

Minutes of the 62nd Meeting of the Expert Appraisal Committee (EAC) for River Valley and Hydroelectric Projects constituted under the provisions of EIA Notification 2006, held on 23-24th November, 2012 at Paryavaran Bhavan, MOEF, New Delhi.

The 62nd Meeting of the Expert Appraisal Committee (EAC) for River Valley and Hydropower Projects was held during 23-24th November, 2012 at Parayavaran Bhavan, Ministry of Environment & Forests, C G O complex, New Delhi. The meeting was chaired by Dr. B. P. Das, Vice-Chairman on 23.11.2012 and by Shri. Rakesh Nath, Chairman on 24.11.2012. Dr. S. K. Mishra and Dr. Dhanajay Mohan, members of EAC could not attend the meeting due to pre-occupation. The list of EAC Members and Officials from various projects who attended the meeting is at per Annexure-I.

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

2nd Day (24.11.2012)

1. Agenda Item No.1: Welcome by Chairman and Confirmation of Minutes of the 61st EAC Meeting held on 12-13th October, 2012.

The Chairman welcomed the members. The Minutes of the 61st EAC meeting were confirmed with the following amendment:-

Agenda Item No. 2.3 & 2.4 (Sumte Kothang and Lara Sumte HEP)

Add the following additional condition:

“As the Dam height is 22 meter, the project proponent has to provide necessary fish ladder for movement of fish, if migratory fish is available”

Agenda Item No. 2.10 (Sip-Kolar link Medium Irrigation Project)

Add the following text in the first para.

“subject to implementation of certain conditions . One of the conditions was with regard to obtaining the Environmental Clearance for the project. As this is a medium sized irrigation project, the proposal was submitted to SEIAA. However, the SEIAA returned the proposal as the original proposal was cleared by the MOEF. Therefore, the Government of Madhya Pradesh has submitted the proposal to MoEF for consideration. The EAC noted the reasons and after critically examining all the issues agreed to consider the project”.

Add to last but, one para.

“The Committee found that this is an extension of the already approved Kolar project for which EC was granted in 1984. Thus the committee decided to consider the additional scope of work and their related environmental safeguard measures only”.

Amend last line as “ as per requirement” instead of as per EIA notification , 2006 and subsequent amendment in 2009.

Agenda Item No. 2.11 (Duggar HEP)

in second para minor amendment adding.

“and 10 MW (with one standby arrangement) additional power has been proposed to be generated through the discharge stipulated for environmental flow”.

Add additional condition at the end

“The project proponent shall have to comply with the findings and recommendations of cumulative impact assessment study of Chenab river with regard to release of minimum environmental; flow as and when it is available”.

1st Day (23.11.2012) & Second Day (24.11.2012)

2. Consideration of Project proposals for Scoping and Environmental Clearance.

The following project proposals were considered

2.1 Telling HEP (94MW) project in Lahaul & Spiti Kinnaur District of Himachal Pradesh by M/s Teling Hydro Power Private Limited – For ToR (J-12011/34/2012-IA-I)

The project proponent made a detailed presentation before the committee of the project. It was noted that the project is proposed on river Chandra in Lahaul & Spiti District of Himachal Pradesh. The project envisages construction of a 22 m high barrage across Chandra River near Gramphu Village to generate 94 MW of hydropower. An underground power house is proposed near Teling Village with 2 units of 47 MW each. The project area lies in an active seismic region, zone IV of the Seismic Zoning Map of India. The design discharge of 107 cumecs is proposed to be utilized for power generation. The annual energy generation is 363.22 Gwh. The total land requirement for the project is 83 ha and total submergence area is 20 ha. The estimated cost of the project is Rs. 1007.87 Crores and will be completed in 90 months.

The proponent also showed the video recording of the catchment area, reservoir area, diversion site and the power house area of project. After going through the video, EAC opined that although vegetation is sparse due to high altitude terrain, there may a likelihood of presence of herbs & shrubs in the area that could belong to rare, endangered and threatened category. Thus, a detailed biodiversity assessment should be studied as a part of EIA study.

The committee noted that the hydrological aspects are based on the discharge data of Ghousal G&D site located just before the confluence of river Chandra with the river Bhaga near Tandi. The catchment area up to the diversion site of Teling HEP is about 1886 Sq. km. at Ghousal for 27 year period. The flow series has been arrived by transposing the Ghousal data from 1973 to 2003 (27 years) on catchment area ratio basis.

The Committee deliberated in detail on this aspect and suggested that the project proponent should use CWC approved flow series, design flood and diversion flood for planning and design of the project. The Committee further suggested that the actual discharges at diversion site of Teling HEP may be measured by installing G&D station during the investigations for the DPR. The Committee also noted that very few rain gauge stations are installed in the area and suggested that adequate rain/snow recorders need to be installed. The project proponent clarified that it proposes to install Automatic Weather Stations, Automatic Water Level recorders, snow and rainfall recorders in the area for observation of hydro-meteorological data.

The project proponent informed that the allotted levels for the project on Chenab River are 3160m (FRL) to 3045 m (TWL). The projects upstream and downstream of Teling HEP are Shangling HEP and Tandi HEP respectively. A free riverine stretch between TWL of Teling HEP and FRL of Tandi HEP (EL. 2849 m) is about 19.6 km and the free riverine stretch upstream of Teling project up to the TWL of the Shangling HEP is about 1.32 km. The EAC suggested that if any project comes up at a later stage in the free riverine stretch of 19.6 Km between Teling & Tandi HEP, the same may be brought to the notice of EAC.

The committee after thorough scrutiny & examination of various issues observed that the Form-1 under the head 8.2 the reply should be affirmative - “Yes” considering the safety aspects. The project proponent should resubmit the Form-1 with above amendments.

The area falls in the seismic zone –IV. Therefore the Committee suggested that detailed subsurface, seismic investigations, in-situ permeability tests of the media may be carried out for realistic assessment of seismic hazard in the area during survey & investigations for the DPR. Proper cut off may be provided in the diversion structure. Committee also suggested that the approval of the seismic parameters’ be obtained from the competent authority.

The EAC opined that the impacts of sediments flow pattern in the reach between diversion structure and the TRT outfall be examined through an appropriate study as a post project monitoring activities. The dissolved Oxygen level gets depleted in long HRT and the same may also be examined accordingly.

The project proponent informed the committee that in the PFR of the project, the environmental flow is considered as 15% of the minimum discharge observed in a 90% dependable year as per the notification of Govt. of Himachal Pradesh. The committee suggested that the minimum environmental flow release may be fixed @ 20% of the average flow of the four lean months in the 90% dependable year, in non-monsoon non lean season the release should be between 20-30% of the flows in 90% dependable year and 30% during the period the monsoon period in 90% dependable year. The Committee also suggested conducting a site-specific study on environmental flow release by an independent reputed agency.

The EAC also recommended that an inventory of fisheries diversity may be established during CEIA studies. In the event of the presence of Migratory species, provision of fish pass/fish ladder may be kept in the diversion structure. The presence of amphibians be also included in the TOR for CEIA studies.

The Committee after critically examining all environmental issues, recommended clearance for pre-construction activities and approved the TOR with the following additional TOR:-

- i. Although vegetation is sparse due to high terrain, there may a likelihood of presence of herbs & shrubs in the area that could belong to rare, endangered and threatened category. Thus, a detailed biodiversity assessment should be studied as a part of EIA study.
- ii. Periphyton forms an important food component for the hill stream fishes, therefore should be studied with the plankton and macrobenthos.
- iii. Fishery study should include listing of fish diversity, composition and status.
- iv. The committee suggested that provision of fish pass/fish ladder may be made in the diversion structure, in the event of presence of migratory species.
- v. Amphibians are the health indicators of the ecosystem and their presence should be ascertained as a part of EIA studies.
- vi. Automatic Water Level Recorders (AWLR) should be installed at G&D sites for recording water levels and then computation of discharges, and Automatic Weather stations to record snow and rainfall.
- vii. A site specific study may be carried-out for establishing the proper environmental flow release during monsoon, non-monsoon and lean months corresponding to the 90% dependable year. Release of minimum environmental flow must mimic the pre-dam flow pattern of the river for sustaining the aquatic bio-diversity together with downstream user need and accordingly, water withdrawal for power generation is to be regulated. Minimum environmental flow release would be 20% of average of four lean months of lean period, 20-30% of flows during non-lean and non-monsoon period and 30% of average flow including spillage during monsoon period corresponding to 90% dependable year.
- viii. The area falls in seismic zone –IV and therefore a site specific study needs to be conducted and the approval of the seismic parameters may be obtained from the competent authority.
- ix. Impact of sediments flow pattern in the reach between diversion structure and the TRT outfall is to be examined during CEIA/DPR study.
- x. The dissolved Oxygen level gets depleted in long HRT. A modelling study be conducted to ascertain the impacts of DO level as a part of CEIA Study and monitoring of DO level beyond the tail race discharge tunnel may be made a component of the post-project monitoring activities. .

2.2 Purthi HEP (300 MW) project in Lahaul & Spiti and Chamba District of Himachal Pradesh by M/s Purthi Hydro Power Private Limited – For ToR (J-12011/37/2012-IA-I)

The project proponent made a presentation before the Expert Appraisal Committee on the project. The project is located on the river Chenab in Lahaul-Spiti and Chamba District of Himachal Pradesh and is on Chandigrah-Manali-Killar road about 232 Km from Manali. The intake point is located about 2 km downstream of Raoli Nallah near Gomakund which is about 36 km from Udaipur. The Power House site is proposed to be located near village Ajog /Purthi about 56km from Udaipur and about 27km from Killar in Chamba District.

The Committee noted that the project is conceived as an extension of Reoli Dugli HEP on Chenab River by utilizing the tail water discharge of Reoli Dugli HEP.

The committee was informed that the project comprises of construction of 10.2 km long and 9.5 m diameter head race tunnel which is proposed to cross the river Chenab through an aqueduct after a length of about 3.6Km downstream of power intake, 95 m high 33 m diameter surge shaft, 2 Nos. 6.2m dia each pressure shaft further bifurcating into 4 Nos. 4.4m dia pressure shafts, an underground power house with an installation of 4 units of 75 MW each, having overall size 122.75 m (L) X 21 m (W) X 44 m (H) and 10m diameter 450 m long circular shaped tailrace tunnel. The nearest project component is at an aerial distance of more than 12 km from the boundary of the Sechu Tuan Nala Wildlife sanctuary. The project area lies in an active seismic region, zone IV of the Seismic Zoning Map of India.

It was explained that the design discharge of 328.23 cumecs for Reoli Dugli HEP is proposed to be utilized for power generation. The annual energy generation is 1204.68 GWh. The project being an extension of Reoli Dugli HEP on Chenab River, utilizing its tail water discharge, there is no land requirement for the submergence area. The land requirement for project component, infrastructure & facilities is 72 Ha. The estimated completed cost of the project is Rs. 2535.92 Crores and will be completed in a period of 90 months.

The Committee noted that the hydrological aspects are based on the Gauge & Discharge data maintained at Udaipur for 36 year period from 1974 to 2010. The flow series in the PFR is based the flow series of Reoli Dugli HEP which were transposed on catchment area basis from Udaipur G&D site on the river Chenab near Udaipur.

The committee noted that the allotted levels for the project on Chenab River are 2333.2m to 2220m. Reoli Dugli HEP is proposed upstream of Purthi HEP and Sach Khas HEP is proposed downstream of Purthi HEP and the riverine stretch between diversion site of Reoli Dugli HEP and FRL of Sach Khas HEP is about 23.32 Km.

The Committee, after critically examining the environmental issues associated both with the instant project and its up-stream/downstream projects was of the following opinion/view:

- The Committee while considering the other projects on Chenab was not told about this project at any point of time. Thus, Purthi HEP has been introduced by Govt. of Himachal Pradesh as an afterthought and extension of Reoli Dugli HEP. The Committee regretted this communication gap. Because, the guidelines of the EAC for maintaining free flow stretch between two projects have been violated as a result of introduction of the project along with its distinct engineering features.
- The proposed tunnelling will deprive release of TRT water of Reoli-Dugli back into Chenab, which will virtually dry-up the flow in 23.32 km long continuous river stretch. This, if this project is allowed to come up, may invite wide spread resentment among the public and various stakeholders as it may substantially damage the ecological health and integrity of Chenab river.
- The Committee further noted that the TWL of Purthi HEP is matching with the FRL of the downstream project sach-Khas, which was already approved by Government of Himachal Pradesh, and thereby leaving no free flow stretch, which is unacceptable from environmental point of view.
- The Committee concluded that the project proponent and Govt. of Himachal Pradesh may review and revise the proposal in the light of the above observations for reconsideration.

Thus, the Committee did not find the instant project, which is reported to be an extension of Reoli Dugli HEP, in its present form and shape fit to be awarded scoping clearance.

2.3 Downward revision of Capacity from 360 MW to 150 MW for Teesta Stage-II in North Sikkim District of Sikkim by M/s. Himurja Hydro Pvt. Ltd (J-12011/34/2008-IA-I)

The project proponent did not attend the meeting and hence project was not considered.

2.4. Hirong HEP (500 MW) project in West Siang District of Arunachal Pradesh by M/s. Jaypee Hydro Power Company Ltd – For Environmental Clearance (J-12011/37/2012-IA-I)

The project proponent made a detailed presentation on the project. The Committee noted that the project was on the River Siyom in West Siang District at about 15 km upstream of village Lungte and about 50 km from Tato town by road in Arunachal Pradesh. The project envisages construction of a 133.50 m high concrete gravity dam across River Siyom to generate 500 MW of hydropower with an Intake structure on the left bank of the Dam. Four bays of sluice type spillways with top sealing radial gates are provided to pass a design flood of 4600 cumec. The diversion arrangement of the project is designed for non-monsoon flood of 1220 cumec with a 10.48 m dia and 473m long diversion tunnel. To augment the water availability in the reservoir, a nearby d/s Sitten nallah is proposed to be diverted into the reservoir. This is a run-of-the-river scheme project. An underground powerhouse is located just upstream of confluence of Shi Chu with Siyom river with 4 units of 125 MW each. The catchment area of the project is 1147 Sq. km. The total land requirement is about 492.76 ha, predominantly covered with dense and open forest. Seven villages consisting of 312 families come from 193 households are likely to be affected due to this project.

The governing levels of FRL and MDDL of the Hirong HE Project are El. 1355m & El. 1349m and for the reservoir of the immediately downstream i.e. Tato HE project, developed in cascade are 1020 m and 1009 m, respectively. The water conductor system of the project is designed for a discharge of 181.79 cumec through an underground head race tunnel (HRT) 7.5 m dia, circular concrete lined, 9.2 km long, which joins the 15m dia circular restricted orifice type vertical surge shaft.

The Powerhouse Complex comprises two main caverns placed parallel to each other, separated by a 41 m wide rock wall in between. Powerhouse cavern is 130 m long, 22 m wide and 46 m high and accommodates the Erection Bay, Machine Hall and Control Bay. Unit bay of the Machine hall is 73 m long which will house four machines placed at 17 m centre to centre.

The Public Hearing for the project was conducted on 18.05.2011.

The committee after thorough scrutiny & examination of various issues sought the following additional information/clarifications:

- Consultants are required to submit accreditation certificate from NABET along with details of individual domain expertise. Availability of all required experts is to be confirmed and mentioned in the report.

- The EIA report should contain an undertaking to the effect that the prescribed TORs have been complied with and the data submitted factually correct as well as the name of the laboratories through which the samples got analyzed, as mentioned in the MOEF's circular No. J-11013/41/2006-IA (II) (I) dated 04.08.2009.
- The diversion of the U/S Sitten Nallah into the reservoir has been proposed which needs verification if it was in original ToR, or else, this is to be studied afresh specially with regard to requirement for environmental flows in the downstream.
- L –Section of the Siyom River depicting all hydropower project coming-up in a cascade needs to be provided and explained. Besides, a line sketch showing the HEPs contiguous to the Hironng HEP, both U/S and D/s on the same river, their FRL – TWL elevations and the free river flow distance between them are also to be given.
- Environmental flow release and a Table of 10-daily discharges (in m³/s) for the 90 % dependable year showing the flow intercepted at the dam, the flow diverted towards the PH and the spill D/S to the dam is not found available in the EMP report. The Environmental flow releases are to adhere to the currently adopted norms of 20% of the average of the 4 lean months of 90% dependable year, 20-30% of the average flows of 90% dependable year during non-lean & non-monsoon months and 30%, of the averages flows of 90% dependable year during monsoon months.
- Several data in Table 6.2 appear to be inconsistent viz. Varying soil texture at the same sampling site in different seasons; the organic matter content of the soil under a densely forested catchment is lower than expected and is not commensurate with the water holding capacity (122% in one case); the soil mineral composition is not commensurate with either bulk density or water holding capacity. These parameters may not influence the design and the operation of an HEP but such inconsistent data may be misleading and thereby raising questions about the quality of the EIA study.
- Total area under severe and very severe erosion categories is about 7167 ha, but the area to be treated under CAT Plan is 2696 ha. This large difference may please be explained. Also, please clarify 'Free draining catchment', as in this case, there is no in between project to take care of the CAT measures in the U/S areas.
- The project lies in the seismic zone V which has witnessed a great earthquake of 8.7 M in 1950. The detailed seismic monitoring is necessary. Morphotectonic studies on large scale are necessary to evaluate type impact of the last great earthquake on the riverbed. The seismic design analyzed by the IIT Roorkee is satisfactorily done. However, micro seismic monitoring of the earthquake is essentially required.
- The length of the HRT is about 9.2 km. Therefore more than 10 km downstream area would be deprived of the normal river flow. Therefore, it entails an environmental flow assessment study covering lean, non-lean and monsoon months. For this, fish and fisheries aspects needs to be taken into account also.
- A warm water fish *Ompokbimaculatus spec.* has been mentioned among the list of fishes available in the river, this needs further verification.
- Flow-through Indoor hatchery system with hatching trays, troughs and feeding troughs needs to be be planned under Fishery Management Plan for cold water fishes available in the river.

- The criteria for fish stocking in the proposed reservoir need further clarification and justification.
- It is required to explain why soil texture varies with seasons by a great extent at some sites. Bulk densities are high while water holding capacities are low. It needs re-analyses.
- Floral part lacks adequate endemic species in the area while the region is one of the hot spots.
- The area recorded low literacy rate. The plan must contain adequate provision of educational facilities for the area.
- The muck dumping sites are not adequately distanced from high flood level (HFL) of rivers as per standard norms. A detailed plan accordingly should be prepared and submitted.
- Recommendations as a result of cumulative impact study (CIA) of Siang Basin, as accepted by the Ministry would be binding as far as maintaining of Environmental Flow (EF) is concerned.

EIA REPORT:

- **Salient Features of the proposed project:** Area of reservoir (submergence) and length of reservoir should be included along with the total land requirement and forest area to be affected.
- **Concept & Methodology:**
 - (i) Complete citation of all the references cited in the Report should be given in List of References.
 - (ii) Sources of Secondary data should be clearly indicated and cited at appropriate places such as Tables and Text.
 - (iii) **Study Area:** Samplings of most of the parameters, located mostly along the river course, are inadequate; such a scanty sampling cannot give a true picture of the vegetation or aquatic ecology in the influence/impact zone. There should have been more intensive sampling in the submergence area (60.08 ha of which 72.08% is forest) which is in the form of very long reservoir (5 km long) There is no sampling in the area of 9.2 km long HRT. Though in the Fig. 2.2 there is one sampling shown near Lungte for vegetation/forest; this is very inadequate. Same is the case with water/aquatic sampling, which is only at the Dam site and Power House and none between Dam and Power House stretch covering 9.2 km in which the aquatic ecology will be greatly affected?
- **Forest & Floristics:** 8.3 Vegetation Profile in the Influence Zone: It is inadequately done with a few samplings and it seems only secondary data have been provided
 - (i) The four locations (i) – (iv) have to be shown in a map
 - (ii) 8.4.1 Vegetation in Submergence Area: Is it near Pide -as in Fig 2.2; Lungte is in the HRT Zone and not submergence?
 - (iii) Listing (such as Table 8.1) of plants in the Tables should be given family-wise and not alphabetically!!!

(iv) Table 8.2: shows only 10 common Pteridophytes; A comprehensive list of all the Pteridophytes should be provided

(v) 8.4.4.2 Species Diversity: Although good amount data have been presented pertaining to various ecological attributes but explanation/ inference to the data is to be given

(vi) Table 8.7 Since, the area is very rich in RET species, especially endemics listing of a few species may be unrealistic. In fact all the Tables have captions such as “some common...”, “some important...” Effort has to be made to study and document the endemics and RET species in this hot spot of biodiversity. Enumeration may be done for RET species likely to be lost in the submergence area, their numbers (trees) and volume etc may also be provided

(vi) Actual methodology followed for conducting faunal surveys is to be given presently only references have been given.

(vii) In the mammal list, it should be clearly stated that which species has been included on the basis of primary and which on the basis secondary data (giving reference of the same).

(viii) Avifaunal listing has been found deficient and should be updated and enlarged based on primary and secondary data.

(ix) The herpetofaunal and butterfly lists are also found deficient and fresh effort (primary to secondary) may be made to make them exhaustive.

EMP REPORT

- **Biodiversity Management and Wildlife Conservation;** Proposed Plan of Action; Management of Genetic Biodiversity and a management plan may be provided. There should have been a thrust on the endemic flora and other RET species which are prevalent in Siang area to be detailed
- Establishment of a Botanical Garden is appreciable but may not be adequate for comprehensive biodiversity management.
- Total financial outlay for EMP superfluous positions and hypothetical for proposed activities for which no justifications given, Therefore, a detailed justification for allocation of funds under each head may be provided
- The consultant got accreditation from NABET on 27.2.2012, Public hearing was held during May 2012, however the EIA report did not have the name of EIA Coordinator and Functional Area Experts as well as their signature, as per Terms and conditions of the Accreditation order (condition No. 5 of Annexure II).
- The EIA report also did not have the undertaking to the effect that the prescribed TORs have been complied with and the data submitted factually correct as well as the name of the laboratories through which the samples got analyzed, as mentioned in the MOEF’s circular no.J-11013/41/2006-IA.(II)(I) dated 4.8.2009.

- Details of the proposal of surrendering hunting guns may be provided. Attempts to engage ex-hunters for patrolling and anti-poaching activities should be made.
- Provision for awareness activities should be enhanced.
- Detailed on recovery of susceptible species along with the list of such species may be provided.

2.5 Revision of TOR for Yamne Stage II HEP for enhancement of capacity from 60 MW to 96 MW in Upper Siang District of Arunachal by M/s. SS Yamne Energy Ventures Pvt. Ltd (J-12011/25/2010-IA-I)

The project proponent made a detailed presentation on the project. It was noted that the project is proposed on the Yamne river, between EL ± 536 m up-to EL \pm 440m in the Upper Siang District of Arunachal Pradesh. This is a run-of-the-river scheme project. The project envisages construction of a 20 m high barrage from average river bed level and barrage site is located about 1.6 km downstream of Siyat Nala confluence with Yamne River. A surface powerhouse is proposed on the left bank of river with 3 units of 32 MW each. The total catchment area up to the barrage site is 890 sq km.

The total land (including Forest, Community land with vegetation cover, Community Private Land (Agricultural/Jhum) for the project is about 90.4 ha. Out of which 35.50 ha falls under submergence area. About 80.4 ha comprise of Community Agricultural Land and Community Land with Forest Cover and remaining 10 ha is private land. However, the project proponent informed the EAC that actual land requirement will be finalized after detailed survey during EIA study/ DPR phase and legal status shall be ascertained as a part of Forest Proposal. There is no protected areas i.e. National Parks, Wildlife Sanctuaries, Biosphere Reserve etc and Historical Monuments are falling within 10 km radius of the Project.

The Committee was informed that the changes made in the revised project layout have yielded environment friendly benefits compared to the original project in view of following:

- total land requirement has been reduced from 300 ha to 90.4 ha;
- Reduction in intervening stretch i.e. dry stretch of the river, as the HRT length has been reduced from 13.7 km to 6.5 km;
- a barrage of 20 m high is proposed in revised layout instead of earlier 45 m high concrete gravity dam resulting substantially less water storage and thereby entailing less submergence; it will therefore, explore the possibility of having a fish ladder in the project
- Increase in free flow river stretch as barrage site is shifted to 6 km downstream.

The Committee sought clarifications pertaining to changes in catchment area, design discharge, methodology adopted for construction of long term series & capacity enhancement, free flow stretch of river between the consecutive projects, minimum flow, number of affected families, sediment load etc.

The project proponent explained that due to shifting of diversion site about 6 Km downstream of earlier site, catchment area has enhanced to 890 sq. km from earlier 770 sq. km. With regard to water availability series and enhancement of capacity, project proponent explained that based on approved available series at Raying and Pangin series, long term series at Jeying was developed and on the basis of catchment area proportion the Jeying

series was further transferred to the project site. It was informed that CWC has already approved the water availability series and design flood for the project. Further, based on approved series, the Installed capacity is worked out to be 96 MW which has since been approved by CEA.

The Committee observed that the design discharge of 131.64 cumecs seems to be on higher side, as average discharge of monsoon season is 142.28 cumecs only and as such availability of 131.64 cumecs discharge for the project might not be possible. For confirmation and assessment of availability of design discharge at project site, Committee told to submit the observed data at Jeying and Siyat site or any other site being maintained by developer near diversion axis.

Regarding free flow stretch between the Yamne Stage-II HEP with upstream and downstream projects it was informed that the free flow stretch between Yamne stage II HEP with FRL as El. 536 m and upstream Yamne stage I HEP with TWL as El. 565 is about 3.68 km. Whereas the free flow stretch between Yamne stage- II HEP with TWL as El. 440 m and downstream Lower Yamne stage – I HEP with FRL as El. 425 m is about 1.16 km and the same was already approved by MoEF as part of TOR for Lower Yamne Stage-I Project. With regard to minimum flow, developer informed that in accordance with the norms and TOR stipulation, provision of 20 % of the average lean season flow at 90 % dependable has been adopted for which 4.8 cumecs shall be released as environmental flow towards the sustenance of the aquatic life and downstream user needs. The Committee opined that the environmental releases in monsoon and pre monsoon seasons should also be worked out keeping in view current norms of MoEF during the EIA studies.

The Committee enquired that after consideration of pre-monsoon and monsoon environmental releases, what shall be the installed capacity of the project. The project proponent informed that once the environmental releases for the pre-monsoon and monsoon seasons are frozen as a part of EIA studies, the power potential for the project shall be optimized considering these releases and same shall be approved by CEA and accordingly MOEF will be informed. However, the project components should remain same.

The project proponent informed that the 3 season baseline study for preparation of EIA/EMP Report is already conducted from April -2010 to January-2011. Keeping in view the revised layout, Committee suggested that 3 season ecological studies should be carried out again for the changed locations of Barrage site, HRT alignment and powerhouse for better identification of the flora species in the study area. However, the baseline data already collected as per earlier TOR could be utilized in EIA Study, wherever applicable. Accordingly, the project proponent agreed to conduct three season ecological study afresh.

Further, the Committee enquired about the number of families likely to be displaced and the R&R issues of the Project. The developer informed as per finding of reconnaissance survey Project is not likely to be subject with R&R issues. However, detailed survey and study in this regard shall be undertaken as a part of EIA/EMP.

After detailed deliberation and clarifications, the Committee recommended revision in capacity for 96 MW with the following additional TOR:

- Three season ecological studies to be conducted as per revised layout.
- Observed discharge data at Jeying and Siyat sites to be submitted to the committee. Environmental releases for pre-monsoon and monsoon season should also be addressed in EIA/EMP study.

- Free flow stretch of about 3.68 km between Yamne stage II HEP and upstream Yamne stage I HEP and about 1.16 km between Yamne Stage-II HEP and downstream Lower Yamne Stage-I HEP shall be maintained
- Accordingly, EIA/EMP report should be prepared and submitted within the stipulated time period.
- The project lies in the seismic zone V which had witnessed a great earthquake of 8.7 M in 1950. The detailed seismic monitoring is necessary. The morphotectonic study on large scale is necessary to evaluate type impact of the last great earthquake on the riverbed. The seismic design analyzed by the IIT Roorkee is satisfactorily done. However, micro seismic monitoring go the earthquake is essentially required.

2.6 Revalidation of Extension of TORs

The following projects were taken-up for the extension of the Validity Period for TOR:

(A) Extension of the Validity Period of TOR for Jameri HEP (50 MW) project in Arunachal Pradesh by M/s. KSK Ventures Pvt. Ltd.

The project proponent requested the Ministry for the extension of their Jameri HEP (50 MW) project in Arunachal Pradesh. The project proponent informed the Ministry the following:

- The TOR was issued to Jameri HEP (90 MW) project 25.10.2010 and two year validity period ended on 25.10.2012.
- No parameter is changed & no change in the scope of the project.
- 3 season data for preparation EIA/EMP studies are almost completed and finalization of EIA/EMP reports for conducting public hearing and other related activities for obtaining EC. These activities could be completed in another 1 year.
- Possibility of shifting of powerhouse has been informed to CEA by the project proponent.
- The name of the company has been changed from M/s. KSK Ventures to M/s. KSK Jameri Hydro Power Pvt. Ltd

The MoEF appraised the EAC accordingly. The EAC recommended for extension of validity for 1 year i.e. up-to 31.10.2013 and also noted the change in name. However, in case of shifting of the powerhouse, the project proponent shall approach the MOEF afresh with details so as to ascertain whether this will entail scope change thereby requiring revised TOR

(B) Extension of the Validity Period of TOR for Lower Siang HEP (2700 MW) in Arunachal Pradesh by M/s Jaypee Arunachal Power Ltd.

The project proponent requested the Ministry for the extension of their Lower Siang HEP (2700 MW) project in Arunachal Pradesh. The project proponent informed Ministry the following:

- The Ministry granted TOR extension to this project which ended on 6.5.2012 for enabling them to conduct public hearing which was not possible due to law and order problems.
- The problem still persists.

- Therefore, the project proponent has sought extension for another year on the same ground

The MoEF appraised the EAC accordingly. The EAC recommended for extension of validity for 1 year i.e. 31.5.2013.

(C) Extension of the Validity Period of TOR for Rupin HEP (45 MW) in Himachal Pradesh by M/s. Shri Bajrang Power & Ispat Ltd.

The project proponent requested the Ministry for the extension of the Rupin HEP (45 MW) project in Himachal Pradesh. The project proponent also informed Ministry the following:

- The Ministry granted TOR to this project on 13.9.2010 and the 2 years validity period ended 13.9.2012.
- No parameter is changed & no change in the scope of the project.
- The draft EIA/EMP Reports for the project have been prepared and likely to be submitted to the SPCB for conducting public hearing. The project proponent informed that the same would be completed in another 1 year time.

The MoEF appraised the EAC accordingly. The EAC recommended for extension of validity for 1 year i.e. 30.9.2013.

(D) Extension of the Validity Period of TOR for Chirgaon-Majgaon HEP (60 MW) in Himachal Pradesh by M/s. Himachal Pradesh Power Corporation Ltd.

The project proponent requested the Ministry for the extension of their Chirgaon-Majgaon HEP (60 MW) project in Himachal Pradesh. The project proponent also informed Ministry the following:

- The Ministry granted TOR to this project 29.10.2010 and the 2 years validity period ended 29.10.2012
- No parameter is changed & no change in the scope of the project.
- 4 season data for flora & fauna 1 studies have incorporated which took additional field visits and EIA/EMP reports are under finalization and will be submitted to the SPCB for conducting public hearing. The project proponent informed that the same would be completed in another 1 year time.

The MoEF appraised the EAC accordingly. The EAC recommended for extension of validity for 1 year i.e. 31.10.2013.

(E) Dhaulasidh HEP (66 MW) Project in Hamirpur and Kangra Districts of Himachal Pradesh by M/s Satluj Jal Vidyut Nigam Ltd – Environmental Clearance.

The EAC in its meeting held on 20-21st July, 2012 considered this project. The committee was satisfied with responses and recommended EC for the project subject to submission of the updated avi-fauna list and revised report on the basal area

calculation for the record purpose. Based on the request of the project proponent, the EAC was informed the following:

- The project proponent has submitted the requisite information and the Ministry, after getting clearance from the EAC will process for issuing the EC.
- The updated avi-fauna list and revised report on the basal area calculation shown to EAC and found to be in order.
- The project proponent has also brought to the notice of the Ministry that they have, after going through the minutes of 59th EAC minutes, found a discrepancy in terms of environmental flow in lean season period. The correct figure of 6.7 cumec has been recorded as 27.6 cumec, probably due to typographical error.
- The above issue was examined in the Ministry by cross referring to documentary evidence and figures on hydrological series. This figure, based on norms being adopted by EAC, as informed by the project proponent confirms to 20% - 30% of the average of non lean season period, 20% of lean season flow and 30% of monsoon flow. In view of this, there appears an overlapping of figure which has been shown as November-May as well as April-May and thereby leading to confusion by way of indicating 2 different figures for the same period. Therefore, the figure of 27.6 cumec which appears in the minutes corresponding to April – May appears unwarranted.

The Committee noted that the percentage norms with regard to environmental flow are correct and the Environmental Clearance for the project may be issued indicating three different set of figures of environmental flow instead of 4 set of figures which appears to be wrongly recorded

2.7 Lurhi HEP (775 MW) in Shimla, Kullu and Mandi Districts of Himachal Pradesh by M/s. Satluj Jal Vidyut Nigam Ltd–Reconsideration for Environmental Clearance (J-12011/27/2007-IA-I)

The project proponent made a detailed presentation on the project. The project was earlier considered by the EAC in its meeting held on 30-31st March, 2012. The detailed and salient feature of the project was brought out in the minutes of the 56th EAC meetings. This is a run-of-river scheme project. The project lies in three Districts of Himachal Pradesh i.e. Shimla, Kullu and Mandi. The project envisages to harness the power potential between D/s of Rampur Project (412 MW) and u/s of Kol dam (800MW). A concrete gravity dam of 86 m high is proposed to be constructed across Satluj river near village Nirath in Distt. Shimla of Himachal Pradesh above deepest foundation level to generate 775 MW of hydropower. The total submergence area is 153.05 ha. The length of reservoir will be 6.8 km with gross capacity of 35 Million m³ which will also act as desilting chamber.

The Satluj River water will be diverted through two parallel Head Race Tunnels of 9.0 m dia having length of 38.14 km. The water will be restored back in Satluj river at EL 642.0 m through parallel Tail Race Tunnel of 9.0m dia having a total length of 454 m on the right bank of river Satluj. The design net head, design discharge and designed flood are 181m, 480 cumec and 8000 cumec, respectively. A total of 3117GWh design energy will be generated in a 90% dependable hydrological year (2000-01) for 95% installed capacity. An underground powerhouse is on the right bank of the river near Marola village with 4 units of

193.75 MW each.. The estimated total cost of the project is Rs. 4795 Crores of which Rs.313.12 Crores will be for EMP and construction period will be 90 months.

The total land requirement for the project is 380.3175 ha., Out of which Govt./forest land is 181.5369 ha and private land is 109.1598 ha excluding the 77.99 ha of river bed land which is not included in physical acquisition. In addition, 89.6208 ha of notional land will be required for underground components of the project.

The Public hearings for the project was conducted at Nirath (District Shimla); Khegsu (District Kullu) and Parlog (District Mandi) on 5.5.2011, 6.5.2011 and 9.8.2011 respectively

The total catchment area of Satluj River up to the proposed dam site is 51,600 sq km of which about 14,774 sq km lies in Indian territory. Total free draining catchment area of the project from the dam site of Rampur HEP project near Rampur to Luhri dam site at Nirath is around 797.14 sq km. The CAT plan was prepared for free draining area as well as the area between dam site to power house site. Total cost of CAT plan is Rs. 124.66 Crores

A total of 84 species of plants were recorded from the project areas, out of which 12 were trees, 18 shrubs and 54 herbs. The forest types in the project area are Northern dry mixed deciduous to temperate. Along the river on both the banks of Satluj the region is either barren or there are only scrubs. At higher altitudes there are patches of *Pinus wallichiana*. The hills at the powerhouse is covered with scrub. The submergence area has only scrub forest except at two or three places, where there is plantation of Eucalyptus. As there is no rare, threatened or endangered plant species observed in the project areas, no impact is anticipated on such plants.

A total of 24 species of mammals (11 species of Order carnivore, 3 species of Order Artiodactyla, more than 5 species of group Rodentia, 1 species of Order Lagomorpha) and more than 100 species of avifauna (come from 11 orders and 28 families) have been reported from the influence area. A total of 54 species of birds were recorded from the project component areas, of which 27 species were common in all seasons. None of species of birds belong to the endangered and vulnerable category.

A total of 24 villages, 2337 of land owners, and 468 of Project affected families belongs to 6 tehsils of 3 districts are likely to be affected due to this project. A total of 37 families will be displaced. A total allocation of Rs. 100.52 Crore has been provided for implementation of R&R plan including Rs. 73.90 Crore under LADC are proposed.

The total release to the D/S of the dam is adequate during 2nd 10-daily in June through the 1st 10-daily in September in the 90% dependable year. But during the entire remaining period, it is 20% of the average lean season flow that should have been 25% of the average flow during the months of April, May, October and November; and 20% of the average lean season flow during the four lean months. This will be possible by slightly reducing the flow diverted towards the power house, which will entail some generation loss.

As regard to environmental flow (EF), a 20% of the lean season flow of 19.73 cumec will be released downstream to maintain the aquatic ecology at the downstream of the project. For assurance of this flow a small power house is proposed in dam body with installed capacity of 7 MW.

A total of 18 fish species have been reported within the influence and project areas. Only three were found to be exclusively located within the Satluj River and the rest were found well distributed in its tributaries upstream of the proposed dam site. None of the fish species found in the project area is included under the IUCN red list, however, as per CAMP-BCPP criterion 9 species have been categorized under 'endangered' and 'vulnerable' category. None of the fish species reported in Satluj river and its tributaries are endemic to this basin. For the management of fish fauna a proper fisheries enhancement plan is proposed with the consultation of H.P. Fishery Department with total outlay of Rs. 3.47 Crores.

The selection of all the muck dumping sites (except DS 10 at all RDs) satisfies the current norm of 30 m minimum distance from the river bed at HFL. However, it was noted that in some of the sites, the land slope between the retaining wall and the river bed at HFL (e.g., DS 2 at all RDs, Ds 3, DS 4, DS 5, DS 6 at '0' RD, etc.) is too steep and in all such cases and also for DS 10, the retaining wall has to be stronger.

The project is likely to generate a total of 26,75,594.84 m³ of muck (with 45% of swelling factor) due to excavation. About 30% of this generated muck will be utilized as construction material. The remaining muck (88,72,916.35 m³) will be dumped at 13 designated dumping sites with total capacity of 90,45,704.77 m³. An RCC retaining structures up-to the requisite height will be provided to ensure that muck does not roll down to river. An amount of Rs. 23.59 Crores have been allocated for proper disposal and rehabilitation of muck.

While the EAC was generally satisfied with the clarifications and additional information provided by the project proponent in response to observations made in earlier EAC meeting, concern was expressed due to long riverine stretch being affected due to tunneling. Therefore, the EAC emphasized on the special need to maintain a reasonable flow in the diverted stretch over above the 20% during the lean period. It was also revealed that in the downstream of the dam up till the power house, there is no significant contribution in flow through nallas etc. The Committee felt a need of a minimum environmental flow of 25% of average of four lean months during lean period considering a longer diverted stretch in order to maintaining the ecological balance in the river. Accordingly, during monsoon period average release should be 30% of the monsoon flow and 20-30% release during non-lean and non-monsoon periods. A downstream study preferably by CIFRI and WII may be carried-out in a holistic and integrated manner to determine the minimum environmental flow required to be maintained for all season to ensure ecological integrity of the river.

After detailed deliberations, the Committee recommended the environmental clearance for the project subject to the following conditions:

- The river holds coldwater mahseer and snow-trout fishes, which need Flow-through Indoor hatchery system with hatching trays, troughs and feeding troughs. Therefore the Fishery Management Plan need be revised with provision of Flow-through Indoor hatchery system.
- A site specific study may be carried-out for establishing the proper environmental flow release during monsoon, non-monsoon and lean months corresponding to the 90% dependable year. Release of minimum environmental flow must mimic the pre-dam flow pattern of the river for sustaining the aquatic bio-diversity together with downstream user need and accordingly, water withdrawal for power generation is to be regulated. A minimum environmental flow of 25% of average of four lean season months shall be released. During monsoon period, average release should 30% of the monsoon flow

including spillage, during monsoon period and release during non-monsoon and non-lean period should be 20-30% of average flow corresponding to 90% dependable year.

- A downstream site specific study preferably by CIFRI and WII may be carried-out in a holistic and integrated manner to determine the minimum environmental flow required to be maintained to ensure the ecological integrity of the river taking into account water requirement for various other downstream uses.

2.8 Appraisal of Draft Report on Study of Siang River Basin in Arunachal Pradesh by M/s. Central Water Commission & M/s. R. S. Technologies Pvt. Ltd.

The Central Water Commission, Government of India has undertaken the task of conducting Environmental Impact Assessment (EIA) Study for Siang and Subansiri river sub-basins in Brahmaputra river valley with an objective to assess the cumulative impacts of hydropower development in the basin. The Expert Appraisal Committee (EAC) for River Valley and Hydroelectric Projects of MoEF has approved the Terms of Reference (TOR) for the study. The CWC awarded the work to M/s. RS Envirolink Technologies Pvt. Ltd., Gurgaon (RSET) to undertake the work of Cumulative Environmental Impact Assessment of Siang basin during December 2011 based on techno-commercial bidding. The Interim report has been prepared and submitted to CWC which in-turn requested the Ministry to place before the EAC for review and mid course correction, if required.

The Central Water Commission and M/s. R.S Technologies Pvt Ltd. have made a detailed presentation on the interim report. The Committee noted/ observed the following:

The Siang River originates as Tsangpo river from Mansarovar near Mt. Kailash in the Himalaya, flows via Tibet, China, India and Bangladesh into Bay of Bengal. Study area for CEIA is Siang basin in India up to the confluence with Dibang & Lohit Rivers, and thereafter it flows as Brahmaputra. Total study area is about 14965.30 Sq. km. In terms of hydropower power potential, the basin has over 18000 MW of power potential, which is planned to be harnessed by setting up about 45 hydropower projects spread throughout the basin. Forty projects totalling a capacity of about 8193 MW has already been allotted by state government to a number of developers and two major projects viz. Siang Upper Stage-I (6000 MW) and Siang Upper Stage-II (3750 MW) are being investigated by NTPC. The CWC mentioned that a proposal is under consideration to combine these two as a single storage project. Out of 45 planned projects, two have been awarded environmental clearance, public hearing have been conducted for two projects for which environmental clearance are to be obtained. And 14 projects have been accorded scoping clearance and are at various stages of investigation.

The longitudinal profile of the main Siang River and its tributaries have been presented. On main Siang river, the reservoir of Lower Siang HEP spreads for about 77.5 Km, followed by reservoirs of Siang Upper Stage-II and Stage-I for 57 Km and 74 Km respectively i.e. total river length in reservoirs will be 208.5 Km without any free flowing river stretch in between. On Siyom river, there are six planed projects in cascade affecting 90 Km of river stretch (63.5 Km in reservoirs and 26.5 Km in tunnels) without significant free flowing river stretch in adjacent projects. Similarly 7 projects are planned on YargyapChhu in cascade.

The EAC asked the consultants to examine the impact of cascade development in detail and make recommendation on requirement of free flowing river stretch between adjacent projects along with assessment and quantification of environmental flow.

The consultants presented the location and spread of three protected areas in the basin viz. D'Ering Memorial Wildlife Sanctuary, Mouling National Park and Yordi-RabeSupse Wildlife Sanctuary. In addition, part of DibangDihang Biosphere Reserve is spread in the northern part of the Siang basin. The Committee enquired about the projects in the vicinity (10 Km radius) of the protected area and asked to study their impacts and make necessary comments and recommendations in the final report.

The Baseline data collection requirement was discussed in detail and it was confirmed that the data collection work both from primary and secondary sources have been completed for all the parameters. Substantial primary data have been collected through field surveys and sampling for flora and fauna; water quality and aquatic ecology including fish fauna. Data compilation and analysis work is under progress. As the size of the study area is large and baseline data is substantial, consultant discussed the approach of dividing the basin into 11 sub-basins so that data analysis and impact assessments can be structured sub-basin wise. Committee appreciated the approach.

To assess the environmental flow requirement, the consultant had presented the methodology and approach. Habitat Simulation and hydrodynamic modelling is being carried out for individual projects, wherever, river cross sections are available and also the flow data for the project. Wherever applicable, CWC approved series is used as an input to the model. So far the modelling is done for lean season for seven proposed projects on Yargyap Chhu for lean season flow release requirement. Output parameters derived for 10% to 50% flow release scenarios based on the average of four leanest months flow in 90% dependable year.

The EAC asked the Consultants to take comprehensive view of the environmental flow assessment and make final recommendations for each stretch. Committee asked to study international literature available on the subject and use the best suitable methodology for this exercise suiting to Indian conditions. The Consultants said that most appropriate method such as Building Block Methodology would be used by them. Detailed habitat simulation modelling for the entire year needs to be considered so that flow release requirement can be established not only for lean season but also for monsoon season and other months.

The Study of the downstream impacts due to change in flow regime downstream of lower Siang HEP up to the confluence with Brahmaputra is part of the scope and it was done by using Mike 11. The model is set up for about 150 Km of the river stretch including 74 Km along Siyom river. Peaking impacts were simulated by considering operation of Middle Siyom and Lower Siang projects. Another scenario considered was operation of Upper Siang Stage I also along with these two projects. Diurnal flow variation in lean season will be of the order of 178 cumec for 20 hours to 4970 cumec (peaking discharge in lean season) for four hours when lower Siang is operational. The flow will get normalised to about 1100 cumec at about 100 Km downstream i.e. after the confluence with Lohit and Dibang. Average lean season flow in the absence of projects is 890 cumec at the diversion site of Lower Siang HEP. Committee asked to make detailed assessment and discuss the impacts of change in flow regime in downstream reach. The Consultants were also asked to study recommend on silt management considering “no dam” and “with dam” scenario as silt substantially impact the ecology and cause sedimentation particularly when its velocity is affected d/s due to construction of dam.

The Committee noted that considerable amount of valuable secondary and primary data have been generated on various parameters in the draft report. Sampling locations have been shown in separate maps. Numerous relevant Research papers, Reports, etc have been

cited along with the supporting data. Illustrations and maps are adequate and relevant and of good quality (except a few) in the draft Report.

After detailed deliberations, the Committee asked the Consultants to incorporate the following in the final report:

- The study has to be carried-out strictly as per the TOR. Source of information have to be revealed and recommendations have to be supported/backed by scientific data and evidential proof.
- Study the impact of cascade development and make recommendations on the requirement of free flowing stretch between two projects. Ecological inventory and geomorphology for different stretches of river to be delineated.
- Information on river stretch affected and forest area affected by each project needs to be modified to include additional details of catchment area; total forest area of the sub basin and the area getting affected and total river length, stretch affected and free flowing.
- Undertake environmental flow release assessment for the entire year i.e. covering lean, non-lean non- monsoon and monsoon periods, based on methodology such as BBM and make recommendations for each stretch.
- Hydro Dynamic Study for assessment of Environmental flow release should be linked with the fauna, habitat requirement for assessment of environmental flow releases for entire year.
- Modelling study carried out to assess the impact of peaking discharge should be concluded with recommendations for mitigation of such impacts. Options of reducing the peaking discharge should be considered to mitigate impacts.
- Downstream impact study should be done up to Guwahati. Ramping study for peaking discharge release may also be carried out.
- Impact of sand mining, boulder mining, etc need to be included in the study.
- Land use and land cover change detection study at an interval of five years should be included as one of the recommendations. The same should be sub basin wise.
- Sampling sites, forest cover and forest type should be listed and illustrated sub basin wise. Endemic species of fishes in Siang basin may be tabulated.

The Committee also observed the following for necessary compliance by the consultant:

- Study should be compatible with similar study conducted internationally.
- It was informed that BBM would be applied in addition to other applicable methodologies for working out EFR. The Consultants while submitted that public hearing as such is not a part of the study as per ToR, informed that BBM entails expert and stakeholder's consultations and would be followed.
- It was pointed out to the Consultants that Scientists agree that the flow requirement vary from site to site for the same species. This implies that in any study, hydraulic structures would need to be assessed on an individual basis by supplementing the data and expertise with locally available information and expertise. The BBM makes use of the opinion from two domains/knowledge; physical scientists such as hydrologists, hydro-geologists and geomorphologists; and biological scientists such as aquatic ecologists. The Consultants agreed that required experts would be deputed for this purpose.

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- Due to construction of a number of projects what will be impact on overall balance of sediment, need to be included in the report.
- The main objective of the study is to bring out the impact of dams being planned on the main Siang River and its seven tributaries on **terrestrial and aquatic ecology, plant and animal biodiversity, including wild life, hydrology of the basin, etc.** However, the Draft Report does not seem to critically synthesize and analyse the probable impacts of a total of 45 dams proposed in the Siang Basin on Main Siang River (3 projects) and its tributaries viz. Siyom (6), Yamne (4) and Simang (2) and Yargyap Chhu (7), Ringong (3), Tagurshit (2), Pitgong (2), Hirit (2). At the end of the Report there should a separate Chapter synthesizing the results of each component so that a holistic picture of impacts could be emerged which should lead to Recommendations. One of the recommendations should be to undertake change detection study in land use/land cover of the basin at least at an interval of five years.
- The report may also include impact assessment should also include "Impacts due to construction of approach roads for the HEPs".
- Source of secondary information used in the report/to be used in the report should be revealed and credit given accordingly.
- Detailed maps of each Sub-Basin have to be provided separately for each parameter such as forest cover, forest type, vegetation, location of sampling sites, etc. For each forest type it will be appropriate to give altitudinal range (for some it is given), its location in Siang Basin/ Sub-Basin in separate maps.
- For betterment of analysis, it may be appropriate to categorise dams as Operational/ Under Construction/ EC, Scoping, Not Allotted yet, No information available etc. This will facilitate decision making on dropping of any dam, should it be required from environmental angle.
- Separate details of each dam given under Tables 3.3 to 3.22 be given under separate Annexure and only the most relevant information may be included in a comparative Table in the main text.
- **Table 3.23 River Reach And Forest Area Affected** need to be modified to include additional details of catchment area, total river/ tributary length, total forest area, etc. so that it becomes easier to undertake an analysis with regard to river length and forest cover lost due to projects on Siang and its tributaries. For example, the following format may be considered:

SN	Main River	Tributary	Total length of river/tributary (km)	Total Catchment Area (Sq km)	Total Forest Area (ha)	Proposed HEP and its capacity	Total length of river/tributary (km)		Total forest area affected		Status of EC
							Affected	Free Flow	Affected (ha)	% of Total	
1	SIANG		295.5			1. Siang Upper Stage-I; 6000 MW	74		5625		Yet to be allotted
						2. Siang Upper Stage-II; 3750 MW	57		4139		Yet to be allotted
						3. Siang Lower; 2700 MW	106		6414		Scoping
		TOTAL	295.5			Three HEP; 12,450 MW	237	57.5	16,178		
		1. Siyom	180			1. Middle Siyom; 1000 MW	16.27				EC
						2. Naying; 1000 MW	15.10				Scoping
						3. Tato-II; 700 MW	8.20				EC
						4. Hirong; 500 MW	13.77				Scoping and PH
						5. Jarong; 90 MW	5.04				-
						6. Taiyong; 56 MW	2.46				-
TOTAL	180			Six HEP 3,346 MW	54.84						
2. Yargyap											

- *Area between Ribbing and Pangin to Area beyond Mechuka and its environs:* Each such location should be shown in a Map giving details of Basin/Sub-Basin and the area of study as otherwise it may not be possible to know where exactly this area lies and how large or small it is along with altitudinal range of the area of study.
- *FLORISTICS:* Prevalence of Endemic species which make the area hot spot of biodiversity has been touched upon very briefly only at the end. A separate detailed treatment for Endemics and RET species have to be provided.
- Occurrence of Orchids, bamboos and canes should be dealt with separately as quite a few of them are endemic species. List of bamboos and canes provided in Table 5.13 appears to be incomplete as there many more species. There should be separate list of Orchids.
- *Pteridophytes:* BSI has reported 452 spp. from Arunachal Pradesh. But from only 48 spp. Have been reported. *Table 5.5 contains List of Pteridophytes reported..* reference / source of information may be indicated.

- *Lichens*: There seems to be a need of verification of only 15 species from Siang basin as the total species of 1162 number of species are reported from North-East. The picture of Lichen in Plate 5.5 found unidentified. From Arunachal Pradesh 331 spp. of Lichens (22 genera and 41 Families) have been reported. Identity of all the Lichen species mentioned in Table 5.7 is only up to generic level (except two). This may be expanded to Families.
- *Density and Dominance*: Though good account of density, abundance and biodiversity richness indices (Shannon-Weiner and IVI) of various species has been given Sub-Basin-wise but neither explanation has been given explanation nor inference has been drawn from the data/ values presented. This needs to be addressed.
- There should be detailed account of Taxonomic diversity (including monotypic endemic genera), Rarity and Endemism, Physiognomic Diversity and Phytogeography. Without these the critical evaluation of biodiversity richness in Siang Basin will be incomplete.
- *FAUNAL RESOURCES: Amphibia*: Only 7 species of Amphibians in Siang Basin has been reported. The number should be more as Amphibians are good indicator of faunal diversity richness. The source of such information has to be mentioned.
- *ANNEXURES: Annexure 1*: Columns for species and Family in the Table are found to be wrongly placed. This needs correction.

2.9 Teesta-IV HEP (520 MW) project in North Sikkim District, Sikkim by M/s. NHPC Ltd - for Reconsideration of Environmental Clearance

The project was earlier considered by EAC in its meeting held during 7-8th September, 2012.

The project proponent made a detailed presentation on the project and queries raised by the EAC earlier on the project. The committee further discussed the following two issues in detail:

- (i) Provisions made by Teesta-IV project for Dzongu Area
- (ii) Environmental flow to be released from Teesta-IV Dam

The proponent explained that the Dzongu area is a restricted one where settlement & business activities by outsiders are not permitted without permission of the Government of Sikkim. The state Govt. has already signed an MOA for development of Teesta-IV HEP project with NHPC. The project proponent has also explained that NHPC has proposed the following measures for minimizing the disturbance to the Dzongu area:

- The original location of the dam proposed by CWC was at Sanklang which was lying on Namprikdang mela ground. On request of the people of Dzongu and Govt. of Sikkim, NHPC has shifted the location of the dam from the said mela ground to about 3.5 km downstream near confluence of Runchu with Teesta.

- The FRL has been lowered by about 13 m, from El 768 m to El 755 m to avoid submergence of mela ground.
- To respect the cultural sensitivity of Lepcha community, layout of the project has been modified in such a manner that it will cause least disturbance on the surface e.g. Underground surge shaft to avoid construction activities on ground, single portal shall serve both the desilting basins & HRT to minimize construction activities on the surface at right bank.
- Access to intake & powerhouse area will be through two separate bridges to be constructed for this purpose and future running of the project. This will cause least interference with the local traffic on right bank PWD road in Dzongu area.
- All the infrastructural facilities like colony, site offices, stores, labour camps etc. will be constructed on the opposite bank of the river except contractor's temporary facility area.
- Nobody, except the persons on duty, will be allowed to stay on the right bank in Dzongu area during night as was done during construction of Teesta-V HEP and proper permission for entry into Dzongu area will be obtained as per rule.
- The list of fishes mentioned under Fishery Management Plan and reply to the clarification of the 60th EAC comments includes a number of species which need also be addressed for estimation of Environmental flow. Some of the reported fishes viz. *Anguilla bengalensis* and *Schizothorichthys progastus* are rare species hence needs proper mitigation measures for conservation.
- Again the rare fish of Kashmir rivers-*Schizothorichthys curvifrons* is mentioned from the river. As per research evidences, there is no record of availability of the fish from N-E rivers. Therefore there is need to seriously confirm the availability of the fish in the river Teesta by fresh field studies and proper identification. The availability of the fish was questioned during 60th EAC too.
- The river holds coldwater fishes including *Schizothorax richardsonii*, the coldwater fishes – mahseer and snow-trout need Flow- through Indoor hatchery system with hatching trays, troughs and feeding troughs. There is no such provision in the EMP submitted. Therefore the Fishery Management Plan need be revised with provision of flow-through Indoor hatchery system. This was also suggested in the 60th EAC meeting.
- Adequate provision for infrastructural developmental works in Dzongu area has been kept in the DPR/ EMP of Teesta-IV, viz. construction of footpath, water supply, sanitation, improvement of Namprikdang mela ground, construction of religious buildings like Gumpha/ Monastic school as per the request of the locals.

The project proponent has mentioned that as per TOR a site study on environmental flow (EF) has been carried out by National Institute of Hydrology, Roorkee (Hydrological Component) and Central Inland Fisheries Research Institute, Barrackpore (Biological Component). The NIH has found that minimum release of 5.2 cumec from the dam is adequate to meet the requirement of Class 'C' river. However, CIFRI, Barrackpore has recommended a minimum release of 10 cumec for sustenance of ecological integrity between dam and TRT during lean season. The CIFRI made a detailed presentation on the study. The committee appreciated the study done by CIFRI, however, the committee observed that the spill during remaining seasons is not adequate and as such CIFRI was asked to work out the environmental flow requirement for remaining seasons following widely accepted methodologies like BBM in an integrated & holistic manner (monsoon and remaining months) from the ecological point of view through the CIFRI.

The project proponent was asked by the Committee to submit the revised environmental flow calculations based on the revised study for further consideration by the EAC.

2.10 Request for revision of TORs for revised capacity from 149 MW to 267 MW (260 MW + 7 MW) for Such Khas HEP project in Chemba District of Himachal Pradesh by M/s L&T Himachal Hydropower Ltd – For Reconsideration.

The original project envisages construction of 52 m high concrete gravity dam across river Chenab near Pangi village to generate 149 MW of hydropower. This is a run-of-the-river scheme. The total land requirement is about 102 ha and that is entirely forest land. Total submergence is 65 ha. An underground powerhouse is proposed on the right bank of the river with 4 units of 37.25 MW each. Total cost of the project is about Rs. 912 Crores and will be completed in 70 months. This project was earlier given TOR on 20.9.2010 for 149 MW.

The project proponent has given a detailed presentation on the revised project for 260 MW. The committee noted that the revised proposal appears to be technically sound and more environmental friendly. The Committee noted that CWC & CEA have cleared the project for a capacity of 260 MW + 7 MW. The present dam site is proposed 850 m downstream of the earlier site. This will increase clear riverine stretch and would be closer to 1 km. The salient details now proposed vis-à-vis for the earlier scheme are as follows:

Details of items	149 MW Scheme	267 MW Scheme
Concrete gravity dam	52 m high	70 m high
FRL	2220 m	2219 m
MDDL	2210 m	2209.3 m
TWL	2210	2149 m
Gross storage	8.5 Mm ³	25.24 Mm ³
HRT	3.5 km	As dam Toe, no HRT
Design drawl	279.49 cumec	428 cumec
Land required	89 ha (Forest)	102.48 ha (Total)
Powerhouse	Underground	Dam Toe (Underground)

The increase in installed capacity is attributed to availability of higher discharge in the river based on approved flow series by CWC in June 2012, where 90% dependable year (1993-94) flow is derived as varying between 400 to 600 Cumec in June-September period, justifying a net power drawl of 428 Cumec. The consistency of the flow series is justified by referring to actual flow data (CWC) at downstream stations in J&K, Gulabgarh (8548 Km) and Benzwar (10687 Km). It has been noted that the downstream basin of 4000 Km² below Sach Khas gets annual rainfall up-to 3000-4000 mm against 1000 mm for basin upstream of Sach Khas and a derivation of yield from Benzwar is not hydrologically sound.

There is no free riverine reach upstream of reservoir tip (RL 2219 m) and downstream of the TWL (RL 2220 m) of Purthi project. Purthi is the upstream project of Sach Khas. A nominal 200 m as free flow stretch has been shown in the report between Purthi and Sach Khas. The EAC noted that Sach Khas project was conceptualized much earlier than the Purthi project. The EAC therefore, did not find the proposed Purthi HEP fit for awarding

scoping clearance at this stage as it is found interfering with Sach Khas and allowing practically no free flowing stretch. Chenab River in this reach has good fish species diversity and their need for sustenance has to be studied by a reputed institute. On the downstream a good 6 Km of free riverine stretch is shown up to the downstream Duggar project.

The Committee after critical examination of all relevant issues, recommended clearance for pre-construction activities and approved the TOR with the following additional TORs -

- The environmental flow release during the non-monsoon and non-lean month (Apr., May, Oct. and Nov) has been shown lower than the lean season release. A site specific study may be carried-out for establishing the proper environmental flow release during monsoon, non-monsoon and lean months corresponding to the 90% dependable year. Release of minimum environmental flow must mimic the pre-dam flow pattern of the river for sustaining the aquatic bio-diversity together with downstream user need and accordingly, water withdrawal for power generation is to be regulated. A minimum environmental flow of 20% of average of four lean season months shall be released. During monsoon period, average release should 30% of the monsoon flow including spillage and release during non-monsoon and non-lean period should be 20-30% of average flow corresponding to 90% dependable year.
- Also in the EIA/EMP reports, it has to be clearly indicated a 10-daily discharge table corresponding to the 90% dependable year giving column-wise discharge values of the flow intercepted at the dam site, the flow diverted for power generation and the downstream release including that for the dam toe power generation. The estimated flow intercepted from tributaries joining the river between the dam and the TRT discharge point may be given in a separate line sketches; one for the lean season average, one for the monsoon season average and one for the other four months average.

2.11 Kalisindh Major Irrigation Project in Shajapur District in Madhya Pradesh by M/s Water Resources Department, Government of Madhya Pradesh - For Reconsideration of ToR [J-12011/41/2012-IA-I]

The project was earlier considered by EAC in its 61st meeting held on 12-13th October, 2012.

The project proponent made a detailed presentation on the project. It is noted that the project envisages construction of a 22 m high earthen dam across Kalisindh river near Samaskhedi village in Shajapur District of Madhya Pradesh to provide for irrigation facility for 36,000 ha. area benefitting 171 villages. The Gross Command Area (GCA) of the project is 61,635 ha; culturable command area is 34,560 ha. The 75% dependable yield is estimated as 182.40 Mm³. About 43.71 Mm³ of water has been earmarked for meeting for irrigation requirements. The length of left bank canal is 81 km long and right bank canal is 80 km long and will irrigate 32,400 ha (Rabi 25920 ha & Kharif 6480 ha) of land in Shajapur & Rajgarh Districts

The total land requirement for the project is 4919 ha. The submergence area is 4239 ha. The total private to be acquired for the project is 4165 ha. and the remaining land of 666 ha is revenue land (Government) is generally barren. The non-revenue land/private land under submergence is 3573 ha. This includes culturable land of 1786 ha. Soyabean and

grams are grown in this area. Remaining 1787 ha is Gochar & Groves land. About 2005 families in 15 villages (7 partially + 8 fully) likely to be affected due to this project.

The water availability for the project is as follows:

Average annual Rainfall	1032 mm
75% Dependable Yield Approved by CWC	182.40 Mm ³
Live Capacity of reservoir	179.91 Mm ³
Domestic & Industrial and Future Irrigation Use	43.71 Mm ³
Crop Water Requirement including Losses	127.51 Mm ³
For U/S (Submergence) Irrigation (Rabi)	3.37 Mm ³
For D/S Water Releases	5.00 Mm ³
Balance Water	0.32 Mm ³

The cropping pattern of the proposed project is given as below:

S. No.	Name of Crop	% Area of CCA	Area (ha)
A.	Rabi Season		
1	Wheat	40	13824
2	Gram	30	10368
3	Oil Seed	2	691
4	Vegetables	3	1037
	Total (A)	75%	25920
B.	Kharif Season		
1	Soybean	18.75%	6480
	Total(B)	18.75%	6480
	Grand Total (A+B)	93.75%	32400

After detailed deliberations, the committee made the following observations:

- While preparing the EIA report, the issue of conjunctive use of surface and groundwater for irrigation should be addressed and elaborate such a plan and discuss its mechanism for implementation. In both EIA and EMP reports, the standard and uniform units should be mentioned and not dissimilar units such as sq. mile and ha-m used under 2.14, respectively for area and silt deposit.
- The soil survey report do not reflect any immediate soil-water problem after introducing irrigation. However, since an overwhelming portion of 90% of the command area has heavy soils, sustainability of irrigation will depend on how the water is managed. In this respect, proper CAD plan and OFD works are need to be explained in detail, in addition to scientific use of irrigation minimizing water losses. The EMP should contain adequate information on these aspects.
- The project area lies in the Deccan Trap which are uncofermably overlying the Proterozoic formation. The basalt is highly porous & fracture and highly jointed around the dam site. The chapter on morphotectonic aspect is not taken due care. Experts from geology/geophysics may be consulted for the estimate the thickness of the basalt.
- The available literature indicates morphotectonic activities due to the gravity high region may trigger the reservoir seismicity. The existing bore well in the vicinity of the project area may be used to monitor the pore pressure condition after the loading of the water in

the proposed reservoir. Morpho-tectonic map of the study area should be prepared to estimate the channel migration patterns.

The Committee after critical examination of all relevant issues, recommended clearance for pre-construction activities and approved the TOR with the following additional TORs -

Data Collection/Generation

- (i) **Detailed Methodology** followed for studying each parameter of all the components for baseline information; give techniques employed and instruments/equipments used should be indicated
- (ii) **Various Details:** Slope/Contour map, Drainage map; Soil Map, Sampling location map for all the parameters at least in 1:50,000 scale; along with FCC a pie diagram to show proportions of different land use/land cover patterns in the project area should be given
- (iii) **Source of Information:** The source of secondary information presented in the report in the form of references cited giving details of research papers, working plans, reports, Government documents, etc. should be given

Baseline Studies

- (i) **Biological Environment:**
 - Include forest types and their extent as per Champion & Seth (1968) Classification;
 - Vegetation profile to include all groups of plant species;
 - Also include IVI Index along with Shannon-Weiner Index;
 - Under economically important species also include “bamboos”
 - Under Endemic/ RET species include “as per IUCN Red List and BSI”
 - Faunal Elements: Terrestrial wildlife - also include “including Reptiles and Amphibians”
 - Ten (10) sampling locations are to be covered under terrestrial ecological survey
- (ii) **Water Environment:** Monitoring of pesticides, available nitrogen, available potassium & phosphorus be conducted in river Kali Sindh , downstream of command area.
- (iii) **Impacts during the Operation Phase - *Water Environment:*** Include Water-borne disease and their management, Aquatic weeds and their management, and water logging in command area and its management.
- (iv) **Kalisindh is a seasonal river**, which remains dry for some of the months in a year. Therefore, ecological flow release of certain percentage of the average lean season flow is not relevant. But for the other seasons and particularly during the monsoon season, there ought to be releases to the D/S of the dam to meet the riparian need of the population downstream. Such releases are to be quantified and discussed in detail during the EIA/EMP study.
- (v) Mapping of location of water harvesting structures in the Kali Sindh flood plains should be done
- (vi) Geospatial mapping of the flood plains to assess the riverine development should be carried-out and detailed geomorphological mapping for flood plains migration and paleochannels should also be done.
- (vii) Sample plan of one outlet covering water courses, field drains, irrigation channels, etc.

- (viii) Soil and water sampling locations be so selected that they are evenly distributed in the head, middle and tail reaches of canal network and the sampling locations are to be shown on a map.
- (ix) Detailed plan for covering 10% of the area command area under pressurized/drip irrigation, including its cost.
- (x) Under soil sampling, additional parameters e.g, soil pH of the saturation extract, Water Holding Capacity, Field Capacity, Wilting point, Calcium, Magnesium, Potassium, Sodium should be studied.
- (xi) Considering large number of project affected families (PAFs), a separate Social Impact Assessment Study to be carried-out.
- (xii) (xii) Govt of MP is to provide details of 666 ha of Government/ Revenue land – 666 ha as mentioned in Form 1.
- (xiii) *Environmental Sensitivity* is to be reassessed as forest is situated within 15km of the project and is likely to be affected and accordingly is to be brought out in the EIA/EMP.
- (xiv) *Command Area Map*: Proper details are to be provided with adequate sized captions for easy reading. Details of streams/nallahs, etc. and their discharge in d/s part of the river have to be given.
- (xv) Details of forest land likely to come under submergence have to be indicated. Details of forest land coming in project area are to be delineated. Because, there is fair likelihood that in the 1891 sq km of catchment area there would be some forest land.

3. Any other item with the permission of Chair

The Following General Points /issues were discussed:

(i) Disclosure of documents in MoEF website:

The need for disclosure of documents pertaining to ToR and EC in the portal of MoEF in connection with their consideration by EAC was emphasized. In this regard, relevant order of CIC was also revisited. Although, disclosure is being done but, sometimes due to a host of issues problems are encountered both in uploading and viewing these documents. It was felt that more care and attention would have to be given on this aspect by the MoEF. The EAC urged that it may be ensured that those projects are only considered for which soft copies have been displayed in the portal before the EAC meeting.

(ii) Multifarious services rendered by a river.

The civilization has traditionally grown and flourished on the banks of rivers, lakes and sea. Because, services provided by a river is immense and generally range from social, environmental/ecological, economic, livelihood, cultural, religious, and recreational and aesthetics etc. Efforts are to be made that the

humanity continues to get these facilities. These aspects are generally considered while carrying out EIA of HEP/RVP. But, a need was felt that the coverage of these issues is given more visibility and prominence in the EIA/EMP with a view to properly and adequately addressing them. Because, a river gets adversely affected as a result of construction of HEPs/RVPs and therefore, in addition to maintaining ecological integrity of the water body, the livelihood, cultural and religious issues are also to be effectively addressed.

(iii) Silt Management:

The silt is an integral part and phenomenon of Indian River. Silt transportation by river flow is important for various reasons. It is natural that construction, operation of HEPs leads to change in silt velocity and impact aquatic bio-diversity including geo-morphological characters. This is covered in the EIA studies but it was felt that a more in-depth study may be required. Therefore, silt management should find a dedicated chapter including “without dam” and “with dam” scenario. Prediction with reliable mathematical model in EIA/EMP delineating the most likely change and the measures to control adverse impacts due to such changes have to be given. Therefore, this aspect is to be addressed adequately in EIA/EMP by the project proponent.

(iv) Procurement of construction material:

A large quantity of construction material from surrounding of the project site such as earth, sand, clay, stone chips, boulders, coarse and fine aggregates are procured as a dam is generally big civil structure. This is compounded as due to poor initial connectivity of project site with city/market as it gives rise to a tendency to procure them locally. On the other hand, mining of such activities/material call for detailed EIA as these activities are potential to adversely impact the human and human environment. These being outside the main scope may get ignored and given short-shrift. Therefore, the EAC decided that the project proponent would include EIA of these mining activities too in the main EIA/EMP religiously, if these are found inadequate.

(v) Compliance of conditions:

The EAC noted that the Regional Office of MoEF presently monitors compliance of various conditions stipulated in ECs of various projects in a particular region. The Project proponent submits 6 monthly monitoring reports to the Regional Offices. In addition of occasional visit by Officers from MoEF HQRS, there are project-wise Multi-disciplinary Committee (MDC) also which is mandated to monitor the compliance regularly.

The EAC felt that the project proponents should upload in their web-site in addition to submitting hard copies of 6 monthly compliance reports. Also, State Government agency such as SPCB, State Environment Department may be requested to also undertake monitoring. Local Institutes may also be engaged for undertaking such monitoring.

(vi) Submission of Application for ToR Clearance:

All documents to be properly referred with index, page numbers and continuous page numbering. All photographs should invariable have date. Where data is

presented in the report especially in table, the period in which the data was collected and the source should invariably be indicated. Where the documents provided are in a language other than English, an English translation should be provided.

The Consultants involved in the preparation of EIA/EMP report after accreditation with Quality Council of India (QCI)/ National accreditation Board of Education and Training (NABET) would need to include a certificate in this regard in the EIA/EMP reports prepared by them and data provided by other organization/laboratories including their status of approvals etc. In this regard Ministry's circular No. J-11013/77/2004-IA-II (I), dated 02.12.2009 & J-11013/41/2006-IA (II) (I) dated 04.08.2009 are posted in the MoEF website, may be referred.

The meeting ended with vote of thanks to Chair

Annexure

List of EAC members and Project Proponents who attended 62nd Meeting of Expert Appraisal Committee for River Valley & Hydro Electric Power Projects held on 23rd - 24th November, 2012 in New Delhi

A. Members of EAC

- | | | | |
|-----|--------------------------------|---|-----------------------------------|
| 1. | Shri Rakesh Nath | - | Chairman |
| 2. | Dr. B. P. Das | - | Vice-Chairman |
| 3. | Dr. Aruna Kumar | - | Member |
| 4. | Dr. S. Bhowmik | - | Member |
| 5. | Dr. K. D. Joshi | - | Member |
| 6. | Dr. (Mrs.) Maitrayee Choudhary | - | Member |
| 7. | Shri G. L. Bansal | - | Member |
| 8. | Dr. S. K. Mazumder | - | Member |
| 9. | Dr. A. K. Bhattacharya | - | Member |
| 10. | Dr. Praveen Mathur | - | Member |
| 11. | Dr. J. K. Sharma | - | Member |
| 12. | Shri. B. B. Barman | - | Member Secretary & Director, MoEF |
| 13. | Dr. P. V. Subba Rao | - | MoEF |

B. Teling HEP (97 MW) Project in Lahaul & Spiti & Kinnaur Districts of Himachal Pradesh by M/s. Telling Hydro Power Pvt. Ltd.

C. Purthi HEP (300 MW) Project in Lahaul & Spiti & Chamba District of Himachal Pradesh by M/s. Purthi Hydro Power Ltd.

- | | | | |
|----|------------------------|---|---------------------------|
| 1. | Shri Naveen Alag, | - | Sr. Vice President |
| 2. | Shri Manoj Pradhan, | - | Additional Vice President |
| 3. | Shri P. S. S. Manian, | - | Vice President |
| 4. | Shri Ashok Kumar, | - | Vice President |
| 5. | Dr. Jainender Thakur , | - | General Manager |
| 6. | Shri Binaya Mishra, | - | General Manager |
| 7. | Shri Gurchetan Singh, | - | General Manager |
| 8. | Dr. Aman Sharma, | - | WAPCOS |

D. Hirong HEP (500 MW) MW Hydroelectric Power in West Siang District of Arunachal Pradesh by M/s. Japee Hydro Power Company Ltd.

- | | | | |
|----|------------------------|---|----------------------------|
| 1. | Shri P. K. Alagh, | - | Sr. Vice President |
| 2. | Shri Vatsal Chopra, | - | Jt. President |
| 3. | Shri Yogendra Sharma, | - | Additional General Manager |
| 4. | Shri, Jitendra Thakur, | - | Dy. Chief Engineer |
| 5. | Dr. Sisodia, | - | Geologist |
| 6. | Dr. S. P. Bhatt, | - | CISMHE, DU |
| 7. | Dr. D. C. Nautiyal, | - | CISMHE, DU |

E. Yamne Stage-II HEP from 60 MW to 90 MW in Upper Siang of Arunachal Pradesh.

- | | | |
|-------------------------|---|----------------------|
| 1. Shri Nipun Tayal , | - | Project Manager |
| 2. Dr. Aman Sharma, | - | WAPCOS |
| 3. Shri S. C. Sud, | - | Consultant Hydrology |
| 4. Dr. S. S. Garlima, | - | Sr. Vice President |
| 5. Shri Gagan Aggarwal, | - | Sr. Vice President |
| 6. Shri Manish Das, | - | Engineer |

F. Lurhi HEP (775 MW) in Shimla, Kullu and Mandi Districts of Himachal Pradesh by M/s. Satluj Jal Vidyut Nigam Limited

- | | | |
|--------------------------|---|------------------------------------|
| 1. Shri Satish Sharma, | - | General Manager (Project) |
| 2. Shri Arvind Mahajan, | - | Additional General Manager (Civil) |
| 3. Shri Ramanuj Verma, | - | Officer |
| 4. Shri Praveen Chandra, | - | Sr. Manager (C) |
| 5. Shri Shiraz Swan, | - | Sr. Engineer (E) |
| 6. Shri Ramesh Chopra, | - | Sr. Manager |
| 7. Shri Dinesh Nautiyal, | - | DU |
| 8. Shri R. C. Chopra, | - | Sr. Manager (C) |
| 9. Shri Rajeev Agarwal, | - | Sr. Manager (C) |
| 10. Shri Awadesh Prasad, | - | Manager |

G. Kalisindh Major Irrigation Project in District Shajapur of Madhya Pradesh by M/s. Water resources Department, Government of Madhya Pradesh

- | | | |
|-------------------------|---|-------------------------|
| 1. Shri R. S Julania, | - | Principal Secretary |
| 2. Shri D. K. Swarnkar, | - | Superintending Engineer |
| 3. Shri S. K. Nigam, | - | Superintending Engineer |
| 4. Shri Mukul Jain, | - | Executive Engineer |

H. Appraisal of Draft Study Report of Siang Basin in Arunachal Pradesh by Central Water Commission & M/s. RS Technologies Pvt. Ltd

- | | | |
|--------------------------------|---|---------------|
| 1. Shri Ravinder P. S. Bhatia, | - | RSET |
| 2. Shri G. Nagamohan, | - | Director, CWC |
| 3. Shri Vimal Garg, | - | RSET |
| 4. Shri N. N. Rai, | - | Director, CWC |

I. Teesta-IV 520 MW Hydro Power Project in North Sikkim District by M/s NHPC Ltd

- | | | |
|-----------------------------|---|---------------------------|
| 1. Shri Atul Kumar, | - | General Manager, NHPC |
| 2. Shri Vipin Kumar, | - | Chief (Env.), NHPC |
| 3. Shi Balraj Joshi , | - | General Manager (D&E) |
| 4. Shri A. K. Chaudhary | - | Chief Engineer (C), NHPC |
| 5. Shri S. L. Kapil, Chief, | - | NHPC |
| 6. Shri R. C. Sharma, | - | Chief (Geology), NHPC |

- | | | |
|-----------------------------|---|----------------------------------|
| 7. Dr. J. P. Bhatt, | - | Scientist, DU |
| 8. Dr. D. C. Nautiyal, | - | Scientist |
| 9. Dr. Doye Dawa, | - | Scientist |
| 10. Ms. Anitha Joy,
NHPC | - | Assistant Manager (Environment), |
| 11. Shri J. P. Patra, | - | Scientist 'B', NIH |
| 12. Ms. Bharti Gupta, | - | Deputy Manager (C), NHPC |
| 13. Shri Anish Gouraha, | - | Manager (E), NHPC |
| 14. Dr. S. K. Bajpayee, | - | Deputy Manager (E), NHPC |
| 15. Dr. A. K. Saha, | - | Scientist |

**J. Sach – Khas HEP of (260 +7) MW in Chamba District of Himachal Pradesh by
M/s. L & T Himachal Hydropower Ltd**

- | | | |
|---------------------------|---|--------------------------------|
| 1. Shri D. N. Kalita, | - | Deputy General Manager, L&THHL |
| 2. Shri Ratnakar Pandey, | - | Environment Manager, |
| 3. Shri B. Bhattachargee, | - | Joint General Manager, L&THHL |
| 4. Dr. Aman Sharma | - | WAPCOS |
| 5. Shri P. Kathiravan, | - | Additional General Manager |
