Minutes of the 75th Meeting of the Expert Appraisal Committee for River Valley and Hydroelectric Projects constituted under the provisions of EIA Notification 2006, held on 3rd- 4th July, 2014 at Narmada Meeting Hall, Indira Paryavaran Bhawan, Jorbagh, New Delhi.

The 75th Meeting of the Expert Appraisal Committee (EAC) for River Valley and Hydropower Projects was held during 3rd -4th July, 2014 at Narmada Meeting Hall, Indira Paryavaran Bhawan, Jorbagh, New Delhi. The meeting was chaired by Shri Alok Perti, Chairman and Shri H. S. Kingra, Vice-Chairman. Dr. Vijay Kumar, member from MoES could not attend the meeting. The list of EAC Members and officials/consultants associated with various projects and who attended the meeting is at **Appendix**.

The following Agenda items were taken-up in that order for discussions:-

1st Day (3.6.2014)

1. **Agenda Item No.1 :** Welcome by Chairman and Confirmation of Minutes of the 74th EAC Meeting held on 5th – 6th May, 2014. The Minutes of 74th EAC meeting was confirmed.

2. **Agenda Item No.2 :** Consideration of Project proposals for Scoping and Environmental Clearance.

The following project proposals were considered:

Agenda Item No. 2.1 HEO HEP (240 MW) on the Yarjep River, in the West Siang District of Arunachal Pradesh – For Environment Clearance

Based on the detailed presentation made by Developer on Heo HEP, the EAC noted the following:

The Project was allotted by Government of Arunachal Pradesh during 2007 and scoping clearance was accorded by MoEF during 2008. Installed capacity was enhanced from 90 MW to 210 MW during 2010 and again in 2011 for an installed capacity of 240 MW was accorded scoping clearance. Scoping approval was extended during 2013 and is valid till October 19th 2014.

Detailed project report has been submitted to CEA during July 2013 and notably clearances of Hydrology, Power potential, GSI, Instrumentation and power evacuation were obtained. The project envisages construction of a 16 m high (from foundations) Barrage across river Yarjep to maintain FRL 1400 m with an active storage of 0.15 MCM. Designed discharge of 130.25 cumec flows will be diverted through a head race tunnel of 3.55 Km length with a 6.5 m diameter. The diverted flows pass through underground surge shaft, pressure shaft, and surface power house to generate 240 MW power from three units of 80 MW each equipped with vertical Francis vertical turbine. Turbine flows enter directly into Tato-I head race channel, which is coupled with Heo tail basin. Heo and Tato-1 HEPs function as a tandem where Heo HEP is master to Tato-1.

Salient features of the projects were presented as below:

Location	Between Puring and Meying villages , West Siang District, Arunachal Pradesh.
Geographical Coordinates of Barrage	94°16'31''E, 28°32'20''N
Geographical Coordinates of Power house	94°18'43''E, 28°32'32''N
Catchment area at the water intake (Km^2)	1065
PMF (m^3/s) & SPF (m3/s)	3900 and 3200
Type of Diversion structure	Barrage
Barrage Top Level	1402 m
Foundation Level	1386 m
Maximum height above deepest foundation	16 m
Full Reservoir Level	1400 m
Minimum Draw Down Level	1398 m
Tail Water level	1189 m
Gross storage / Active storage	0.39 MCM / 0.15 MCM
Submergence of surface land / River bed	2.8 ha / 5.6 ha
Head race Tunnel	Circular, 6.5m dia, 3.55 Km long

Design Discharge	130.25 cumec
Gross head / Rated head	211 m / 201.8 m
Power house	Surface, 83m (L) x 19.6m (W) x 28m (H)
Installed capacity	240 MW (3 x 80 MW)
Turbine	Vertical Francis Turbine

The design features of the project were discussed in detail. Considering the elevations of FRL and TWL of Heo and turbine flows of Heo entering directly into Tato-I water conducting system, establishing functional tandem relationship of Heo master and Tato-I slave.

The total land requirement is about 55.7 ha, out of which i) surface land is 47.1 ha and classified as forest land, ii) 5.9 ha is river bed and iii) 2.7 ha correspond to underground structures. The total submergence area is 8.4 ha, of which 2.8 ha is surface land and 5.6 ha is river bed).

66 families are likely to be affected due to this project by partly losing their land. No family is likely to lose homestead. It was reported that there is no National Park/Wildlife Sanctuary/Historical place within 10 Km radius of the project area.

Environmental studies have been conducted by consultants CISMHE – Delhi University while second set of baseline data during 2013/2014 was collected by RS Envirolink Technologies Pvt. Ltd, Gurgaon. Base line data sampling and surveys for water quality, fauna, flora, geology, soil, fish, aquatic ecology, air, noise and socio-economic was conducted from February 2009 to April 2014 covering different seasons. Detailed impact assessment was carried out as per scope and environment management plan prepared with the following components:

- Catchment area treatment considers 8300 ha including 1348.75 ha area of severe and very severe erosion and treatable area of 927.27 ha spread over 9 nos of sub-watersheds. Total treatable period is 5 years. Engineering measures are planned such as gully control, brushwood check dams, contour bunding and bench terracing. Biological measures are planned such as afforestation, assisting

natural regeneration in existing forest, NTFP generation and pasture development. A total budget of 491.08 lakh is proposed.

- Bio diversity management plan covers management measures to establish Task force, documentation on Bio-resources, Removal of invasive species, wild life conservation and project protection plan, Biodiversity committee as a safeguard measure is also planned. Total budget of 182 lakhs is provided.

- Total muck generation with 40% swell factor works out to 13,38,355 cum out of which 3,84,800 cum will be utilised for construction purpose. The remaining quantity of 9,33,555 cum is proposed to be rehabilitated. Four muck dumping areas of 8.3 ha with a capacity to accommodate 10,02,947 cum is provided. Mitigation measures such as compaction, construction of retaining walls, soil treatment, usage of Geo-textile and plantation provision is made with total budget of Rs. 248 lakhs.

- Landscaping and restoration of construction sites such as quarry sites, colony and office complexes and roads a budget of Rs 84.56 lakhs is provided.

- Greenbelt development plan near pond periphery, barrage and power house with plantation of trees and bamboo/Iron tree guards and nursery development is proposed with a budget of Rs. 29.76 lakhs.

- Fisheries development and downstream management plans are proposed for budget of Rs. 212 lakhs.

- Public health delivery system is planned keeping in view all three projects. A hospital unit of Tato-I HE project and child welfare centre of Pauk HE project will extend facilities to the Heo HE project affected families. Under the Heo Project, the plan includes centre primary health centre, immunization programme and distribution of first aid boxes and mobile medical van. A budged of Rs. 264.4 lakhs is proposed for that purpose.

- Waste management plan is designed to process 220 ton/annum of solid waste and 1.29 lakh litres/day of liquid waste to be generated by the migrant population. A budget of Rs. 198.85 lakhs is provided.

- Fuel wood energy management and conservation plan with LPG depot is planned under the Tato-I HE project and will be extended to surrounding villages of Heo HE project and Pauk HE project. Distribution of LPG connections, Kerosene depot, community kitchens/canteens, distribution of energy efficient challahs, distribution of solar cookers and training biogas production have been planned under the Heo HEP with a budget of Rs. 70.2 lakhs.

- Management of Air, water quality and noise level have been proposed with a budget of Rs.40 lakhs.

- Under the R&R plan, relief package to affected families with ST grant, BPL grant, pension for vulnerable persons and free electricity grant amount to a budget of 141 lakhs. Under the rights and privileges and in order to compensate the loss of usage of forest produce from USF, a budget of Rs. 184.8 lakhs is provided. Under the Local area development plan covering merit scholarships, training programme, income generation schemes, establishment of electric sub-station, education facilities, community welfare centres, transportation facilities, adopting model village, construction of rain shelters and footpaths, sanitation facilities, and training for fish farming, a budget of Rs. 443.63 lakhs is provided. Including a monitoring budget of Rs.30 lakhs, a total budget of Rs. 799.43 lakhs provided under R&R plan.

- Disaster management plan has been prepared for infrastructure development, prevention, administrative and procedural aspects, communication system, recovery, evacuation and rescue operation, mitigation and rehabilitation, notification and public awareness. A budget of Rs.185 lakhs is provided.

- Good practices programmes, training and awareness programmes are proposed with a provision of Rs 25.00 lakhs is made.

- Implementation and Monitoring with environmental cell and Corporate social responsibility cell, monitoring and evaluation committees are planned with a budget of Rs 60.00 lakhs.

Total EMP budget prepared to implement the above mitigation measures is Rs. 2890.28 lakh.

EAC enquired about the total project cost and EMP cost as a percentage of total project completion cost. Developer explained that total project completion cost as per DPR is Rs.2001 crore and EMP budget is about 1.44%. EAC observed that overall EMP budget is on the lower side and has to be at least 2% of the total project cost. The developer agreed to enhance the cost of EMP and also that EMP cost will increase proportionately if the project cost increases.

EAC enquired about the status of forest clearance. Developer explained that during February 2014 Forest Advisory Committee meeting has been held and the proposal for diversion of 55.7 ha forest land (surface land 47.1 ha, River bed 5.9 ha and underground 2.7 ha) was discussed, and some additional information was sought from Government of Arunachal Pradesh. Government of Arunachal Pradesh has furnished the required information in June 2014.

A detailed discussion was held on Environment Flow Release. Developer explained that as per the Scoping requirement, an environmental flow study has been conducted by CISMHE, Delhi University, New Delhi and NIH (National Institute of Hydrology, Roorkee) to arrive at the appropriate discharge of flow to be left in the river to ensure appropriate depth and velocities during monsoon, pre and post monsoon and lean seasons, depending on the requirements of the fish and other aquatic life. *Schizothorax richardsonii* has been considered as the dominant fish species and habitat requirements have been considered as per Wildlife Institute of India, 2012. HEC-RAS software has been used for simulation modelling by NIH. Critical stretches have been defined downstream of diversion structure and upto confluence with the first major tributary. For Heo HEP the first major tributary, called

Sang Nala joins on the right bank at 1.43 Km downstream of the barrage. The river cross sections covering critical stretch have been used in HEC-RAS software with simulations of different discharges to arrive at required depths and velocities for three seasons i.e. Monsoon season, Pre and post monsoon seasons and lean season.

The study recommended the environment flow release of 17.35 cumec, 2.7 cumec and 7.59 cumec in monsoon season, lean season and other 4 months season respectively. In addition to the E-flow to be released at the barrage site, several nalas join up to Sang nala i.e. within the 1.43 Km critical stretch, which will increase the flow in such critical stretch to 25.02 cumec, 3.65 cumec and 10.86 cumec in monsoon season, lean season and other 4 months season respectively

EAC observed that as these projects are part of the Siang basin study, and that a detailed environmental flow assessment study for each project has already been carried out under such study, which has been approved by CWC. Therefore, a comparison should be made between NIH study and the Siang basin study recommendations. Developer showed the following comparison:

Season	Velcan's environmental flow study			Siang basin study		
	Env. Flow (m^3/s)	Mean depth (m)	Mean velocity (m/s)	Env. Flow (m^3/s)	Mean depth (m)	Mean velocity (m/s)
Monsoon	17.35	1.6	1.32	19.9	1.46	2.01
Intermediate	7.59	1.17	1.08	8.78	1.07	1.68
Lean	2.7	0.80	0.85	2.7	0.68	1.3

EAC discussed at length all possibilities of flow considering the target groups, and dynamics of the river with the project proponents. Further, EAC discussed about developers values, comparing them with the Siang basin study recommended values and expressed that lean season values are matching but and intermediate and monsoon seasons values retained by the developer are slightly lower than Basin study recommended values. NIH values are still satisfying desired parameters of *Schizothorax richardsonii* as per WII, 2012. However the EAC expressed that, Siang basin study has already been approved by CWC and is in final stages of discussions in EAC, and therefore it should be more appropriate to adopt Siang basin study

values. Therefore the EAC decided that the minimum flows should be retained as those recommended by the basin study viz., 19.9 cumec during the monsoon season, 8.78 cumec during the intermediate season and 2.7 cumec during the lean season.

The Arunachal Pradesh State Pollution Control Board conducted the public hearing for the project at Lipusi Helipad Ground, Mechuka division, West Siang district on 27th November 2013 with a total attendance of 384 persons. The public raised main issues like change in nomenclature of the Project as per villages located in the vicinity, change of nomenclature of the river as per local name, construction of a community centre, education, health and sanitation facilities, employment and training, Risk of submergence of Puring, Meying, Padusa and Lipusi villages and their inclusion in R&R plan. Developer explained the responses provided during the hearing that issues raised by the public have been addressed in EIA and EMP reports.

Some external observations from SANDRP have been received by EAC on this project and were communicated to the developer. Developer responded in detail to the EAC, and also submitted a written response to MoEF and same is given as below.

Observations	**Response**
Consultants not aware of policies and Acts: In Para 1.5.1 the EIA says: "In the course of its development, the Heo HEP needs to adhere to all relevant policies and guidelines in general and the following, in particular: i.) National Forest Policy (NFP), 1988 ii.) National Water Policy (NWP), 2002 iii.) National Rehabilitation and Resettlement Policy (NRRP), 2007 iv.) Rehabilitation and Resettlement Policy (RRP), 2008 of GoAP" This shows that the EIA consultants are not even aware of latest policies and Acts. For example, the latest Water Policy is National Water Policy of 2012 and latest R&R Act is that of 2013.	The new land acquisition and R&R act came into force on 1st January 2014. Public hearings were conducted in august and November 2013. The rules of the new Act are to be implemented along with land acquisition and the developer will comply with whatever rules are applicable.
Inadequate impact assessment	

Observations	Response
No mention of Climate Change: No assessment of the possible impact of climate change on the project and impact of the project on the local climate as well as increase in green house gas emissions from the reservoir and construction of the project has been done. Similarly impact of the project on adaptation capacity of the local communities in changing climate has not been assessed. Word 'Climate Change' does not feature in EIA report or in the EMP.	No study of climate change aspects have been mandated by TORs and the pondage of HEPs are negligible in this regard: • Pondage/Reservoir area of Pauk is only 34 Ha including 8 Ha of river bed, and located in deep gorges. • Heo submergence is very small mostly confined to river bed (only 8.4 Ha including 5.6 Ha river bed). • Tato submergence is almost inexistent, only 3 ha including 1.8 ha of river bed.
Inadequate impact assessment **Impacts of the dam on the flood characters of the river:** The EIA report does not talk about impacts of the dam on the flood characters of the river, what will be the changes and how these will impact downstream areas. While discussing the alternative sites for construction of dam the EIA report states that the present dam site was chosen as best alternative as 'orientation of axis is chosen so that flood discharge will not damage the downstream banks.' (p.45 Volume-I EIA Report) Other than this there is no mention of impacts of dam on floods downstream. Area upstream of the He dam is Mechuka plain and the report claims that water is cleared from silts while it flows through the Mechuka plain (p.136 Volume-I EIA Report). It also claims that water velocity does not increase significantly even during extreme flood event.	As is discussed in detail in EIA report, all three projects are small run of the river schemes and not storage projects. Apart from diverting the design discharge, all the flood water will be released from the spillway and hence there will not be any significant change in the flood character of the river.
Inadequate impact assessment **Impacts of changing silt flows:** Impacts of changing silt flows downstream from desilting chamber and from silt flushing in monsoon on the downstream areas are not analyzed. A detailed account of how the silt from the dam would be flushed out annually and what would be the impact of this in the downstream as well as on the geo morphology, erosion, stability of	This is not a part of the EIA study and was not a TOR item. However, these aspects are covered in the DPR.

Observations	Response
structures etc is not done.	
Inadequate impact assessment **Impact of the project on disaster potential** in the project area as well in the downstream due to construction and also operation at various stages, say on landslides, flash floods, etc. is not assessed.	Only significant disaster potential of the barrage is the flooding of downstream areas in the unlikely event of barrage break, where storage volume is superimposed on PMF. As per the TOR, Dam Break Analysis has been carried out for Pauk HEP using Mike 11 software; inundation map during such an eventuality has been prepared along with disaster management plan including the cost of implementation. This is discussed in a separate chapter in EMP of Pauk HEP.
Inadequate impact assessment **Impact of peaking generation**: The report though not explicitly stated, indicates that the project will function as a peaking station. (e.g. the report states that the inflows for the project will be divided into flows for peaking power generation, surplus flows and environmental flows.) (p. 261 Volume-I EIA Report) When a project operates as peaking station, there are severe impacts in the downstream and also upstream (including rim stability and increased chances of landslides). These impacts have not been assessed, nor is it assessed how the project will perform in the cascade development it is in.	These three projects are planned to be developed in cascade. Impacts of peaking generation are not significant in such a case as long as adequate environment flow provisions are made for the intermediate de-watered stretch during the diurnal storage period. Peaking discharge from Pauk will be utilized by Heo and Tato I; release from Tato I tailrace will go to Tato II reservoir. There is no downstream river stretch which will be impacted by diurnal variation due to peaking. Reservoir rim stability and treatment requirement have been covered in DPR and EIA study.
Inadequate impact assessment **Seismic impacts** A detailed site specific study for design earthquake parameters for Pauk HEP – the upstream most project under Yarjep cascade development - has been carried out by the Department of Earthquake Engineering, IIT, Roorkee. Pauk HEP is in the upstream of the Heo HEP (about 3.5 km) and falls in the same geotectonic block having similar geomorphological features, lithology and seismogenic sources. The EIA report very conveniently adopts seismic analysis carried out for Pauk HEP and the horizontal seismic co-efficient arrived at for Pauk stating that “In view of proximity, size of the structure, similarity of lithological/ tectonic features, location in	Heo and Tato1 HEP have received GSI clearance, and Pauk is under progress. Projects geological and seismic studies are under the purview of National Committee of Seismic Design Parameters. NCSDP will provide appropriate assessment of seismic parameters, which are not a part of EIA/EMP studies

Observations	Response
the same geotectonic block, and absence of any major additional tectonic features, it is considered appropriate“(p. 89 Volume-I EIA Report). However, seismic issues are site specific and site specific study should have been done.	
<u>Inadequate impact assessment</u> **Impacts on fish:** As per the report out of the six recorded fish species, two species are categorized as threatened (Schizotharax richardsonii and Garra naganensis). The report states “Those two species are usually migrating in winter season, **but can adapt to lacustrine environment**, like a reservoir or a pond created by a dam. However, adverse impact is anticipated due to habitat fragmentation.” (p. 175 Volume-I EIA Report) This is clearly not helpful and EIA should be doing full impact assessment on the fish, their habitat, life cycle and how the construction and operation of the series of hydropower projects would affect all that. This EIA clearly fails in this. The report shows quite a disregard for these migrating species. The report states that Schizothorax richardsonaii, Schizothoraicthys prograstus and Gara can survive in lentic as well lotic waters (p. 97 Environmental Management Plan, Volume-II EIA Report). It also states that because of the height of Pauk dam no fish movement from 95 m high Pauk arch dam is possible in 3.3 km river stretch between downstream of Pauk dam and Heo barrage. The Heo pond spread is about 1 km upstream of Heo barrage, and according to table 3.7.1, the distance between diversion of Pauk dam and Power House is 2.6 km. Firstly, this means that there is NO *free* flowing stretch of river between TWL of Pauk and FRL of Heo HEP. The claim about even the 1 m elevation difference between TWL of Puak (1401 m) and FRL of Heo (1400 m) seems to be in contradiction with the river stretch	We refer to the state of the art E-Flow studies: • Conducted by CISMHE and National Institute of Hydrology (NIH Roorkee). • Scientific approach enabling to arrive at the appropriate quantities of water to be left in the river depending on depth and velocities requirements • Covers the entire river stretch of the cascading projects Pauk HEP, Heo HEP and Tato-I HEP • Critical stretches defined downstream of diversion structures and up to confluence with major tributary • HEC-RAS software used for simulation studies • Schizothorax Richardsonii fish species requirements retained as per Wildlife Institute of India, 2012. • Studies of three seasons such as Monsoon, Pre & Post monsoon and Lean seasons • The study contains the assessment of habitat, life cycles and fish requirements and provides appropriate quantum of water. There is no deprivation of water in the utilized stretch. • The total river length is 78 km. There is no free stretch within the cascade, which is using only 16 Km of river stretch for 571 MW. • The layout with no free stretch within the cascade has been approved through TORs several times.

Observations	Response
figures given above. Similarly there is no *free* flowing stretch of river between TWL of Heo (1189 m elevation) and FRL of TatoI (also 1189 m), see table 3.7.1. The report says that Sangshi Bu nala joins 1.74 km downstream of Pauk dam, and would be available as spawning ground for fragmented population of snow trout. It also concludes that the fragmented population is snow trout between Tato-I trench weir and Heo barrage (5 km) would be able to persist in such stretch, as Sang nala is located at 1.43 km downstream of Heo barrage and would act as spawning ground. Based on this analysis the report does not provide for fish pass in the Heo barrage. However, this whole analysis is seriously suspect considering that there is no free flowing stretch of river between the projects and this conclusion is not backed by sufficient scientific analysis of various phases of operations of the projects	
<u>Inadequate impact assessment</u> **Impacts on landslides:** Impact on landslides is summarized merely in two sentences. “The construction of about 3.55 km long HRT, new approach roads, barrage and power house complexes would require frequent blasting activities. These actions may lead to some geophysical consequences like disturbance in the underground water table, activation of new and old landslides and induction of earth vibration in the nearby area or villages.” (p. 299 Volume-I EIA Report) No further detailed assessment or analysis of this issue of serious consequences has been carried out. In the EMP biological and engineering measures have been detailed out for prevention of soil erosion. No specific measures have been suggested for landslides.	CAT Plans are providing large anti erosion measures. The GSI has cleared the geological studies and assessed properly rock qualities, underground features, shear zones, landslides, etc.... The geological risk, which exists in every hydropower project, will be assessed closely on a continuous basis at the time of implementation.
Impacts on forests and wildlife: Impact of clearing forests which would result in land cover change has been stated as “small in magnitude.” (p. 300 Volume-I EIA Report) The report categorises impacts on	It is a fact that the impacted land areas and submergences are mostly of small magnitude. Wildlife, referring here to terrestrial

Observations	Response
wildlife as “temporary” stating that they would last up to the end of construction period only (p. 301 Volume-I EIA Report). This is clearly wrong considering that the change in downstream river flows in operation phase will have impact on aquatic and terrestrial wildlife. As per the report the most affected animal species in the surroundings are Common leopard, Leopard, cat, Jungle cat, Barking deer, Wild boar, etc. However no detailed assessment of their habitats and corridors has been carried out. The report surprisingly states that “Contrarily, the diversion of water in the downstream part of the river may open new corridors for the movement of animals. It is considered as positive impact.” (p. 301 Volume-I EIA Report) Which new corridors the report is talking about when there is ZERO distance of *free* flowing river between the projects? There are clearly contradictions and that shows how non serious the EIA agency is. The report also clearly does not recognize the hazard of animals getting washed away with sudden release of discharge.	fauna, is indeed impacted only temporarily. Regarding the fish, there will more fish in the area after the HEPs and EMPs are implemented, thanks to fisheries, pond and E-Flows. The river will be easier to cross for animals during lean season E-Flow.
<u>Inadequate impact assessment</u> **Impact of blasting:** The project requires 2.7 Ha of land to construct Horse Shoe shaped Head Race Tunnel (HRT), adits and related works (p. 52 Volume-I EIA Report). This will involve tunneling and blasting works. No detailed assessment of impacts of tunneling and blasting works involved in this construction has been done. Impacts on local water resources such as springs, impact on the pucca houses, impact on wildlife has not been detailed. No preventive measures have been suggested in the management plan. This again shows non serious attitude of the EIA agency	No nala at all is intercepted by the HRT, and there are no villages along alignment of HRT**.** Preventive measures have been planned under chapter 5.2.6 and 5.13.11 of the EMP.

Observations	Response
No mention of free flowing river stretch There is no mention of what is the flowing river stretch upstream and downstream of the project. As is clear from the EIA, the elevation difference between FRL of Heo HEP (1400m) and TWL of upstream Pauk II (1401m) is just 1 m, (p. 262 Volume-I EIA Report) which too seems suspect considering that river lengths given in the EIA does not match with these elevations. Also, there is no elevation difference between TWL of Heo HEP (1189 m) and FRL of downstream Tato-I HEP (1189m). Heo power house turbine flows are not joining into river, instead they flow directly into Tato-I water conducting system (p. 266 Volume-I EIA Report). However, it is not clear what is the flowing river length in these three locations. This point was raised in 34th EAC Meeting held on 19-20.01.2010 and it was observed that as there is no free stretching of river between the three contiguous projects (Pauk, Heo and Tato-I) the river will be a pull of water for a stretch of about 13 kilometres. However, the report does not talk about free flowing river stretch at all. Unless this length is assessed and is found to be adequate for river to regain its vitality, the project should not be considered and it should be asked to change the parameters. The length should in any case higher than 1 km.	• The total river length is 78 km. There is no free stretch within the cascade, which is using only 16 Km of river stretch for 571 MW. • The layout with no free stretch within the cascade has been granted TORs several times. • There is no deprivation of water in the concerned stretch as the necessary quantum of water will be left in the water to preserve the aquatic biota. • Inserting a free stretch of 1 km in the cascade is not possible for geological and topographical reasons, and would lead to a high cost of scrapping a project for a very limited benefit.
The project lists 7 projects on rive Yarjep. The report states that the cumulative impact assessment study has been conducted only for the 3 projects in the cascade development. The model for computing environmental- flows is site specific and focused on the Yarjep river part related to the Pauk, Heo and Tato-I HEPs only. However there is not detailed assessment of any of the cumulative impacts. The report merely states in a single sentence that “Nature of all impacts are same for all projects, however, magnitude of impacts would increase while considering cumulatively.” (p. 316 Volume-I EIA Report) This is clearly unjustified looking at the large number of hydro power projects on Yarjep river and in Siang Basin. The report has completely	Not relevant. Cumulative impact has been studied for the entire cascade. The basin study is a different study, and is not the responsibility of the developer. The basin study is under the purview of CWC / MOEF. E-Flows has to be site specific to take into account the specific parameters of the river at this location and its specific environmental baseline.

Observations	Response
failed in having serious attitude towards the cumulative impacts assessment	
EIA report completely misses out on the det analysis of cumulative impacts in terms of • Impacts on flora, fauna, carrying capacity, livelihoods • Impact of reduction in adaptive capacity of the people and area to disasters in normal circumstance AND with climate change • Impacts on springs and drainage pattern • Disaster potential of the area • Tunneling and blasting • Muck disposal • Changed silt flow pattern in different phases • Cumulative downstream impact • Cumulative impact of hydro peaking • Measures for safety as recommended by SANDRP • Mining of materials for the project • Cumulative disaster management • Geological disturbance caused • Seismic impact	All these issues have been covered in the EIA study as per the scoping requirement. Compliance to scoping requirement has also been included in the reports.
Environmental flows The Environment flow should be assessed through a Building Block method which has not been done, one of the key requirements for building block method is participation of all stake holders.	• Environment flow assessment has been done as per scoping requirement • The study retains recognized methodologies, including habitat simulation method and HEC-RAS modelling, • The study has considered the stakeholders and it appears that fishery in the activity is very low. This will be improved, as a benefit to the local people, as part of the EMP. • BBM is not required and is not practical in such a situation.
Issues with Rehabilitation & Resettle Plan The report states that the proposed R & R plan is mainly based on the Resettlement & Rehabilitation Policy of Arunachal Pradesh Government (2008) (p. 124 of EMP Volume-II EIA Report). It further states that in order to provide an effective plan some of the clauses outlined in National Policy on Rehabilitation and	The new land acquisition and R&R act came into force on 1st January 2014. Public hearings were conducted in august and November 2013. The rules of the new Act are to be implemented along with land acquisition procedure and the developer will comply with whatever rules are applicable.

Observations	Response
Resettlement (2007) have been taken in the proposed plan. This is clearly wrong; the new R&R Act of 2013 has to be made applicable. The PP should be asked to redo the R&R Plan in consultation with the affected people, EMP and cost estimates and come back. The R&R Plan should also include compensatory measures for all social impacts in the upstream and downstream, not only for those who lose land or houses.	EIA/EMP under EIA Notification do not need to be redone under the new Act. The new act shall be implemented lawfully and any additional requirements will be complied at appropriate time.
Public Hearing It is mandatory for the EIA to include public hearing minutes and than show how they have responded to it. But this is not the case in case of this EIA. Section 3.8 that discussed the PH does not provide minutes of the PH and hence EIA is legally incomplete. The Public hearing minutes clearly do not seem to reflect what transpired, considering it gives selected bullet points. The statement by DC that "PH is a platform for PAFs/PAPs to place their demands and grievances" is clearly wrong, the public hearing is much more than that, it is supposed to be an opportunity for the affected people to give their informed opinion for or against the project and various aspects of the project. This wrong statement by the DC shows that either he does not know the law or is misinforming the people, in either case it is serious indictment of the DC. Moreover the statement of the DC "The company has already invested huge amount for the project. So that the credibility of the company should not be doubted" is most seriously wrong and problematic. How come DC is giving certificate for credibility to the company at a platform where people are invited to give their objective views about the project, company and EIA? This statement is not only illegal and inappropriate, it is contrary to the very spirit of public hearing. If the EAC and MEF accepts such public hearings where DC makes statements that are tantamount to creating fear among the participants, than	Minutes of Meetings are freely available on APSPCB website. If required they can be attached also to EIA/EMP reports. Minutes cannot be appropriately commented by a party who did not attend the meeting, and on such baseless and vague justification of "bullet points". SANDPR could have attended the meeting at its convenience. A biased approach is arising from comment guided exclusively by anti-development mindset. It is a fact that poor people of this area want the projects, which are their unique opportunity of social and economic upliftment. There is no difference between "place their demands and grievances" and "give their informed opinion". This contention is irrelevant. .. There is nothing illegal in supporting the project development for the district administration. Here the DC refers to complaints from locals that some other companies have disappeared from the site after the PH and not invested because they are short of funds. These contentions are irrelevant in view of the content of the comments that have been furnished by the public during the hearing, and which are not questionable. All legally required formalities have been complied with and attendance of

Observations	Response
there will be no sanctity to the public hearing process. The minutes also say, about DC is supposed to have said: “PAFs/ PAPs are requested to cooperate with the company”. This is like the DC asking the people not to oppose the project, that too at a public hearing! This public hearing must be cancelled and strictures passed against the DC for making such remarks. This also raises doubts if the PH minutes are accurately reported what exactly transpired at the PH and hence a copy of the video of the PH should be put up on the EAC website at last two weeks in advance of the EAC discussing the project. The PH minutes says: “Any suggestion or objection on the minutes should be sent directly to the MEF directly”. We hereby are writing this to MEF that we have serious objection to the PH and also doubt if the minutes are accurate representation of the PH and request MEF not to consider the project without putting up the PH video on the MEF website at least two weeks in advance of EAC meeting considering the project. The public hearing minutes also say that information dissemination about the PH through drum beats was not done, but this should have been done since information dissemination should happen in manner that people can understand	the Public Hearing hasbeen very satisfactory for such remote place. If SANDPR has that much of doubts, it should attend the public hearings rather submitting baseless and late accusations.
Pro Hydro bias The Executive summary starts with a strange statement, “Such (“midsized ROR”) kind of projects is highly environment friendly”, which is clearly wrong and has no place in an EIA. This is not an ROR project, since it also hopes to do peaking power generation. By definition, an ROR project should not be doing peaking, since an ROR project is not supposed to change downstream flow pattern, where as a peaking station changes the downstream hydrograph.	If EAC wishes, we can analyse the other available ways to generate 571 MW of power with approximately 50 pct PLF. It is well known that hydropower is a renewable energy. Peaking is provided at Pauk HEP for the entire cascade (3 hours diurnal peaking). The question of peaking comes only for the lean season. This is called ROR with pond for Pauk. Heo and Tato are pure ROR schemes with no pond. This is another well planned feature as per which Heo and Tato produce peak power without high intake structures and without pond.
Over 3 yrs old data As stated in the	A new set of baseline data has beer

Observations	Response
report, large no of data is from years 2009-10, more than three years old now and in any case before the TOR approval given in 2011. This is clearly in violation of the MEF norms.	collected for the 3 seasons in 2013 and 2014 specifically for that purpose.

After detailed deliberations, EAC recommended the Heo HEP environmental clearance with the following observations and conditions:

1. Suitable Fish ladder/pass should be provided at barrage area to enable fish movement from upstream to downstream & vise-versa.
2. The provision of CAT plan seems to be on lower side and needs to be increased appropriately while increasing the overall EMP budget.
3. Provision for Muck management was found to be inadequate and requires more budgetary provision.
4. Provision of a mobile medical centre with permanent doctor to be deployed suitably and to visit regularly in villages across the project area, should be made.
5. The R&R plan will have to comply with The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013, as and when necessary.
6. Total budget of environment management plan should be about 2% of the total project cost. This estimate shall be proportionately enhanced with the escalation in project cost.
7. Environment flow release should be as per the Siang basin study report i.e. 19.9 cumec during the monsoon season, 8.78 cumec during the intermediate season and 2.7 cumec during the lean season;
8. NBWL clearance may be obtained if so required.
9. The EAC suggested that the project proponents of HEO, TATO-I and PAUK HEPs in consultation with the Arunachal Pradesh State Forest Department, the local communities and other project proponents planning HEPs on Yarjep River to identify large intact forest patches within the Yarjep Catchment and get them declared as " Conservation Reserves" or " Community Reserves" under the Indian Wildlife (Protection) Act. This effort along with an intensive

conservation education in this region would help in biodiversity conservation.

EAC concluded that the Ministry may issue EC after receiving modified/revised EMP estimate from the project proponent.

Agenda Item No. 2.2 Tato-1 HEP (186 MW) on the Yarjep River, in the West Siang District of Arunachal Pradesh – For Environment Clearance

Based on a detailed presentation was made by Developer on Tato-I HEP the EAC noted the following:

The Project was allotted by Government of Arunachal Pradesh during 2007 and scoping clearance was accorded by MoEF during 2008, installed capacity was enhanced from 60 MW to 170 MW during 2010 and again in 2011 where the installed capacity of 186 MW was accorded scoping clearance. Scoping approval was extended during 2013 and is valid till October 19th 2014.

Detailed project report has been submitted to CEA during June 2013 and notably clearances of Hydrology, Power potential, GSI, Instrumentation, power evacuation, CSMRS and FE&SA were obtained. Project envisages the construction of a 7.5 m / 9 m high (from river bed) raised trench weir across river Yarjep to supplement direct flows received from Heo tail basin for onward transmission into Tato-I water Head race channel. Project contemplates to receive total 130.88 cumec flows i.e. 130.25 cumec direct flows from Heo tail basin and supplemented 2.63 cumec flows from raised trench weir. The designed discharge flows through a Head race channel (6.6 m (W) x 6.5 m (H) and 840 m long) and enters into a head race tunnel of 3.64 Km length and 6.5 m diameter. Further it passes through underground surge shaft and pressure shaft and surface power house to generate 186 MW from three units of 62 MW each equipped with Francis vertical turbines. Salient features are as follows.

Location	Between Meying and Heo villages, West Siang District, Arunachal

	Pradesh.
Geographical Coordinates of Trench weir	94°18’43’’E, 28°32’32’’N
Geographical Coordinates of Power house	94°21’31’’E, 28°31’53’’N
Catchment area at the water intake (Km^2)	1154
PMF (m^3/s) & SPF (m3/s)	4100 and 3400
Type of Diversion structure	Raised Trench weir
Trench weir Top level	1195.5 m, 1197m
River bed level	1188 m
Maximum height above river bed level	7.5 m/9m
FRL / TWL	1189 m / 1025 m
Gross storage / Active storage	Nil
Submergence of surface land / River bed	1.2 ha / 1.8 ha
Head race channel	RCC box type, 840m long , 6.6m(W) x 6.5 m (H)
Head race Tunnel	Circular, 6.5m dia, 3.64 Km long
Design Discharge	132.88 cumec
Gross head / Rated head	164 m / 153.3 m
Power house	Surface, 80m (L)x19.6m(W)x33.38m(H)
Installed capacity	186 MW (3 x 62 MW)
Turbine	Vertical Francis Turbine

The design features of Tato-I were discussed in detail. Considering the elevation of FRL of Tato-I and TWL of Heo, and establishing the Tato-I system as directly dependent on Heo direct flows. Heo and Tato-I HEP form a tandem where Tato-I is slave to Heo.

The total land requirement is about 52.8 ha, out of which i) surface land is 50 ha and is forest land, ii) 2.3 ha is river bed and iii) 2.8 ha are for underground components. Total submergence area is 3 ha, of which 1.2 ha is surface land and 1.8 ha is river bed. 88 families are likely to be affected due to this project by partly losing their land. No family is likely to lose homestead. There is no National

Park/Wildlife Sanctuary/Historical place within 10 Km radius of the project area.

Environmental studies have been conducted by consultants CISMHE – Delhi university while second set of baseline data during 2013/2014 was collected by RS Envirolink Technologies Pvt. Ltd, Gurgaon. Base line data sampling and surveys for water quality, fauna, flora, geology, soil, fish, aquatic ecology, air, noise and socio-economic was conducted from February 2009 to April 2014 covering different seasons. Detailed impact assessment was carried out as per scope and environment management plan prepared with the following components:

- Catchment area treatment considers 8900 ha of severe and very severe erosion and of 2468.28 ha spread over 7 nos of sub-watersheds and total treatable area of 578.91 ha. Total treatment period is 5 years. Engineering measures are planned such as gully control, brushwood check dams and bench terracing. Biological measures are planned such as afforestation, assisting natural regeneration in existing forest and NTFP generation. A total budget of 305.85 lakh is proposed.

- Bio diversity management plan covers management measures like distribution of artificial trophies, incentive for the surrender of guns, establishment of seed centre, wildlife conservation and forest protection plan, safe guard measures and setup of biodiversity management committee as a safeguard measure is also planned. Total budget of 141 lakhs is provided.

- Total muck generation with 40% swelling factor works out to 12,19,798 cum and 3,77,909 cum will be utilised for construction purpose. Remaining quantity of 9,13,889 cum is proposed to be rehabilitated. Two muck dumping areas of 3.2 ha each with a total capacity to accommodate 9,76,993 cum is provided and is 82 m away from HFL of river. Mitigation measures such as compaction, construction of retaining walls, soil treatment, usage of Geo-textile and plantation provision are proposed with total budget of Rs. 148 lakhs.

- Landscaping and restoration of construction sites such as quarry sites, colony and

office complexes and roads are proposed with a budget of Rs 84.57 lakhs.

- Greenbelt development plan near pond periphery, weir and power house with plantation of trees and bamboo/Iron tree guards and nursery development are proposed with a budget of Rs. 17.27 lakhs.

- Fisheries development and downstream management plans are proposed with a budget of Rs. 70.00 lakhs.

- Public health delivery system is planned keeping in view all three projects. A child welfare centre under the Pauk HE project and primary health centre of Heo HE project will extend facilities to the Tato-I HE project affected families. A hospital unit has been proposed under the Tato-I H.E. Project. In addition, a veterinary centre, immunization and vaccination programme and distribution of first aid boxes are also proposed. A budged of Rs. 337.36 lakhs is provided.

- Waste management plan for managing 1,98,151 kg of solid waste per year and 1,16,000 litres per day of liquid waste to be generated by migrant population is proposed with a budget of Rs. 224.3 lakhs is provided.

- Fuel wood energy management and conservation plan with LPG depot at Tato-I HE project with 750 connections can be extended to surrounding villages of Heo HE project and Pauk HE project. Kerosene depot, community kitchens/canteens, distribution of energy efficient challahs, distribution of solar cookers and training biogas production are also planned. A budget of Rs. 54.80 lakhs is proposed.

- Management of Air, water quality and noise level is proposed with a budget of Rs. 36 lakhs.

- Under R&R plan, relief package to affected families with ST grant, BPL grant, pension for vulnerable persons, free electricity grant is provided with a budget of 202 lakhs. Under the rights and privileges to compensate the loss of usage of forest produce from USF, a budget of Rs. 186.39 lakhs is provided. Under the

Local area development plan covering merit scholarships, training programme, education facilities, communication facilities, transportation facility, adoption of a model village, construction of rain shelters and footpaths, sanitation facilities, crafts and skill upgradation and community halls, a budget of Rs. 804.4 lakhs is provided. Including the monitoring budget of Rs. 30 lakhs, a total budget of Rs. 1222.89 lakhs provided under R&R plan.

- Disaster management plan is prepared for surveillance and monitoring. For prevention of disaster measures such as emergency plan, administrative and procedural aspects, preventive action, communication system, satellite communication system, recovery, evacuation and rescue operation, mitigation and rehabilitation, notification and public awareness are planned. A budget of Rs. 143 lakhs is provided.

- Good practices programmes, training and awareness are proposed with a provision of Rs 25.00 lakhs.

- Implementation and Monitoring with environmental cell and Corporate social responsibility cell, monitoring and evaluation committees are proposed with a budget of Rs 60.00 lakhs.

Total EMP budget prepared to implement the above mitigation measures and benefits is Rs. 2870.15 lakh.

EAC inquired about the total project cost and the EMP budget as a percentage of total project cost including IDC and cost escalation. Developer explained that total project cost as per draft DPR is Rs. 1867 crores and that the EMP budget is about 1.54%. EAC observed that overall EMP budget is on the lower side and has to be at least 2% of the total project cost. The developer agreed to enhance the cost of EMP and also that EMP cost will increase proportionately if the project cost increases.

EAC enquired about the status of forest clearance. Developer explained that during February 2014 Forest Advisory Committee meeting examined proposal for

diversion of 52.8 ha land (surface land 47.1 ha, River bed 2.3 ha and underground 2.8 ha) and some additional information was sought from the Government of Arunachal Pradesh. Government of Arunachal Pradesh has furnished the required information in June 2013.

A detailed discussion was held on Environment Flow Release. Developer explained that as per the Scoping requirement, an environmental flow study has been conducted by CISMHE, Delhi University, New Delhi and NIH (National Institute of Hydrology, Roorkee) to arrive at the appropriate discharge of flow to be left in the river to ensure appropriate depth and velocities during monsoon, pre and post monsoon and lean seasons, depending on the requirements of the fish and other aquatic life. *Schizothorax richardsonii* has been considered as the dominant fish species and habitat requirements have been considered as per Wildlife Institute of India, 2012. HEC-RAS software has been used for simulation modelling by NIH. Critical stretches were defined downstream of the diversion structure and up to the confluence with the first major tributary; for Tato-I HEP the Sitin Nala joins the Yarjep river on the left bank at 0.289 Km downstream of the weir and the Pirpit korang nala joins at 2.56 Km. The river cross sections covering the critical stretch have been used in HEC-RAS software with simulation of different discharges to arrive at required depths and velocities for three seasons i.e. Monsoon seasons, Pre and post monsoon seasons and lean seasons.

The study recommended the environment flow release requirement of 18.8 cumec, 2.92 cumec and 8.22 cumec in monsoon season, lean season and other 4 months season respectively. In addition to the E-flow to be released at the trench weir site, Sitin nala at 0.29 Km will increase the flow in the intermediate stretch to 20.64 cumec, 3.15 cumec and 9 cumec in monsoon season, lean season and other 4 months respectively. Further flowing downstream up to joining of Pipit korang nala at 2.56 downstream of the weir, with the contribution of all nalas the flow in this intermediate stretch will increase to 24.31 cumec, 3.60 cumec and 10.58 cumec in monsoon season, lean season and other 4 months respectively

EAC inquired that as these projects are part of the Siang basin study and as a

detailed environment flow assessment study for each project has already been carried out under the study which has been approved by CWC, therefore, a comparison should be made between the NIH study and the Siang basin study recommendations. Developer showed the following comparison:

Season	Velcan's environmental flow study			Siang basin study		
	Env. Flow (m^3/s)	Mean depth (m)	Mean velocity (m/s)	Env. Flow (m^3/s)	Mean depth (m)	Mean velocity (m/s)
Monsoon	18.8	1.45	1.93	21.58	1.52	2.51
Intermediate	8.22	1.06	1.56	9.49	1.1	2.09
Lean	2.92	0.72	1.20	2.92	0.7	1.60

EAC discussed at length all possibilities of flow considering the target groups, and dynamics of the river with the project proponents. Further, EAC has discussed about developers values compared to the Siang basin study recommended values, and expressed that lean season values are matching but intermediate and monsoon season values retained by the developers are slightly lower than that of Basin study recommended values. The NIH recommended values are still satisfying desired parameters of *Schizothorax richardsonii* as per WII, 2012. However EAC expressed that, Siang basin study has already approved by CWC and is in final stages of discussions in EAC, and it should be more appropriate to adopt Siang basin study values. Therefore the EAC decided that the minimum flows should be retained as those recommended by the basin study viz. 21.58 cumec during the monsoon season, 9.49 cumec during the intermediate season and 2.92 cumec during the lean season.

The Arunachal Pradesh State Pollution Control Board conducted the public hearing for the project at Tato Community Hall, Tato, West Siang district on 20th August 2013 with a total attendance of 147 persons. The public raised main issues like change in nomenclature of the river as per local name, construction of a community centre, education, health and sanitation facilities, employment, infrastructure and training. Developer explained the responses provided during the hearing and that issues raised by the public and they have been addressed

in EIA and EMP reports.

Observations from SANDRP have been received by EAC on this project and were communicated to the developer. Developer responded in detail to the EAC and also submitted a written response to MoEF and same are given below.

Observations	Response
Consultants not aware of policies and Acts In Para 1.5.1 the EIA says: "In the course of its development, the Tato-I HEP needs to adhere to all relevant policies and guidelines in general and the following, in particular: i.) National Forest Policy (NFP), 1988 ii.) National Water Policy (NWP), 2002 iii.) National Rehabilitation and Resettlement Policy (NRRP), 2007 iv.) Rehabilitation and Resettlement Policy (RRP), 2008 of GoAP" This shows that the EIA consultants are not even aware of latest policies and Acts. For example, the latest Water Policy is National Water Policy of 2012 and latest R&R Act is that of 2013.	The new land acquisition and R&R act came into force on 1st January 2014. Public hearing was conducted in August 2013. The rules of the new Act are to be implemented along with land acquisition and the developer will comply with whatever rules are applicable.
Inadequate impact assessment Impact assessment is inadequate and several essential aspects of impact assessment are missing from the report.	
No mention of Climate Change: No assessment of the possible impact of climate change on the project and impact of the project on the local climate as well as increase in green house gas emissions from the reservoir and construction of the project has been done. Similarly impact of the project on adaptation capacity of the local communities in changing climate has not been assessed. Word 'Climate Change' does not feature in EIA report or in the EMP.	No study of climate change aspects have been mandated by TORs and the pondage of HEPs are negligible in this regard: • Pondage/Reservoir area of Pauk is only 34 Ha including 8 Ha of river bed, and located in deep gorges. • Heo submergence is very small mostly confined to river bed (only 8.4 Ha including 5.6 Ha river bed). • Tato submergence is almost inexistent, only 3 ha including 1.8 ha of river bed. Therefore No major impacts of emission of green house gases are anticipated.
Impacts of the dam on the flood characters of the river: The EIA report does	There is no Dam. Tato-I diversion structure is only a trench weir of 7.5m height with no

Observations	Response
not talk about impacts of the dam on the flood character of the river, what will be the changes and how these will impact downstream areas. Heo HEP (240 MW) is the upstream project of Tato I project. Area upstream of the Heo dam is Mechuka plain and the report claims that water is cleared from silts while it flows through the Mechuka plain. It also claims that water velocity does not increase significantly even during extreme flood event p.137 Volume-I EIA Report) It however does not assess the downstream impact of floods when Yarjep River flows through mountains till reaching Tato II Reservoir which is downstream of the Tato-I project.	storage and no impacts are foreseen with this structure. Mechuka plain is spread over a length of 22 km with bed slope of 0.39% and river width is ranging from 200 m to 300m and adjoined with gentle slope banks. Even during the flood season the river width will increase and due to gentle bed slope the increment in velocity will be lesser as comparing with mountainous region.
Impacts of changing silt flows: Impacts of changing silt flows downstream from desilting chamber and from silt flushing in monsoon on the downstream areas are not analyzed. A detailed account of how the silt from the dam would be flushed out annually and what would be the impact of this in the downstream as well as on the geo morphology, erosion, stability of structures etc is not done.	A detailed sedimentation study has been discussed in DPR. The Mechuka plain spreading for 22 Km long is acting as a natural sediment basin. The catchment area covered up to the end of Mechuka plain is 766 sq.Km. The sediment contribution of remaining catchment area has been accounted up to Pauk dam. In pauk dam, silt deposition occurs in reservoir up to elevation 1492.4m permanently. To handle siltation, Bottom outlets will be operated during high flood flows and annual flushing operations. Implication of sediment impact has already covered in DPR.
Impact of the project on disaster potential: in the project area as well in the downstream due to construction and also operation at various stages, say on landslides, flash floods, etc. is not assessed.	The diversion structure is 7.5 m / 9 m high structure having no storage no impact on downstream during disaster triggered by landslides, flash flood is anticipated.
Impact of construction and operation of coffer dams & Diversion channels has not been assessed. The project does involve a trench weir which will require these structures.	A 3 m height of coffer dam proposed during construction period in river channel and box type diversion channel of 2m x 3m, 115m long. No adverse impacts are anticipated with this magnitude of structures.
Impact of peaking generation: The report though not explicitly stated, indicates that the project will function as a peaking station. E.g. the report states that the inflows for the project will be divided into flows for peaking power generation, surplus flows and	The Tato-I trench weir contributes 2.7 cumec in monsoon and 1.38 cumec in lean seasons. Based on intermediate catchment area discharge a part of discharge (after ensured releases of environmental flow) will be diverted during pre and post monsoon

Observations	Response
environmental flows.(p. 258 Volume-I EIA Report) When a project operates as peaking station, there are severe impacts in the downstream and also upstream (rim stability). These impacts have not been assessed, nor is it assessed how the project will perform in the cascade development it is in.	season. There is no peaking release from Tato-1 trench weir.
Seismic impacts: A detailed site specific study for design earthquake parameters for Pauk HEP – the upstream most project under Yarjep cascade development - has been carried out by the Department of Earthquake Engineering, IIT, Roorkee. (p. 102 Volume-I EIA Report) This project is in the upstream of the Heo HEP (about 3.5 km) and falls in the same geotectonic block having similar geomorphological features, lithology and seismogenic sources. The EIA report very conveniently adopts seismic analysis carried out for Pauk HEP and the horizontal seismic co-efficient arrived at for Pauk stating that "In view of proximity, size of the structure, similarity of lithological/ tectonic features, location in the same geotectonic block, and absence of any major additional tectonic features, it is considered appropriate". (p. 102 Volume-I EIA Report) However, seismic impacts are very location specific and should be separately looking into for each project singly and in conjunction with other projects in the basin and region.	As the structure height is 7.5m / 9m, site specific seismic studies are not required as per norms of NCSDP. However Seismic parameters of Pauk dam are adopted for design purpose.
Inadequate impact prediction At several places the impact prediction is inadequate.	
Impacts on fish: As per the report out of the eight recorded fish species, Schizothorax richardsonii and Schistura rupecola have been categorized as 'vulnerable' species while Ompok bimaculatus has been placed under 'near threatened' category. Garra naganensis is considered to be endemic to North-east	A total of 11 species are recorded in influence area of Tato I H.E. project . Influence area of Tato I covers a larger area of Siyom river. And some of the species like Labeo and Danio are restricted in lowest part of influence area in Siyom river. It is clearly mentioned in the report

Observations	Response
region of India. Even so the report concludes that “Yarjep (Shi Shito) River and its tributaries are not rich in the fish diversity.” (p.176 of EIA Report Volume-I) Schizotharax richardsonii, Labeo pangusia, and Garra naganensis are column feeder, thus, considered to move relatively longer distance as compared to other species dwelling the river bed. Schizothorax richardsonii and Labeo pangusia are considered to perform migration in river system. (p.176 of EIA Report Volume-I) The report shows quite a disregard for these migrating species. No mitigation measures for the habitat fragmentation of these species are considered. The report states that the back waters of Tato-II reservoir spreads more than 3 km in upstream of confluence of Yarjep with Siyom river. The report concludes that the stretch of 5.5km available between Tato-I trench weir and Tato-II backwaters which is fed by perennial nalas such as Sitin Nala and Pirpit Korang nala, would act as spawning grounds for snow trout. The fragmented population of snow trout between Tato-I trench weir and Heo barrage (5 Km stretch) would be able to persist in such stretch, as Sang nala is located at 1.43 km downstream of Heo barrage and would act as spawning ground. Report finally states that no fish pass is proposed in the trench weir. (p.176 of EIA Report Volume-I) What report fails to mention is that there is no elevation difference between TWL of Heo HEP (1189 m) and FRL of downstream Tato-I HEP (1189m). Heo power house turbine flows are not joining into river, instead they flow directly into Tato-I water conducting system. Thus there is no free flowing river stretch. Similarly there is no free flowing river stretch between TWL of Pauk HEP which is upstream of Heo HEP and FRL of Heo HEP as the distance between diversion of Pauk	that the species like Labeo does not enter in Yarjep river as per our observation. Therefore, for the environmental flow, Schizothorax was targeted as per requirement as well as per ToR. As far as low diversity of fish is concerned, number of 11 species is always considered as low diversity, the fact cannot be denied. Though as per our study, fish pass does not seem to fulfill its purpose in this stretch due to the reason that Tato II and Pauk are larger dam structures, where fish pass are not possible. Only 16 km river stretch is left. However fish pass will be provided at Heo HEP and Tato-I diversion structures if required by the EAC.

Observations	Response
dam and Power House is 2.6 km. Impact of lack of free flowing river stretches and fragmentation of habitats is not assessed at all. Assessment of aquatic ecosystem remains a major weak point of the report.	
Impacts on landslides: The report acknowledges that the catchment is prone to landslides and changes in landscape features. Impacts of project on landslides are however summarized in a few sentences stating "A head race tunnel of 3.641 km would pass through a few nalahs. The HRT might disturb the water tables. In addition, blasting, quarrying and road construction activities may give rise to landslides and slips in the area." (p. 296 Volume-I EIA Report) No further detailed assessment or analysis of this issue of serious consequences has been carried out. In the EMP biological and engineering measures have been detailed out for prevention of soil erosion. No specific measures have been suggested for landslides.	The HRT passes under Pirpit korang nala about 53 m below the nala bed level. Proper cover is being maintained and in case of interception with water table anywhere in HRT alignment, suitable draining arrangements will be provided in the HRT excavation. Control blasting system will be followed in quarrying and road construction to minimise noise and vibration . The impacts of construction on land slides are mentioned in the report (Please refer to 4.2.2 of chapter 4 of EIA report). During the investigation no existing land slide except at 500 m downstream of proposed Trench Weir (see section 2.4 of chapter 2 of volume I) was observed in the study area. However, it was mentioned that catchment area is prone to landslides (please refer to section 3.2.4.1 of chapter 3 of Volume I). A detailed CAT plan is proposed for the purpose
Impacts on forests and wildlife: The EIA report acknowledges that the project activity would lead to the shrinkage of the habitat of wild animals. (p. 297 Volume-I EIA Report) The most affected animal species in the surroundings are Common leopard, Leopard cat, Jungle cat, Barking deer, Wild boar, etc. the report also states that close vicinity of Pirpir Korang Nalah was observed as a corridor of wildlife, therefore, project activities must be restricted and controlled in that area. However no appropriate details are provided in the EMP. The 'Wildlife Conservation & Forest Protection Plan' is entirely focused around strengthening the infrastructure facilities such as vigilance and measures to check poaching, check posts and watch towers, provision of necessary equipments to wildlife	Numerous measures have been proposed in the EMP report (please refer to chapter 5.2 of Volume II). Also, Biodiversity management plans have been formulated under other projects of cascade development, which would cater to this project also due overlapping of influence area. In addition, precautionary measures, guidelines and some good practices are also proposed in the report.

Observations	Response
and forest departments to increase their capability and efficiency etc. (p. 57 EMP Volume-II EIA Report) It however does not talk of any measures to preserve the ecologically sensitive habitats.	
Impact of blasting: The project requires 2.8 Ha of land to construct Horse Shoe shaped Head Race Tunnel (HRT), adits and related works. (p. 53 Volume-I EIA Report) This will involve tunneling and blasting works. No detailed assessment of impacts of tunneling and blasting works involved in this construction in terms of spatial assessment of areas to be blasted and their overlap with ecologically sensitive and geologically fragile areas has been done. Impacts on local water resources such as springs, impact on the pucca houses, impact on wildlife has not been detailed. No preventive measures have been suggested in the management plan. This again shows non serious attitude of the EIA agency.	The impacts of blasting have been addressed under the sections 4.2.2, 4.3.1.3, 4.3.4.3, Table 4.1.1.6 in chapter 4 of Volume I It is addressed in the report that the Head Race Tunnel crosses a number of cross drainage systems and one of them is Pirpit Korang nalah falling on the alignment just before the second bend and first major bend where 53 m cover is expected (pl refer section 4.3.2 of chapter 4 in Volume I). Possibility of such impacts has been addressed under section 5.13.11 of chapter 5.13 (Good Practice)
<u>No mention of free flowing river stretch</u> There is no mention of what is the flowing river stretch upstream and downstream of the project. There is no elevation difference between FRL of Tato-I HEP (1189m) and TWL of upstream Heo HEP (1189 m). Heo power house turbine flows are not joining into river, instead they flow directly into Tato-I water conducting system. Also the elevation difference between TWL of Tato-I project (1025 m) and FRL of downstream Tato-II project (1020 m) is just five meters. (p. 259 Volume-II EIA Report) However, it is not clear what is the flowing river length in these three locations. This point was raised in 34th EAC Meeting held on 19-20.01.2010 and it was observed that as there is no free stretching of river between the three contiguous projects (Pauk, Heo and Tato-I) the river will be a pull of water for a stretch of about 13 kilometres. However, the report does not talk about free flowing river stretch at all.	• The total river length is 78 km. There is no free stretch within the cascade, which is using only 16 Km of river stretch for 571 MW. • The layout with no free stretch within the cascade has been granted TORs several times. • There is no deprivation of water in the concerned stretch as the necessary quantum of water will be left in the water to preserve the aquatic biota. • Inserting a free stretch of 1 km in the cascade is not possible for geological and topographical reasons, and would lead to a high cost of scrapping a project for a very limited benefit.

<table>
<tr><th>Observations</th><th>Response</th></tr>
<tr><td>Unless this length is assessed and is found to be adequate for river to regain its vitality, the project should not be considered and it should be asked to change the parameters. The length should in any case higher than 1 km.</td><td></td></tr>
<tr><td>Cumulative impacts
<table><tr><th>Sr. No.</th><th>Name of the Project</th><th>Installed Capacity</th></tr><tr><td>1</td><td>Pauk HE Project</td><td>145 MW</td></tr><tr><td>2</td><td>Heo HE Project</td><td>240 MW</td></tr><tr><td>3</td><td>Tato-I HE Project</td><td>186 MW</td></tr><tr><td>4</td><td>Rapum HE Project</td><td>66 MW</td></tr><tr><td>5</td><td>Rego HE Project</td><td>80 MW</td></tr><tr><td>6</td><td>Kangtangshiri HE Project</td><td>80 MW</td></tr><tr><td>7</td><td>Pemashelpu HE Project</td><td>91 MW</td></tr></table>
The project lists seven projects on rive Yarjep. The report states that the cumulative impact assessment study has been conducted only for the three projects in the cascade development. The model for computing environmental-flows is site specific and focused on the Yarjep river part related to the Pauk, Heo and Tato-I HEPs only. (p. 277 Volume-II EIA Report) While report makes a brief mention of cumulative impacts on different environmental components, there is not detailed assessment of any of the cumulative impacts.
This is clearly unjustified looking at the large number of hydro power projects on Yarjep River and in Siang Basin. The report has completely failed in having serious attitude towards the cumulative impacts assessment.</td><td>Cumulative study of 7 project is beyond the scope of study. However an account on cumulative Impacts of the three cascading projects has been addressed in the report (please refer to section 4.5 of chapter 4 of volume I

A basin study, which is a different study, and is not the responsibility of the developer has been prepared under the purview of CWC / MOEF.</td></tr>
</table>

Observations	Response
EIA report completely misses out on the detailed analysis of cumulative impacts in terms of • Impacts on flora, fauna, carrying capacity, livelihoods • Impact of reduction in adaptive capacity of the people and area to disasters in normal circumstance AND with climate change • Impacts on springs and drainage pattern • Disaster potential of the area • Tunneling and blasting • Muck disposal • Changed silt flow pattern in different phases • Cumulative downstream impact • Cumulative impact of hydro peaking • Measures for safety as recommended by SANDRP • Mining of materials for the project • Cumulative disaster management • Geological disturbance caused Seismic impact	Impacts on flora and fauna, livelihood: Please refer to section 4.3.1.3, 4.3.1.4, 4.3.1.5, 4.3.1.6, 4.3.1.7, 4.3.3.5,4.3.6.3 of chapter 4 of Volume I. Impacts on Spring and drainage pattern: Please refer to sections 4.3.2 and 4.3.6.2 of chapter 4 of Volume **I** Area of Disaster & Climate Change: In spite of the fact that Trench weir of Tato I would create a pondage of 3 ha only (including 1.8 Ha of river bed), however the downstream area was considered and a Disaster Management Plan has been proposed (Please refer to chapter 5.12 of Volume II. Impacts of tunneling and Blasting: Please refer to sections 4.21, 4.2.2, 4.3.1.3, 4.3.4.3, Table 4.1.16 in chapter 4 of Volume I Disaster Management Plans are prepared for individual projects. However, Pauk HEP is uppermost and largest reservoir, and a detailed disaster Management Plan with dam break modeling has been formulated for this project. Geological Disturbance: Please refer to sections 4.2.2 and 4.3.2 of chapter 4 of Volume I

After detailed deliberations, EAC recommended the Tato-I HEP environmental clearance with the following observations and conditions :

(i) Suitable Fish ladder / pass should be provided at Trench weir for movement of fish from upstream to downstream of diversion structure.

(ii) The provision of CAT plan seems to be on lower side and needs to be increased appropriately while increasing the overall EMP budget.

(iii) Provision in Muck dumping area is found to be inadequate and requires more budgetary provision.

(iv) The R&R plan will have to comply with The Right to Fair Compensation

and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 as and when necessary.

(v) Total budget of environment management plan should be about 2% of the total project cost. This shall be proportionately enhanced with the escalation in project cost.

(vi) Environment flow release should be as per the Siang basin study report i.e. 21.58 cumec during the monsoon season, 9.49 cumec during the intermediate season and 2.92 cumec during the lean season.

(vii) Clearance from NBWL may have to be obtained if so required.

(viii) The EAC suggested that the project proponents of HEO, TATO-I and PAUK HEPs in consultation with the Arunachal Pradesh State Forest Department, the local communities and other project proponents planning HEPs on Yarjep River to identify large intact forest patches within the Yarjep Catchment and get them declared as " Conservation Reserves" or " Community Reserves" under the Indian Wildlife (Protection) Act. This effort along with an intensive conservation education in this region would help in biodiversity conservation.

EAC concluded that the Ministry may issue the EC on receipt of revised EMP cost from the project proponent.

Agenda Item No. 2.3 PAUK HEP (240 MW) on the Yarjep River, in the West Siang District of Arunachal Pradesh – For Environment Clearance

The Developer explained that they have proposed 3 cascading projects namely, Pauk HEP 145 MW, Heo HEP 240 MW and Tato-I HEP on Yarjep Chu (Shi shito) river (a tributary of Siyom river) on Tato-Mechuka road in West Siang District of Arunachal Pradesh. Presentation was made with a videography of three projects in cascade and explanation of the cascade arrangement presented as below.

Sl.no	Description	Pauk	Heo	Tato-1
1	Catchment area	982 Sq.km.	1065 Sq.km.	1154 Sq.km.

2	Intake type and height	Arch Dam, 105 m	Barrage, 16 m	Trench weir, 7.5/9 m
3	F.R.L / MDDL	1540 m / 1535 m	1400 m / 1398 m	1189 m
4.	TWL	1401m	1189m	1025m
5	Gross storage / Live storage	11.5 Mm^3 / 1.67 Mm^3	0.39 Mm^3 / 0.15 Mm^3	Nil
6	Submergence (excl. river bed)	25.3 ha	2.8 ha	1.2 ha
7	HRT length	2117 m	3550 m	3641 m
8	Gross Head / Net Head	140 m / 130.5 m	211 m / 201.8 m	164 m / 153.3 m
9	Designed Discharge	121.65 m3/sec	130.2 cumec	132.9 cumec
10	Installed Capacity	145 MW (3x 48.3 MW)	240 MW (3x 80 MW)	186 MW (3x 62 MW)
11	Land Requirement	91.7 ha	55.7 ha	52.8 ha

Thereafter, a detailed presentation was made by the Developer on Pauk HEP and EAC noted the following**.**

Pauk HEP is a run-of-the-river scheme with active storage of 1.67 MCM to enable diurnal peaking generation for Pauk HEP, Heo HEP and Tato-I HEPs. Heo HEP turbine flows enter directly into water conducting system of Tato-I HEP, as Tato-I HRC is coupled with Heo HEP tail basin. Heo- Tato-I form a tandem where Tato-I is slave to Heo master.

Project was allotted by Government of Arunachal Pradesh during 2007 and scoping clearance was accorded by MoEF during 2008, installed capacity was enhanced during 2010 and again in 2011 where the present installed capacity of 145 MW was accorded scoping clearance. Scoping approval was extended during 2013 and is valid till October 19, 2014.

Hydrology & Power Potential of the Project have been approved by CWC and CEA.

Project envisages construction of an Arch dam of 105m high (from deepest foundation level) in a narrow gorge across river Yarjep to maintain FRL 1540m. Designed discharge flows will be diverted through head race tunnel of 2.117 Km long with 6.5m diameter. The diverted flows pass through underground components of surge shaft, pressure shaft and underground Power house to generate 145 MW power from three units of 48.33 MW each equipped with vertical Francis turbine. Salient Features of the Pauk HEP are as follows:

Location	Between Chengrung and Puring villages , West Siang District, Arunachal Pradesh.
Geographical Coordinates of Dam	94°14'43"E, 28°32'46"N
Geographical Coordinates of Power house	94°15'53"E, 28°32'32"N
Catchment area at the water intake (Km^2)	982
PMF (m^3/s) & SPF (m3/s)	3700 and 3000
Type of Dam	Concrete Arch Dam
Dam Top level	1550 m
Foundation Level	1445 m
Maximum height above deepest foundation	105 m
Full Reservoir Level	1540 m
Minimum Draw Down Level	1535 m
Gross storage / Active storage	11.5 MCM / 1.67 MCM
Submergence of surface land / River bed	25.3 ha / 8.8 ha
Head race Tunnel	Circular, 6.5m dia, 2.117 Km long
Design Discharge	121.65 cumec
Tail Water Level	1401 m
Gross head / Rated head	139 m / 130.53 m
Power house	Underground, 89m (L) x 19m (W) x 37m (H)
Installed capacity	145 MW (3 x 48.33 MW)

Turbine	Vertical Francis Turbine

The design features of the project were discussed in detail. Considering the height of the dam and its storage, EAC asked as to whether it should be named as ROR scheme or otherwise. The developer replied that Pauk reservoir/pond is proposed with gross storage of 11.5 MCM and of which 1.67 MCM is live storage, of 5m height between Full reservoir level 1540m and Minimum Draw Down Level 1535 m elevation. This storage of 1.67 MCM (equivalent for 3.8 hours designed discharge) is proposed to be utilised for diurnal peaking power generation for 3 hours for Pauk during lean season, and will also benefit Heo and Tato-I HEPs. As the live storage is very limited and utilised for diurnal usage, therefore Pauk HEP is termed as ROR project. In addition the reservoir is small (25.3 Ha of surface land) as confined to deep gorges, and there is no consumptive use of water, which is put back in the river and never stored for more than a day during the lean season.

Considering the elevations of FRL and TWL of each project, the EAC questioned the absence of free stretch between the projects. The developer replied that for all the 3 HEPs the cascade layout has already been approved by MOEF through TORs dated 20th April 2010 and 20th October 2011 and the cascade is covering only 16 Km of river, out of a total length of 78 KM of Yarjep river, for generating 571 MW. The developer explained that there are 4 other HEPs planned on the Yajep River, and these 4 HEPs are using 17.6 Km stretch and therefore, the total stretch under hydropower development is only 33.6 Km, leaving 58% of the river as free flowing stretch. In addition the developer referred to the minimum flow study as per which the concerned stretch will not be deprived of flows, and the E-Flow will preserve the fish and the river biota. The EAC took into consideration these clarifications and found that these schemes should not be considered as separate schemes but as one cascade in a stretch of 16 Km.

The total land requirement is about 91.7 ha, out of which i) surface land is 79.1 and is classified as forest, ii) 9.3 ha is river bed. The power house will be underground, along with other underground structures which are totalling 3.3 Ha.. Total submergence area is 34.1 ha, of which 25.3 ha is surface land and 8.8 ha is

river bed.

55 families are likely to be affected due to this project by parts losing their land. No family is likely to be displaced. There is no National Park/Wildlife Sanctuary/Historical place within 10 Km radius of the project area. Environmental studies have been conducted by consultants CISMHE – Delhi university while second set of baseline data during 2013/2014 was collected by RS Envirolink Technologies Pvt. Ltd, Gurgaon. Base line data sampling and surveys for water quality, fauna, flora, geology, soil, fish, aquatic ecology, air, noise and socio-economic was conducted from February 2009 to April 2014 covering different seasons. Detailed impact assessment was carried out as per scope and environment management plan prepared with the following components:

- Catchment area treatment is planned for 14800.02 ha including 8717 ha area of severe and very severe erosion and the treatable area of 5954.19 ha spreads over 12 nos of sub-watersheds. Total treatment period is 5 years. Engineering measures are planned such as gully control, brushwood check dams, contour bunding and bench terracing. Biological measures are planned such as afforestation, assisting natural regeneration in existing forest, NTFP generation and pasture development. A total budget of 2156.36 lakh is proposed.

- Bio diversity management plan covers management measures to establish botanical gardens, natural resource and skill management, butterfly park, identification of invasive species and recovery of susceptible species and wildlife conservation and forest protection. Biodiversity management committee as a safeguard measure is also planned. Total budget of 227 lakhs is provided.

- Total muck generation with 40% swell factor works out to 10,70,106 cum and for construction purpose 2,36,000 cum will be utilised. Remaining 8,34,106 cum is proposed to be rehabilitated. A muck dumping area of 5.1 ha with a capacity to accommodate 10,34,900 cum is provided and is 181 m away from HFL of river. Mitigation measures such as compaction, construction of retaining walls, soil treatment, usage of Geo-textile and plantation provision is made with total budget

of Rs. 121 lakhs.

- Landscaping and restoration of construction sites such as quarry sites, colony and office complexes and roads are proposed with a budget of Rs 72.20 lakhs

- Greenbelt development plan near pond periphery, dam and power house with plantation of trees and bamboo/Iron tree guards and nursery development are proposed with a budget of Rs.24.63 lakhs.

- Fisheries development and downstream management plan are proposed with a budget of Rs. 55 lakhs.

- Public health delivery system is planned keeping in view all three projects. A hospital unit of Tato-I HE project and primary health centre of Heo HE project will extend facilities to the Pauk HE project affected families. A child welfare centre, deploying health workers, immunization programme and distribution of first aid boxes are planned under the Pauk H.E.P. A budged of Rs.100 lakhs is proposed for that purpose.

- Waste management plan is proposed to handle and process the waste to be generated by an estimated 1548 migrant population. Subsequent solid and liquid generation waste treatment facility and measures are proposed with a budget of Rs. 225.4 lakhs.

- Fuel wood energy management and conservation plan with LPG depot at Tato-I HE project can be extended to surrounding villages of Heo HE project and Pauk HE project. Kerosene depot, community kitchens/canteens, distribution of energy efficient chullahs, distribution of solar cookers and training biogas production are planned. A budget of Rs. 49.50 lakhs is proposed.

- Management of Air, water quality and noise level would be ensured with a proposed budget of Rs. 40 lakhs.

- Under R&R plan, relief package to affected families with ST grant, BPL grant, pension for vulnerable persons, free electricity grant amount to a budget of 117.5 lakhs. Under rights and privileges to compensate the loss of customary usage of forest produce from USF, an additional budget of Rs.309 lakhs is provided. Under the Local area development plan covering merit scholarships, training programme, education facilities, community welfare centres, adopting model village, construction of rain shelters and footpaths, sanitation facilities, cultural, religious and sports facilities, crafts and skill upgradation and horticulture and agriculture support, a budget of Rs. 446.00 lakhs is provided. Including monitoring budget of Rs.30 lakhs, a total budget of Rs. 902.5 lakhs provided under R&R plan.

- Dam break analysis for Pauk dam has been carried out with the software Mike 11 and relevant inundation area map has been prepared. Disaster management plan has been prepared for surveillance and monitoring and for prevention of disaster. Measures such as emergency plan, administrative and procedural aspects, preventive action, communication system, satellite communication system, recovery, evacuation and rescue operation, mitigation and rehabilitation, notification and public awareness are planned. A budget of Rs. 117.6 lakhs is provided for that purpose.

- Good practices programmes, training and awareness are planned under a provision of Rs 25.00 lakhs.

- Implementation and Monitoring with environmental cell and Corporate social responsibility cell, monitoring and evaluation committees are prosed through a budget of Rs 60.00 lakhs.

Total EMP budget prepared to implement the above mitigation measures is Rs. 4176.19 lakh.

EAC inquired about the total project cost and EMP cost as a percentage of total project cost including IDC. Developer explained that total project cost as per draft DPR is Rs. 1595 crores and the proposed EMP budget is therefore about

2.62%. EAC observed that overall EMP budget is on the lower side and has to be at least 3% of the total project cost. The developer agreed to enhance the cost of EMP and also that EMP cost will increase proportionately if the project cost increases.

EAC enquired about the status of forest clearance. Developer explained that the process has reached an advanced stage as the proposal for diversion of forest land has been cleared by DFO, CF and PCCF Itanagar and the recommendation by GoAP to MoEF is expected shortly. The total land requirement has been categorized as USF.

A detailed discussion was held on Environment Flow Release. Developer explained that as per the Scoping requirement, an environmental flow study has been conducted by CISMHE, Delhi University, New Delhi and NIH (National Institute of Hydrology, Roorkee) to arrive at the appropriate discharge of flow to be left in the river to ensure appropriate depth and velocities during monsoon, pre and post monsoon and lean seasons, depending on the requirements of the fish and other aquatic life. *Schizothorax richardsonii* has been considered as the dominant fish species and habitat requirements have been considered as per Wildlife Institute of India, 2012. HEC-RAS software has been used for simulation modelling by NIH. Critical stretches defined downstream of diversion structure and upto confluence with major tributary; for Pauk HEP it extends up to the confluence of left bank Songshibu Nala, at 1.74 Km downstream of the Dam. The river cross sections covering the critical stretch have been used in the HEC-RAS software, and simulation with different discharges have been run to arrive at the required depths and velocities for three seasons i.e. Monsoon, Pre and post monsoon and lean seasons.

The study recommended the environment flow release requirement of 16 cumec, 2.5 cumec and 7 cumec in monsoon season, lean season and other 4 months respectively. In addition to the E-flow to be released at the Dam site, several nalas join up to Songshibu nala, i.e. within the 1.74 Km critical stretch, which will increase the flow in the intermediate stretch to 26.32 cumec, 3.78 cumec and 11.40 cumec in monsoon season, lean season and other 4 months respectively

EAC inquired that as these projects are part of the Siang basin study, and as a detailed environment flow assessment study for each project has already been carried out under the basin study which has been approved by CWC, therefore, a comparison should be made with NIH study and the Siang basin study recommendations. Developer showed the following comparison:

Season	NIH environmental flow study			Siang basin study		
	Env. Flow (m^3/s)	Mean depth (m)	Mean velocity (m/s)	Env. Flow (m^3/s)	Mean depth (m)	Mean velocity (m/s)
Monsoon	16.0	1.11	2.11	18.35	1.24	1.24
Intermediate	7.0	0.81	1.74	8.1	0.91	1.00
Lean	2.5	0.55	1.37	2.5	0.58	0.75

EAC discussed at length all possibilities of flow considering the target groups, and dynamics of the river with the project proponents. Further EAC has discussed about developers values compared to the Siang basin study recommended values, and expressed that lean season values are matching and intermediated and monsoon season values retained by the developers are slightly lower than that of Basin study recommended values, but still satisfying desired parameters of *Schizothorax richardsonii* as per WII, 2012. However the EAC expressed that, Siang basin study has already approved by CWC and is in final stages of discussions in EAC, it should be more appropriate to adopt Siang basin study values. Therefore the EAC decided that the minimum flows should be retained as those recommended by the basin study viz. 18.35 cumec during the monsoon, 8.1 cumec during the intermediate season and 2.5 cumec during the lean season.

The Arunachal Pradesh State Pollution Control Board conducted the public hearing for the project at Lipusi Helipad Ground, Mechuka division, West Siang district on 27th November 2013 with a total attendance of 380 persons. The public raised main issues like change in nomenclature of the Project as per villages located in the vicinity, change of nomenclature of the river as per local name, construction of a community centre, education, health and sanitation facilities, employment and training. Developer explained responses to the issues raised by Public have been given during the hearing and that the observations they have

been addressed in EIA and EMP reports.

Observations from SANDRP have been received by EAC on this project and were communicated to the developer. Developer responded in detail to the EAC and also submitted a written response to MoEF and same are given below.

Observations	Response
Opening chapter (Apart from Developer's Foreword, which is inappropriate in an EIA Study) of the EIA begins with 'Need of hydropower' and 'Power potential of Arunachal Pradesh'. This is not expected from an EIA coming from an organizations like CISMHE. This does not lay grounds for unbiased impact assessment and supports the project implicitly from word go.	National Policy for Hydro power development and the 50,000 MW Hydroelectric initiative (2003) and need of hydropower and details of power potential of Arunachal Pradesh are facts. Consultant's intention is not to favour or oppose any hydro power project. Study is based on the facts. The brief accounts were given on Power potential in India, Need of hydro-power in India and Power potential in Arunachal Pradesh. Need of hydro-power in Arunachal Pradesh is not given in the report as mentioned in the observation. This assessment is based on the CEA report (Pl refers to page 4-7 of chapter 1 of Volume I. It is also a part of the cost – benefit approach.
Pauk HEP has undergone multiple changes in scope. The TORs for the Project was originally issued on 9.9.2008 for 50 MW capacity which was revised on 20th April, 2010 for 120 MW. Again in September 2011, the EAC recommended capacity increase from 120 to 145 MW. It also underwent extension of validity of TORs and some modifications in TORs	Increases of Installed capacities have been approved by CEA based on CWC approved hydrological series. Capacity enhancement and extension and revision of TORs were granted within the ambit of EIA notification.
Environmental Flows from Pauk, Heo and Tato I Dams: Section on Environmental Flows	• These three projects are planned to be developed in cascade. • E-Flow Study conducted by

Observations	Response
discusses all three projects of the developer together. These three projects will change the character of at least 14 kilometers of the river and also beyond. It has to be noted that the Powerhouse discharges from Heo do not enter the river at all, but are intercepted by the water conductor system of Tato I which also diverts additional water through ungated trench weir. So the section of the river which carries only environmental flows is significant, highlighting the importance of holistic eflows recommendations and not one focused on single species.	CISMHE and National Institute of Hydrology (NIH Roorkee). • Scientific approach enabling to arrive at the appropriate quantities of water to be left in the river depending on depth and velocities requirements. • Covers the entire river stretch of the cascading projects Pauk HEP, Heo HEP and Tato-I HEP. • Critical stretches defined downstream of diversion structures and up to confluence with major tributary • HEC-RAS software used for simulation studies • Schizothorax Richardsonii fish species requirements retained as per Wildlife Institute of India, 2012. • Studies of three seasons such as Monsoon, Pre & Post monsoon and Lean seasons • The study contains the assessment of habitat, life cycles and fish requirements and provides appropriate quantum of water. There is no deprivation of water in the utilized stretch. • The total river length is 78 km. There is no free stretch within the cascade, which is using only 16 Km of river stretch for 571 MW. • Study compliant with TORs • Comparing environmental flows values assessed based on site specific study with Siang basin study, it can be observed that during lean season no difference in eflow release discharge values and remaining monsoon and pre & post monsoon seasons values are 86% of Siang basin study values.

Observations	Response
***Schizothorax* as the only indicator specie**: The consultant has used only the *schizothorax* species as an indicator of discharge, depth and velocity. Such assessment based on single species downplays the impact on other species like smaller fish, benthic macro and micro invertebrates which form an important part of the food chain which also supports the target specie. This is also violation of original TORs.	***Schizothorax*** occupies top slot of aquatic food chain, it has been considered that if the requirement targeting the largest fish/species is fulfilled, it implies the need of all species down in pyramid up to algae will be satisfied. In ToRs it was clearly mentioned that E-flow will be based on targeting Schizothorax. However, during the investigation care was taken into account all species.
Non fulfilment of TOR: According to the original TORs dated 09/2008: The assessment of eflows stated: "Estimation of environmental flow for the *aquatic species and river morphology*". However, the study forgets this TOR and focuses only on *Schizothorax* species and does not comply with the ToRs. There are issues of merit and significant impact here and the eflows assessment part of the EIA study needs to be redone.	• All the fish fauna of the Yarjep river was studied (Refer Chapter 3.3.3). Environment flow needs to be established for *Schizothorax* species as this is the largest species and if water requirement is assessed and met for this species, other species' needs will also be fulfilled. • No control on daily flood peaks exceeding design discharge. • The environmental flow is a stimulation provision between flood peaks. • The active pondage at Pauk can retain only 1.67 MCM, equivalent to 3.8 hours of designed discharge of 121.65 cumec. • The active pondage at Heo barrage is only 0.15 MCM and no pondage is planned at Tato-I trench weir, hence least impact on flow control is anticipated. • Therefore no impact is foreseen on river morphology.
Non fulfillment of TORs: Eflows discharge designs: The TORs state that the EIA should contain : *"The design details for ensuring minimum environmental flows should be provided in the EIA/EMP report."*	Chapter 3.7 – Environmental flow releases is a dedicated chapter and contains all required information.

Observations	Response
No design details of how eflows will be released and monitored have been given in the EIA. This is a serious lacuna as we have seen that eflows recommendations remain on paper in the absence of detailed discharge mechanisms and robust monitoring. The EIA and EMP needs to be redone on the above count.	Eflows will be released from Pauk dam bottom outlets. Similarly from Heo barrage flows will be released from under sluice. Tato-I is an ungated structure of 7.5m and always overflowing.
Non fulfillment of TOR: Aiding fish migration: The TORs had also asked the proponent to explore ways to aid fish migration and ladders. The proponent's response does not deal with this. In fact the proponent states: *"The height of dam of Pauk H.E. project is more than 100 m so that fish ladders are not proposed for Pauk considering its feasibility."* Although ladders may not be feasible of such a project there are a number of other ways like passes, fish lifts and a combination of ladder and lifts that can be explored to aid fish migration, as is being done the world over. Fish ladder in any case should have been considered for Heo and Tato I trench weir.	Considering the 95 m height of the arch dam from river bed level, fish ladders are not feasible in Pauk HEP. In case of Tato I and Heo HEP, fish passes may be included depending on requirements of EAC Pauk reservoir will create a significant lacustrine environment where fish presence will increase with the development of fishery. In addition a hatchery is planned under Heo HEP.
Turbine designs also need to be changed to protect downstream migrating fish from being mortally injured by the turbine blades. Precautionary measures like bubble walls, acoustic barriers, racks etc., have to be adopted to avoid fish mortality in the turbines for downstream migration. None of these measures are even explored, although the TORs asked for measures to aid fish migration. This is not confirming to the TORs and hence this part of the study needs to be done again.	Suitable fish ladder/pass will be provided in Heo and Tato-1 HEP, and therefore fish migration / movement will be ensured in these concerned stretches.
Playing down fisheries diversity: The chapter on Fisheries compares fisheries in Yargyap, which is Siyom's tributary with	The facts indicate that upper reaches of Yarjep river harbour low fish diversity. CIA and CCS study

Observations	Response
Siyom and concludes that the icthyological fauna is lesser than Siyom. That is a flawed comparison as Siyom has a bigger drainage area and is a bigger river. Siang CIA CCS Study indicates presence of additional RET fish species than EIA Report.	considered entire sub basin while our study was focused to influence area.
Dangerous Mitigation measures suggested Mitigation measures suggested in the EMP like River channelization are downright dangerous, indicating the flawed impact assessment by the consultant. Reinstating Habitat complexity downstream of dam stretches is one of the mitigation measures for fish conservation. Many countries are working towards reinstating this habitat complexity by introducing boulders, creating riffles, etc, while the Pauk EMP actually suggest removing boulders and channelization of river between dam and powerhouse, which will increase the impacts downstream!	Here the removal of boulders is attributed to the removal of large boulders from the way of flow not from the river bed.
Seismic Zone: The project falls in highest seismicity zone of V. The EIA does not undertake a disaster management study or the potential of the project to trigger disaster. With tunneling and blasting involved for the horse HRT, this study is imperative.	The EMP report contains a disaster management plan under chapter 5.12 including a dam break analysis carried out with Mike 11 software and inundation map generated for identifying inundation areas. Only significant disaster potential of the dam is the flooding of downstream areas in the unlikely event of dam break, where storage volume is superimposed on PMF. A detailed disaster management is planned and required measures were depicted in the chapter 5.12. HRT tunnelling operations will be carried out 100 m to 500 m beneath the ground level and alignment of HRT is 300 m away from river course. Careful pattern of drill holes and optimal explosive charge per each cycle of blasting

Observations	Response
	planned to restrict excavation to geometry of section of tunnel implies little effect in triggering land slides on the surface.
Impacts of Peaking: Not only Pauk, the entire cascade of projects will be peaking. But there is no mention of the impacts of individual and cumulative peaking on the downstream ecology, communities and safety aspects. World over, impacts of peaking are being addressed and mitigation measures are being devised and the proponent/ consultant cannot ignore these impacts.	Pauk active storage of only 1.67 MCM (equivalent to 3.8 hours of power generation) is main dependable source of peaking for downstream Heo and Tato-I power generation. To maintain aquatic requirement, environmental flows are released in entire system. Downstream of Heo barrage and up to Tato-I power house, 10.4 Km stretch benefits from environmental flows from Heo barrage, and flows from entire intermediate catchment area (129 sq.Km), both flows being uninterruptedly available. Minimum environmental flows added with intermediate catchment area flows is an advantage and no further impact of peaking impacts are foreseen downstream.
Pauk HEP is NOT a Run of the River project: The proponent and consultant keep referring to Pauk as an RoR, but in various sections also states that *"2.4.1 One storage capacity in the most upstream project, Pauk, is sufficient to regulate the natural flow during the lean season, and to ensure the diurnal peaking hours of the entire cascade."* Pauk has storage and in addition, it will undertake peaking. Both of these issues disqualify it as an RoR since the project will be changing the downstream hydrograph, which an ROR project cannot do. The proponent and the EIA consultant are misleading the MoEF as well as investors, statutory bodies and general concerned public that this is an RoR, thus painting a falsely benign picture of the project.	The active storage happens only during the lean season and is very small, of 1.67 MCM (equivalent for 3.8 hours designed discharge). It is proposed to be utilised for diurnal peaking power generation for 3 hours for Pauk, Heo and Tato-I HEPs. As the live storage is very limited and utilised only for diurnal usage, therefore Pauk HEP is termed as ROR project. In addition the reservoir is small (25.3 Ha of surface land) as confined to deep gorges, and there is no consumptive use of water, which is put back in the river and never kept for more than a day during the lean season.

<table>
<tr><th>Observations</th><th>Response</th></tr>
<tr><td></td><td></td></tr>
<tr><td>Impacts of seepage induced bank erosion due to peaking: It has been established that sudden hydrological changes associated with peaking result in increased seepage erosion through banks. Ramping rates of many projects are being changes to counter bank erosion in the downstream. The EIA sates that the project zone lies in region of severe to very severe erosion challenges. The region also witnesses landslides. In keeping with this context, in depth study of the impacts of peaking on seepage induced bank erosion need to be undertaken.</td><td>The live storage of 1.67 MCM is contemplated to be maintain within 5 m height i.e., between FRL 1540m and MDDL 1535m and no seepage or erosion through banks is anticipated in steep and narrow gorge. Further downstream Impact of Bank erosion is mentioned under section 4.3.6.5 of chapter 4 of Volume I</td></tr>
<tr><td>No mention of free flowing river stretch: There is no mention of what is the flowing river stretch downstream & upstream of the project, as well as other porjects. This point was raised in34th EAC Meeting held on 19-20.01.2010 and it was observed that as there is no free stretching of river between the three contiguous projects (Pauk, Heo and Tato-I) the river will be a pull of water for a stretch of about 14 kilometers. However, the report does not talk about free flowing river stretch at all.

Unless this length is assessed and is found to be adequate for river to regain its vitality, the project should not be considered and it should be asked to change the parameters.</td><td>All the 3 HEPs the cascade layout has already been approved by MOEF through TORs issued in April 2010 and October 2011, and the cascade is covering only 16 Km of river, out of a total length of 78 KM, for generating 571 MW.
There are 4 other HEPs planned on the Yajep River, and these 4 HEPs are using 17.6 Km stretch. 58% of the river is left as free flowing stretch. In addition the minimum flow study as per which the concerned stretch will not be deprived of water, and the E-Flow will preserve the fish and the river biota, has been included in the report.</td></tr>
<tr><td><table>
<tr><th>Sr. No.</th><th>Name of the Project</th><th>Installed Capacity</th></tr>
<tr><td>1</td><td>Pauk HE Project</td><td>145 MW</td></tr>
<tr><td>2</td><td>Heo HE Project</td><td>240 MW</td></tr>
<tr><td>3</td><td>Tato-I HE Project</td><td>186 MW</td></tr>
<tr><td>4</td><td>Rapum HE Project</td><td>66 MW</td></tr>
<tr><td>5</td><td>Rego HE Project</td><td>80 MW</td></tr>
</table></td><td>Cumulative impacts of 3 projects which are within the scope of study) is given under section 4.6 of chapter 4 of Volume I. Cumulative study of 7 project is out of scope of EIA study..</td></tr>
</table>

<table>
<tr><th colspan="3">Observations</th><th>Response</th></tr>
<tr><td>6</td><td>Kangtangshiri HE Project</td><td>80 MW</td><td rowspan="2"></td></tr>
<tr><td>7</td><td>Pemashelpu HE Project</td><td>91 MW</td></tr>
<tr><td colspan="3">The project lists seven projects on rive Yargyap. The report states that the cumulative impact assessment study has been conducted only for the three projects in the cascade development. The model for computing environmental-flows is site specific and focused on the Yarjep river part related to the Pauk, Heo and Tato-I HEPs only. While report makes a brief mention of cumulative impacts on different environmental components, there is no detailed assessment of any of the cumulative impacts. This is clearly unjustified looking at the large number of hydro power projects on Yargyap River and in Siang Basin.</td><td></td></tr>
<tr><td colspan="3">EIA report completely misses out on the detailed analysis of cumulative impacts in terms of
• Impacts on flora, fauna, carrying capacity, livelihoods
• Impact of reduction in adaptive capacity of the people and area to disasters in normal circumstance AND with climate change
• Impacts on springs and drainage pattern
• Disaster potential of the area
• Tunneling and blasting
• Muck disposal
• Changed silt flow pattern in different phases
• Cumulative downstream impact
• Cumulative impact of hydro peaking
• Measures for safety as recommended by SANDRP
• Mining of materials for the project
• Cumulative disaster management
• Geological disturbance caused
• Seismic impact</td><td>• Impacts on flora and fauna – Please refers to sections 4.3.1.1 to 4.3.1.8 of chapter 4 of Volume I
• No other impacts on livelihood is foreseen.
• Impacts of Spring and drainage: Please refers to sections 4.3.2 and 4.3.6.2 of chapter 4 of Volume I
• A separate chapter on Disaster Management is given in chapter 5.12 of Volume II
• Impacts of Muck Disposal: Please refers to section 4.3.3.1, 4.3.4.3 of chapter 4 of Volume I
• Cumulative Impacts: Section 4.6 of chapter 4 of Volume I
• Disaster Management is given separately for individual project
• Geological disturbance and seismic imacts: Please refer to section 4.3.2 of chapter 4 of Volume I. A detailed site specific study for Seismic design earthquake parameters for Pauk HEP has been carried out by Department of Earthquake Engineering, IIT Roorkee.</td></tr>
</table>

Observations	Response
Public Hearing minutes not included The EIA is supposed to include the full minutes of the Public hearing, which has not been included in this report, violating the legal norm. Instead, the EIA indulges in biased unwarranted statements of "Everyone" Clearly supporting Pauk HEP.	All those issues in public hearing related to EIA/EMP report have been mentioned in the report. Full report along with minutes of the meeting and video recording has already been submitted to MoEF.The minutes are available on the APSPCB website.
Issues with Rehabilitation & Resettlement Plan: Rehabilitation and Resettlement plan of the project refers to Resettlement & Rehabilitation Policy of Arunachal Pradesh Government (2008). (p. 120 Volume-II EIA Report) This is clearly wrong; the new R&R Act of 2013 has to be made applicable. The PP should be asked to redo the R&R Plan in consultation with the affected people, EMP and cost estimates and come back. The R&R Plan should also include compensatory measures for all social impacts in the upstream and downstream, not only for those who lose land or houses.	The new land acquisition and R&R act came into force on 1st January 2014. Public hearing was conducted in august 2013. The rules of the new Act are to be implemented along with land acquisition and the developer will comply with whatever rules are applicable.
Climate change: Most crucially, the EIA makes no estimation of how climate change and related hydrological, climatic and safety concerns will affect the project and downstream population. Himalayas are witnessing accelerated impacts of climate change, as compared to global scenario. In this situation, it is irresponsible not to account for the risks and uncertainties that Climate Change will pose on the project and on the people.	Climate change aspects are not part of the scope of study.

After detailed deliberations, EAC recommended the Pauk HEP for environment clearance, with the following observations and conditions:

(i) The provision of CAT plan seems to be on the lower side and it needs to be increased appropriately while increasing the overall EMP budget.

(ii) Budgetary provision in Muck dumping area is found to be insufficient and requires more budgetary provision keeping in view the muck volume.

(iii) Public health delivery system should be an integrated system of three projects together as the population is not very large in that area.

(iv) The R&R plan will have to comply with The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 as and when necessary.

(v) Total budget of environment management plan should be about 3% of the total project cost. This shall be proportionately enhanced with the escalation in project cost.

(vi) Environment flow release should be 18.35 cumec during the monsoon, 8.1 cumec during the intermediate season and 2.5 cumec during the monsoon.

(vii) NBWL clearance is to be obtained if so required.

(viii) The EAC suggested that the project proponents of HEO, TATO-I and PAUK HEPs in consultation with the Arunachal Pradesh State Forest Department, the local communities and other project proponents planning HEPs on Yarjep River to identify large intact forest patches within the Yarjep Catchment and get them declared as " Conservation Reserves" or " Community Reserves" under the Indian Wildlife (Protection) Act. This effort along with an intensive conservation education in this region would help in biodiversity conservation.

EAC concluded that the Ministry may issue EC on receipt of revised EMP estimate.

Agenda Item No. 2.4 Shutkari Kulan HEP (84 MW) by M/s. JK&PDC, in Jammu & Kashmir- For consideration of TOR

The project proponent made a detailed presentation on the project. It was noted that the Shutkari Kulan Hydro project was conceived earlier as a storage project with 165 m high dam near Sonamarg in Ganderbal District. The earlier proposal was not pursued by JKSPDC as the construction of Stage II of the proposal would have lead to submergence of Sonamarg, a tourist destination emerged in the recent times. Subsequently, in October 2013, JKSPDC engaged SP Infra for implementation of the said project.

The Shutkari-Kulan Hydro Electric Project is located in Ganderbal District of Jammu & Kashmir envisages utilization of the waters of the Sindh River harnessing a gross head of approx. 411m. The project is located between Shutkari and Kulan villages, which are 85 km and 70 km from Srinagar respectively in Ganderbal District. Total land requirement for the project has been worked out as 65.5 ha. The project has the capacity to generate an annual energy of 328 Gwh in a 90% dependable year.

The Shutkari-Kulan Hydro Electric Project envisages construction of the following:-

- River diversion works comprising of diversion channel with upstream and downstream cofferdams.
- Barrage across the Sindh River near Shutkari to divert design flow of 22.65 cumecs
- Power intake
- 1125 m long intake tunnel to 250 m Desilting Chamber.
- 8194 m long 3.5 m wide D-Shaped HRT from Desilting Chamber to Surge shaft.
- 4 m dia 110 m high Surge Shaft
- 490 m long Pressure Shaft and 2200 m long surface penstock
- Power House near Kulan housing two units of 42 MW each.90 m long Tailrace Channel to Sindh River (subject to finalization of power house location durng detailed investigations).

An existing National Highway NH 1D connects Srinagar - Leh and the diversion site and power house site are located at a distance of 85 km and 70 km respectively from Srinagar along this road. At present, the nearest broad gauge railway station is Udhampur which is around 300 km from Srinagar and the nearest airport is at Srinagar.

The project area is in the Kashmir Himalayas, in the sub basin of the Sindh river, a part of the Jhelum basin, originating from the Great Himalayan range. The Basmai anticline of Kashmir synclinorium is the main structural element in which the project area is proposed.

The Sindh River drains an area of 493.54 sq. km at the proposed barrage site. The water availability for the project has been considered on the basis of historical 10-daily discharge series available at Shutkari G&D site. This inflow series has been utilized for power potential studies. The design flood has been assessed as 870 cumecs. The inflow series for 22 years viz. 1990-91 to 2011-12 has been considered for the assessment of power benefits from the project. The 90% dependable years works out to be 2008-09. Based on this incremental energy analysis for various installed capacities during this 90% dependable year, an installed capacity of 84 MW is considered to be optimum and is proposed for the Shutkari Kulan Hydro-Electric Project. The annual energy availability from the project in 90% dependable year is 328.12 MU with a Plant Load Factor of 45%.

Longitudinal profile of the Sind river has been presented and it was noted that there is no upstream project on Sindh river; on the downstream side, USHEP I is a commissioned project and is more than 1 Km away. Consultant also presented the satellite data and location of protected areas in the vicinity. Committee noted that there are two protected areas falling within 10 Km radius of the project component viz. BaltalThajwas Wildlife Sanctuary and OveraAru Wildlife Sanctuary. Exact distance of the project component from the boundary of the sanctuary is not known at this stage, however, it was observed that project is in close proximity to BaltalThajwas, whereas OveraAru is at distance of 5-6 Km. Developer confirmed that they have already initiated the dialogue with the Forest Department and shall include the distance, based on authenticated information, in the EIA report. EAC observed that project will have to go for Wildlife Clearance separately.

Regarding the environment flow, it was discussed that, as the large part of catchment is snow fed and area is not served by monsoon; the prevalent norms of environment flow in monsoon, lean and non-lean non-monsoon periods will not be applicable to this project. A typical flow hydrograph reveals that three different flow patterns are observed viz. 5 months long lean flow period from Oct to Feb, followed by intermittent flow period of two months (Mar and April); thereafter three moths of peak flow period (May-July) and again two months of intermittent flow period (Aug and Sept). EAC observed that environment flow assessment should be based on site

specific study, however, for the purpose of planning, 20% of the average flow as environment release should be taken up in each flow period.

Observations have been made by SANDRP on the documents submitted by developer for Scoping Clearance. Issues were deliberated and developers response was also sought by EAC, which is given below.

Observations	Clarification

Observations	Clarification
No Cumulative Impact Assessment (CIA) in Jhelum Basin: Some of the projects that have been completed in this basin include: 480 MW Uri I, 240 MW Uri II, 22.6 MW Upper Sindh-1, 105 MW Upper Sindh II, 15 MW Gandharbal, 9 MW Mohra, 105 MW Lower Jhelum (see basin map at: http://sandrp.in/basin_maps/Hydro_Electric_Projects_on_Jhelum_River_Basin.pdf). 330 MW Kishanganga HEP is under construction. In March 2013 EAC recommended Environmental Clearance for 93 MW New Gandharbal HEP on Sindh / Jhelum River. So this river basin already has a very large number of projects, but there is no cumulative impact assessment. Taking up any further projects in this basin without the cumulative impact assessment would be clearly in violation of the May 28, 2013 MEF order.	Of the projects mentioned, only New Ganderbal and Shutkari projects are recently conceived And New Ganderbal is more of a replacement project for Old Ganderbal Project. This is not a case where large numbers of new projects are coming up calling for Cumulative Impact Assessment. Moreover, these projects will relieve the acute shortage of power during winters when these areas are cut of from the main land. The total length of river from the source to the confluence with Jhelum is about 108 KM. Only three hydropower stations are installed across the total length of the river. Cumulative Impact Assessment may be required if any change in quality of water, or impacts on flora & fauna, change in sediment, impact on navigation or on local communities' livelihood, which is not the case with this project. Hence CIA is suggested not for this project alone but at location where a series of hydroelectric projects could impact the basin.

Observations	Clarification
<u>Form I and PFR severely incomplete without crucial information:</u> Much crucial information about the project is missing in the PFR and Form I of the project. The project is a Run off the River scheme on Nallah Sindh a tributary of River Jhelum. The project proposes to make use of natural drop between Shutkari and Kulan villages of Ganderbal District of J&K by utilising the discharge of Sindh River. The project proposes the diversion of designed flow of the Sindh River near Shutkari by constructing barrage across Sindh River. The PFR and Form I which are the basis for grant of TOR clearance by EAC do not contain even basic information like FRL, TWL, Live Storage, Design Flood and Probable Maximum Flood. PFR states that total catchment area for the project is 493.54 Sq. Km. out of which snow-fed catchment is 184.4 Sq. Km (p.12 of PFR). It also states that Design Discharge is 23.15 Cumecs and Flood Discharge is 870 Cumecs. This information does not feature in Form I.	This is a part of detailed information given in PFR and not called in the format of Form 1. PFR is also uploaded on MOEF website for public consumption. The Form-1 along with PFR forms a complete document and may be read in totality.

Observations	Clarification
PFR and Form I state that the total land requirement of the project is 65.5 Ha and the submergence is 22.5 Ha (p. 6 of Form I). It is also stated that forest land involved is 62.5 Ha. The project description however does not give a clear breakup of and ownership. The documents just state that land ownership in the project area mainly rests with private parties, forest department and Government (p.4 of Form I). Area of land to be acquired is not mentioned in the document. Also lacking is the estimate of population affected due to project. The documents completely miss out on socio economic profile of the project area. Form I states that 'There is a possibility' that vulnerable groups 'may be' affected (p.12 of Form I). No details of vulnerable groups affected are furnished. It is stated that it will be quantified during EIA.	Such information is collected and analyzed during EIA stage. Details like population, Socio-economic survey shall be taken up during EIA studies period.

Observations	Clarification
<u>Cumulative impacts</u>: Form I states that there are no upstream projects planned on Sindh River. Immediately downstream of the proposed project are Upper Sindh I (22 MW) and Upper Sindh II (105 MW) (p.21 of Form I). These projects are under operation. The document however does not give any details about the distance between proposed project site and these projects. No details of how FRL and TWL of proposed projects interact with the existing projects are given. **<u>No detailed investigations conducted during the pre feasibility study</u>:** According to the Form I no alternative sites are explored for the project (p.3 of Form I). It states that it will be taken up during DPR preparation. While answering about preconstruction investigations the answer given is affirmative (p.7 of Form I). However it further states that it will be taken up during DPR. Answer given for 'Temporary sites used for construction works or housing of construction workers' is affirmative (p.6 of Form I). However further it is stated that the sites are yet to be identified. Details about land under agriculture are not furnished. Form I states that as per the Land use derived by NRSC data most of the area consists if forest, agriculture, pasture and fallow land (p.11 of Form I). However detailed land-use for each category is missing. Influx of people during construction and operation is not calculated.	The longitudinal profile of Sindh river was presented during the EAC meeting. There is no upstream project on Sindh river; downstream project is more than 1 Km away. PFR has been prepared based on the available data and information as JKPDC has carried out site investigations earlier. No detailed investigations were warranted for the preparation of PFR. After award of Scoping Clearance, survey and investigation work will start at site. All the required information will be furnished in the EIA study.
The PFR states that Rehabilitation and resettlement package will be prepared based on the guidelines of NRRP 2007 (p. 44 of PFR) even when new R&R Act of 2013 is to be made applicable.	R&R Plans shall be made as per the applicable acts in J&K.

Observations	Clarification
<u>Environmental Sensitivity</u>: Form I states that Overa-Aru wildlife sanctuary is located at about seven km from the project site. It also states that the Barrage is 'very close to' Baltal Thajwas Wildlife Sanctuary (p. 22 of Form I). It does not mention the distance. If the project area is used by protected imp sensitive species has not been explored. The project involve underground construction of diversion tunnel, headrace tunnel, surge shaft, pressure shaft and tailrace tunnel. The project is located in Zone IV as per seismic zoning map of India (p. 23 of Form I). Even so the Terms of EIA detailed in the Form I do not include seismic impacts, impacts of tunnelling, blasting on landslides etc. (p.27 of Form I) The TOR does not stipulate Dam Break Analysis. It also does not stipulate any plan for catering to seismic activities and tunnelling blasting.	The matter has already been brought to the notice of the Forest Department and they will give the exact distance from the protected areas. Such detailed analysis is part Detailed Project Report as per CEA Guidelines for Preparation of Detailed Project Report for Hydro Power Projects
<u>Discrepancies</u>: PFR on its page 35 states "Total land requirement for the construction of the project has been envisaged as 40 ha, of which 5 ha shall be submergence area." Table 10 on the same page calculates total land requirement as 65.5 ha with submergence as 22.5 ha.	Typographical Error - It may be read as 65.5 hect, the breakup of which is provided in Table-10 on the same page.
Form I on page 7 states "8194 m long 3.5 m wide HRT" but page 40 of PFR states 8194 m long 3 m wide HRT. Also page 8 of Form I states Power house of 2 units 42 MW each, while page 40 of PFR states Power house of 2 units 36 MW each.	Typographical Error – Form I information is correct. However, final sizing and unit configuration may reduce slightly during detailed investigations of Detailed Project Report.

Observations	Clarification
<u>Missing Terms of Reference (TORs)</u>: The TORs are grossly inadequate and spelled out very vaguely which miss out on a lot of details. Following terms for the EIA study need to be spelled clearly for the EIA study to be effective. • Downstream impact assessment: Social, environmental, others. The TORs only specify environmental flows. Other environmental, social & other impacts are completely missing • Impact of climate change on project • All of the above to be seen cumulatively with other existing projects • How the project will perform in view of operation of upstream and downstream projects. • How the project will affect performance of upstream and downstream projects. • Credible compliance mechanism involving representatives of local communities and other independent persons should be part of EMP for construction and operation phase.	The document enclosed is the proposed TOR and the matter will be reviewed by EAC/MoEF, who shall issue the final TOR which will be binding on PP.

After detailed discussions, EAC recommended the project for scoping clearance with the following conditions:

i. A table of 10 daily water discharges in 90% dependable year showing the intercepted discharge at the barrage, the environmental and other flow releases downstream of the barrage and spill are to be provided in the EIA report.
ii. Muck disposal sites should be selected at least 30 m away from the bank corresponding to HFL of river /stream and shall be shown including location , quantity of muck to be deposited off vis -à-vis the total area for dumping in map.
iii. Biodiversity study, which is a component of EIA study, is to be carried-out by associating a reputed organization as recommended by WII, Dehradun or by ICFRE, Dehradun. The list of Institutes is available on MoEF portal.
iv. FC application form has to be submitted soon to appropriate authority and not later than 6 months from the date of issue of the TOR for this project. IA Division of MoEF shall be informed when such Application is submitted.
v. Compensation for acquisition of the land, R & R plan and other applicable benefits shall be in line with applicable law/policy in J&K.
vi. Environmental flow release shall be assessed based on the site specific study. However, for the purpose of planning, 20% of the average flow for all distinct seasons as environment release is to be taken up in each flow period i.e. lean, intermittent and peak flow periods.
vii. Wild Life Clearance (WLC) is to be obtained from the designated Authority.
viii. Downstream impact assessment including social, environmental & other relevant aspects to be undertaken.
ix. Study on safety measures necessary at downstream to be undertaken.
x. Impact of project on increased vulnerability of the area to various disasters, including those induced by Climate Change. Impact of project on loss of adaptation capacity of the local area and people due to the destruction of forests, river, biodiversity and increased risks of landslides and others disasters to be assessed.
xi. Impact of mining of materials for the project to be accounted for.
xii. Impact of change in silt flow pattern in the river in different seasons immediately downstream of the dam and downstream of TWC to be taken into account.
xiii. Study of kind of fish ladder needed and feasibility thereof to be undertaken

xiv. Impact of peaking on downstream areas in terms of social impacts, bank stability, survival of fish and other biodiversity to be taken up.

xv. Impact of changing flood flow pattern in downstream areas to be accounted for.

xvi. Impact of construction and operation of diversion tunnels and coffer dams to be assessed.

Agenda Item No. 2.5 Chuzachen (99 MW) HEP in Sikkim by M/s. Gati Infrastructure Pvt. Ltd. – For consideration of EC for revised capacity of 110 MW.

The project proponent made a detailed presentation. It was explained that the project is located in East Sikkim District of Sikkim, was commissioned on 18th May '2013 and is under operation. Developer has requested MoEF to give environment clearance for enhanced capacity of 110 MW to utilize the enhanced flow in river which was established through measurement later with the help of G & D station.

The HEP utilizes the flow of Rangpo and Rongli River, a tributary of Teesta River, for generation of electrical power through a run-of-the-river scheme. It is about 20 km upstream of Rangpo Bazar. The Chuzachen project is a RoR/ peaking power plant comprising two intakes each with a storage reservoir and a Head Race Tunnel (HRT) each joining to a common HRT, an underground surge shaft, a surface penstock, an open-air powerhouse with two units and an outdoor switchyard.

The project area is located between Latitude 27°12'14" N to 27°14'30'' N and Longitude 88°39'59''E to 88°42'46"E.The project comprises Ranpo and Rongli concrete gravity dams 45.6 m and 39.0 m high respectively from foundation level with FRL at 909.0 m and MDDL at 893.0 m elevation. The Rangpo and Rongli un-gated Ogee crest spillways consists of 4 bays each with crest at El 909.2 m.

The Head Race Tunnel (HRT) system consists of Rangpo tunnel (Concrete lined, circular, 3.55 meter diameter, 2601 m Long) for water intake from Rangpo River and Rongli Tunnel (Concrete lined, circular, 3.10 meter diameter, 2077 m Long) for water intake at Rongli River. Two tunnels meet at a common point after which a

common Chuzachen Head race tunnel(Concrete lined, circular, 4.45 meter diameter, 3230 m Long) terminating in a open to the sky surface restricted orifice Surge Shaft; 12.0/4.45 m diameter, 137 meter high. One 3 / 3.3 meter diameter penstock bifurcating into two penstocks of 1.68 m diameter each, takes water to a surface power house located on the right bank of river Rangpo. A Tail Race Channel 33.0 meter wide and 18.4 meter long with TWL at 605.5 m elevation discharges tail water into Rangpo River.

Chronology of project events is as given below:

- DPR approval was accorded by Energy & Power Department, GOS Lr. No. SPDC/228/2003-04/337, November 30, 2004 for installed capacity of 99 MW.
- Environment Clearance was granted by MoEF, GoI, as per provisions of EIA Notification 1994 for 99 MW Chuzachen HEP, Lr.No.J-12011/12/2005-IA-I, 9th September'2005.
- Forest Clearance was obtained for diversion of 7.4598 Ha of forest land vide MoEF letter no.3-SK C 055/2005-SHI/4219-20 dated 09.01.2006 and for additional 3.2250 Ha of forest land vide MoEF, letter No. 3-SK B 131/2007-SHI/2425-26 dated 18.11.2008.
- The construction of the project started in September 2006 and project was commissioned on 18thMay'2013.
- Connectivity agreement is signed for 99 MW with Power Grid Corporation of India (PGCIL) for evacuation of power.

The Project Proponent (PP) explained that water availability as part of approved DPR was based on a limited series of 12 years. Thereafter, a G&D station at Chuzachen HEP project site was established (in July 2004). The Project Proponent stressed upon the fact that power potential studies were initially made on the basis of limited and scattered discharge data on these tributaries.Review studies were undertaken during the period of project construction utilizing the monitored data, which have established water availability greater than that considered in DPR. In light of additional information on water series on the streams, it was considered prudent to get the installed capacity revised to 110 MW in order to generate and evacuate power optimally. The higher capacity was

thought of factoring into release of flow towards meeting of e-flow. Therefore, with additional discharge data available, a proposal was mooted to revise the generation capacity from 99 MW to 110 MW. Due consideration was given to environment flow release and following process was followed:

- Technical approval for increase in installed capacity of the HEP from 99 MW to 110 MW was first obtained from Energy & Power Department, Government of Sikkim vide Lr.No.SPDC/228/2003-04/498 dated 24.09.2013
- No objection certificate was obtained from State Pollution control Board Sikkim, and Lr.No. FN 15/SPCB/1325 dated 01.11.2013 respectively. State Pollution Control Board (SPCB) advised to obtain clearance from MoEF also.
- MoEF was intimated vide our letter dated GIPL/CHEP/CA/469/2013 dated 19.12.2013.

The PP explained that for revising the installed capacity from 99 MW to 110 MW, design discharge stands revised upwardly from 39.5 cumec to 42.6 cumec; an increase of 3.1 cumecs (about 8%), which will be utilized during monsoon season and balance river inflow will be available in river and contribute to environment flow (e-flow). Although, a capacity of 110 MW has been instated, the project proponent have also informed that are operating the HEP within the 99 MW capacity range and created a water conductor system that provides for that. A video of both the dams and spillway overflows taken in the month of June was played before the EAC.

EAC enquired about the lean season discharge provision towards maintenance of e-flow as per the environment clearance. The PP explained that there was no such explicit provision in the environment clearance letter. However, EIA and EMP studies had considered a release of 2.13 cumec as environment flow, which works out to be 32% of the average of lean season flow as per DPR series 90% DY and 20% of the average of lean season flow as per updated hydrological series. As per EC letter, the Developer is to ensure this release of water and which they are adhering to. EAC also enquired about the provision of release of water in monsoon season. The developer responded that monsoon spills are substantial and are of the order 40-50%, out of which only 3.1 cumec is increase in design discharge is requested for 110 MW

capacity. The Developer, in this context, presented last 9 years observed daily discharge data to substantiate this. It was informed that even during the leanest year, the spills are more than 30%. The Developer also presented the flow pattern; before and after diversion and emphasized that sufficient flow is available in the river and utilisation of additional 3.1 cumec of design discharge will not affect the environment flow in monsoon. In view of this, it was explained that revision of installed capacity of Chuzachen HEP to 110 MW will not have any adverse impact on environmental flow release.

After detailed and further deliberations, the EAC made the following observations:

i) The presentation made by the company m/s Gati Infrastructure Ltd indicated that the project for commissioning a hydroelectric power plant of 99 MW capacity was given EC in September 2005. In May 2006 the company engaged Kayviat International Project consultants Pvt Ltd, who conducted a review and recommended enhancement of the capacity to 105 or 110 MW. The construction work started in Sept 2006. This could have been done normally after the revised DPR has been prepared. This is a clear indication that the company was fully aware of the revised proposal in Sept 2006. The para 6 of the EC letter issued by the Ministry of E&F clearly says that in case of change in the scope of the project, project would require a fresh appraisal. The spirit behind this provision is that the project proponents do not initiate any construction till the revised proposal is given the necessary EC. The action of the project proponent is a clear violation of the Environment Clearance issued by the government.

ii) The project proponent in the meeting of the committee indicated that the dimensions of various construction components of the project have undergone change vis-à-vis the approved project for commissioning a power plant of capacity 99MW. In other words the company constructed a project which had no Environment Clearance. Further the land use has also change, particularly forest land. This may require fresh clearance from the FAC.

iii) The role of the EAC has been out lined under the ministry's notification dated 14th Sept 2006. Under these guidelines there appears no specific provision for EAC to take up such cases where the power project has been constructed and commissioned without an EC. However, the ministry in 2013 brought out an OM (No. J-11013/41/2006-IA.II(I) dated 27.06.2013) in which some direction has been given for considering case of violation of ECaccorded, where violation is essentially related to operating the project beyond authorized capacity. While deciding action to be taken is this case public interest must be given due consideration besides keeping in mind the spirit behind the provisions of the aforesaid OM.

iv) The Ministry needs to indicate to the EAC the provision in the rules under which this case is to be considered by EAC for grant of Environment Clearance for the revised project. In order to expedite matters the EAC would at this stage needs to examine the deviations which have occurred due to change of design and capacity of the power project and assess the environmental impact of such changes. The project proponent therefore needs to provide information with respect to any change required in the TORs issued for the original project along with all details of deviations in the project from the original to the EAC for further consideration. The company must also give an estimation of the benefit which will accrue to them from the increased capacity over the life of the project. After the matter is clear as to how EAC is to proceed the need for submission of a revised EIA/EMP will be considered.

v) Para 3(viii) requires the Regional Office, Shillong to submit six monthly monitoring reports to MOEF. It appears that no such reports have been received, otherwise in not conceivable that this drastic deviation goes unnoticed. EAC suggests that the ministry seeks an explanation from the concerned official and strengthens the monitoring mechanism so that such instances do not recur.

vi) This is a fit case for taking stringent action under the relevant law by the government. The EAC, therefore, further recommends that the government

i.e. the Ministry of Environment and Forest take appropriate action under section 5, explanation (b) of the EC Act for regulating the generation of electricity and limit it to the capacity for which EC has been granted till the Environment clearance is granted for the New/ Revised project following the procedure as laid down under the prevalent law.

Agenda Item No. 2.6 Kundalia Major Irrigation Project in Rajgarh District of Madhya Pradesh by M/s. Water Resources Department, Government of Madhya Pradesh – For Environment Clearance

The project has not been discussed.

Agenda Item No. 2.7 Siang Basin Study in Arunachal Pradesh by M/s. - For Discussions

"Cumulative Impact and Carrying Capacity Study of Siang Sub-basin including Downstream Impacts" study has been assigned to M/s RS Envirolink Technologies by Central Water Commission, Ministry of Water Resources, Government of India. After approval and finalization of the study by EAC, MoEF brought the study for discussion in Expert Appraisal Committee (EAC) for River Valley and Hydroelectric Projects. The study was discussed during 72nd meeting of the EAC, held on 20th and 21st February, 2014. The presentation went on for more than 3 hours and due to paucity of time, it was decided to continue the presentation in the next EAC meeting. Also, it was decided that some members of the EAC would make a field visit in Siang sub basin. The CIA report shall be further appraised after the field visit taking into account the observations/ comments of the visiting EAC members.

State Government of Arunachal Pradesh has organized a meeting in Itanagar on 7th May 2014 where detailed presentation of the Siang basin study report was made before the visiting EAC members including Mr. Alok Perti, Chairman, EAC and state government officers including Mr. Ramesh Negi, Chief Secretary, Mr. H K Paliwal, Adviser and others. Another meeting was organized on 8th May 2014 where

all the developers having projects in Siang basin were invited to discuss the findings of the study and offer their view.

As a follow up of the meetings, Chief Secretary, Government of Arunachal Pradesh has sent a DO letter No. CE(M)/HPD/W-498/2014-15/535 dated June 18, 2014 to Secretary Environment, MoEF and highlighted their concerns about the recommendations of the Siang basin study requesting MoEF to take a view in respect of critical issues in favour of the developers and state government. The EAC deliberated on the issues raised in the letter of Arunachal Pradesh government.

Environment Flow

Siang basin study has analysed various methodologies for environment flow assessment such as Hydrological Methods, Index Method, Flow Duration Curve and EMC, hydraulic rating method, habitat simulation and hydraulic modelling, BBM and DRIFT. A detailed discussion was held on various methodologies and selection of suitable methodology for flow assessment in Siang basin. EAC agreed that Habitat Simulation and Hydraulic Modelling method is the best suited to the situation of Siang. Holistic approaches such as BBM/DRIFT are not considered practical in context of Siang basin where the major stakeholder is only riverine ecology and fish; other water uses such as industrial, religious, drinking, agriculture, etc. are absent. Results and findings were also reviewed in detail with respect to habitat requirement in three different seasons viz. lean, monsoon and non-lean non-monsoon period. EAC expressed its satisfaction to the environment flow assessment in Siang basin study and recommended acceptance of these results for all the projects in Siang basin.

Issues Raised by Government of Arunachal Pradesh:

1. Issue:

The Interim Report was submitted in May 2012 and the draft final report was submitted to CWC in August 2013. Neither comments of the State Government nor that of the developers who are major stake holders have been obtained while finalizing the report. This has led to a situation where project features mentioned in the report do not match with actual features of many projects.

Response:

Consultants produced copies of various communications with state government and developers by way of letters and emails and also informed that visits were also undertaken to Itanagar and information and data used in the report have been sourced from state government and developers, who have responded.

2. Issue:

Fresh stringent conditions in respect of environmental flow and free flow stretch of river renders the projects unviable in some cases and make it unattractive to investors in most cases. The change in project parameters necessitates de novo exercise for almost all approvals and clearances delaying the project implementation by a minimum of three years apart from affecting the cost and tariff adversely.

Response:

The study has been undertaken with an objective to suggest optimal and sustainable way of hydropower development in the Siang basin. Wherever necessary, recommendations have been made to ensure sustainable development, which include preclusion of an activity, modification of project features to minimize cumulative impacts and/or suggesting measures to ameliorate negative impacts. This may have resulted in entailing some of the projects go for re-evaluation of the viability with respect to suggested changes. However, the recommendations are essential to protect the sensitive ecological settings of the Siang basin. In fact, hydropower potential should be in sync with environmental considerations and financial viability should be linked with environmental concerns.

3. Issue:

The report has recommended increased environmental flow release in respect of 24 projects and modification of project configurations in respect of 4 projects on Siyom river by lowering the FRL to keep 1 km free flow stretch in cascade projects. On the river Siyom, which is a tributary of Siang river, there are 6 allotted projects viz. Taiyong HEP (56 MW), Jarong HEP (90 MW), Hirong HEP(500MW),Tato-II HEP(700 MW), Naying HEP(1000 MW) and Siyom HEP(1000 MW). Out of these 6

projects, TEC has been accorded by the CEA in respect of 4 projects viz. Hirong, Tato-II, Naying and Siyom. Environmental Clearance has been accorded for Tato-II and Siyom. For Hirong and Naying, Public Hearings have been held and Environmental Clearances are pending with MoEF. As regards the other 2 projects which are upstream of Hirong, Taiyong is under S&I and Jarong has been found to be unviable. The State Govt. strongly feels that it is not justified to impose fresh conditions in respect of the projects which are in advanced stages of implementation.

Response:

One of the objectives of the study is to assess and review the cumulative impacts and make recommendations to minimize such impacts. Environment flow recommendations have already been discussed and found appropriate. Four projects in cascade on Siyom river viz. Siyom Middle (1000 MW), Naying (1000 MW), Tato II (700 MW) and Hirong (500 MW) are together taking 53.4 Km of the Siyom river with only 400 m of free flowing stretch. This 53.4 Km of river will be converted to reservoir and diverted to tunnels without any natural flowing section of the river. It is important to have free flowing river stretches for river to recover and maintain a natural habitat in continuation with the tributaries. Therefore, recommendation have been made to drop the FRL of only three projects viz. Siyom Middle, Naying and Tato II to have 1 Km of free flowing river stretch between Siyom Middle and Naying; Naying and Tato II and Tato II and Hirong.

Creating free flowing stretch for river to recover and maintain a natural habitat in continuation with the tributaries can be reviewed once again especially in light of the fact that the gradient is steep in this region and requirement may be met with even with less than 1 Km of free flowing river stretch.

4. Issue:

As regard the recommendations of Environmental flow as 20% each during the three seasons- lean, monsoon, pre & post monsoon, the same consultant i.e. M/s R.S. Envirolink Technologies Pvt. Ltd. carried out the EIA/EMP studies in respect of Naying HEP (1000 MW), wherein they have categorically concluded that even a release of 10% downstream provides adequate habitat for snow trout and mahseer which is more than the minimum requirement of 60 cm depth and 1.25 m/s velocity.

However, in the EIA/EMP report, they have recommended minimum release of 20% of average of lean season flow. In the current Basin study report in respect of Naying HEP (1000 MW), the consultant has mentioned that even 15% release provides adequate depth which is 44% of pre-project depth. They however recommended 20% environmental flow each during lean, pre & post monsoon, and monsoon season so as to provide 50% of pre-project depth. Therefore, it is seen from the reports that the e-flow recommendations are not based on scientific studies.

Response:

Consultant explained that e-flow is assessed based on habitat simulation and hydraulic modelling for which methodology has been described in detail. Habitat requirement along with the results of simulation modelling have been combined to make final recommendations on flow requirement. Modelling output for depth can not be taken as absolute value to meet the habitat requirement, therefore flow width/wetted perimeter and depth at other points in the identified river cross section is also taken into account, while making the final recommendation. Objective of environment flow assessment is to simulate the natural river conditions with the reduced flow and therefore, less than 50% of width reduction is not desirable even if the flow depth is desirable. Keeping these variables in mind final flow release requirements have been assessed and recommendations made accordingly.

It was further explained that E-flow assessment for Naying HEP has been done as part of EIA study in 2010. Based on the TOR requirement, only lean season flow requirement was assessed and 20% of average discharge of four leanest months in 90% dependable year was recommended. A detailed assessment for Naying HEP's environment flow release requirement along with other projects in Siang basin has been done as part of the CIA report and this was done for full year covering monsoon, lean and non-lean and non-monsoon months keeping in view the habitat needs.

5. Issue:

The State Government appreciates the environmental concerns but strongly feels that holistic view should be taken so that the projects are not rendered unviable. More so keeping in-view the fact that requirement of environmental releases as per the Cumulative Impact & Carrying Capacity study of Siang Sub-basin including

downstream impacts are higher than the required flow for survival of aquatic life downstream of diversion structure. It may be worthwhile to inform that unlike in other projects areas, there is no opposition to these projects in Siyom basin from the local people.

Response:

Objective of CIA study is to take holistic view of project impacts and therefore study has captured many issues which cannot be assessed in individual project specific EIAs. Recommendations for environment flow for habitat requirement have already been discussed earlier and accepted by EAC.

6. Issue:

The Report recommends that 15 Nos. of hydroelectric projects with installed capacity of 473.50 MW be dropped on the ground that dropping of these projects will have little impact on power generation (reduction of 2.6%) whereas long river stretches (59.5 m) will be saved in this biodiversity rich area. This is not acceptable. The development of small projects have their own advantages as they can be commissioned within 2-3 years. They will not only meet the local power requirements but will meet power requirement of bigger projects during construction period.

Response:

EAC understand and appreciate the concern of the state government about protecting the smaller projects. However, each project has been recommended to be dropped for a specific reason to reduce the impact in that area keeping in view the environment setting and cumulative impacts.

7. Issue:

In respect of one project i.e. Palsi (24 MW) being developed by M/s Meenakshi Infrastructures Pvt. Ltd, work has already started on site and dropping of the same will not be possible. As regards, Kaying HEP (14 MW) allotted to M/s Sarda Eco Power Ltd and Nyikong HEP (13 MW) & Sipit Upper HEP (45 MW) allotted to M/s Aswani

Power Projects Pvt. Ltd, DPRs have been completed and are under examination with AHEC, IIT, Roorkee. The remaining projects are under survey and investigation stage.

Response:

The project status can not be a criterion while making recommendations to drop/modify a project to protect environment. However, if there is a significant change in location/parameter of a project from what it was at the time of basin level assessment; a review can be undertaken.

8. Issue:

The report further recommends that neither any new projects even less than 25 MW nor re-allotment of the dropped projects be made. The report also recommends that projects of less than 25 MW capacity should be brought under EIA notification. Prevailing norms should be retained to enable the State to decide on small projects as per local needs.

Response:

This recommendation is critical to ensure sustainable hydropower development in Siang basin. If the project recommended to be dropped are re-allotted by state government then whole purpose of this study will be defeated. EAC observed that installed capacity of hydropower project does not define its environmental impacts and smaller projects can also be brought under the purview of EIA notification by MoEF.

9. Issue:

The developers have reportedly incurred expenditure to the tune of Rs.76.60 crores in respect of smaller projects and Rs. 323.44 crores in respect of 4 projects on Siyom river viz. Hirong, Tato-II, Naying and Siyom. The consequence of dropping of the projects and rendering the projects unviable will have legal implications as the developers may claim reimbursement of expenditure already incurred which will be a huge burden on the State.

Response:

As discussed above, the cost incurred or the status of project was not considered to formulate recommendations of the study was focused on assessment of cumulative impacts and ensuring sustainable hydropower development.

10. Issue:

The study in its present form is likely to create a considerable domain confusion as it appear to be simply pushing pre-determined "national norms" of environmental flow etc. without allowing flexibility to relax/modulate them as per local conditions. If an all- India one 'size fits all approach' is to be adopted then the rationale of such studies itself becomes questionable.

Response:

There are no pre-determined national norms. In respect of environment flow, EAC in recent years have started recommending environment flow release requirement as 30% of monsoon flow average; 20% of lean season flow average and 20-30% of other months (non lean non monsoon months) average based on 90% dependable year discharge data. However, in this study, without any pre-conceived notion, project specific assessment has been done and varied flow release requirements have been made depending upon requirement.

EAC expressed its agreement and concurrence on the above response/clarification offered by the Consultants.

Issues raised by SANDRP

SANDRP has sent comments on the Siang basin report. Consultant has prepared the point wise response, which was discussed in 72nd Meeting of EAC and

uploaded on MoEF website. Some additional observations received were discussed and detailed below.

<table>
<tr><th>Observations</th><th>Response of Consultant</th></tr>
<tr><td>The CIA CCS Study is unacceptable entirely as it underplays the fact that even 20-25 kilometers downstream the Lower Siang Dam Site, the level fluctuation when all three upstream projects (Upper Siang I, Upper Siang II, Siyom and Lower Siang) are peaking will be an unbelievable 23.66 feet![1]

The corresponding fluctuation in discharge will be from 200 cumecs to 5000 cumecs. This massive hydro peaking due to upstream projects is possibly one of the greatest peaking fluctuations in the world and forms a huge cumulative impact, which should have been addressed by the study.</td><td>A detailed downstream impact study has been carried as part of the Siang basin study and results have been included and downstream impacts discussed in detail. Diurnal discharge variation in the downstream reach of Lower Siang HEP is substantial and impacts have been studied up to Guwahati in Assam.</td></tr>
<tr><td>The study has not considered the impacts of this huge fluctuation in the downstream, although this was a part of the TORs. It selects no chainage between Dibru Saikhowa National Park to Dibrugarh, where the right bank in Assam will face tremendous social and ecological impacts and severe safety issues due to cumulative peaking operations of upstream projects. This region includes, villages, settlements, tea estates, riverine islands farms and significant part of Dhemaji district downstream Pasighat area.</td><td>The study has defined the downstream study area up to Guwahati which is about 500 Km downstream of Lower Siang HEP, analyzed the flooding potential and discussed the level variation due to peaking generation in lean season at following significant locations en-route:
<table>
<tr><th>Place</th><th>Chainage from Siang Lower HEP (m)</th></tr>
<tr><td>D Erring WLS</td><td>20140</td></tr>
<tr><td>D Erring WLS</td><td>25090</td></tr>
</table>
</td></tr>
</table>

Observations	Response of Consultant
	<table><tr><td>D Erring WLS</td><td>33260</td></tr><tr><td>Dibrugarh</td><td>102020</td></tr><tr><td>Bokaghat-Kaziranga</td><td>269280</td></tr><tr><td>Tezpur</td><td>355460</td></tr><tr><td>Guwahati</td><td>462580</td></tr></table> Dibru Saikowa is along left bank of Brahamaputra after the confluence of Lohit and Dibang. This falls outside the study area of Siang basin. Further a separate study has already been conducted to assess the impact of peaking power on Dibru Saikowa due to peaking in Lohit and Dibang basin. This was not part of the scope; however this can be taken up as a separate study.
Looking at the recent tragedy in Beas where 25 students lost their lives when water was released from Larji Hydropower Project and our history of dealing with safety issues related to such projects[2], the EAC and MoEF needs to consider safety issues along with social and ecological impacts of demand-based electricity generation and water releases from dams very seriously. How can the EAC do that when the Cumulative Impact Assessment Study itself does not deal with this central issue?	This issue is not related to the CIA study.
It offers no solutions in terms of:	The entire study has been done

Observations	Response of Consultant
1. Dropping projects/ changing project parameters for projects with huge downstream impacts 2. Changing reservoir operations to mitigate impacts of peaking 3. Suggesting changes in ramping rates to protect downstream communities, river banks, infrastructure and ecosystems The entire study does not even touch the issue of ramping rates, when it is so critical for the safety of downstream population in Assam and when it was also explicit part of the TORs.	as per the scope.
SANDRP was recently a part of the International Conference on Eco-Hydraulics in Norway, where several countries presented the exemplary work being done on impacts of peaking, safe ramping rates for projects, mitigation for hydropeaking, etc., amongst others[3]. Even for projects where discharges change from 20-100 cumecs due to peaking, elaborate assessment and mitigation measures are being devised, put in place and monitored. This has been possible because the administration and decision making bodies have been concerned about these impacts and ensured that these were studied and addressed comprehensively. Indian projects are possibly witnessing some of the highest hydro-peaking rates in the world, which hold huge consequences not for downstream ecosystems and populations, which should be of paramount importance to the administration.	These detailed studies need to be taken up separately and such work is completely out of purview of the present study, which has already been concluded.

EAC concluded with the following recommendations:

1. Siang basin study report may be accepted in the present form.

2. Environment flow assessment and recommendations thereof, as made in respect of hydropower projects in Siang river basin may be adopted for all proposed HEPs in the basin
3. At least 1 Km free flow stretch involving dropping of FRL of three projects viz. Middle Siyom (1000 MW), Naying (1000 MW) and Tato II (700 MW) are found in order. Although, it may entail reworking out of power potential, in the interest of overall riverine ecological integrity, the recommendation is very good. However, if steep gradient is involved, EAC, while considering specific case, may take an appropriate view.
4. Regarding State Governments contention about dropping of 4 projects, which are claimed to be in advance stages, viz. Palsi (24 MW), Kaying HEP (14 MW), Nyikong HEP (13 MW), & Sipit Upper HEP (45 MW) shoulcan, the Consultants may undertake ground verification in collaboration with State Government and submit a report to CWC. Based on that, CWC may send their recommendation to MOEF &CC.

Appendix

List of EAC members and Project Proponents who attended 75th Meeting of Expert Appraisal Committee for River Valley & Hydro Electric Power Projects held on 3rd- 4th July, 2014 in New Delhi

A. Members of EAC

1.	Shri Alok Perthi	-	Chairman
2.	Shri Hardip Singh Kingra	-	Vice- Chairman
3.	Dr. S. Sathya Kumar	-	Member
4.	Dr. P. K. Choudhuri	-	Member
5.	Shri N. N. Rai	-	Member
6.	Shri G. M. Lingaraju	-	Member
7.	Shri B. B. Barman	-	Member Secretary & Director, MoEF
8.	Dr. P. V. Subba Rao	-	MoEF

B. HEO HEP (240 MW) on the Yarjep River, in the West Siang District of Arunachal Pradesh – For Environment Clearance

C. Tato-1 HEP (186 MW) on the Yarjep River, in the West Siang District of Arunachal Pradesh – For Environment Clearance

D. PAUK HEP (240 MW) on the Yarjep River, in the West Siang District of Arunachal Pradesh – For Environment Clearance

1.	Shri Benoit Laborie	-	Executive Director
2.	Dr. Manohar Arora	-	Scientist 'D'
3.	Shri (Er.) V. K. Sharma	-	Sr. Advisor
4.	Shri (Er.) Kashif Khan	-	Sr. Engineer
5.	Shri (Er.) P. R. Ravikiran	-	General Manager
6.	Dr. Dorje Dawa	-	Scientist
7.	Dr. J. P. Bhatt	-	Scientist
8.	Shri Ravinder Bhatia	-	Director
9.	Dr. D. C. Nautiyal	-	Scientist
10.	Shri Arun Bhaskar	-	Director
11.	Shri S. Mohammad Khasim	-	General Manager

E. Shutkari Kulan HEP (84 MW) by M/s. JK&PDC, in Jammu & Kashmir- For consideration of TOR

1.	Dr. Vijay Kuljarni	-	Sr. Vice President
2.	Shri Sunil Kulkarni	-	Sr. Vice President
3.	Shri I. A. Kakroo	-	General Manager
4.	Shri Gurudarshan	-	Manager
5.	Srhi Ravinder Bhatia	-	Consultant

F. Chuzachen (99 MW) HEP in Sikkim by M/s. Gati Infrastructure Pvt. Ltd. – For consideration of EC for revised capacity of 110 MW

1.	Shri V. Krishnan	-	COO & D (F)
2.	Shri Sanjeev Kumar Upadhyay	-	President
3.	Shri Niladri Mandal	-	AGM (E)
4.	Shri Rakesh Kumar Poddar	-	Sr. Manager
5.	Shri Kishor Kumar Singh	-	AGM (Design)
6.	Shri Rajesh Sharma	-	Sr. Manager
7.	Shri Devesh Gautam	-	Manager (E)
8.	Shri Ravinder Bhatia	-	Consultant

F. Kundalia Major Irrigation Project in Rajgarh District of Madhya Pradesh by M/s. Water Resources Department, Government of Madhya Pradesh – For Environment Clearance

Absent

G. Siang Basin Study in Arunachal Pradesh by M/s. - For Discussions

1.	Shri (Ch.) Ashok Reddy	-	MD
2.	Shri Topden Puning	-	Director
3.	Shri B. Sriniwas	-	Director
4.	Shri S. K. Kathuria	-	Manager

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