.*
- iii. The PP shall explore the possibility of fulfilling the entire power requirement to pump the water from the lower reservoir to the proposed upper reservoir from renewable sources except under exceptional unforeseen situations.*
- iv. A study shall be carried out on impact of project activity on the aquatic and terrestrial ecosystem, within project area classifying the impact zones (highly impact/low impact zone) based on seasonal variations and covering the aspects related to impacts on aquatic ecosystem/primary productivity due to quantity of water to be lifted for power*

generation and thermal stratification. Accordingly, Environment Management plan shall be prepared.

- v. *Fisheries Management Plan shall be prepared along with other Environmental Safety Measures for Boduru Gedda river and shall be incorporated in the EIA/EMP report.*
- vi. *Declaration by the project proponent by way of affidavit that “No” Inter-state issue / policies issue is involved with any state in the project.*
- vii. *All the tasks including conducting public hearing shall be done as per the provisions of EIA Notification, 2006 and as amended from time to time. Public hearing issues raised and compliance of the same shall be incorporated in the EIA/EMP report in the relevant chapter. Statement on the commitments (activity-wise) made during public hearing to facilitate the discussion on the CER in compliance of the Ministry’s OM F.No.22-65/2017-IA.III dated 30th September, 2020 shall be submitted.*
- viii. *Consolidated EIA/EMP report to be submitted as per the generic structure (Appendix III & IIIA) given in the EIA Notification, 2006.*
- ix. *Pre-DPR Chapters viz., Hydrology, Layout Map and Power Potential Studies duly approved by CWC /CEA shall be submitted.*
- x. *Techno-economic viability of the project must be recommended from CEA/CWC.*
- xi. *Environmental matrix during construction and operational phase needs to be submitted.*
- xii. *Matrix formulated on the basis of detailed study and field survey of flora and Fauna methodology used may be mentioned in the EIA report.*
- xiii. *Both capital and recurring expenditure under EMP shall be submitted.*
- xiv. *Endemic plant and animal species found in the area concerned shall be provided instead listing entire endemic species found in the State.*
- xv. *Environmental Cost Benefit Analysis shall be done in terms of water availability, water uses for generation of hydro power and Ecological flows in the Boduru Gedda river.*
- xvi. *Undertaking regarding water allocated to this scheme shall not be diverted to other purpose such as lift irrigation scheme etc.*
- xvii. *Photograph of sampling location shall contain specific date and time along with coordinates which shall be incorporated in EIA.*
- xviii. *Details of quantity of muck generation component wise (Excavation in tunnels, pressure shaft and powerhouse etc) and disposal site/ transportation to be provided.*
- xix. *Tentative no. of project affected families shall be identified and accordingly appropriate Rehabilitation & Resettlement plan shall be prepared.*

- xx. *Details of Flora and Fauna reported in submergence area, No.s of tree along with their density required to be cut for reservoir creation and other project component.*
- xxi. *Ground water depth in project vicinity area to be collected and to be incorporated in EIA/EMP report.*
- xxii. *Impact on aquatic ecosystem due to quantity of water to be lifted for power generation be incorporated in EIA/EMP report.*
- xxiii. *Impact of Project activity on the aquatic and terrestrial ecosystem, within study area to be studied and be incorporated in EIA/EMP report.*
- xxiv. *An undertaking as part of the EIA report from Project proponent, owning the contents (information and data) of the EIA report with the declaration about the contents of the EIA report pertaining to a project have not been copied from other EIA reports.*

Agenda No. 18.3

Karrivalasa Pumped Storage Hydroelectric Project (1000MW), in an area of 593 Acres located at village Ganjaibhadra and Kurukutti, Tehsil Salur, District Vizianagaram, Andhra Pradesh by M/s New and Renewable Energy Development Corporation of Andhra Pradesh Ltd. (NREDCAP) – Terms of Reference - reg.

[Proposal No. IA/AP/RIV/233717/2021; F. No. J-12011/14/2021-IA. I (R)]

18.3.1 The proposal is for grant of Terms of Reference (ToR) to Karrivalasa Pumped Storage Hydroelectric Project (1000MW), in an area of 593 Acres located at village Ganjaibhadra and Kurukutti, Tehsil Salur, District Vizianagaram, Andhra Pradesh by M/s New and Renewable Energy Development Corporation of Andhra Pradesh Ltd. (NREDCAP)

18.3.2 The details of the project submitted by project proponent and ascertained from the document submitted are mentioned below:

- i. The proposed project is pumped storage being develop by M/s New and Renewable Energy Development Corporation of Andhra Pradesh Limited (NREDCAP) is the State Nodal Agency for development of renewable power in the state of Andhra Pradesh.
- ii. Karrivalasa pumped storage project is a standalone pumped storage scheme envisaged with an installed capacity of 1000 MW (7000 MWH) storage capacity. The scheme envisages recycling of stored water between upper reservoir and lower reservoir (common for both Kurukutti and Karrivalasa PSPs) located across Boduru Gedda river, a tributary of Suvarnamukhi river in Nagavali river basin.
- iii. Project is proposed to utilize the head available between upper dam proposed across a minor nallah draining into Boduru Gedda river and lower dam proposed across Boduru Gedda river, a tributary of Suvarnamukhi river (Nagavali river basin).
- iv. The upper dam is located near Ganjaibhadra village, Salur Taluka, Vizianagaram district of Andhra Pradesh state having a geographical latitude 18° 38' 8.70" N and longitude 83°

3' 0" E. The lower dam is located near Kurukutti village, Salur Taluka, Vizianagaram district of Andhra Pradesh with the geographical latitude 18° 36' 33.8" N and longitude 83° 04' 45.6" E.

- v. It utilizes available gross head of about 509 m and envisages non-consumptive utilization of 11.1 Mm³ (0.39 TMC) of water by recirculation between upper and lower reservoirs on a weekly basis.
- vi. The proposed Karrivalasa PSP (4x250 MW) envisages following major civil structures:
 - a) Upper Dam (RCC-Roller Compacted Concrete): Crest length 520 m, maximum height 88 m above the deepest river bed level. The gross storage capacity of Upper reservoir is 13.2 Mm³.
 - b) Lower Dam (RCC-Roller Compacted Concrete): Crest length 740 m, maximum height 62 m above the deepest river bed level. The gross storage capacity of Lower reservoir is 38.7 Mm³.
 - c) Upper Intake/Outlet: Vertical type, circular intake, 20.3 m dia., 12 nos. trashrack bays, each with a size of 3.9 m (W) x 8.0 m (H).
 - d) Lower Intake/Outlet: Vertical type, circular intake, 20.3 m dia., 12 nos. trashrack bays, each with a size of 3.9 m (W) x 7.0 m (H).
 - e) Headrace Tunnel: 1410 m (length), 8.0 m (diameter), horse-shoe shaped, concrete lined.
 - f) Surge Shaft: Restricted orifice type, 11 m diameter, 115 m high, circular, concrete lined.
 - g) Pressure Shaft: 2180 m (length), 7.0 m (diameter), steel lined and branching near powerhouse, each with 4.5 m diameter and 140 m long.
 - h) Shaft Type Powerhouse: Four (4) nos. of shafts, each of 29 m finished diameter, circular shaped and concrete lined
 - i) Tailrace Tunnel: 440 m (length), 8.0 m (diameter), horse-shoe shaped, concrete lined.
 - j) Pothead Yard: 220 m x 70 m
 - k) Approach road: Strengthening of existing village roads - 5 km Construction of new road - 10 km
- vii. Power from Karrivalasa PSP will be evacuated to / drawn from 400kV grid substation through 400kV double circuit line on multi circuit tower. 220/400kV Maradam substation is considered as grid station, which is approximately 40 km away from project site for evacuation / drawal of power for proposed PSP. The estimated average annual energy generation from the PSP is 2106 Mu and total energy required for pumping is 2808 Mu per annum. The overall cycle efficiency of the project works out to be about 75%.
- viii. **Project Cost:** The capital cost of the project is Rs. 4446 Crores at 2020-21 price level including Interest During Construction (IDC) of Rs. 502 Crores.

The levelized cost of generation of the project has been found to be Rs 8.38/kWh considering cost of pumping @ Rs 3.00/kWh. Karrivalasa pumped storage project is a technically feasible project and will be beneficial in meeting the peaking requirement of energy during evening/night in the beneficiary state i.e. Andhra Pradesh.

- ix. **Land requirements:** The total land required for the construction of various components including infrastructure facilities for Karrivalasa PSP is estimated to be around 152.971 ha, out of which 127.971 ha is private land and 25 ha is forest land. Diversion of forest land for non-forest purpose will be involved for construction of Karrivalasa project

components. Therefore, Forest Clearance is required to be obtained under Forest Conservation Act.

As per the PFR submitted by PP, the total land required for the project components and related works has been estimated to be about 593 Acres, which includes 583 Acres of land that needs to be acquired and 10 Acres of land which needs to be taken on lease basis. In addition to the above, the extent of land involved for Right of Way (RoW) for underground works & transmission line has been estimated to be about 460 Acres. The land area apportioned to Karrivalasa PSP works out to be about 388 Acres, which includes 378 Acres of land area which needs to be acquired and 10 Acres of land area which needs to be taken on lease.

As there was discrepancy in land requirements for the project, the Member secretary sought clarification from the PP vide email dated 1st November, 2021 and PP vide email dated 1st November, 2021 informed that following are the land requirement for Karrivalasa Pump Storage HEP:

Sl. No.	Description / Project Component	Area (ha)	
		Private Land	Forest Land
1	Upper dam/reservoir (incl. upper intake)	37.23	
2	Powerhouse complex	5.26	
3	Lower dam/reservoir (including lower intake)	57.15	25.00
4	Approach road	4.86	
5	Offices & Colony	2.02	
6	Dumping Area	20.23	
7	Bay Extension	1.21	
Total		127.97	25.00

Accordingly, submergence area will be about 113.44 ha including Upper reservoir (33.82 ha) and Lower Reservoir (79.62 ha).

Diversion of forest land for non-forest purpose will be involved for construction of Kurukutti project components. Therefore, Forest Clearance to be obtained under Forest Conservation Act.

- x. There is no Protected Area in the vicinity of the proposed project. Kambalakonda WLS is about 88 Km from site, is the nearest protected area
- xi. The project will involve submergence of agricultural lands and/or habitations under the upper and lower reservoirs. A detailed socio-economic analysis of people, structures and property likely to be impacted by the proposed project will be planned during DPR stage.
- xii. **Inter State / Inter-national aspects:** The catchment area of Boduru Gedda river upto lower dam site is about 83 km². Out of the above catchment area, about 35 km² of catchment area lies in the state of Odisha and remaining catchment area lies in the state of Andhra Pradesh. Considering the respective catchment area contribution, about 42% of total annual yield upto proposed lower dam site is expected to be realized from the catchment area situated in Odisha. Balance 58% of annual yield is realized from the catchment area situated in Andhra Pradesh.

- xiii. **Employment and Local Area Development:** The setting up of a 1000 MW PSP project would provide employment to hundred plus technical staff and provide job opportunity to thousands during the construction phase.
- xiv. **Water availability & Catchment area:** Boduru Gedda river and lower dam is proposed across Boduru Gedda river. Boduru Gedda river, which is a tributary of Suvarnamukhi river originates at an elevation of about RL 1400 m near Serubandha Parbat located in Odisha State. It flows for a length of about 22 km and drains a total catchment area of about 102 km, upto its confluence with Pedda Gedda River near Mokhasadandigam village. After its confluence with Pedda Gedda river, it is known as Suvarnamukhi river and further flows for a length of about 72 km and joins Vegavathi river near the Madduvalasa Reservoir. The total catchment area of Suvarnamukhi river upto its confluence with Vegavathi river is about 1337 km².

18.3.3 The EAC during deliberations noted the following:

EAC in the present meeting (18th meeting) deliberated on the information submitted (Form 1, PFR, etc.) and noted that the lower reservoir will be common for Kurukutti Pumped Storage Hydroelectric Project (1200MW) and Karrivalasa Pumped Storage Hydroelectric Project (1000MW).

The EAC further noted that about 35 km² of catchment area falling in the state of Odisha and remaining catchment area lies in the state of Andhra Pradesh. The total land required for the project is estimated to be around 152.971 ha, out of which 127.971 ha is private land and 25 ha is forest land.

The Project will generate 1000 MW by utilizing available gross head of about 509 m and envisages non-consumptive utilization of 11.1 Mm³ (0.39 TMC) of water by recirculation between upper and lower reservoirs on a weekly basis.

18.2.4 *The EAC after detailed deliberation on the information submitted and as presented during the meeting **recommended** for grant of Standard ToR to Karrivalasa Pumped Storage Hydroelectric Project (1000MW), in an area of 593 Acres located at village Ganjaibhadra and Kurukutti, Tehsil Salur, District Vizianagaram, Andhra Pradesh by M/s New and Renewable Energy Development Corporation of Andhra Pradesh Ltd. (NREDCAP) under the provisions of EIA Notification, 2006, as amended along with the following additional/specific ToR:*

- i. *Three season (Pre-monsoon, Monsoon and winter season) baseline data of all the environmental attributes including biological environment as mentioned in the Standard ToR shall be collected for preparation of EIA/EMP report. Soil characteristics shall be studied at minimum 10 locations. The ground water level at 10 locations shall be measured in project area in all three seasons.*
- ii. *Scope of watershed development in the 10 km radius of the project shall be studied in consultation with Indian Council of Agriculture Research (ICAR) and accordingly a detailed Water Shed development Plan shall be prepared and incorporated in EIA/EMP report.*

- iii. *The PP shall explore the possibility of fulfilling the entire power requirement to pump the water from the lower reservoir to the proposed upper reservoir from renewable sources except under exceptional unforeseen situations.*
- iv. *A study shall be carried out on impact of project activity on the aquatic and terrestrial ecosystem, within project area classifying the impact zones (highly impact/low impact zone) based on seasonal variations and covering the aspects related to impacts on aquatic ecosystem/primary productivity due to quantity of water to be lifted for power generation and thermal stratification. Accordingly, Environment Management plan shall be prepared.*
- v. *Fisheries Management Plan shall be prepared along with other Environmental Safety Measures for Boduru Gedda river and shall be incorporated in the EIA/EMP report.*
- xxv. *Declaration by the project proponent by way of affidavit that “No” Inter-state issue / policies issue is involved with any state in the project.*
- vi. *All the tasks including conducting public hearing shall be done as per the provisions of EIA Notification, 2006 and as amended from time to time. Public hearing issues raised and compliance of the same shall be incorporated in the EIA/EMP report in the relevant chapter. Statement on the commitments (activity-wise) made during public hearing to facilitate the discussion on the CER in compliance of the Ministry’s OM F.No.22-65/2017-IA.III dated 30th September, 2020 shall be submitted.*
- vii. *Consolidated EIA/EMP report to be submitted as per the generic structure (Appendix III & IIIA) given in the EIA Notification, 2006.*
- viii. *Pre-DPR Chapters viz., Hydrology, Layout Map and Power Potential Studies duly approved by CWC /CEA shall be submitted.*
- ix. *Techno-economic viability of the project must be recommended from CEA/CWC.*
- x. *Environmental matrix during construction and operational phase needs to be submitted.*
- xi. *Matrix formulated on the basis of detailed study and field survey of flora and Fauna methodology used may be mentioned in the EIA report.*
- xii. *Both capital and recurring expenditure under EMP shall be submitted.*
- xiii. *Endemic plant and animal species found in the area concerned shall be provided instead listing entire endemic species found in the State.*
- xiv. *Environmental Cost Benefit Analysis shall be done in terms of water availability, water uses for generation of hydro power and Ecological flows in the Boduru Gedda river.*
- xv. *Undertaking regarding water allocated to this scheme shall not be diverted to other purpose such as lift irrigation scheme etc.*
- xvi. *Photograph of sampling location shall contain specific date and time along with coordinates which shall be incorporated in EIA.*

- xvii. *An undertaking as part of the EIA report from Project proponent, owning the contents (information and data) of the EIA report with the declaration about the contents of the EIA report pertaining to a project have not been copied from other EIA reports. Photograph of sampling location shall contain specific date and time along with coordinates which shall be incorporated in EIA.*
- xviii. *Details of quantity of muck generation component wise (Excavation in tunnels, pressure shaft and powerhouse etc) and disposal site/ transportation to be provided.*
- xix. *Tentative no. of project affected families shall be identified and accordingly appropriate Rehabilitation & Resettlement plan shall be prepared.*
- xx. *Details of Flora and Fauna reported in submergence area, No. of tree along with their density required to be cut for reservoir creation and other project component.*
- xxi. *Approval from CWC regarding total availability of water for the instant project.*
- xxii. *Ground water depth in project vicinity area to be collected and to be incorporated in EIA/EMP report.*
- xxiii. *Impact on aquatic ecosystem due to quantity of water lifting for power generation to be studied and incorporated in EIA/EMP report.*
- xxiv. *Impact of Project activity on the aquatic and terrestrial ecosystem, within study area to be studied and incorporated in EIA/EMP report.*

Agenda No. 18.4

Somasila Pumped Storage Hydroelectric Project (900MW), in an area of 183 ha located at village Racheyapeta and Ramapuram, Tehsil Gopovaram Mandal, District Kadapa, Andhra Pradesh by M/s New and Renewable Energy Development Corporation of Andhra Pradesh Ltd. (NREDCAP) – Terms of Reference - reg.

[Proposal No. IA/AP/RIV/233871/2021; F. No. J-12011/15/2021-IA.I (R)]

18.4.1 The proposal is for grant of Terms of Reference (ToR) to Somasila Pumped Storage Hydroelectric Project (900MW), in an area of 183 ha located at village Racheyapeta and Ramapuram, Tehsil Gopovaram Mandal, District Kadapa, Andhra Pradesh by M/s New and Renewable Energy Development Corporation of Andhra Pradesh Ltd. (NREDCAP).

18.4.2 The details of the project submitted by project proponent and ascertained from the document submitted are mentioned below:

- i. The proposed project is pumped storage being develop by M/s New and Renewable Energy Development Corporation of Andhra Pradesh Limited (NREDCAP) is the State Nodal Agency for development of renewable power in the state of Andhra Pradesh.

- ii. Somasila Pumped Storage Project (4x 225 MW = 900 MW) Somasi is located close to villages Racheypeta and Ramapuram in the Gopavaram Mandal of Kadapa district in Andhra Pradesh.
- iii. The project location falls on the left bank of existing Somasila Reservoir in NE direction with upper reservoir at geographical co-ordinate 14°38'4.12"N and 79°10'41.98"E and lower reservoir at geographical co-ordinate 14°39'14.09"N and 79°10'34.25"E.
- iv. The project is a standalone pumped storage scheme to meet the power requirements during the peaking time and to maintain grid stability. The scheme envisages drawl of water from existing Somasila reservoir for initial filling into the proposed lower reservoir through a pipeline arrangement. Both the reservoirs are planned to be interconnected through water conductor system and the reversible generator pump turbine would be installed in the underground powerhouse.
- v. The scheme is envisaged to meet the peak demand of about 6 hours with an estimated annual energy generation of 1971.0 GWh. Off-peak pumping hours are estimated as 7.33 hours with annual pumping energy of 2409.0 GWh. The cycle efficiency of the project is 80.73%. The proposed Somasila Project is envisaged as a pumped storage scheme with traditional fixed speed synchronous motor/generator design.
- vi. **Project Components:**
 - a) **Upper Reservoir & Dam (Concrete Gravity Dam):** The Upper reservoir is located in the natural depression area having potential to create sufficient pondage by providing concrete gravity dam on both sides of depression area for creating the reservoir. a. North Facing Dam (Upper Intake side) b. South Facing Dam
 - b) **Upper Intake:** Two intake structure, one for each reservoir (Upper and Lower) consisting of four bays each of 3.75m width to accommodate 17 numbers of trash rack panel of size 3.75m x 2.5m, at the mouth of the intake.
 - c) **Pressure Shaft:** 2 Nos. 5.30m diameter 903.2m long steel lined pressure shaft bifurcating into 2 nos. branch penstock of 3.75m diameter 78.70m length leading to powerhouse.
 - d) **Underground Powerhouse & Transformer Cavern:** The overall dimension of the Powerhouse is 147m (L) x 23m (W) x 52m (H). Transformer Cavern size is 160.0m (L) x 21.5m (W) x 29.50m (H).
 - e) **Tailrace Tunnel:** Four nos. tail race tunnel of 4.50m diameter from the downstream wall of machine hall merging with the twin main tailrace tunnel of 6.30m diameter.
 - f) **Lower Reservoir & Dam (Concrete Gravity Dam):** The lower reservoir is proposed by providing a concrete gravity dam only on one side. The maximum height of Concrete Gravity Dam is around 33.50m.
 - g) **Intake cum Jack well pump house and D.I pipe line:** 1.2m diameter, 14.70km long ductile iron pipe line is proposed from the jack well pump house (located near the existing Somasila reservoir) to the lower reservoir for initial filling.
 - h) **Pothead Yard:** Considering four numbers outgoing feeders, 420kV pothead with tentative area of 140m x 60m has been propose
- vii. **Project Cost:** The estimated cost of the Project is Rs. 3498.08 Crores (including IDC of Rs. 492.72 Crores). The annual energy generation is 1971.0 GWh and the annual pumping energy requirement is 2409.0 GWh. The levelized cost of generation of the

project has been estimated as Rs 7.28/kWh considering cost of pumping @ Rs 3.00/kWh.

viii. **Land requirement:** Entire Project area falls under forest land and 183 ha of land is required for Project Construction. Diversion of forest land for non-forest purpose will be involved for construction of Somasila project components. Therefore, Forest Clearance to be obtained under Forest Conservation Act 1980. The submerged area for Lower reservoir is **76.14 ha** and that for upper reservoir is 29.09 ha. The total area of the land being **submerged is 105.23 ha.**

ix. **Ecological Sensitive Area, if any within 10km of project site (WLS, Tiger/elephant corridor, Critically Pollute Area etc**

The project components are proposed outside the Eco-Sensitive Zone (ESZ) of Sri Penusila Narasimha Wildlife Sanctuary (PNWLS), the pipeline for the initial filling of reservoir will be laid through the PNWLS. Thus, Wildlife Protection Act is applicable for this project and clearance / NOC to be obtained for this project from National Board for Wild Life (NBWL). Forest Cover in the State is 29,137.40 sq km which is 17.88 % of the State's geographical area. In terms of forest canopy density classes, the State has 1,994.22 sq km under Very Dense Forest (VDF), 13,938.36 sq km under Moderately Dense Forest (MDF) and 13,204.82 sq km under Open Forest.

x. **BIODIVERSITY & WILDLIFE** - Andhra Pradesh forests are endowed with varied forest types, unique eco-systems, diverse habitats and biodiversity rich areas. Andhra Pradesh has 3 National Parks and 13 Wildlife Sanctuaries covering an area of 7,311.08 sq km which is about 4.49% of the geographical area of the State. It's store house of several unique and endemic flora and fauna which includes Pterocarpus santalinus (Red Sanders), Cycas beddomi, Shorea tammaggia, Syzizium alternifolium, Terminalia pallida etc. It has fauna like Tiger, Gaur (Indian Bison), Great Indian Bustard, Lesser Florican, Jerdon's Courser, Golden Gecko, other avifauna like Flamingo, Pelican etc. It has the largest Tiger reserve in the country i.e Srisailam Tiger reserve, and the second largest Mangrove eco-system in the country (Godavari and Krishna Estuaries.) It has fauna like Tiger, Gaur (Indian Bison), Great Indian Bustard, Lesser Florican, Jerdon's Courser, Golden Gecko, other avifauna like Flamingo, Pelican etc.

xi. **INTER-STATE AGREEMENT ON SHARING OF WATERS:** Both the reservoirs of the project (Upper and Lower Reservoir) lie in the State of Andhra Pradesh. As such there is no Inter-state aspects involved in the development of the Project. As filling from the existing Somasila reservoir will be taken up during monsoon season when there is surplus water available; no impact on any international or national aspects is envisaged. There will be minor replenishment to compensate for the evaporation losses which will be taken up twice a year.

18.4.3 The EAC during deliberations noted the following:

EAC in the present meeting (18th meeting) deliberated on the information submitted (Form 1, PFR, etc.) and noted that the pipeline for the initial filling of reservoir will be laid through the Sri Penusila Narasimha Wildlife Sanctuary (PNWLS).

The EAC further noted that water requirement will be lifted from Sri Penusila Narasimha Wildlife Sanctuary Reservoir which could lead to severe impacts on aquatic ecosystem and availability of water to Wildlife animals during lean season.

18.4.4 *The EAC after detailed deliberation on the information submitted and as presented during the meeting by Project authorities felt that the feasibility of site proposed in terms of Environmental issues is not appropriate as water will be drawn from forest Reservoir and pipelines will be laid through the Sri Penusila Narasimha Wildlife Sanctuary. Alternative sites study shall be submitted in consultation of WII along with their comparison with selected proposed site by the PP, for further consideration in EAC.*

*The project was **deferred** on above lines.*

Agenda No. 18.5

Cumulative Impact Assessment and Carrying Capacity Study (CIA & CCS) of Tirap Basin. Inclusion of Chinglum Hydroelectric Project in Subansiri Basin - Recommendation of the Study – reg

18.5.1 The Member Secretary informed the EAC that MoEF&CC has received a request from Govt, of Arunachal Pradesh vide letter no. CE(M)/HPD/W-614/2020-21/688 dated 11th October, 2021 for conducting a Cumulative Impact Assessment and Carrying Capacity Study (CIA & CCS) of Tirap River and Dikrong River and Inclusion of Chinglum Hydroelectric Project in Cumulative Impact Assessment and Carrying Capacity Study (CIA & CCS) of Subansiri Basin in Arunachal Pradesh.

18.5.2 The EAC noted that Shri R.K. Joshi, Chief Engineer (Monitoring) a representative of Government of Arunachal Pradesh was present during discussion on the subject. It was also noted that the Member Secretary has circulated a background note about the status of CC&CIA conducted so far for different river basin in the state of Arunachal Pradesh which inter-alia mentions as under:

Background:

- i. A number of CIA & CCS have been conducted since 2006. The CIA & CCS studies of river basins in the States have so far been carried out mainly by Central Water Commission (CWC).
- ii. First time CIA & CCS of Teesta basin was conducted by Centre for Interdisciplinary Studies of Mountain and Hill Environment (CISMHE), University of Delhi, funded by NHPC. CIA & CCS studies were taken up by developers in Arunachal Pradesh, Bichom, Lohit. Thereafter CWC and Govt. of Himachal Pradesh (H.P.) taken up CIA & CCS studies (Siang & Subansiri by CWC and Chenab and Sutlej in HP by H.P. Govt.).
- iii. As per OM dated 28.05.2013 regarding streamlining the process of EC&FC cases by EAC/FAC for Hydro power and River Valley projects- the relevant para 3 (iv) states under:
“The carrying capacity study of a river basin is important to plan optimal number of power projects in a basin. All State Governments will be required to get such studies done

for river basins in their State. The process may be initiated in the next three months and completed 'within a period of two years, after which the carrying capacity study report would be made a pre-requisite for considering EC/FC cases of projects of any basin. All State Governments will send the details of river basins where such studies are to be done and confirm initiation 'of studies to MoEF within 3 months of issuance of this OM. The institutes for such studies may be settled by the State Government in consultation with the EAC''.

- iv. Later on, for a meaningful outcome of these studies by way of factoring into environmental concerns in a dispassionate and unbiased manner, it was proposed that it would be appropriate, if MoEF&CC take over these studies. A Meeting was held on 20.01.2015 in MOEF&CC and decided to take over all CIA&CCS studies from the State Govt. CWC on as is where is basis as conducting of such study falls primarily in the domain of the Ministry of Environment & Forests.
- v. MoEF&CC has decided to conduct the CIA&CCS of river Basins under the supervision and ownership for appraisal of Hydro-electric Projects (HEPs) by EAC for grant for Environmental Clearance as mandated under the EIA notification, 2006. It was also decided that MoEF&CC & Ministry of Power, Govt. of India will jointly decide to which Central Public Sector Units (CPSU) will fund which river basin study. Mode of payment to consultants/ Institute will also be decided by MoEF&CC and MoP.
- vi. To facilitate the Cumulative Impact Assessment & Carrying Capacity (CIA&CC) studies, a committee was constituted vide OM dated 27.05.2015 under the chairmanship of the Joint Secretary (IA-I Division), MoEF&CC.
- vii. EAC discuss and finalise TOR for the river basin study and suggest some additional study if required. the draft report Cumulative Impact Assessment & Carrying Capacity (CIA&CC) studies are again considered by the EAC and after detailed deliberations it is recommended for acceptance by the regulatory authority i.e. MoEF&CC.
- viii. Till date following CIA&CCS study of River basin study has been completed in Arunachal Pradesh:
 1. Bichom
 2. Lohit
 3. Subansiri
 4. Siang
 5. Kameng
 6. Dibang
 7. Tawang
- ix. Initially, 28 HEPs projects having capacity of less than 25 MW as well as more than more than 25 MW proposed in Subansiri River basin (Subansiri, Kurung, Kamla, Kale, Kamla, Siu and Payam rivers) covered as a part of the CIA&CC study. The list of projects is as under:

Projects above 25 MW			
Sr.No.	Name	Installed Capacity (MW)	Altitude (m)

1.	Oju-I HEP	700*	2275
2.	Oju-II HEP	1000*	1889
3.	Niare HEP	800	1560
4.	Naba HEP	1000	1180
5.	Mili HEP	75	4395
6.	Sape HEP	38	1365
7.	Chomi HEP	80	1135
8.	Chela HEP	75	1004
9.	Kurang I & II HEP	330	840
10.	Tamen HEP	175	320
11.	Tago – I HEP	55	1028
12.	Subansiri Lower HEP	2000	241
13.	Subansiri Middle (Kamala HEP)	1728	317
14.	Subansiri Upper HEP	2000	537
15.	Nalo HEP	360	925
16.	Dengser HEP	552	675
17.	Tammu HEP	55	300
18.	Neypin HEP	32	2092
19.	Hiya HEP	41	1044
Project less than 25 MW			
20.	Pange MHP @Hake Tari	2	586
21.	Taksing MHS	0.1	2426
22.	Jette Koro MHS @ Bora Rupok	0.05	933
23.	Jugdin Nallah MHS	1	910
24.	Kush MHS @ Sangram	2	899
25.	Payu MHS @ Koloriang	0.5	1755
26.	Kidding MHS	0.5	673
27.	Pagu MHS @ Palin	2	1230
28.	Fure MHP @ Damin	0.05	774

- Further, 27 HEPs were identified for inclusion in the additional CIA&CC study in Subansiri River Basin by Department of Hydropower Development, Government of Arunachal Pradesh. This includes one commissioned project namely Ranganadi HEP on Ranganadi adjoining Dikrong with IC of 405 MW (3x1 35) in 2002. These additional projects were considered by MOEFCC for additional study for cumulative Impact Assessment and Carrying Capacity Study (CIA & CCS) of Subansiri basin.
- Additional study for CIA & CC of Subansiri river basin was conducted and approved by the MoEF&CC vide letter dated 13th April, 2018. The list of HEPs recommended in the Additional Study of Subansiri river basin is as under:

S.No.	Name of the project	Present Capacity (IC)	Installed	Tributary
1 .	Pein HEP	8.00		Subansiri River
2.	Siken HEP			
3.	Palin HEP			
4.	Pani HEP	24.00		-do-
5.	Sichi HEP	24.00		-do-
6.	Pei HEP	5.00		-do-
7.	Phurchi HEP	5.00		-do-
8.	Vahi HEP	10.00		-do-
9.	Adum Panyor HEP	25.00		Panyor River
10.	Panor Lepa Middle HEP	21 .00		-do-
11.	Paren HEP	14.50		-do-
12.	Paren HEP	24.00		-do-
13.	Paren III HEP	21.00		
14.	Paren IV HEP	24.00		-do-
15.	Kei HEP	23.00		
16.	Pan or HEP	80.00		-do-
17.	Pith HEP	13.00		-do-
18.	Pare HEP	1 10.00		Dikron River
19.	Turu HEP	60.00		-do-
20.	Dardu HEP	49.00		-do-
21.	par HEP	52.00		-do-
22.	Pa umpam HEP	21.00		-do-
23.	Senki HEP	2.00		-do-
24.	Pa urn HEP	15.00		-do-
25.	Doimukh HEP	52.00		-do-
26.	Resing HEP	6.00		-do-
	Proposed Capacity	Installed	711.50 MW	
27	Ranganadi Hydroelectric Project (HEP) is a commissioned HEP of NEEPCO with IC of 405 MW (3x1 35) since 2002 on Panyor river (also known as Ranganadi in the Plains) and has been considered in the additional CIA & CC study of Subansiri river basin.			

3. Further, Govt of Arunachal Pradesh requested vide letter dated 4th September, 2019 to conduct CIA & CC study of Tirap Basin and Dikrong river basin on similar line as of other basins which have already been covered.
4. Govt. of Arunachal Pradesh further informed that during the additional study of Subansiri river basin (Subhansiri, Dikrong and Paniyor rivers) One (1) project namely Chinglum HEP (6 MW) was not included in Dikrong River Basin which may be included. Accordingly, vide letter dated 11th October, 2021 Govt. of Arunachal Pradesh has requested for conducting additional study of Dikrong Sub-basin of Subansiri river basin having following projects:
 - i. Chinglum HEP (6 MW)
 - ii. Pare- I SHP (2x6 MW)
 - iii. Pare-II SHP (2x6 MW)

- ii. Pre-III SHP (2x3 MW)
- iii. Pare-IV SHP (2x1.5 MW)
- iv. Pare-V SHP (2x1.5 MW)
- v. Su SHP (2x1.5 MW)

18.5.3 The EAC after detailed deliberations noted the following:

- a) The Dikrong River basin study covering 09 hydro-electric projects has already been completed in Additional CIA&CC study of Subansiri river basin which is approved by the Ministry vide letter dated 13th April, 2018.
- b) The recent request for CIA&CC study in Dikrong river basin for proposed 7 HEPs which are below than 12 MW capacity, the same are not attracting EIA notification, 2006 as amended.
- c) Representative of Govt of Arunachal Pradesh stated that the list of HEPs proposed on Dikrong river is full and final and no other HEPs will be proposed in Dikrong and Tirap River. Govt. of Arunachal Pradesh can submit undertaking, if required, in this regard. He further informed that till now no CIA&CC study has been undertaken for Tirap River basin where several nos. of HEPs are proposed. He assured that decision for development of HEPs on Dikrong river and Tirap river, will be taken as per CIA&CC study recommendations.

18.5.4 *The EAC after detailed deliberation observed that information following points is required to ascertain the need of any further study:*

1. *The longitudinal distances of proposed HEPs in Dikrong and Tirap River shall be submitted.*
2. *Status report of all Hydro-electric Project (commissioned/proposed/under construction) developed on Tirap, Dikrong and Subansari River of Arunachal Pradesh.*
3. *Water availability status in Tirap River and Dikrong river throughout the year (season wise) shall be submitted.*
4. *Location map of proposed HEPs on River & River basin networking indicating major tributary of Subansiri, Siang and Brahmaputra rivers.*
5. *Drainage/Flow direction indication map of Catchment area of Dikrong and Tirap River including their confluence with Brahmaputra River shall be submitted.*

The meeting ended with vote of thanks to the Chair.

Annexure**ATTENDANCE LIST**

Sr. No.	Name & Address	Role	Attendance
1	Dr. K. Gopakumar	Chairman	P
2	Dr. N. Lakshman	Member	P
3	Dr. B. K. Panigrahi	Member	P
4	Dr. Chandrahas Deshpande	Member	P
5	Dr. A. K. Malhotra	Member	P
6	Dr. Uday Kumar R.Y.	Member	P
7	Shri Sharvan Kumar	Member (Representative of CEA)	P
8	Dr. J. A. Johnson	Representative of WII	P
9	Shri Amrendra Kumar Singh	Representative of (CWC))	P
10	Shri Yogendra Pal Singh	Member Secretary	P

APPROVAL OF THE CHAIRMAN

From: kgopa@iisc.ac.in

To: "Yogendra Pal Singh" <yogendra78@nic.in>, "Amrendra Kumar Singh" <ceenvtmgmt@nic.in>, ajitkumarmalhotra463@gmail.com, udayk@iisc.ac.in, lnand@rocketmail.com

Sent: Thursday, November 18, 2021 8:26:54 PM

Subject: Fw: draft MoM of 18th EAC (RVHEP) meeting held on 28.10.2021-reg

Dera Dr Yogendra

If all the experts are agreeing to this one then kindly go ahead. I will not be available till Jan11th,2022. During this period Prof. Uday will chair the sessions.

With warm regards

Prof. K.Gopakumar, FIEEE, FNAE

DESE, Indian Institute of Science

Bangalore-560012, INDIA

From: Yogendra Pal Singh <yogendra78@nic.in>

Sent: Thursday, November 18, 2021 3:26 PM

To: Gopakumar K <kgopa@iisc.ac.in>

Subject: Fwd: draft MoM of 18th EAC (RVHEP) meeting held on 28.10.2021-reg

External Email

Dear Sir,

Please find attached the draft MOM of the 18th EAC meeting of RVHE, after receiving the comments of EAC members, for your approval please.