

MINUTES OF THE 41st MEETING OF THE EXPERT APPRAISAL COMMITTEE FOR RIVER VALLEY AND HYDROELECTRIC PROJECTS HELD ON 15TH FEBRUARY, 2023 FROM 10.30 AM – 05:30 PM THROUGH HYBRID MODE.

The 41st meeting of the re-constituted EAC for River Valley & Hydroelectric Projects organized by the Ministry of Environment, Forest and Climate Change, Indira Paryavaran Bhawan, Jor Bagh Road, New Delhi, was held on 15th February, 2023 through hybrid mode, under the Chairmanship of Dr. K. Gopakumar. The list of Members present in the meeting is at **Annexure**.

Agenda Item No. 41.1

The Member secretary informed that Shri K. Gowarppan (Co-opted EAC member) was present during the deliberations on agenda Item No. 38.5 (Additional Agenda) in the 38th EAC meeting held on 15.12.2022; however, due to typo graphical error his name could not be mentioned in the list of participants mentioned in the Minutes of the meeting. The EAC after examining the facts agreed to make necessary correction in the minutes of the 38th EAC meeting so as to incorporate name of Shri K. Gowarppan (Co-opted EAC member).

Confirmation of the minutes of 40th EAC meeting held on 25th January, 2023.

Agenda Item No. 41.2

Saundatti HEP (1260 MW) Integrated Renewable Energy with Pumped Storage Project at village Karlakatti, Tehsil Saundatti, District Belgaum (Karnataka) by M/s Greenko Solar Energy Pvt. Ltd. – Amendment/ correction in Environmental Clearance - reg.

[Proposal No. IA/KA/RIV/296852/2023, F. No. J-12011/11/2018-IA.I(R)]

41.2.1: The proposal is for amendment/ correction in environmental clearance granted by the Ministry vide letter dated 19.09.2022 to the project for expansion of Saundatti HEP (1260 MW) Integrated Renewable Energy with Pumped Storage Project at village Karlakatti, Tehsil Saundatti, District Belgaum (Karnataka) in favour of M/s Greenko Solar Energy Pvt. Ltd.

41.2.2: The project proponent made a detailed presentation on the project and informed that:

- i. The Ministry vide letter dated 19.09.2022 granted EC to the project for expansion of Saundatti HEP (1260 MW) Integrated Renewable Energy with Pumped Storage Project at village Karlakatti, Tehsil Saundatti, District Belgaum (Karnataka).

- ii. The project proponent has submitted proposal for amendment/ correction in environmental clearance with the details as under:-

S. No	Details (Reference of Approved EC)	Original (Description as per Approved EC)	Revised (Description as per Proposal)	Remarks
1.	Subject	1200 MW	1260 MW	Capacity Correction
2.	Point 2	1200 MW	1260 MW	Capacity Correction
3.	Point 2	228.97 Ha	213.70 Ha	Area Correction
4.	Point 3	37.34 Ha	34.64 Ha	Private Area Correction
5.	Point 3	23.98 Ha	18.66 Ha	Government area Correction
6.	Point 3	167.65 Ha	160.40 Ha	Forest Area Correction
7.	Point 3	228.97 Ha	213.70 Ha	Total Area Correction
8.	Point 6(i)	96 m high Dam for creation of Saundatti IREP reservoir of 1.01 TMC live storage capacity	Rockfill embankment of varying from 10m to 43 m height dam for creation of Saundatti IREP reservoir of 1.00 TMC live storage capacity	Statement Correction
9.	Point 6(ii)	Power Intake structure g.2 nos. of 833m long and 12.0 dia concrete lined head race tunnel.	Power Intake Structure	Statement Correction
10.	Point6(iii)	2 nos. of 30m dia. circular shape surge shaft with orifice dia of 5 m.	--	delete statement
11.	Point6(iv)	4 nos. of 730m long and 7.5m dia. inclined circular steel lined penstock tunnel/pressure shaft each for each unit of 252 MW.	4 nos. of 856m long and 6m dia. inclined circular steel lined penstock tunnel/pressure shaft each for each unit of 252 MW.	Statement Correction

12.	Point 6(v)	one 730m long and 7.5m dia. inclined circular steel lined penstock tunnel/pressure shaft bifurcated to 2 penstocks to feed 2 units of 126 MW.	One 804m long and 6m dia.inclined circular steel lined penstock tunnel/pressure shaft bifurcated to 2 penstocks to feed 2 units of 126 MW.	Statement correction.
13.	Point 6 (vi)	A surface power having an installation of four nos reversible Francis turbine each of 252 MW Capacity (all 4 units are with variable speed turbines) and two nos reversible Francis turbines each of 126 MW capacity (both units are with variable speed turbines) operating under a rated head of 147.99 m in generating mode and 156.39 m in pumping mode.	A surface power having an installation of four nos reversible Francis turbine each of 252 MW Capacity (all 4 units are with variable speed turbines) and two nos reversible Francis turbines each of 126 MW capacity (both units are with variable speed turbines) operating under a rated head of 206.22 m in generating mode and 217.42 m in pumping mode.	Statement correction
14.	Point 6 (vii)	70m wide and full supply Depth (FSD) of 5.50m tailrace channel of 1.93 km long connecting to the existing Renuka Sagar reservoir.	45m wide and FSD of 6.0m Tail race channel 1749 m long connecting to the Existing Renuka Sagar reservoir.	Statement Correction.
15.	Point 7: Salient Features- Land Area Breakup	Private land 36.64Ha	Private land 34.64Ha	Private Land area correction
16.	Point 9	Capacity 1200MW	Capacity 1260MW	Capacity Correction
17.	Point 12	Capacity 1200MW	Capacity 1260MW	Capacity correction
18.	Point 12	Total Area 228.97Ha	Total Area 213.70Ha	Total Area correction

41.2.3 The EAC during deliberations noted the following:

The proposal is for amendment/ correction in environmental clearance granted by the Ministry vide letter dated 19.09.2022 to the project for expansion of Saundatti HEP (1260 MW) Integrated Renewable Energy with Pumped Storage Project at village Karlakatti, Tehsil Saundatti, District Belgaum (Karnataka) in favour of M/s Greenko Solar Energy Pvt. Ltd.

The EAC noted that the amendment/ corrections sought by the project proponent are factual in nature and has been verified with the revised EIA/EMP report and other additional information submitted at the time of grant of environmental clearance and found in order.

41.2.4 The EAC, after detailed deliberations on the information submitted by the project proponent, accepted and recommended the amendments/ correction as requested by the project proponent.

Agenda Item No. 41.3

Greenko UP01 Off-Stream Closed Loop Pumped Storage Project (3660 MW) at Village Gurar, Tehsil Robertsganj, District Sonbhadra (Uttar Pradesh) by M/s Greenko Energies Private Limited – Amendment in Terms of Reference (ToR) - reg.

[Proposal No. IA/UP/RIV/297281/2023; F. No. J-12011/22/2021-IA.I (R)]

41.3.1 The proposal is for amendment terms of reference (ToR) granted by the Ministry vide letter dated 24.1.2022 to the project for Greenko UP01 Off-Stream Closed Loop Pumped Storage Project (3660 MW), in an area of 688.14 Ha located at Village Gurar, Tehsil Robertsganj, District Sonbhadra (Uttar Pradesh) in favour of M/s Greenko Energies Private Limited.

41.3.2 The project proponent made a detailed presentation on the project and informed that:

- i. The Ministry vide letter dated 24.1.2022 granted terms of reference to the project for Greenko UP01 Off-Stream Closed Loop Pumped Storage Project (3660 MW), in an area of 688.14 Ha located at Village - Gurar, Tehsil - Robertsganj, District Sonbhadra, Uttar Pradesh by M/s Greenko Energies Private Limited.
- ii. During survey and investigation, with availability of additional data, project was optimized; resulting in revision of installed capacity from 3000 MW with 6.12 hour storage capacity to 3660 MW with 6.10 hour storage capacity. Unit sizing and dimensions of project components have been changed accordingly.

- iii. Total land requirement has marginally increased from earlier 688.14 ha to 699.20 ha. Forest land and non-forest land was earlier 656.28 ha and 31.86 ha respectively which has now been revised to 586.50 ha and 112.65 ha respectively i.e. reduction of forest land and increase in non-forest land.
- iv. The project proponent has submitted proposal for amendment in terms of reference with the details as under:-

S. No	Para as per ToR Letter dt 24.01.2022	Details as per ToR	Amendment sought	Remarks
1.	Subject Line-Capacity	3000 MW	3600 MW	Capacity increased from 3000 MW to 3660 MW.
2.	Subject Line-Area	688.14 Ha	699.15 Ha	Total land was increased from 688.14 Ha to 699.15 Ha. Due to change in layout and additional of access roads
3.	Subject Line - Village	Gurar	Gurar, Garawa, Pindari, Ranidho, Muhuna and Baijnath	More nearby villages added due to change in layout
4.	Point.2- Capacity & Land requirement	3000 MW & 688.14 Ha	3600 MW & 699.15 Ha	Change in installed capacity and land requirement
5.	Point 4 (i)- Capacity, Storage & Village Name	3000 MW, 18360 MWH & Gurar	3600 MW 22326 MWH & Gurar, Garawa, Pindari, Ravidho, Muhuna and Baijnath	Change in installed capacity, stored energy and villages
6.	Point 4 (ii)- Capacity, Storage & Village Name	3000 MW, 18360 MWH, Non consumption utilization of 0.733 TMC for 6.12 hr storage capacity	3660 MW, 22326 MWH, Non consumption utilization of 0.935 TMC for 6.10 hr storage capacity	Change in storage capacity with revised layout

7.	Point 4 (iii)	Non consumption utilization of 0.733 TMC	Non consumption utilization of 0.935 TMC	Change due to increase of capacity
8.	Point 4 (vi)	Upper reservoir Gross storage-0.879 TMC. Live Storage Capacity-0.733 TMC & Dead storage-0.146 TMC. Rockfill embankment average height of around 26 m (maximum height 48 m) of length of 4118 m.	Upper reservoir Gross storage-1.230 TMC. Live Storage Capacity-0.935 TMC & Dead storage-0.296 TMC. Geomembrane faced rockfill embankment average height of around 28 m (maximum height 57 m) of length of 4186 m.	Change in storage for increase in installed capacity and due to change in dam type
9.	Point 4 (vii)	Lower reservoir Gross storage-0.824 TMC. Live Storage Capacity-0.738 TMC & Dead storage-0.086 TMC. Rockfill embankment, average height of around 12 m (maximum height 21 m) of length of 1450 m.	Lower reservoir Gross storage-1.246 TMC. Live Storage Capacity-1.016 TMC & Dead storage-0.229 TMC. Geomembrane faced rockfill embankment, average height of around 15 m (maximum height 30 m) of length of 2020 m.	Change in storage for increase in installed capacity and due to change in dam type
10.	Point 4 (viii)	Five number of independent penstocks & each penstock will get bifurcated into two numbers near to powerhouse to feed water of 10 units of turbine which connects the powerhouse located at 1136 m from intake structure. Proposed project will generate 3000 MW by utilizing design discharge of 942.65 Cumec with	Twelve number of independent penstocks & one no of penstock will get bifurcated into two numbers near to powerhouse to feed water of 13 units of turbine which connects the powerhouse located at 1292 m from intake structure. Proposed project will generate 3660 MW by utilizing design discharge of 1186.80 Cumec with	Penstock redesigned for revised capacity

		rated head of 356.50m	rated head of 349.80m	
11.	Point 4 (x)	The Greenko UP01 OCPSP will utilize 3300 MW to pump 0.733 TMC of water to the upper reservoir in 6.82 hours	The Greenko UP01 OCPSP will utilize 4026 MW to pump 0.935 TMC of water to the upper reservoir in 6.90 hours	Pumping power revised proportionate to change in installed capacity
12.	Point 4 (xi)- Construction if	<ul style="list-style-type: none"> • Rock fill embankments of average height of around 26m with maximum of 48m height in upper reservoir and average height of around 12m with maximum of 21m in lower reservoir for creation of Greenko UP01 OCPSP upper & lower reservoir with 0.733 TMC & 0.738 TMC live storage capacity respectively. • 44.85 m high Power Intake Structure. • 5 nos. each of 1156.68 m long and 6.5 m dia. surface circular steel lined Penstock/Pressure Shaft (ie. consisting of 193.09 m as intake tunnel, 805.27 m long surface penstock, 91.22 m long vertical pressure shaft and 67.1m long Horizontal pressure shaft) bifurcated in to 2nos. each of 101.67m long to feed 10 units of 300 MW. 	<ul style="list-style-type: none"> • Geomembrane faced Rock fill embankments/ Dam (GFRD)of average height of around 28 m with maximum of 57m height in upper reservoir and average height of around 18m with maximum of 30m in lower reservoir for creation of Greenko UP01OCPSP upper & lower reservoir with 0.935TMC & 1.016TMC live storage capacity respectively. • 40.05m high Power Intake Structure. • 11nos.each of 1393m long and 4.30m dia. surface circular steel lined Penstock / Pressure Shaft (ie. consisting of 156.5m as intake tunnel, 953.5m long surface penstock, 77.2m long vertical pressure shaft and 206.1m long Horizontal pressure shaft). One no. of penstock of length1332.85m long&4.3 m dia will be 	Change in dam/embankment type

		<ul style="list-style-type: none"> • A surface Powerhouse having an installation of 10 nos. reversible Francis turbine each of 300 MW capacity (All 10 unit are fixed speed only) operating under a rated head of 356.50m in generating mode and 369.50m in pumping mode. • 10 nos. 5.50m diameter, 233m long Tailrace Tunnel. • 75 m wide and FSD of 5.00m Tail race channel of 1530 m long joining with the proposed lower reservoir. 	<ul style="list-style-type: none"> • bifurcated into 2nos. each of 60.15m long & 3.00m dia. to feed 2units of 152.5MW each. • A surface Powerhouse having an installation of 13nos. reversible Francis turbine of 305MW capacity 11No. & 152.5MW capacity of 2 No. (All 13unitarefixed speed only) operating under a rated head of 349.8m in generating mode and 370.3m in pumping mode. • 11nos. 5.5m diameter & 2 No. 4.00 m diameter, 328m long Tailrace Tunnel. • Lower intake structure of 13no. will be connected to Lower reservoir and will be used for pumping of water from lower reservoir to upper reservoir. 	
13.	Point 4 (xii)	Total land requirement- 688.14 Ha, involving 656.28 Ha of forest land and 31.86 Ha of Non-forest land. Project cost estimated is 13085.17 Cr	Total land requirement- 699.17 Ha, involving 586.52 Ha of forest land and 112.65 Ha of Non-forest land. Project cost estimated is 17180.79 Cr	Total land revised as per new layout after optimisation
14.	Point 4 (xiii)	Nearest Protected area is around 11.32 Km from outside	Nearest Protected area is around 12.35 Km from outside	Change due to minor relocation of project components

		notified boundary	ESA	notified boundary	ESA	
15.	Point 4 (xv)	Online application will be submitted subsequently thereby seeking forest diversion for around 656.28 Ha		Online application will be submitted subsequently thereby seeking forest diversion for around 586.52 Ha		Change in forest land

41.3.3 The EAC during deliberations noted the following:

The proposal is for amendment in Terms of Reference granted by the Ministry vide letter dated 24.1.2022 to the project for Greenko UP01 Off-Stream Closed Loop Pumped Storage Project (3000 MW), in an area of 688.14 Ha located at Village Gurar, Tehsil Robertsganj, District Sonbhadra (Uttar Pradesh) in favour of M/s Greenko Energies Private Limited.

The project proponent has informed that no additional muck will be generated due to proposed changes and proposed land is coming under grassland and there is no habitation at present.

41.3.4 The EAC, after detailed deliberations on the information submitted by the project proponent, accepted and recommended the amendments in Terms of Reference as requested by the PP subject to compliance of following additional conditions: -

- i. Impacts on Sone river sustainability due to withdrawal of water in monsoon season to fill the reservoir and to fulfil the gap of evaporation losses shall be studied through reputed Government institution.
- ii. All the terms and condition mentioned in ToR letter dated 24.1.2022 shall remain unchanged.

Agenda Item No. 41.4

Malshej Ghat Borande Pumped Storage Project of capacity 1440 MW at Village Adoshi & Borande, Tehsil Junnar & Murbad, District Pune & Thane (Maharashtra) by M/s Adani Green Energy Limited - Terms of Reference (TOR) - reg.

[Proposal No. IA/MH/RIV/409504/2022; F. No. J-12011/21/2022-IA.I (R)]

41.4.1 The proposal is for grant of terms of reference to the project for Malshej Ghat Borande Pumped Storage Project of capacity 1440 MW in an area of 116.5 Ha at Village Adoshi & Borande, Tehsil Junnar & Murbad, District Pune & Thane (Maharashtra) by M/s Adani Green Energy Limited.

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

- i. The proposal is for grant of terms of reference to the project for Malshej Ghat Borande Pumped Storage Project of capacity 1440 MW in an area of 116.5 Ha at Village Adoshi & Borande, Tehsil Junnar & Murbad, District Pune & Thane (Maharashtra) by M/s Adani Green Energy Limited.
- ii. Malshej Ghat Borande PSP is an Off-Stream Closed Loop Pumped Storage Scheme with an installed capacity of 1440 MW (6 X 240 MW). The Upper reservoir (New) is proposed on hilltop across seasonal minor rivulet/nallah draining into Kukadi river and lower reservoir (New) proposed across seasonal minor rivulet/nallah draining into Kalu river. The quantum of water required for initial/one time filling of reservoirs (i.e. 11.2 MCM) shall be pumped from existing reservoir of Manikdoh dam during monsoon months. Malshej Ghat Borande PSP has been designed to meet the peaking requirement daily in the southern region grid and the state of Maharashtra for a duration of about six (6) hours.
- iii. The upper dam is proposed on a tabletop hill near Adoshi village in Junnar Taluka, Pune district of Maharashtra state having a geographical latitude 19° 17' 59.3" N and longitude 73° 41' 27.7" E. The lower dam is proposed near Borande village in Murbad Taluka, Thane district of Maharashtra State with the geographical latitude 19° 18' 43.1" N and longitude 73° 40' 30" E. The project area lies in the Sahyadri Ranges of Western Ghats in the State of Maharashtra in the area bordering Pune and Thane districts.
- iv. The proposed Malshej Ghat Borande PSP (6 x 240 MW) envisages following major civil structures:
 - a. **Upper Dam** (RCC Dam): Crest length 1990 m, maximum height 37 m above the deepest riverbed level. Gross storage capacity of Upper reservoir is 8.8 Mm³.
 - b. **Lower Dam** (RCC Dam): Crest length 870 m, maximum height 67 m above the deepest riverbed level. Gross storage capacity of Lower reservoir is 9.6 Mm³.
 - c. **Upper Intake/Outlet**: Horizontal pit type intake, 4 nos. of trash rack bays, each with a size of 7.25 m (W) x 15.0 m (H).
 - d. **Lower Intake/Outlet**: Horizontal pit type intake, 4 nos. of trash rack bays, each with a size of 6.5 m (W) x 15.0 m (H).
 - e. **Pressure Shaft**: 1660 m (length), 8.5 m (diameter), Circular shaped, steel lined and branching near powerhouse
 - f. **Surface Powerhouse**: 180 m (L) x 23 m (W) x 45 m (H)
 - g. **Tailrace Tunnel**: 65 m (length), 8.5 m (diameter), horseshoe shaped, concrete lined.
 - h. **Approach Road**
 - Strengthening of existing roads - 3 km

- Construction of new road - 4 km
- i. **Adit to bottom of pressure shaft** - 620 m (length) x 7.6 m (width) x 8.5 m (height), D-shaped, unlined.
- v. **Land requirement:** The total land required for the project components and related works has been estimated to be about 116.5 ha, which includes 44.9 ha of forest land and 71.6 ha of private land. Being an off-river PSP, the environmental impacts of the project are minimal.
- vi. The cost of the project is Rs. 5860 Crores at 2022-23 price level including Interest During Construction (IDC) of Rs. 635 Crores. As a preliminary estimate, a construction period of 5 years (60 months) from the date of award of civil works package has been estimated for this project.
- vii. Proposed Project is located outside the Protected area and located more than 10 km away from boundary of Bhimashankar Wildlife Sanctuary (WLS) & Kalsubai Harishchandragad WLS. The final notification for ESZ of Bhimashankar WLS & Kalsubai Harishchandragad WLS published by MOEF vide notification dated 6th August 2020 & 28th April 2017 respectively and the proposed project is located outside the notified ESZ boundaries of both WLS.
- viii. The proposed project is falling under ESA of Western Ghat as per MOEF draft ESA notification dated 6th July 2022. However, Hydropower Projects are permitted in ESA of Western Ghats as per MOEF notification dated 20th December 2013.
- ix. The silent features of the project is as under:-

Project details:

Name of the Proposal	Malshej Ghat Bhorande Pumped Storage Project (1440MW)
Location (Including coordinates)	Upper dam (Proposed): Pune district, Maharashtra - Lat 19° 17' 59.3" N & Long 73° 41' 27.7" E. Lower dam (Proposed): Thane District, Maharashtra – Lat 19° 18' 43.1" N & Long 73° 40' 30" E
Inter- state issue involved	No
Seismic zone	Zone III

Category details:

Category of the project	Cat "A" of item 1(c)
Provisions	
Capacity / Cultural command area (CCA)	1440 MW
Attracts the General Conditions (Yes/No)	No

Additional information (if any)	
--	--

Electricity generation capacity:

Powerhouse Installed Capacity	1440 MW
Generation of Electricity Annually	2996 MU
No. of Units	6 Nos. (6*240 MW)
Additional information (if any)	

ToR Details:

Cost of project	Rs. 5860 Cr. (incl. IDC of Rs. 635 Cr.)
Total area of Project	116.5 ha
Height of Dam from River Bed (EL)	Upper Dam (Proposed new) Height of Dam: 37 m Lower Dam (Proposed new) Height of Dam: 67 m
Length of Tunnel/Channel	2700 m
Details of Submergence area	Upper reservoir (proposed new) with an area of 44 ha & Lower reservoir (proposed new) with an area of 36 ha
Types of Waste and quantity of generation during construction/ Operation	As per preliminary study about 30 lakhs cum of muck will be generated from excavation out of which about 15 lakhs Cum shall be utilized in project construction and balance 15 lakh Cum shall be disposed in muck disposal sites. Detailed Muck Management Plan shall be evaluated during EIA/EMP studies. Construction waste, domestic solid waste from labour camps, etc. quantities will be estimated during EIA study.
E-Flows for the Project	Not applicable
Is Projects earlier studies in Cumulative Impact assessment & Carrying Capacity studies (CIA&CC) for River in which project located. If yes, then a) E-flow with TOR /Recommendation by EAC as per CIA&CC study of River Basin.	Not applicable <ul style="list-style-type: none"> • This is a pump storage scheme and not a conventional hydropower project and independent of any main river/perennial river. Being a Pumped Storage project there is no diversion of water from main river. • Proposed Project is Closed Loop Off-Stream PSP scheme. Upper reservoir (New) proposed on hilltop near Adoshi village, Pune district and lower

<p>If not the E-Flows maintain criteria for sustaining river ecosystem.</p>	<p>reservoir (New) proposed near Bhorande village, Thane district. Both the reservoirs are located across seasonal minor rivulet/nallas with a very small catchment area of 0.6 Km² and 3.0 Km² for upper and lower reservoir, respectively.</p> <ul style="list-style-type: none"> • Water requirement for initial/one-time filling of reservoirs is about 11.2 Mm³ and same shall be taken from existing Manikdoh reservoir. • Water will be stored once and recirculated on daily basis without any consumptive use and without obstructing/diverting the flow of the River where e-flow release is required. • Therefore, e-flow release in off stream PSPs is not relevant.
---	--

Muck Management Details:

<p>No. of proposed disposal area/ (type of land- Forest/Pvt. land)</p>	<p>These will be ascertained during the preparation of DPR and EIA study</p>
<p>Muck Management Plan</p>	<p>Will be prepared as part of Environment Management Plan</p>
<p>Monitoring mechanism for Muck Disposal</p>	<p>Will be carried out by Pollution Control Board</p>

Land Area Breakup:

<p>Private land/Non forest Land</p>	<p>71.6 ha</p>
<p>Government land/Forest Land</p>	<p>44.9 ha (Forest Land)</p>
<p>Submergence area/Reservoir area</p>	<p>Upper reservoir (Proposed) - 44 ha Lower reservoir (Proposed) – 36 ha</p>
<p>Land required for project components</p>	<p>116.5 ha (Total Land)</p>
<p>Additional information (if any)</p>	<p>-</p>

Presence of Environmentally Sensitive areas in the study area:

<p>Forest Land/ Protected Area/ Environmental Sensitivity Zone</p>	<p>Yes/ No</p>	<p>Details of Certificate/letter/Remarks</p>
<p>Reserve Forest/Protected Forest Land</p>	<p>Yes</p>	<p>As per preliminary estimate around 44.9 ha of forest land will be diverted for</p>

		development of Project components, however exact quantum of forest land shall be ascertained by forest dept as a part of forest diversion application under the Forest Conservation Act.
National Park	No	
Wildlife Sanctuary	No	Proposed Project is located outside the Protected area. Proposed project is located more than 10 km away from boundary of Bhimashankar Wildlife Sanctuary & Kalsubai Harishchandragad Wildlife Sanctuary. The final notification for ESZ of Bhimashankar Wildlife Sanctuary published by MOEF vide notification dated 6th August 2020 & final notification for ESZ of Kalsubai Harishchandragad Wildlife Sanctuary published by MOEF vide notification dated 28th April 2017 and the proposed project is located outside the notified ESZ boundaries of both WLS.

Court case details:

Court Case	NA
Additional information (if any)	

Affidavit/Undertaking details:

Affidavit/Undertaking	Undertaking attached
Additional information (if any)	

Previous EC compliance and necessary approvals:

Particulars	Letter no. and date
Certified EC compliance report (if applicable)	NA
Status of Stage- I FC	Yet to be applied
Additional detail (If any)	
Is FRA (2006) done for FC-I	

Miscellaneous

Project Benefits	<ul style="list-style-type: none"> The project will facilitate energy storage and balance variable power from renewable energy sources (predominately large-scale solar plants) available during
-------------------------	---

	<p>daytime effectively for meeting the energy requirement during peak hours and thereby ensuring grid balancing.</p> <ul style="list-style-type: none"> Proposed project envisages a scheme to generate 1440 MW of peak power for duration of about Six (6) hours daily. Employment generation for technical staff & workmen category (including locals) during construction and operation
Status of other clearances	Pre-DPR stage clearances awaited / ongoing
R&R details	<p>Based on the preliminary layout formulated for proposed Malshej Ghat Borande PSP, the project prima-facie involve submergence of agricultural land and few habitations in the upper reservoir area. Further, the entire lower reservoir area falls under forest land category and hence no habitations are involved. In addition to the above land under submergence, additional land is required for construction of civil structures, which requires acquisition of private/government lands. Based on the above, 71.6 ha has been identified as non-forest land & 44.9 ha has been identified as forest land for the project.</p> <p>Private land is proposed to be purchased through private negotiations, as it is within the specified limits by the relevant rules notified by the State Government, related to rehabilitation and resettlement under RFCTLARR, 2013. Detailed requirements for the R&R plan, if applicable, will be based on the social-economic survey and land utilization for the project. Due consideration ought to be given to the societal requirements in developing the R&R plan as a part of EIA/EMP studies.</p>
Additional detail (If any)	<p>The proposed Malshej Ghat Borande Pumped Storage Project (“Project”) is a Closed Loop Off-Stream PSP scheme with an installed capacity of 1440 MW (6 x 240 MW) with both upper and lower reservoir proposed to be newly constructed.</p> <p>The proposed project involves construction of Upper dam located on a hilltop near Adoshi village, Pune district with maximum height of 37 m and a length of 1990 m with a gross storage capacity of 8.8 MCM by keeping FRL & MDDL at EL 781.00 m & EL 760.00 m respectively. Similarly Lower dam proposed near Borande village, Thane district with maximum height of 67 m and a length of 870 m with a gross storage capacity of 9.6 MCM by keeping FRL & MDDL at EL 263.00 m & EL 222.00 m respectively. Both reservoirs are located across seasonal minor rivulet/nallas with a very small catchment areas of 0.6 Km² and 3.0 Km²</p>

	<p>for upper and lower reservoir, respectively. Water requirement for initial/one-time filling of reservoirs is about 11.2 Mm³ and same shall be taken from existing Manikdoh reservoir.</p> <p>Proposed project envisages to generate 1440 MW of peak power for duration of about Six (6) hours daily by drawing water from the upper reservoir into the reversible PTG units by utilizing a gross head of about 525 m available at project site. Water will be pumped up to the upper reservoir in pumping mode during off-peak periods for duration of about 6.7 hours daily. A daily cycle of operation of the reservoirs has been proposed for the scheme and it is found that about 6.9 Mm³ of net storage is required. The energy storage potential is estimated as 1440 MW (in terms of power storage) and 8640 MWhr (in terms of energy storage).</p> <p>The proposed project is falling under ESA of Western Ghat as per MOEF draft ESA notification dated 6th July 2022. However, Hydropower Projects are permitted in ESA of Western Ghats as per MOEF notification dated 20th December 2013.</p>
--	---

41.4.3: The EAC during deliberations noted the following:

The EAC deliberated on the information submitted (Form 1, PFR, kml file, etc.) and as presented in the meeting and observed that the proposal is for grant of terms of reference to the project for Malshej Ghat Bhorande Pumped Storage Project of capacity 1440 MW in an area of 116.5 Ha at Village Adoshi & Bhorande, Tehsil Junnar & Murbad, District Pune & Thane (Maharashtra) by M/s Adani Green Energy Limited.

The project/activity is covered under category A of item 1 (c) ‘River Valley projects’ of the Schedule to the Environmental Impact Assessment Notification, 2006 and requires appraisal at Central level by the sectoral EAC in the Ministry.

The proposed project comes under ESA of Western Ghats (Maharashtra) and as per O.M dated 20th December, 2013, hydro power projects are allowed in Western Ghats ESA.

41.4.4 The EAC after detailed deliberation on the information submitted and as presented during the meeting **recommended** for grant of Standard ToR for conducting EIA study for Malshej Ghat Bhorande Pumped Storage Project of capacity 1440 MW in an area of 116.5 Ha at Village Adoshi & Bhorande, Tehsil Junnar & Murbad, District Pune & Thane

(Maharashtra) by M/s Adani Green Energy Limited, under the provisions of EIA Notification, 2006, as amended along with the following additional/specific ToR:

[A] Environmental Management and Biodiversity Conservation:

- i. Tentative estimation of muck generation with their disposal sites along with protection.
- ii. Cumulative Impact of project on carrying capacity and sustainability of Reservoir/ nalahs of catchment area / due to tapping of water for filling reservoir.
- iii. Impact zone decided prior to base line data generation and accordingly, sampling location shall be finalized. Baseline data as mentioned in Standard ToR shall be collected for preparation of EIA/ EMP report along with soil characteristics which shall be studied at minimum 10 locations. The ground water level at 10 locations shall be measured in project area in all three seasons.
- 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. Sampling locations be located to cover villages situated near the reservoir and around boundary of forest area for collection of baseline data and data to be incorporated in EIA/ EMP report.
- vi. The study shall be conducted and approved by CWC regarding assessment of E-Flow of water in the river in terms of draft notification S.O. 3072(E) dated 6th July, 2022 issued by the Ministry for Western Ghats.
- vii. Identify the sand mining/ quarrying sites in submergence area and downstream of reservoir.
- viii. Source of construction material and its distance from the project site along with detailed transportation plan for construction material in view of the project site location in Western Ghats be submitted.
- ix. A detailed reclamation/ restoration plan of quarrying site/sites be incorporated in the EIA/EMP report.
- x. Certificate and certified map from Chief Wildlife Warden shall be submitted mentioning that project boundary is located outside the Eco Sensitive Zone (ESZ) and no Wildlife Sanctuary falls within 10 km of Project site.
- xi. A detailed wildlife conservation plan for Schedule –I species be prepared duly approved by the Chief Wild Life Warden be submitted.

- xii. In case any Wildlife Corridor is located within 10 km radius of the project site a detailed study shall be conducted to assess the impact of project on safe movement of wild animals.
- xiii. Reservoir/ River banks protection plan all along the submergence need to be prepared and incorporated in EIA/ EMP.
- xiv. Scope of watershed development in the 10 km radius of the project shall be studied in consultation with Govt. institutions/ Indian Council of Agriculture Research (ICAR)and accordingly a detailed Water Shed Development Plan shall be prepared and incorporated in EIA/ EMP report.
- xv. MoU for water uses for the project shall be signed and approved by concerned authority.
- xvi. Environmental matrix during construction and operational phase needs to be submitted.
- xvii. Matrix formulated on the basis of detailed study and field survey of flora and Fauna methodology used shall be mentioned in the EIA report.
- xviii. Endemic plant and animal species found in the area concerned shall be provided instead listing entire endemic species found in the State.
- xix. Details of Flora and Fauna reported in submergence area, Nos. of tree along with their density and nomenclature required to be cut for reservoir creation and other project component.
- xx. Project impact on avi-fauna shall be studied and incorporated in EIA/ EMP report.
- xxi. Impact assessment on the fish diversity based on the hydrological alteration at the water drawing sources shall be studied.
- xxii. Stage-I Forest Clearance shall be obtained.
- xxiii. Cumulative impact assessment study shall be carried out.
- xxiv. Study report on impact on River Rejuvenation shall be submitted.

[B] Socio-economic Study

- 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.
- xxvi. 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.
- xxvii. 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.
- xxviii. Tentative no. of project affected families shall be identified and accordingly appropriate Rehabilitation & Resettlement plan shall be prepared.

xxix. Details of settlement in 10 km area shall be submitted.

[C] Muck Management/ Disaster Management

- xxx. Details of quantity of muck generation component wise and disposal site along with transportation plan and its monitoring to be provided.
- xxxi. Details of Muck Management plan prepared along with estimated cost incorporated in EIA/ EMP report.
- xxxii. Techno-economic viability of the project must be recommended from CEA/ CWC

[D] Miscellaneous.

- xxxiii. Pre-DPR Chapters viz., Hydrology, Layout Map and Power Potential Studies duly approved by CWC I CEA shall be submitted.
- xxxiv. Undertaking need to submitted on affidavit that regarding no activities has been yet on the project site and water allocated to this scheme shall not be diverted to other purpose.
- xxxv. Both capital and recurring expenditure under EMP shall be submitted.
- xxxvi. The photograph should bear the date, time, latitude & longitude of the monitoring station/ sampling location. In addition to this PP should submit the original test reports and certificates of the labs which will analyse the samples.
- xxxvii. Arial view video of project site shall be recorded and to be submitted.
- xxxviii. The PP has to obtain clearance from inter-state aspect from the designated authorities as per procedure.

Agenda- No. 41.5

Basin Wise Re-assessment of Hydroelectric Potential in the country, draft report of Indus Basin.

The Member Secretary informed the Committee that the Hydro Electric Potential Reassessment Division (HEPRD), Central Electricity Authority (CEA), Ministry of Power has forwarded the draft Report of 'Reassessment of Hydroelectric Potential of Indus River Basin' for comments of the MoEF&CC.

Based on examination in the Ministry, it has been decided that it would be appropriate to discuss the draft report in the EAC meeting and then finalize the comments as per recommendation of the EAC. Accordingly, the matter was discussed by the EAC in its 41st Meeting held on 15.02.2023.

The EAC during examination noted the following:

1. A total of 164 hydroelectric projects in various stages of development in the Indus River basin have been covered in the draft report. Out of these projects, 77 nos. of projects are under planning/ DPR preparation stage which are being examined for Environmental Aspects. The basin wise reassessment of hydro potential help in achieving the following objectives:
 - i. The opportunity to optimize the river cascade system.
 - ii. Identify the most viable projects to develop first.
 - iii. Reduce the duplication of various studies, particularly hydrology, sedimentation, regional geological issues, seismic studies and power evacuation studies. This would make an important contribution in reducing the long implementation period for the projects.
 - iv. Coordinated development of power evacuation system.
 - v. Optimize construction and use of road network in a coordinated way.
 - vi. Provide systematic approach and improvement in implementation & monitoring of environmental & social aspects.
 - vii. The main purpose to study report to develop the concept of preliminary identification of location of the hydropower component across the River basin which will be supplement the consideration of projects for grant of EC, if required and also to minimize the impacts/pressure on Eco sensitive locations.
 - viii. As a part of the scope of work, among others, environmental aspects are included. The key aspects to be covered under this component are:
 - a. Review of environmental aspects of the project, location of dam and power house with respect to protected across like National Parks, Sanctuaries, Biosphere Reserves, Eco-Sensitive Zones, etc.
 - b. To ensure free flow stretches for the projects in cascade development schemes.
 - c. Environmental Flows releases as per the Ministry of Environment, Forest and Climate Change (MoEF&CC) norms.
 - d. Impacts likely to accrue based on preliminary investigation.
 - e. Recommendations, if any, for further studies.

2. The EAC deliberated on the contents of **Chapter 4 - Environmental Aspects** in the report and observed following:

Sl No.	Content of Chapter 4 - Environmental Aspects	Comment of the EAC
1.	The list of the protected areas in Indus River Basin and status of their Eco-Sensitive Zone is given in Table-4.1	The status of ESZ Notification & Date of Notification should be mentioned where it is not given
2	ASSESSMENT OF PROJECTS : Based on the proximity of the projects with respect to boundaries of ecologically sensitive areas, the project	The proposed project components (such as power house, dam/barrage, HRT, TRT etc.) distance from ESZ

	wise recommendations in Table 4.2, 4.4,4.5, 4.8, 4.11	area/Protected areas to be mentioned in Remarks/ Recommendation column or add separate column for project distance from ESZ/Protected areas.
3	For preparation of Table-4.13: (List of major floral species recorded from the Indus River and its Sub-Basin) data collected from Forest working plan, Flora of Himachal Pradesh, CEIA reports on various on Chenab, Jhelum, Ravi , Beas, and Satluj river basin projects and available published literature on flora diversity of Himachal & J&K Himalaya	Till date CEIA study for Ravi, Jhelum River has not been undertaken. So, data source may be reviewed accordingly. The tributaries/rivulets meeting with major rivers in the basin may also be covered in the survey so as to have current trends about the species, habitats and ecological systems.

The EAC further stated that the report may provide a base line information about the ecological, geomorphological and socio-economic profile of the proposed sites of hydro-electric projects in the Indus basin, the same will ultimately facilitate the comprehensive assessment of anticipated environmental concerns under the provisions of the EIA Notification, 2006, as amended.

Agenda Item No. 41.6: Cumulative Impact Assessment and Carrying Capacity Study (CIA & CCS) of Yamuna River Basin in Himachal Pradesh by Indian Council of Forestry Research and Education (ICFRE), Dehradun - Terms of Reference (TOR)

The Indian Council of Forestry Research and Education (ICFRE), Dehradun along with its partner institutions viz. Indian Institute of Technology (IIT), Roorkee; ICAR Directorate of Coldwater Fisheries (DCFR), Bhimtal and Salim Ali Center for Ornithology and Natural History (SACON), Coimbatore, made a presentation before the EAC (River Valley and Hydroelectric Projects) on the draft report on "Cumulative Impact Assessment and Carrying Capacity Study (CIA & CCS) of Yamuna River Basin in Uttarakhand".

The ICFRE during the presentation informed that:

- i. ICFRE in association with study partner institutions submitted draft Final Report of Cumulative Environmental Impact Assessment (CEIA) Study of Hydroelectric Projects in Yamuna River Basin in Uttarakhand to UJVNL, GoUK on 18.11.2015 and same presented before SEIAA & SEAC on 28.07.2016.
- ii. Further, Study Report was presented before 22nd EAC for River Valley & Hydroelectric Projects of MoEF&CC, GoI, New Delhi during its meeting held on 27.02.2019.

- iii. EAC in its 22nd meeting (27.02.2019) besides giving comments and observations on the study report mentioned that “....*the river basin study should not be limited to a particular state, it has to be considered the complete basin or sub-basin. Thus, the hydroelectric projects located in the State of Himachal Pradesh in the Yamuna river basin should be included in the CIA & CC Study. Hence, all the hydro-electric projects in Yamuna river basin up to Paonta Sahib (Sirmour district of H.P) should be included in the study. To that end, a proposal detailing revised scope of work, Terms of References, time frame, cost estimates, deliverables is required to be invited for completing the study in Yamuna river basin as above.....*”
- iv. Accordingly, ICFRE, Dehradun vide letter dated 24.06.2019 was requested by MoEF & CC to submit a proposal detailing revised scope of work, ToR, time frame, cost estimates deliverables for additional study of Hydroelectric projects in Yamuna River basin falling in Himachal Pradesh.
- v. In this context, Directorate of Energy (DoE), Govt. of Himachal Pradesh (GoHP) was requested by the ICFRE, Dehradun vide letter dated 03.07.2019 to provide details of all hydroelectric projects falling in Himachal Pradesh part of Yamuna river basin. The UJVNL Uttarakhand was also requested vide letter dated 04.07.19 to share updated details of hydroelectric projects in Uttarakhand part of Yamuna river basin.
- vi. A list of about 94 HEPs falling in Yamuna river basin in the part of Himachal Pradesh was received from HIMURJA through DoE, GoHP vide email dated 17.02.2020 to CIFRE, Dehradun.
- vii. Proposal for CEIA Study of Hydroelectric Projects in Yamuna River Basin including Himachal Pradesh part (i.e. up to Paonta Sahib in Sirmour district) was submitted to the Ministry by ICFRE letter dated 10.12.2020.
- viii. Accordingly, the part proposals received from partner institutions were considered and a consolidated proposal has been prepared by CIFRE, Dehradun. The proposal (**Annexure-I**) contains revised scope of works, Term of Reference, time schedule, cost estimate, deliverable, etc. for the additional study of HEPs in Yamuna river basin in the part of Himachal Pradesh.

The Expert Appraisal Committee after examining the ICFRE proposal for grant of TOR for conducting the Cumulative Impact Assessment (CIA) and Carrying Capacity Study (CCS) of Yamuna River Basin in Himachal Pradesh finalised following additional TOR along with TOR as proposed by the ICFRE:

- I. The basin study also envisages a broad framework of environmental action plan to mitigate the adverse impacts on environment, which is in the form of:
 - a. Preclusion of an activity
 - b. Infrastructure development
 - c. Modification in the planned activity
- II. Implementation of set of measures for amelioration of adverse impacts.
- III. Ecological carrying capacity analysis of the Disaster affected river valleys.
- IV. Socio-economic impact of HEPs.

- V. Study the impact of cascade development and make recommendations on the requirement of free flowing stretch between two projects. Ecological inventory and geomorphology for different stretches of river to be delineated.
- VI. Information on river stretch affected and forest area affected by each project needs to be modified to include additional details of catchment area; total forest area of the sub basin and the area getting affected and total river length, stretch affected and free flowing.
- VII. Undertake environmental flow release assessment for the entire year i.e. covering lean, non-lean non- monsoon and monsoon periods, based on methodology such as BBM (Building Block Methodology) and make recommendations for each stretch.
- VIII. Hydro Dynamic Study for assessment of Environmental flow release should be linked with the fauna, habitat requirement for assessment of environmental flow releases for entire year.
- IX. Modelling study carried out to assess the impact of peaking discharge should be concluded with recommendations for mitigation of such impacts.
- X. The main objective of the study is to bring out the impacts of dams being planned on the main river and its tributaries. At the end of the Report there should be a separate Chapter synthesizing the results of each component so that a holistic picture of impacts could be emerged which should lead to Recommendations.
- XI. Impact of sand mining, boulder mining, etc need to be included in the study
- XII. Impact assessment should also include "Impacts due to construction of approach roads for the HEPs".
- XIII. Source of secondary information used in the report/to be used in the report should be revealed and credit given accordingly.
- XIV. Detailed maps of each Sub-Basin have to be provided separately for each parameter such as forest cover, forest type, vegetation, location of sampling sites, etc. For each forest type it will be appropriate to give altitudinal range (for some it is given), its location in the study area in separate maps.
- XV. For betterment of analysis, it may be appropriate to categorize dams as Operational/ Under Construction/ EC, Scoping, Not Allotted yet, This will facilitate decision making on dropping of any dam, if it is required from environmental angle.
- XVI. Disaster mitigation plans.
- XVII. Review of existing and planned developments as per various developmental plans and records.
- XVIII. Evaluation of impacts on various facets of environment due to existing and planned hydro power project developmental activities vis-à-vis development activities other than hydro.
- XIX. Suggest a road map of sustainable way of development of various projects & HEPs in the basin.
- XX. In the list of about 94 HEPs, must be mention for its type of Storage (RoR).
- XXI. Base line data generation 3 seasons for Himachal Pradesh and one season for Uttarakhand for conducting CIA&CCS study of Yamuna Basin.
- XXII. The latest data generation required to consider for the study.

- XXIII. E-flow assessment on the basis of Velocity/Depth & cross section, Drone Based aerial survey.
- XXIV. Habitat Simulation or Micro-Habitat Modeling Methodologies for biological sustainability of aquatic ecosystem.
- XXV. Expert required for study of Impact on ecology, including fisheries, biodiversity of riverine ecosystem.
- XXVI. Specific recommendation for specific project in the report.
- XXVII. Recommendation in terms of reduction of flow/ tunnel based E-flow shall be estimated.
- XXVIII. Impacts on fisheries due to fluctuations in Water Level, HEP components (hydraulic turbines, Spillways, penstock etc).
- XXIX. Additional information from Project authority collected as required for conducting said study.
- XXX. Quantity of water releases from each project fix/Quantity of water releases to be fixed in a basin.
- XXXI. Consultant should assess the depth of flow, velocity and top flow width on well-established software like HEC-RAS etc for various scenario of flow releases namely 10%, 15%, 20%, 25%, 30%, 40%, 50% and 100% in 90% dependable year considering lean, monsoon and other four months.
- XXXII. The estimated depth of flow, velocity and top flow width should be correlated with riverine fauna for environmental flow recommendations.

Agenda Item No. 41.7

Cumulative Impact Assessment (CIA)and Carrying Capacity Study (CCS) of Hydroelectric projects in Sutlej River Basin in Himachal Pradesh including less than 10 MW projects—reconsideration of the draft Report

The Indian Council of Forestry Research and Education (ICFRE), Dehradun along with its partner institutions viz. Alternate Hydro Energy Center (AHEC), Indian Institute of Technology (IIT), Roorkee; ICAR Directorate of Coldwater Fisheries (DCFR), Bhimtal and Salim Ali Center for Ornithology and Natural History (SACON), Coimbatore, made a presentation before the EAC (River Valley and Hydroelectric Projects) on the draft report on “Cumulative Environmental Impact Assessment (CEIA) & Carrying Capacity Study (CCS) of hydroelectric projects in Sutlej river basin in Himachal Pradesh”.

It was informed that:

- I. A total of 153 HEPs (37 HEPs of >10 MW covered in past study conducted during 2012-15 and 116 HEPs of less than 10 MW and Luhri stage I, II, III HEPs covered in additional study conducted during 2017-18) have been considered for the study in Sutlej river basin. Out of 153 HEPs 28 HEPs have been commissioned having total installed capacity of 4346.90 MW, 18HEPs having 983.10 MW installed capacity are in advanced stage of construction and 107 HEPs with installed capacity of 3282.70 MW are identified/proposed/ under development projects.

- II. **EAC meeting on 08.02.2016:** Final draft CEIA study report for 38 HEPs in Sutlej River Basin (SRB), H.P. was submitted and presented before EAC for River valley and hydropower projects of MoEF&CC held on 08.02.2016. EAC suggested to include all HEPs including less than 10MW in CEIA study; including Luhri project (775 MW), to be studied as Luhri stage I (210MW), II (170MW) & III (355MW).
- III. **EAC meeting on 28.01.2019:** Revised Study Report including 10 MW HEPs and Luhri-I,II,III HEPs submitted to MoEF&CC in November, 2018 & presented before EAC (River valley and hydro-electric projects) during its meeting held on 28.01.2019. After examination of the revised study report, the EAC made following observations:
- i. EFR is required to be relooked and need to be revisited based on the river cross sections at important places and water depth requirement specific to the fish species and other uses, in the diverted river stretch due to the hydroelectric project. As lower stretch of the Sutlej river is having high fish abundance and catch, river being flat compared to middle and upper Sutlej river stretch may require different EFR for hydroelectric projects falling therein.
 - ii. Land Use / Land Cover changes with respect to snow cover area class should be rechecked and verified for the variation shown in the change detection for snow cover area.
 - iii. Occurrence of Golden Mahseer in lower stretch of Sutlej River has been reported by Department of Zoology, Punjab University, Chandigarh / Department of Fisheries, Punjab Govt. The presence/absence of Golden Mahseer in lower stretch of Sutlej River (i.e. reservoir of Kol dam and its upstream) should be rechecked and documented appropriately in the study report. The presence/absence of two endemic fish species reported from Spiti Valley may also be taken into account in the study report.
 - iv. The exact locations / stretches of the fish breeding and spawning sites as mentioned in the report should be marked on a map and highlighted and details be given in the report.
 - v. Draft Guidelines of CWC regarding longitudinal connectivity has not yet been finalized or approved by Gol. Therefore, such references and exercise to be avoided.
 - vi. The HEPs of below 10 MW/25 MW capacity proposed to be dropped based on their location in core or buffer zone of Protected Areas and their ESZ shall be relooked in terms of threat to the wild life (terrestrial faunal groups like mammals, reptiles, amphibians, birds, butterflies, etc.) on habitat, migration routes, breeding sites, plants, fish, etc. due to hydroelectric project. The recommendations presented should be consolidated and specific. The recommendation regarding hydroelectric projects proposed to be dropped should be supported with scientific data.

- vii. The mammals like Snow Leopard, Common Leopard and birds like Monal, Cheer Pheasant, etc. are also of conservation concern as per IWPA, IUCN. This should be taken into consideration in the study report.
- viii. Data inventory and revival of natural springs in H.P may be collected from secondary sources.
- ix. Fish species listed to be revisited, important species such as Mahseer, Dipticus, schistura sp. Are missing. Also requested to check species valid names.
- x. E-flow recommended for downstream area is 20% is inadequate in the contest of presence of migratory species like I. dero, I. dyochelius and mahseer. It needs to be revisited according to the species need.
- xi. Endemic bird species and threatened mammals species in the project area need to be included.

IV. **EAC meeting on 05.12.2019:** The revised report along with the compliance to the above observations was presented before the EAC meeting held on **05.12.2019**.

After detailed deliberations on the revised study report following recommendations were derived:

1. The total number of HEPs recommended, precluded, considered after modification:

a. Hydroelectric project located in and around Cold Desert Biosphere Reserve:

- i. The commissioned Rongtong(2.25 MW) HEP is located in the transition zone of CDBR.
- ii. Proposed Lara Sumta (48 MW) and Sumte Kothang (62 MW) HEPs fall within transition zone of CDBR.
- iii. Proposed Berang (1.5 MW) fall within buffer zone of CDBR. The SHEP shall be subjected to regulatory norms and statutory clearance from appropriate authority.
- iv. Proposed Namkan (2.25 MW) HEP is located in the ESZ of Pin valley National Park. The SHEP shall be subject to regulatory norms and statutory clearance from appropriate authority.
- v. Proposed/under development Barakhamba (45MW), HimaniChamundaThingri (9.5MW) and Kaachrang (5 MW) falls in RupiBhaba WLS.
- vi. Proposed Shushang (1.0MW), Khargola (2.5MW), Shailpya (2.4MW), GorGalang (2.20MW), MangsaGarang (2.4MW) are located at border of Rakchham WLS boundary assessed to have cumulative impact. However, these SHEP shall be subjected to regulatory norms and statutory clearance from appropriate authority.
- vii. Proposed Dogali (2.0MW), Ratadori (1.8MW) fall in the core zone and Gartada (0.25MW), Darkali (2.5MW) and Kotagad (3.5MW) in the eco-sensitive zone of Dharanghati WLS assessed to have cumulative impact; these SHEP shall be subjected to regulatory norms and statutory clearance from appropriate authority.

- viii. Proposed Kot-II (0.50MW), Sovari (0.90MW), Kheuncha (0.50MW) and Chaunda-II (2.2MW) falls in Key Biodiversity Area assessed to have cumulative impact. These SHEP shall be given least priority as far as possible.

b. Hydroelectric project recommended for Preclusion

- i. Lara Sumta (48 MW) and Sumte Kothang (62 MW) HEPs fall within transition zone of Cold Desert Biosphere Reserve (CDBR)–considering the importance flora and natural resources on which the community depends and the socio-cultural value, it is **Recommended for preclusion** of these projects having total installed capacity of 110MW.
- ii. Barakhamba (45MW) HEP falls in Rupi Bhaba Wildlife Sanctuary – Considering the importance of reach flora, fauna and the habitat it is **recommended for preclusion**.
- iii. Himani Chamunda Thigri (9.5MW) HEP falls in Rupi Bhaba Wildlife Sanctuary- Considering the importance of reach flora, fauna and the habitat, **it is recommended for preclusion**.
- iv. Kaacharang (5.0 MW) HEP falls in Rupi Bhaba Wildlife Sanctuary - Considering the importance of reach flora, fauna and the habitat, it is **recommended for preclusion**.

2. Distance Maintained Between Two Consecutive Projects

Distance between two consecutive projects is recommended in 18 proposed HEPs for re-aeration process. Such revision will consequently contribute to reduction of 152.54 MW in the installed capacity proposed and the revised IC would be 1644.06 MW instead of the proposed capacity (1796.6 MW). The HEPs are given in the below table:

Table: Impact of maintaining the distance between two consecutive HEPs

S. No.	Project Name	IC (MW)	Proposed Head (m)	Modified Head (m)	Revised IC (MW)
1.	Jangi Thopan Powari	960	295	277	901
2.	Shongtong Karacham	450	129	111	387
3.	Youngthang Khab	261	187	175	244
4.	Tidong II	60	595	564	57
5.	Ani IV	5.0	166	152	4.58
6.	Balan Sarogi	2.0	65	51	1.57
7.	Kaachrang	5.0	142	125	4.40
8.	Upper Sumej II	2.0	72	54	1.50

9.	Lower Sumej	5.0	155	133	4.29
10.	Kareri	5.0	119	96	4.03
11.	Kurpan III	14.6	267	252	13.78
12.	Upper Kurmi	5.0	186.4	146	3.93
13.	Khanderi	2.0	35.52	15	0.82
14.	Nind	3.0	150	129	2.58
15.	Himani Chamunda Thingri	9.5	239	207	8.23
16.	Hurba II	3.0	142	118	2.49
17.	Bagh Garehna	2.0	163	145	1.78
18.	Raura Top	2.5	640	277	1.08
Total		1796.6			1644.06
Reduction identified in the those above projects that are identified					

3. EFR Using Water Depth in River Cross Section

As per the observation of 21st EAC meeting dated 28.01.2019, the discharge and corresponding depth for EFR in the lean period were compared with the depth and discharge obtained from river cross sections. For computation of discharge and corresponding depth for EFR, river cross-sections of 26 HEPs covering the main stream of river Sutlej having both existing/planned large, medium or small scale hydropower projects was used. It is seen that the depth of water corresponding to recommended EFR discharge worked out based on percentage of inflow in the actual river cross sections are generally higher than the depth of water recommended for fish movement. From the results, it can be concluded that the actual depth of water of recommended EFR discharge based on the river cross-sections is sufficient for required depth of water for aquatic life and its corresponding EFR.

The HEPs having Installed Capacity <5 MW for which the Project details were not available need not to be revisited for maintaining minimum e-flow. However, these projects shall be governed by the Notification of the HP Government on minimum release at the downstream of barrage/dam and also the NGT Order dated 09.08.2017. It is further mentioned that the quantum of e-flows, whichever is higher shall be followed. The recommended of EFRs for recommended projects to be implemented in Satluj river basin is provided in Table below:

Calculation of Water Depth for corresponding EFR calculated through actual river cross sections at Different Project Sites:

S. No.	Water Depth and EFR recommended						Calculation of Water Depth for corresponding EFR calculated through river cross sections		
	Name of Project	Fish occurrence	Depth Range (m)	Minimum Depth (m)	EFR (m ³ /s)	Av. (Dec-Jan-Feb) inflow (%)	River	Q=AV(m ³ /s)	Depth (m)
1	Jangi Thopan P	Nil	NA	NA	6.63	20	Sutlej	10.40	1.35
2	Karchham Wangtoo	Rare	0.2-0.3	0.15	12.13	20	Sutlej	12.16	0.46
3	Nathpa Jhakri	Occasional	0.2-0.3	0.15	12.4	20	Sutlej	12.65	0.50
4	Rampur	Frequent	0.3-0.4	0.3	14.55	20	Sutlej	14.25	0.33
5	Luhri-I	Frequent	0.3-0.4	0.3	14.93	20	Sutlej	14.90	0.27
6	Luhri-II	Frequent	0.3-0.4	0.3	14.93	20	Sutlej	14.88	1.27
7	Luhri-III	Frequent	0.3-0.4	0.3	15.14	20	Sutlej	15.29	0.97
8	Kol Dam	Abundant	0.3-0.4	0.3	25.03	20	Sutlej	25.01	0.70
9	Shongtong Karcham	Nil	NA	NA	13.52	20	Sutlej	13.69	0.14
10	Baspa-II	Frequent	0.2-0.3	0.2	1.86	20	Baspa	1.82	0.76
11	Tidong-I	Rare	0.2-0.3	0.15	0.99	20	Tidong Khad	0.99	0.20
12	Tidong II*	Nil	NA	NA	0.86	20	Tidong Khad	0.84	0.22
13	Wanger Homte	Nil	NA	NA	0.66	20	Wanger Gad	0.67	0.09
14	Masrang Selti	Nil	NA	NA	0.67	20	Kashang Khad	0.75	0.11
15	Kashang-I*	Nil	NA	NA	0.47	20	Kashang Khad	0.49	0.03
16	Rakshad	Nil	NA	NA	0.17	16	Salring Khad	0.19	0.07
17	Jeori	Nil	NA	NA	0.22	20	Manglad Khad	0.23	0.03

18	Nanti	Nil	NA	NA	0.43	20	Nanti Khad	0.45	0.12
19	Jogni	Nil	NA	NA	0.38	15	Nogli Gad	0.60	0.13
20	Rala*	Nil	NA	NA	0.29	20	Panwi Khad	0.29	0.05
21	Manglad	Nil	NA	NA	0.25	20	Manglad Khad	0.26	0.03
22	Roura-II*	Nil	NA	NA	0.27	20	Raura Gad	0.28	0.06
23	Behna I	Occasional	0.20 –0.30	0.2	0.8	20	Anni Gad	0.83	0.15
24	Umli	NIL	NA	NA	0.41	20	Kurpan Khad	0.42	0.08
25	Sumej*	NIL	NA	NA	0.09	19	Sechi Khad	0.09	0.06
26	Kurmi	NIL	NA	NA	0.12	16	Nanti Khad	0.3	0.03

*(Steep Slope i.e. 1:6 or steep)

4. HEPs that are coming within the ESZ area shall be governed by the ESZ Notification and are to be strictly adhered to the stipulations of the Notification. In case, there is any modification/s proposed, viz. the location of the Power House, etc. the same may be undertaken with prior consultation with the State Government and MoEF&CC. The minimum e-flow in such cases shall be decided based on fresh modeling or by the Notification of the HP Government on minimum release downstream of barrage/dam and the NGT Order dated 09.08.2017, whichever is higher.
 5. The challenges and uncertainties in the data due to non-availability of various data for most of the aspects resulted in significantly high variations between the components used in CIA for each project developed using 22 identified aspects under 6 selected VEC. However, few components such as protected area, forest area affected and river length affected showed a distinct value protected area & pristine area, undisturbed, forest area, river length affected by project per MW of installed capacity social un-acceptance.
 6. All the 153 HEPs were subjected to ranking for the above parameters with the value between 0-10 to aggregate the value mathematically using valued ecosystem components such as forest type, flora, fauna & avian diversity, richness and aquatic diversity and river length affected by project per MW. In addition, the projects in the higher zone were given 50% weightage and the remaining 50% is given to their project specific impacts and cumulative impacts.
- V. Above recommendations derived during EAC meeting held on 05.12.2019 were conveyed to the Consultant (ICFRE, Dehradun) vide letter dated 30.12.2019 by MOEF&CC, New Delhi for their incorporation in the Final Study Report and submit

- revised CIA and CCS of Hydro projects of Sutlej River Basin to the Ministry for taking approval of the competent authority.
- VI. The recommendations derived during the EAC meeting 05.12.2019 were further corrected by the EAC in its meeting held on 27.01.2020. Accordingly, the consultant, ICFRE, Dehradun has incorporated the corrections/modifications in the final draft report on Cumulative Environment Impact Assessment (CIA) of Hydroelectric projects in Sutlej River Basin in Himachal Pradesh and submitted vide letter dated 10.06.2020 to MOEF&CC.
- VII. During examination of the report in the Ministry certain factual errors were observed and the same was communicated to ICFRE vide letter dated 26.10.2021. The corrected final draft report on Cumulative Environment Impact Assessment (CIA) of Hydroelectric projects in Sutlej River Basin in Himachal Pradesh was submitted by the ICFRE vide letter dated 16.11.2021 to MOEF&CC.

The EAC during the present meeting deliberated on the corrected final draft report on Cumulative Environment Impact Assessment (CIA) of Hydro-electric projects in Sutlej River Basin in Himachal Pradesh. During discussion, the representatives of Government of Himachal Pradesh raised certain issues regarding inclusion and preclusion of certain Hydro-electric projects. It was also informed that the same issues have already been informed to the MoEF&CC vide letter no. HPDoE/CE (Energy)/CEIA Satluj Basin /2018-19-428-29 dated 22.05.2020, though the ICFRE replied that they were not intimated with such issues at the time of completion of the report.

The EAC after detailed deliberations was of the view that the issues of Govt. of Himachal Pradesh related to report on Cumulative Environment Impact Assessment (CIA&CCS) Sutlej River Basin in Himachal Pradesh needs to be discussed by Government of Himachal Pradesh expeditiously with ICFRE, Dehradun on priority basis so that the same can be addressed before finalisation of the study report. The ICFRE may modified the report accordingly and submit for further deliberations by the EAC.

The meeting ended with vote of thanks to the Chair.

ATTENDANCE LIST

Sr. No.	Name & Address	Role	Attendance	
			Virtual	Physical
1.	Dr. K. Gopakumar	Chairman	P	
2.	Dr. A. K. Malhotra	Member	P	
3.	Dr. Uday Kumar R. Y.	Member		P
4.	Shri Sharvan Kumar	Member	P	
5.	Shri Ashok Kumar Kharya	Representative of CWC		P
6.	Dr. Amiya Sahoo	Member		P
7.	Shri Yogendra Pal Singh	Member Secretary		P

Annexure-I referred in agenda item no. 41.5

Proposal for Cumulative Environmental Impact Assessment (CEIA) Study of Hydroelectric Projects in Yamuna River Basin including Himachal Pradesh part (i.e. up to Paonta Sahib in Sirmour district)

1.0 Background

The Uttarakhand Jal Vidhyut Nigam Limited (UJVNL), Govt. of Uttarakhand *vide* its letter No.147/UJVNL/EDC Civil/2012 dated 26th March, 2012 requested Indian Council of Forestry Research and Education (ICFRE), Dehradun to give consent and submit a proposal for conduct of 'Cumulative Environmental Impact Assessment (CEIA) Study of Hydroelectric Projects (HEPs) on River Yamuna, Tons and its Tributaries in Uttarakhand' based on Terms of Reference (ToR) provided by UJVNL. The ICFRE submitted its consent along with proposal considering forty six hydroelectric projects in Yamuna river basin in Uttarakhand state in association with national subject expert institutions. i.e. Department of Hydro and Renewable Energy (DHRE), Indian Institute of Technology (IIT) Roorkee; Directorate of Cold Water Fisheries Research (DCFR), Bhimtal, Uttarakhand and Salim Ali Centre for Ornithology and Natural History (SACON), Coimbatore. Accordingly, the study was awarded to ICFRE and study partner institutions by UJVNL *vide* letter No 541/UJVNL/Civil-New Projects/CEIA dated 03rd July, 2012.

As per the assignment, the study was conducted by ICFRE and its partner institutions and draft report was submitted to UJVNL on 18.11.2015 and presented before State Environmental Impact Assessment Authority (SEIAA) and State Environmental Appraisal Committee (SEAC) on 28.07.2016. The comments/observations/suggestions received from SEIAA and SEAC members were incorporated suitably and final report was submitted to UJVNL on 29.05.2017. Thereafter, UJVNL *vide* letter no. 52/UJVNL/03/Dir(P)/GM(CDH&NP)/Yamuna Tons dated 25.02.2019 requested ICFRE to present the study report before 22nd Expert Appraisal Committee (EAC) for River Valley & Hydroelectric projects of MoEF&CC, GoI, New Delhi. Subsequently, the ICFRE and study partner institutions presented the study report before 22nd EAC of MoEF&CC, GoI, New Delhi on 27.02.2019. The EAC *vide* its minutes of meeting suggested that the river basin study should not be limited to a particular state and it has to be considered on complete River basin or sub-basin. Thus, the hydroelectric projects located in the state of Himachal Pradesh i.e upto Paonta Sahib in Sirmour district in the Yamuna river basin should be included in the CIA & CC study (*Annexure-II*). The Director IA, MoEF&CC, GoI *vide* letter no. J-11013/21/2019-IA-I dated 24.06.2019 requested ICFRE, Dehradun to submit a proposal detailing revised scope of work, Term of Reference (ToR), time schedule, cost estimate, deliverable, etc. for the additional study of HEPs in falling in Yamuna river basin in Himachal Pradesh for incorporation in CEIA study report.

Accordingly, the ICFRE requested Directorate of Energy (DoE), Govt. of Himachal Pradesh (GoHP) *vide* letter no. 1-72/2012-ADG (EM)/CEIA/UJVNL DDN/ICFRE Vol-IV dated 03.07.19 to provide details of all hydroelectric projects falling in Himachal Pradesh part of Yamuna river basin. The UJVNL Uttarakhand was also requested *vide* letter no. 1-72/2012-ADG

(EM)/CEIA/UJVNL DDN/ICFRE Vol-IV dated 04.07.19 to share updated details of hydroelectric projects in Uttarakhand part of Yamuna river basin. A list of about 94HEPs (Annexure-I Table-1) was received from HIMURJA through DoE, GoHP *vide* email dated 17.02.2020 falling in Yamuna river basin in the part of Himachal Pradesh. The information received so far was shared with the study partner institutions for their part proposal in the respective domain of work. Accordingly, the part proposals received from partner institutions were considered and a proposal has been prepared for submission to the MoEF&CC, New Delhi.

The proposal contains revised scope of works, Term of Reference (ToR) as *Annexure-I*, time schedule, cost estimate, deliverable etc for the additional study of HEPs in Yamuna river basin in the part of Himachal Pradesh.

2.0 Approach and Methodology

A desk review of available secondary source data on hydrological flows, sediment load, muck generation, springs and ground water and data available on different aspects of environmental in DPRs/PFRs/EIA-EMPs of all commissioned/under construction/under development hydroelectric projects made available by DoE/UJVNL/Govt. and other agencies will be done for extraction of relevant data required in the study. A spatial data base of required thematic maps will be created by using GIS. Three seasons field study will be considered for biodiversity study in Himachal Pradesh part of the river basin and one season study for updating the Uttarakhand part of Yamuna river basin done earlier. The outline of the work components as per revised ToR is given in Annexure Table-3. The studies will be carried out as per standard methodologies.

3.0 Data Requirement-Data requirement is summarized as below:

Category	Type	Source	Responsibility for Procurement
Meteorology (from 1990 onwards)	<ul style="list-style-type: none"> ▪ Rainfall (daily), temperature, sun shines hour, wind speed, relative humidity, pan evaporation from observatories of IMD and of State Government. 	IMD and HP State Government	DHRE
Hydrology (from 1990 onwards)	<ul style="list-style-type: none"> ▪ Daily/Ten-daily stream flow from 1990 (or as available) - till date. ▪ Sediment characteristics and transport data, River cross sections at desired distance intervals 	CWC, HP Govt. Agencies	DHRE
Hydropower projects	<ul style="list-style-type: none"> ▪ Location and index map, salient features 	HP Govt. Agencies	DHRE and ICFRE
	<ul style="list-style-type: none"> ▪ Elevation Area-capacity relation for reservoir based schemes, sediment deposition data 	DPRs, HP Govt. Agencies	
	<ul style="list-style-type: none"> ▪ Evaporation data (10-daily/Monthly), demands for various purposes. 	IMD, HP Govt. Agencies	

Category	Type	Source	Responsibility for Procurement
	<ul style="list-style-type: none"> ▪ Working tables (10-daily/monthly) from 1990 – till date ▪ Power demand (load curve), demand centres ▪ Installed plant capacity, generation efficiency, power generated and water released through plant (1990 onwards) 	HP Govt. Agencies	
Hydropower	<ul style="list-style-type: none"> ▪ DPRs/PFRs of all commissioned/proposed Hydropower Projects and EIA studies and Environmental Management Plans (EMPs) of all commissioned / proposed HEPs ▪ Monitored observations and activities under taken post clearances as per requirement ▪ Sediment data 	HP Govt. Agencies	DHRE
Actual Cross Section	<ul style="list-style-type: none"> ▪ River cross sections at desired distance intervals 	HP Govt. and other project developers	
Water quality	<ul style="list-style-type: none"> ▪ Point, non point sources of pollution, water variables parameters observed by CWC, CPCB, NRCB from 1990 onwards 	HP State Govt. and Agencies mentioned	DHRE and ICFRE

4.0 Time Schedule- Time frame for the study will be eighteen (18) months after award of the study and from receipt of first installment. Schedule of activities is given in Table-1.

5.0 Budget Estimate-

The estimated cost of the study will be **Rs. 226.327 Lakhs** +GST and other taxes as applicable (Table-3).

5.1 Financial Arrangement

The payment schedule will be as below:

- 75% amount + GST as advance along with the assignment letter to meet the expenditure towards initiation and completion of projects works.
- 15% amount + GST of balance amount on the submission of draft report.
- 10% amount +GST of balance amount on the submission of final report.

Table 1: Schedule of work activities (Quarter (Q) wise)

SN	Details of Activities	Q-I	Q-II	Q-III	Q-IV	Q-V	Q-VI
1	Recruitment of Manpower						
2	Collection of relevant documents from DoE/UJVNL and other agencies, their desk review and analysis of existing baseline data of river basin						
3	Working group meeting between the study partner institutions for finalization of approach, methodology and modality for baseline data collection.						
4	Collection of baseline data on physical, biological and social environment and data computation						
5	Compilation of data/information for preparation of draft report.						
6	Preparation of consolidated draft report						
7	Finalization and submission of draft report to MoEF&CC, GoI, New Delhi						
8	Submission of final report to MoEF&CC, GoI, New Delhi						

Note- The above time schedule will depend upon the availability of data from respective agencies and accessibility to the Project site as well as COVID-19 pandemic situation in the concerned areas of study.

Table-2 Budget Estimate (Rs in Lakh)

S. No.	Budget Head	Sub Head	ICFRE	IITR	SACON	DCFR	TOTAL	
1.	Salary/Emoluments	1.1	Cost of man-days of official deployed/Scientists' Man-days cost	12.00	-	3.60	-	15.60
		1.2	Cost of physical inputs/services/utilities/consumable/raw material, satellite imaginary etc. (including engagement of project staff and skilled person, office expense and report writing etc.)	12.00	9.00	-	-	21.00
		1.3	Engagement of sub-consultant/domain expert	8.00	-	-	-	8.00
		1.4	Manpower	-	34.00	-	-	34.00
		1.5	Direct Expenses (including, wages for hiring manpower (One SRF & One YP-I/ Fishermen) TA/DA cost, Other Contingency-hiring of vehicles, Chemicals etc.); if any:	-	-	-	12.00	12.00
		1.6	Project Staff salary (SRB-01, JRB-02 & FA-02)	-	-	19.302	-	19.302
		<i>Sub Total -1</i>			<i>32.00</i>	<i>43.00</i>	<i>22.902</i>	<i>12.00</i>
2.	Consumables	2.1	Consumables and miscellaneous expenses, data, report etc.	-	-	0.80	-	0.80
		<i>Sub Total-2</i>			<i>-</i>	<i>-</i>	<i>0.80</i>	<i>-</i>
3.	Travel expenses	3.1	TA/DA	20.00	4.00	19.80	-	43.80
		3.2	Equipments/ Camp maintenance	-	-	3.00	-	3.00
<i>Sub Total-3</i>			<i>20.00</i>	<i>4.00</i>	<i>22.80</i>	<i>-</i>	<i>46.80</i>	
4.	Contingency	4.1	Contingencies including capacity building	2.00	-	2.325	-	4.325
		<i>Sub Total-4</i>			<i>2.00</i>	<i>-</i>	<i>2.325</i>	<i>-</i>
5.	Overhead	5.1	Overhead	-	-	2.325	-	2.325
		<i>Sub Total-5</i>			<i>-</i>	<i>-</i>	<i>2.325</i>	<i>-</i>
TOTAL (Sub Total 1 - 5)			54.00	47.00	51.152	12.00	164.152	
6.	Institutional Charges		-	15.66	9.30	-	24.96	
	Intellectual fee		17.82	-	-	18.00	35.82	
7.	Taxand insurance		-	-	1.395	-	1.395	

S. No.	Budget Head	Sub Head	ICFRE	IITR	SACO N	DCF R	TOTA L
8.		Grand Total (excluding GST)	71.82	62.6 6	61.847	30.00	226.32 7
		GST as applicable (presently 18%)					

6.0 Deliverables

A report in soft and hardcopy detailing i) environmentally and ecologically sustainable and optimal ways of hydropower development in Yamuna river basin in Uttarakhand and Himachal Pradesh, ii) environmental flow requirement for each hydroelectric project during lean season, iii) length of free flowing riparian distance to be maintained between two successive hydroelectric projects in cascading series, iv) a practicable environment action plan to mitigate the adverse impact on environment and suggested mechanism for implementing the same at the river basin level.

Revised Terms of Reference (ToR) for Cumulative Impact Study of Hydropower Projects on Yamuna River Basin including Himachal Pradesh Part (i.e. upto Paonta Sahib in Sirmour District)

1. PREAMBLE

Yamuna River is a major tributary of river Ganga in northern India that joins river Ganga at Allahabad. With a total length of around 1,376 km, it is the largest tributary of the Ganges (Ganga). The Yamuna river, the largest tributary of river Ganga, originates from the Yamunotri Glacier near Bandarpunch peaks in the Mussourie ranges of the lower Himalayas/Lesser Himalaya at an elevation of about 6,387m above mean sea level in the Uttarkashi district of Uttarakhand state. The river flows south-southwest through narrow and steep valleys until Kalsi (near Dakpathar) where it Tons river confluences with it. The river Tons is the largest tributary of river Yamuna, originates from JamdarBamak Glacier (Har-ki-dun gad) and joins Maninda Tall (Maninda gad) at Har-ki-dun. In the downstream, it merges with Ruinsara gad originating from Bandarpunch Galcier near Seema below Calcattidhar. Further the Har-ki-dun flows down through Osla, Gangar and Taluka to Sankri where it meets river Supin. River Supin is formed at Bencha (5 km upstream of Jakhol) by the confluence of Supin gad (Manjee gad) and Obra gad that arises at the base of DeokiarBamak glacier.

The river Tons is known only after the confluence of river Supin at Naitwar with river Rupin which originates in Himachal Pradesh. The river Pabbar which originates in higher reaches of Shimla district of Himachal Pradesh confluences with River Tons at Tiuni. Along its downstream course it meets with large number of seasonal streams and drains in to steep slopes. Along its lower course, the river Tons forms the border between Himachal Pradesh and Uttarakhand. After flowing for 150 km the river Tons joins the Yamuna at Kalsi near Dakpathar on its right bank whereas Aglar and Asan joins Yamuna on its left bank. Giri river which originates in Sirmour district of Himachal Pradesh confluences with river Yamuna downstream of confluence of Tons river with Yamuna. The river Yamuna flows through the Shivalik range of Himachal Pradesh and Uttarakhand and enters into plains at Dakpathar in Uttarakhand where the river water is regulated by a weir and is diverted into a canal for power generation. From Dakpathar, the Yamuna flows adjacent to the famous Sikh religious shrine of Paonta Sahib and reaches Hathnikund in the Yamuna Nagar district of Haryana. At Hathnikund, river water is diverted into Western Yamuna Canal (WYC) and Eastern Yamuna Canal (EYC) for irrigation and drinking water supply in Delhi. It flows through the states of Uttarakhand, Himachal Pradesh, Haryana, Uttar Pradesh & Delhi, before its confluence with the Ganga at Allahabad. The major tributaries of this river are the Tons, Chambal, Betwa and Ken. Yamuna River is being gauged by CWC & Irrigation Department since long back at number of locations. Discharge data of Yamuna River is available at Naugaon, Lakhwar, Haripura and Bausan.

The catchment of the Yamuna river system covers parts of Uttarakhand, Uttar Pradesh, Himachal Pradesh, Haryana, Rajasthan, Madhya Pradesh and National Capital Territory – Delhi.

The major towns along Yamuna River in Uttarakhand state is Janaki-chatti. Hanuman-chatti, Siyan-Chalti, Barkot. Naugaon, Naingaon, Lakhwar, Haripur, Dakpathar and Dhalipur. The

Chirgaon, Hatkoti, Rohru along Pabbar river, Paonta Sahib along Yamuna river, Renuka ji along Giri River are the major towns in Himachal Pradesh.

The basin study is a step beyond the EIA as it incorporates an integrated approach to assess the impacts due to various developmental projects. The study is aimed at assessing the cumulative or aggregate ecological impact of all the hydroelectric projects planned or under execution on River Yamuna and its tributaries in Himachal Pradesh and Uttarakhand states on hydrology, biodiversity of the riverine ecosystem of the river and surrounding area of Yamuna river system.

2. SCOPE OF WORK

The scope of the study is as under:

2.1 The basin study envisages to cover the following major aspects:

- Inventory of the existing natural resources in the project affected area in the river basin.
- Determination of regional ecological fragility/sensitivity based on geo-physical, biological, socio-economic and cultural attributes.
- Review of existing and planned hydro power developments
- Evaluation of impacts on various facets of environment due to existing and planned hydropower development.
- Suggest environmental flows to be maintained immediately below the diversion structure of each of the HEPs in the basin.
- Suggest free flowing riparian distance to be maintained between two successive projects in cascading series in the river basin.
- Suggest flows necessary for observing religious practices, downstream users, if any.

2.2 The basin study would also envisage a broad framework of environment action plan to mitigate the adverse impacts on environment. The outline of work

3 STUDY AREA

Study area will encompass Yamuna river basin falling in Shimla and Sirmour district (i.e up to Paonta Sahib) of Himachal Pradesh for the additional study and from Yamunotri in Uttarkashi district to Kulhal in Dehradun district in Uttarakhand part of Yamuna river basin. A total of 140 hydroelectric projects including about 94 hydroelectric projects (Table-1) in Himachal Pradesh part for additional study and 46 hydroelectric projects (Table-2), which have earlier been studied, will be considered for CEIA study in whole of the Yamuna river basin.

4 DATA COLLECTION

The present study will be conducted by ICFRE, Dehradun in association with DHRE, IIT Roorkee, ICAR-DCFR, Bhimtal and SACON, Coimbatore and data will be collected on different aspects of environment in the study area. Outline of work components based on revised ToR along with responsibility of each study partner institutions is given in Table-3.

The data collection will include the following:

4.1 *Meteorology*-The information on various meteorological aspects is to be collected from India Meteorological Department (IMD) for meteorological stations located within the basin area or in vicinity to the basin boundary as available and reported.

4.2 *Water Resources*-The information on following aspects would be collected:

- Review of drainage characteristics of the basin, including various surface water bodies like rivers and lakes.
- Hydrological data collection.
- Review of existing water sharing agreements for meeting various need-based existing and future demands viz. municipal, irrigation, power availability, as per updated data for the system as a whole and at existing ongoing/proposed project locations on annual/monsoon/non-monsoon and monthly basis.
- The existing flow pattern be first detailed along the river on a monthly basis for the present untapped condition and post hydro power development.
- Collection and review of sediment load at various points in the basin.
- Identification of perennial sources of water and their designated usages.

4.3 *Water Quality*-As a part of the studies, secondary data is to be collected for water quality in the study area. In addition to above, information on human settlement, sewage generated and mode of collection, conveyance, treatment and disposal of sewage would also be collected. The water quality monitoring will be conducted in the study area through water samples taken from adequate number of locations representing the study area. The frequency of sampling would be once per month for 6 months. Parameters that are important for sustainability of aquatic life like temperature, pH, dissolved oxygen, conductivity, total dissolved solids, turbidity, BOD, faecal coliform, phosphates, nitrates and other parameters as done in case of Uttarakhand part of the Yamuna river basin will be considered and analyzed. Assessment of water quality will be based on the user quality criteria of CPCB or other generally acceptable classification in vogue.

4.4 *Terrestrial Flora*-Three seasons field study would be considered for Himachal Pradesh part of the river basin and one season study for revisiting the Uttarakhand part of Yamuna river basin. The data on following aspects would be collected from various secondary sources for the study area:

- Characterization of forest types (as per Champion and Seth method) in the study area and extent of each forest type as per the Forest Working Plan.
- General vegetation profile and floral diversity covering all groups of flora including Bryophytes, Pteridophytes, Lichens and Orchids.
- A comprehensive checklist of flora would be provided. Assessment of plant species with respect to dominance, density, frequency, abundance, diversity index, similarity index, importance value index [IVI], Shannon Weiner Index etc. of the species would be

provided.

- Existence of National Park, Sanctuary, Biosphere Reserve etc in the study area, if any, would be detailed.
- Economically important species like medicinal plants, timber, fuel wood etc.
- Details of endemic species found in the project area.
- Flora under RET categories would be documented using International Union for the Conservation of Nature and Natural Resources (IUCN) criteria and Botanical Survey of India's Red Data list along with economic significance.

4.5 Terrestrial Fauna and Avifauna-

Three seasons field study would be considered for Himachal Pradesh part of the river basin and one season study for revisiting the Uttarakhand part of Yamuna river basin. The following data would be collected from various secondary sources and conducting real time three season survey of the study area.

- Inventory of avifauna (resident/migratory/passage migrants etc.), land animals including mammals, herpetofauna (reptiles, amphibians), butterflies reported and surveyed in the basin area would be prepared.
- Presence of RET faunal species as per the categorization of IUCN Red Data list and as per different schedules of Indian wildlife Protection Act, 1972 in the basin area.
- Details of endemic species found in the project area.
- Existence of barriers and corridors for wild animals, if any, in the basin area would be covered as a part of the study.
- Identification of threats to wildlife in the region.
- Presence of National Park, Sanctuary and Biosphere Reserve etc. in the basin area would be listed and its importance and influence assessed.
- Ecological sensitive areas may be identified in the basin.

4.6 Aquatic Flora and Fauna-

Three seasons field study would be considered for Himachal Pradesh part of the river basin and one season study for revisiting the Uttarakhand part of Yamuna river basin. The following data would be collected from various secondary and primary sources for the study area:

- Assessment of nutrient levels, biotic resources and primary productivity.
- Presence, population density and diversity of plankton (zooplankton, phytoplankton), benthic (macrophytes, macro-invertebrates), periphyton and ichthyofauna.
- Inventory of migratory fish species and migratory seasons and routes of various fish species.
- Presence of major breeding and spawning sites
- Actual breeding sites for the fish, particularly in the area/ stretches of the river where critical habitats are to be protected.
- Critical fish fauna in the entire basin of studies.

The field studies to collect primary data on aquatic ecology and fisheries would be conducted at adequate number of sampling locations representative of the river basin..

4.7 Socio-Economic Aspects

The study would include the demographic and socio-cultural-economic aspects of the people in the river basin and their requirements vis-à-vis the development projects. The data on following aspects would be collected:

- Demographic profile
- Land details
- Economic structure
- Development profile
- Agricultural practices
- Cultural and aesthetic sites
- Infrastructure facilities: education, health and hygiene, communication network, etc.
- Impact on socio-cultural and ethnographic aspect due to project

5 IMPACTS DUE TO HYDROPOWER DEVELOPMENT

The impacts on terrestrial and aquatic ecology would be studied. The scenario to be considered for assessment in the present study would be based on hydropower projects presented in Table-1 & 2. The key aspects to be covered are listed as below:

- Modification in hydrologic regime due to diversion of water for hydropower generation.
- Depth of water available in river stretches during lean season and its assessment of its adequacy vis-à-vis various fish species.
- Length of river stretches with normal flow due to commissioning of various hydropower projects due to diversion of flow for hydropower generation
- Impact on discharge in river stretch during monsoon and lean season due to diversion of flow for hydropower generation
- Impact on water users in terms of water availability and quality
- Impact on aquatic ecology including riverine fisheries, biodiversity of riverine ecosystem of the river and surrounding areas, and ecological integrity of river system as a result of diversion of flow for hydropower generation
- Suggestions for maintaining minimum releases of water during lean season to sustain riverine ecology maintain water quality and meet water requirements of downstream users.
- Impacts on terrestrial ecology, flora and fauna (including avifauna) of the basin due to hydropower development.
- Impacts due to loss of forests, if any
- Impacts on RET species and economically important plant species.
- Impacts due to increased human interferences. It also encompasses development related anthropogenic and biotic pressures on high attitude areas.
- Impacts on agriculture.

6. OUTCOME OF THE STUDY

The key outcomes of the study would be to:

1. Provide environmentally & ecologically sustainable and optimal ways of hydropower development in Yamuna river basin limited to Paonta Sahib in Sirmour district of Himachal Pradesh.
2. Environmental flow requirements during lean season.
3. Length of free flowing riparian distance to be maintained between two successive hydropower projects in the cascading series.
4. A practicable environment action plan to mitigate the adverse impact on environment with suggested institutional mechanism for implementation and monitoring for the same at the river basin level.

Table- 1 List of Hydroelectric projects in Yamuna river basin part of Himachal Pradesh

S. No.	Project Name	District	River and Tributary	Stream	Name of Developer
COMMISSIONED					
1	Giri (60 MW)	Sirmour	Yamuna	Giri	HPEBL
2	Andhra-II (5.0MW)	Shimla	Yamuna	Andhra	Gowthami Hydro Electric Co.(P) Ltd.
3	Masli (5.0MW)	Shimla	Yamuna	Peja	NSL Masli Power Generation (P) Ltd.
4	Sainj (5.0MW)	Shimla	Yamuna	Minus	Himshakti Project Pvt. Ltd.
5	Shimla (5.0MW)	Shimla	Yamuna	Shimla	Sai Engineering Foundation
6	Chandni (3.0MW)	Sirmour	Yamuna	Gorion Ka Khalla	Himalayan Crest Power Ltd.
7	Manal (3.0MW)	Sirmour	Yamuna	Sheuwara Ka Khalla	Himalayan Crest Power Ltd.
8	Timbi (3.0MW)	Sirmour	Yamuna	Kuniar	Himalayan Crest Power Ltd.
9	Hamal (2.0MW)	Shimla	Yamuna	Hamal	Hamal Hydel Limited
10	KotarGhodki (2.0MW)	Shimla	Yamuna	Kotar+ Ghodki_ un named nala	Nav Bhardwaj
11	Ching (1.0MW)	Shimla	Yamuna	Ching	Hateshwari Om Power Enterprises Pvt. Ltd.
UNDER CONSTRUCTION					
12	SwaraKuddu (111 MW)	Shimla	Yamuna /Tons	Pabbar	HPPCL
13	Shatul (5.0MW)	Shimla	Yamuna	Shatul	Gowthami Renewable Power (P) Ltd.
14	Pallor-II (4.5MW)	Sirmour	Yamuna	Palor	Manglam Energy Development Co. Pvt. Ltd
15	Gumma-II (2.5MW)	Shimla	Yamuna	Gumma	Ravipati Venkateshwara Rao Power (P)Ltd.
16	Jabbal (2.0MW)	Shimla	Yamuna	Jabal	Himalaya Vidyut Rural Electric Co.operative Society Ltd.
17	Khanyara (2.0MW)	Shimla	Yamuna	Khanyara	Shree Venkateshwara Enterprises
UNDER DEVELOPMENT					
18	DhamvariSunda (70MW)	Shimla	Yamuna/ Tons	Pabbar	HPPCL
19	Chirgaon-Majhgaon (60MW)	Shimla	Yamuna/ Tons	Pabbar	HPPCL

S. No.	Project Name	District	River and Tributary	Stream	Name of Developer
20	TanguRomai-I (44MW)	Shimla	Yamuna/ Tons	Pabbar	Tangu Romai Power Generation Private Limite
21	Paudital Lassa (24MW)	Shimla	Yamuna /Tons	Pabbar	GreenkoHatkoti Energy Private Limited
22	Chandernahan (4.0 MW)	Shimla	Yamuna /Tons	Pabbar	Chanshal Power Projects
23	Renuka Dam (40MW)	Sirmour	Yamuna	Giri	HPCCL
24	Giri (3.0MW)	Sirmour	Yamuna	Giri	Ganga Universal Powers (Partnership)
25	Giri-III (3.0MW)	Sirmour	Yamuna	Giri	Green Mountain Hydro Power (P) Ltd.
26	Giri (1.0MW)	Shimla	Yamuna	Giri	Dev Bhumi Hydro Power Project
27	Kotkhai (0.5MW)	Shimla	Yamuna	Giri	Shimla Hydel Power Producers Group
28	Rupin (45MW)	Shimla	Yamuna/ Tons	Rupin	hri Bajrang Power &Ispat Ltd (SBPI)
29	Nargiri (10 MW)	Shimla	Yamuna/ Tons	Rupin	-
30	Pandar (8.0MW)	Shimla	Yamuna/ Tons	Rupin	-
31	Kwar (4.0MW)	Shimla	Yamuna/ Tons	Rupin	Chenab Power (P) Ltd.
32	Andhra (16.95MW)	Sirmour	Yamuna	Andhra	
33	Goshali-Rohru (2.8MW)	Shimla	Yamuna	Andhra	Ajay Kumar Sood Engineers & Contractor
34	TanguRomai-II (6.0MW)	Shimla	Yamuna Tons	Supin	Tangu Romai Power Generation Private Limited
35	Horli (5.0MW)	Shimla	Yamuna	Horli	ARVS Construction Pvt. Ltd.
36	Aali- Dodrakwar (2.0MW)	Shimla	Yamuna	Horli	AaliDodrakwar Power (P) Ltd.
37	Ashni (5.0MW)	Shimla	Yamuna	Ashwani	Shalivahana Green Energy Ltd.
38	Kotar (5.0MW)	Shimla	Yamuna	Kotar	Hateshwari Hydro Power
39	Mareog (5.0MW)	Sirmour	Yamuna	Kwali	Shalivahana Green Energy Ltd.
40	Basru (4.8MW)	Shimla	Yamuna	Basru	Pramod Dutta
41	Shalvi (4.75MW)	Shimla	Yamuna	Shalvi	BLA Shalvi Hydro Power (P) Ltd.

S. No.	Project Name	District	River and Tributary	Stream	Name of Developer
42	Masret (3.5MW)	Shimla	Yamuna	Masret	Indra Hydro Power (P) Ltd.
43	Sainj-II (3.5MW)	Shimla	Yamuna	Sainj- Minus	Borthi Power Pvt. Ltd.
44	Charna (3.0MW)	Sirmour	Yamuna	Palor&Bawai Ka Nala	Satluj Constructions Ltd.
45	Gumma Top (3.0MW)	Shimla	Yamuna	Gumma	Gumma Top Hydro Power (P) Ltd.
46	Kattan (3.0MW)	Shimla	Yamuna	Kattan	Dev Bhumi Hydro Power Project
47	Maila (3.0MW)	Shimla	Yamuna	Maila	Dev Bhumi Hydro Power Project
48	Pallor (3.0MW)	Sirmour	Yamuna	Palor	Manglam Energy Development Co. Pvt. Ltd
49	Saru-I (3.0MW)	Shimla	Yamuna	Saru	Chureshwar Hydro Power
50	Shatul Top (3.0MW)	Shimla	Yamuna	Shatul	Chanshal Power Projects
51	Dogri (2.5MW)	Shimla	Yamuna	Dogri	Ajay Energy & Power Corporation (P) Ltd.
52	Peja Top (2.5MW)	Shimla	Yamuna	Peja	Peja Top Hydro Power (P) Ltd.
53	Tela (2.5MW)	Shimla	Yamuna	Tela	Bharasar Hydro Power Projects Pvt. Ltd.
54	Baras (2.4MW)	Shimla	Yamuna	Bashari	Bhageshwari Hydro Power Projects Pvt. Ltd.
55	Kanda Bheri (2.2MW)	Sirmour	Yamuna	Jha Khala /JhaltaKhala/Unnamed	Pankaj Thakur & Sardar Singh Thakur (Partnership)
56	Dev Manal (2.1MW)	Sirmour	Yamuna	Reundakhala/ Rana ka Khala/Kum arlaKhala	Pankaj Thakur & Sardar Singh Thakur (Partnership)
57	Panahara (2.1MW)	Sirmour	Yamuna	NaitKhala	SHASHRA (Partnership)
58	Banipul (2.0MW)	Shimla	Yamuna	Shalvi	Rajinder SablaConstrucion (Partnership)
59	Peja (2.0MW)	Shimla	Yamuna	Peja	Rosswin Pharmaceuticals (P) Ltd.
60	Saru (2.0MW)	Shimla	Yamuna	Saru	Bharasar Hydro Power Projects Pvt. Ltd.
61	TranhCharoli (2.0MW)	Shimla	Yamuna	Banah	Hydromore Power Pvt. Ltd.,

S. No.	Project Name	District	River and Tributary	Stream	Name of Developer
62	Warada (2.0MW)	Shimla	Yamuna	Waraya	Bradasar Power (P) Ltd.
63	PatalKhad (1.8MW)	Shimla	Yamuna	Patal	Chureshwar Hydro Power (Partnership)
64	Shikdi (1.7MW)	Shimla	Yamuna	Shikdi- Gadyai	Jai DevtaBhondra Hydel Co.
65	Bajhetu-II (1.5MW)	Sirmour	Yamuna	Bajhetu- Bajoja	Maa Vaishno Hydro Power
66	Basari (1.5MW)	Shimla	Yamuna	Basari	Magleshwar Enterprises (Partnership)
67	Pakhal (1.5MW)	Shimla	Yamuna	Pakhal	Leela Devi (sole Prop)
68	Rana Ka Khala (1.5MW)	Sirmour	Yamuna	Rana Ka khala/Sumit Ka khala/Palor	Mohan Lal Chauhan (Sole)
69	Satyani Mair (1.5MW)	Shimla	Yamuna	Satyani+Mair	Rahul Singh Thakur (Sole)
70	Dhamla (1.2MW)	Sirmour	Yamuna	Bajethu	Surender Singh Thakur
71	Noin (1.2MW)	Sirmour	Yamuna	Nait	Ashwani Kumar
72	Salanti (1.2MW)	Shimla	Yamuna	Salanti	Sturdy Industries Ltd.
73	Nerwa (1.1MW)	Shimla	Yamuna	Nerwa	Valley Energy Pvt. Ltd.
74	BaluKhatali (1.0MW)	Shimla	Yamuna	BaluKhatlu- Shalve	G.R. Kaushal
75	Dhawas (1.0MW)	Shimla	Yamuna	Sarahan	Valley Energy Pvt. Ltd.
76	Gumma-III (1.0MW)	Shimla	Yamuna	Gumma	P.R. Jingt
77	Kayarnu (1.0MW)	Shimla	Yamuna	Kayarnu	Friends Hydro
78	Maira (1.0MW)	Shimla	Yamuna	Maira	Rahul Singh Thakur (Sole)
79	Mural (1.0MW)	Shimla	Yamuna	Salanti	Irawat Ravin Valley Jalvidyut Sanchar Sabha Simiti
80	Nera-I (1.0MW)	Sirmour	Yamuna	Nera	Bhadur Singh Chauhan
81	Nerwa (1.0MW)	Shimla	Yamuna	Shalwi	Friends Hydro
82	Salanti-II (1.0MW)	Shimla	Yamuna	Salanti	Salanti Hydro Power
83	Saru Top (1.0MW)	Shimla	Yamuna	Saru	RKC Hydro Power Projects
84	Khagna (0.9MW)	Shimla	Yamuna	Khagna- Hamal	M/s Vaishnavi Hydro Power Projects Pvt. Ltd
85	Sandhar (0.75MW)	Shimla	Yamuna	Sandhar	Yashwant Chauhan
86	Satyani (0.70MW)	Shimla	Yamuna	Satyanir	Rahul Singh Thakur (Sole)

S. No.	Project Name	District	River and Tributary	Stream	Name of Developer
87	STP-Baragaon (0.60MW)	Shimla	Yamuna	STP- Lalpani	Lucky Power Projects Co.Operative Society Ltd.
88	Dhanoi-1 (0.5MW)	Sirmour	Yamuna	Dhanoi	Mukesh Chand (Sole)
89	Rai (0.5MW)	Shimla	Yamuna	Rai	Raj Hydro Power Projects
90	Bharan- Mashran (0.4MW)	Shimla	Yamuna	Mashran	Sabla Ram Chauahan
91	Manal-II (0.4MW)	Sirmour	Yamuna	Manal	Yaseen Engg. Industries
92	Dogra (0.2MW)	Shimla	Yamuna	Dorgi	Santosh Kumar
93	Hingori (0.2MW)	Shimla	Yamuna	Hingori	Sarswati Hydro Powers
94	Koku Nala (0.2MW)	Shimla	Yamuna	Bedar + Dhabrot tributary of Giri	Jai Ram Madaik

Table-2 List of HEPs considered for study in Yamuna river basin part of Uttarakhand

S. No.	Name of HEP	District	River and Tributary	River/ Gad Name	Name of Developer
Commissioned					
1	Chibro (240MW)	Dehradun	Tons		UJVNL
2	Khodri (120MW)	Dehradun	Tons		UJVNL
3	Istar gad (0.20MW)	Uttarkashi	Tons	Istar Ganga	UREDA
4	JankiChatti (0.20MW)	Uttarkashi	Yamuna		UREDA
5	Dhakrani (33.75MW)	Dehradun	Yamuna		UJVNL
6	Dhalipur (51MW)	Dehradun	Yamuna		UJVNL
7	Kulhal (30MW)	Dehradun	Yamuna		UJVNL
8	Galogi (3MW)	Dehradun	Yamuna	Asan/Kiyarkuli	UJVNL
9	Hanuman (4.95MW)	Ganga Uttarkashi	Yamuna	Hanuman Ganga	Regency Yamuna Energy
Under construction					
10	Gangnani (8MW)	Uttarkashi	Yamuna		Regency Yamuna Energy
11	Badiyar (4.9MW)	Uttarkashi	Yamuna	Vadya Gad/Badiyar gad	Regency Yamuna Energy
12	Rayat (3MW)	Tehri	Yamuna	Aglar	Aglar Power
13	Langrasu (3MW)	Tehri	Yamuna	Aglar	Aglar Power
14	Lakharwar (300MW)	Dehradun	Yamuna		UJVNL
15	Vyasi (120MW)	Dehradun	Yamuna		UJVNL
Under Development					
16	Taluka-Sankri (140MW)	Uttarkashi	Tons		UJVNL
17	SidriDeori (60MW)	Uttarkashi	Tons		
18	Naitwar Mori (33MW)	Uttarkashi	Tons		SJVNL

S. No.	Name of HEP	District	River and Tributary	River/ Gad Name	Name of Developer
19	Mori Hanol (63MW)	Uttarkashi	Tons		Krishna Knitwear
20	HanolTiuni (60MW)	Dehradun	Tons		Sunflag
21	Tuini-Plasu (66MW)	Dehradun	Tons		Irrigation Deptt.
22	Kishau Dam (600MW)	Dehradun	Tons		UJVNL
23	Jakhol-Sankri (35MW)	Uttarkashi	Tons	Supin	SJVNL
24	ArakotTiuni (70MW)	Uttarkashi	Tons	Pabar	Irrigation Deptt.
25	Rupin –II (10MW)	Uttarkash	Tons	Rupin Nalla	Identified
26	Rupin –III (3MW)	Uttarkashi	Tons	Rupin	Tons Hydro
27	Rupin–IV (10MW)	Uttarkashi	Tons	Rupin	Tons Hydro
28	Rupin–V (24MW)	Uttarkashi	Tons	Rupin	Himalaya
29	Hanuman Chatti - SainaChatti(40MW)	Uttarkashi	Yamuna		UIPC
30	SainaChatti-Kuthnaur (12MW)	Uttarkashi	Yamuna		UIPC
31	Sauli – Barnigad (10MW)	Uttarkashi	Yamuna		UIPC
32	Barnigad (6.50MW)	Uttarkashi	Yamuna		UJVNL
33	Barnigad- Naingaon (10MW)	Uttarkashi	Yamuna		UIPC
34	Pali gad (0.30MW)	Uttarkashi	Yamuna	Pali gad	UREDA
35	RiknalKhad (4MW)	Dehradun	Yamuna	Garsad gad	Identified
36	GarsadKhad (4.50MW)	Dehradun	Yamuna	Garsad gad	Identified
37	Thatyur (4MW)	Tehri	Yamuna	Aglar	Identified
38	Ringali (1MW)	Tehri	Yamuna	Aglar	UREDA
39	Purkul (1MW)	Dehradun	Yamuna	Asan	UIPC
40	Tewa (3.50MW)	Tehri	Yamuna	Aglar	Identified
41	Bangseel (3.50MW)	Tehri	Yamuna	Aglar	Identified
42	Asnor gad (0.50MW)	Uttarkashi	Yamuna	Asnor gad	Identified
43	Bhadri gad (24MW)	Tehri	Yamuna	Bhadri gad	Identified
44	Obra (12MW)	Uttarkashi	Tons	Supin	
45	Kashla (14MW)	Uttarkashi	Tons	Supin	
46	Amlawa (5MW)	Dehradun	Yamuna	Amlawa	

Table-3 Outline of work components based on revised ToR along with responsibility of each study partner institutions

Component of Environment	Sub- component	Activities based on ToR	Responsibility
Physical (Water)	Surface water (hydrology, env. flow, water quality & hydropower development)	<ul style="list-style-type: none"> • Review of drainage characteristics of the basin, including various surface water bodies like rivers and lakes. • Data collection and review of past studies/reports/data etc. • Review of existing water sharing agreements for meeting various need-based existing and future demands viz. municipal, irrigation, power generation and industrial. • Analysis of all past assessment of the water availability and assessing the water availability, as per updated data for the system as a whole and at existing ongoing/ proposed project locations (all major projects on main Yamuna River) on annual/monsoon/ non-monsoon and monthly basis. • Existing flow pattern will be detailed along the river on a monthly basis for the present untapped condition and post hydro power development. • Estimation of sediment load at various points in the basin based on available secondary data. • Identification of perennial sources of water and their designated usages. • Draw hydrography of the river every month and review the change due to construction of hydro projects. • Actual discharge computation from river cross sections • Brief description of physiography of the area <ul style="list-style-type: none"> (i) Water balance of the basin (ii) Appraisal of surface water resources (iii) Estimating river flows at selected hydropower project sites and derivation of flow duration curves at selected sites. <ul style="list-style-type: none"> ▪ Assessment of Environmental Flows for sustenance of river eco-system at selected hydropower projects. 	DHRE, IIT Roorkee

Component of Environment	Sub- component	Activities based on ToR	Responsibility
		<ul style="list-style-type: none"> • Determining the status of water quality at different locations in undisturbed stretches of rivers at hydropower project sites • Assessing the impact of hydropower projects on water quality in the basin. <ul style="list-style-type: none"> ▪ Organizing technical, financial, hydrological, morphological details of all hydropower projects in a matrix ▪ Analysis of the above matrix of data on various considerations. ▪ Analysis of the diverted as well as submerged stretches of the rivers from power generation consideration. ▪ Impact of operation of selected hydropower projects on variability of downstream river flows. ▪ Concerns for hydropower development like Energy Payback ratio, Life Cycle Assessment and Green House Gas (GHG) emission from hydropower projects will be studied and presented. ▪ Impact of environmental flow release on hydropower generation at selected projects. ▪ Thematic map showing areas under submergence and diverted river stretches ▪ Thematic map of Yamuna river and its tributaries showing location of hydropower projects both in Himachal Pradesh and Uttarakhand states 	
	Ground water (Springs)	<ul style="list-style-type: none"> ▪ Assessment of the impact of hydropower project construction on springs in the vicinity of hydropower projects will be examined. ▪ Assessment of the impact of any individual project will be assessed if long term data of groundwater levels and other data are available. 	

Component of Environment	Sub- component	Activities based on ToR	Responsibility
		<p>Assessment of the impact of each of the hydropower projects on the following and in light of the prevailing concepts of cumulative impact assessment on the identified ecosystem components will be carried out:</p> <ol style="list-style-type: none"> a) Flow regime of the stream b) Sedimentation c) Ensuring environmental flow on power generation d) Springs and drinking water e) Irrigation f) Tourism g) Storage and diversion of water h) Water quality. 	
		<p>Assessment of the impacts on terrestrial and aquatic ecology of the following:</p> <ul style="list-style-type: none"> ▪ Modification in hydrologic regime due to diversion of water or hydropower generation. ▪ Depth of water available in river stretches during lean season and its assessment of its adequacy vis-à-vis various fish species. ▪ Minimum releases of water during lean season to sustain riverine ecology, maintain water quality and meet water requirements of downstream users. ▪ Environmental flow need in the monsoon season in the river 	
Physical (Land)	Land	<ul style="list-style-type: none"> ▪ Hydropower projects location mapping using the satellite images of period 2000-2005 and 2018-2020 and Survey of India topographic maps. ▪ Land use and Land cover mapping and change detection 	DHRE, IIT Roorkee
Biological (Aquatic)	Planktons	<ul style="list-style-type: none"> ▪ Assessment of nutrient levels 	DCFR-ICAR Bhimtal-
	Benthos	<ul style="list-style-type: none"> ▪ Presence of plankton and benthic lives ▪ Estimation of population densities and diversity indices 	
	Fish	<ul style="list-style-type: none"> ▪ Presence or absence of fish species 	
		<ul style="list-style-type: none"> ▪ Inventory of migratory fish species, migratory season and route 	

Component of Environment	Sub- component	Activities based on ToR	Responsibility	
		<ul style="list-style-type: none"> ▪ Presence of major spawning and breeding sites ▪ Critical fauna in the river basin 		
		<ul style="list-style-type: none"> ▪ Depth and velocity of water available in river stretches during lean season and assessment of its adequacy vis-à-vis various fish species 		
		<ul style="list-style-type: none"> ▪ Impact on aquatic ecology including riverine fisheries, biodiversity of the riverine ecosystem of the river and ecological integrity of river system as a result of diversion of flow for hydropower generation 		
		<ul style="list-style-type: none"> ▪ Assessment of maintaining minimum releases of water during lean season to sustain riverine ecology 		DHRE, IIT Roorkee & DCFR-ICAR Bhimtal
		<ul style="list-style-type: none"> ▪ Impact on RET species & on economically important fish species 		DCFR-ICAR Bhimtal
		<ul style="list-style-type: none"> ▪ CIA for the identified aquatic diversity parameters Management plan with institutional mechanism 		
Biological (Terrestrial fauna & avifauna)	Mammals Herpetofauna Birds Butterflies	<ul style="list-style-type: none"> ▪ Terrestrial and avifaunal diversity assessment in respect to hydropower projects 	SACON- Coimbatore	
		<ul style="list-style-type: none"> ▪ Identification of important wildlife corridors/ protected areas/ migratory pathways/ important habitats etc. 		
		<ul style="list-style-type: none"> ▪ Impact assessment of hydropower development 		
		<ul style="list-style-type: none"> ▪ CIA for the identified parameters, suggesting mitigation and management measures with institutional mechanism 		
Biological (Terrestrial flora)	Angiosperms Gymnosperms Algae Fungi Bryophyta Pteridophyta,	<ul style="list-style-type: none"> ▪ Identification and characterization of forest types 	ICFRE	
		<ul style="list-style-type: none"> ▪ Preparation of comprehensive checklist of flora (Algae, fungi, Bryophyta, Pteridophyta, Angiosperms and Gymnosperms) from secondary and primary sources 		
		<ul style="list-style-type: none"> ▪ Estimation of frequency, density, abundance and Importance Value Index (IVI) of each species of trees, shrubs and herbs at representative sampling sites 		

Component of Environment	Sub- component	Activities based on ToR	Responsibility
		<ul style="list-style-type: none"> ▪ Identification and listing of plants of genetically, biologically, economical and medicinal importance. ▪ Critical and endemic flora as per BSI, Kolkatta and IUCN in the entire basin—including information from the secondary sources ▪ Major forest produce, if any and dependence of locals on the same in the forests observed in the study area ▪ Impact assessment due to hydropower development ▪ CIA for the identified parameters, suggesting mitigation and management measures with institutional mechanism. 	
Social	Society(especially Project Affected and Displaced Families)	<ul style="list-style-type: none"> ▪ Collection of data/information on land details, demographic profile, economic structure, development profile, agricultural practices, cultural aesthetics sites, infrastructure facilities, education, health and hygiene communication network, etc., from primary and secondary sources ▪ Impact assessment due to hydropower development ▪ CIA for the identified parameters, suggesting mitigation and management measures with institutional mechanism. 	ICFRE

APPROVAL OF THE CHAIRMAN

From: kgopa@iisc.ac.in

To: "Yogendra Pal Singh" <yogendra78@nic.in>

Sent: Sunday, March 5, 2023 10:23:32 AM

Subject: Re: Draft MOM of the 41st EAC (RV&HEP) meeting held on 15.02.2023-reg

Dear Sir

Yes I approve it

With regards

Prof K Gopakumar

Get [Outlook for iOS](#)