

Submission to the Ministry of Power regarding the financial viability related issues for the proposed Etalin Hydro Electric Project (EHEP)



Photo: Courtesy CIFRI Report on E-flows for Etalin HEP

The Forest Advisory Committee (FAC), In its meeting held on 23rd April 2020 discussed the issue of diversion forest land for the proposed 3097 MW Etalin Hydro Electric Project (EHEP) in Dibang valley of Arunachal Pradesh. Before taking a decision, the FAC has posed several questions to the Ministry of Power (MoP) regarding the necessity as well as financial viability of the concerned project. The undersigned independently carried out an analysis of the issues forwarded by the FAC to MoP and submitted the same to the MoP for their consideration while responding to the FAC. This is the full text of the submission. This submission clearly shows that there is no economic or financial rationale for the project, and urges the MoP that it should recommend to the FAC that the project need not be proceeded ahead with.

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Background and context

1. In its meeting held on 23rd April 2020 the Forest Advisory Committee (FAC) discussed the issue of diversion of 1165.66 ha of forest land for the proposed Etalin Hydro Electric Project (EHEP) in Dibang valley of Arunachal Pradesh by M/s Etalin Hydro Electric Power Company Ltd. As per the minutes of the said meeting, the FAC has posed several questions to the Ministry of Power (MoP) regarding the necessity as well as financial viability of the concerned project, which are reproduced below:

After thorough deliberation and giving due consideration to all facts and reports, FAC observed that it would be prudent that the inputs of the nodal Ministry i.e Ministry of Power, Government of India may be sought with respect to its stand regarding implementation of this project (EHEP) in view of:

- (i) the project is delayed by over six years and the country's energy plan might have changed during this period,
- (ii) large number of hydro-electricity projects are pending for environmental /forest clearance, and inter-se priority may be considered in view of minimising cumulative adverse impacts of the projects to be implemented in a given period of time in a given area; and
- (iii) tariff structure of this project which was already high at the time of proposal (2014).

It may also be got clarified that if the Ministry of Power wishes to consider the project for approval in its present form or some other decision on the project has been taken. In addition to it the FAC observed that:

2. In response to the issues raised by the FAC, our submission is as follows:
 - As suggested by the FAC, in the last 6 years the country's demand supply situation has indeed changed significantly with high level of renewable energy based capacity addition and excess thermal capacity. In fact, the country has been dealing with the challenges of surplus power, as around 15% - 30% of the installed thermal capacity in some of the states is being backed down annually¹.
 - The proposed project is not mentioned in the latest National Electricity Plan of 2018, which projects the country level demand and supply situation till 2027. Considering this and in the absence of a thorough and scientific demand-supply analysis of the concerned beneficiaries after evaluating all alternatives, the proposed project cannot be considered.
 - Cheaper alternatives such as solar PV and/or wind combined with battery storage systems, which are also environmentally more benign, are available to meet the

¹ <https://www.prayaspace.org/peg/publications/item/335-the-price-of-plenty-insights-from-surplus-power-in-indian-states.html>

same energy requirement at a much lower cost and with a much higher reliability. As the submission below highlights, the prices of solar PV system plus battery storing 25% of the PV energy are estimated to be around ₹ 3.94/kWh in 2020, ₹ 3.32/kWh in 2025, and ₹ 2.83/kWh in 2030. These tariffs are even cheaper than the levelized tariff of the proposed project of ₹ 4.32/kWh estimated in 2013. As highlighted below, the levelized tariff of the project after accounting for the delay of 6 years and using a more realistic estimate for e-flows would be in the range of ₹ 7 to 9 /kWh. Thus, there seems to be no economic rationale for allowing the proposed project.

- In spite of such apparent short-comings — excessively high costs, possibility of further delay and cost increase, and severely adverse environmental impacts vis-à-vis alternative sources — if the proposed project is still allowed to be considered further, then it should be done only after undertaking a due public process for this purpose by making all the relevant documents and underlying assumptions public, and giving people enough time and opportunity to comment on the same.

The following paragraphs provide further details to substantiate the above-mentioned points.

2013 Concurrence has expired and a fresh one can be issued only after accounting for the present demand-supply situation and cost of alternative options

3. As per Section 8 (1) of the Electricity Act, 2003, any generating company intending to set up a hydro generating station is required to seek concurrence of the Central Electricity Authority (CEA). With regard to the objectives, scope and validity of the concurrence, the 2014 Guidelines for accord of concurrence to Hydro Electric Schemes submitted to the CEA under Section 8 of the Electricity Act, 2003² state as follows:

...

3.3 To meet the objectives at 3.1 and 3.2, it should be ensured that Hydro Electric Scheme:

(i) meets the requirement of the best ultimate development of the river basin as provided in the National Electricity Policy and National Electricity Plan.

...

(vi) is either included in National Electricity Plan drawn by the Authority under Section 3(4) of the Act or results in generation of power at reasonable tariff.

...

6.0 Validity of concurrence

In case the time gap between the concurrence to the scheme by the Authority and the actual start of the work of the project by the generating company is three years or more, a fresh Concurrence of CEA shall be obtained by the generating company before the start of actual work. Revalidation of Concurrence can also be considered, in case the reasons for not starting of works are beyond the control of generating company. However, proposal for revalidation shall be submitted three months before the expiry of validity of Concurrence which is three years from the date of issue of Concurrence letter. (Emphasis added)

² http://www.cea.nic.in/reports/others/hydro/hpa1/guidelines_accord_he.pdf

It is understood that the CEA had accorded its concurrence for the proposed project in July 2013. However, this concurrence can no longer be valid, unless it was renewed or reissued based on updated cost estimates.

4. Regarding project appraisal and validity of the concurrence, the January 2015 Guidelines for Formulation of Detailed Project Reports for Hydro Electric Schemes³, their Acceptance and Examination for Concurrence state as follows:

...

2.1 Justification of project from power supply-demand considerations on all India / regional basis

2.2 Details of scheme for wheeling evacuating power

2.3 Resources for power development in the region/state.

(i) Coal resources

(ii) Hydro resources

(iii) Renewable resources

2.4 Available generating capacity in the state/region from different sources

2.5 Peak load and energy requirement in future in all India/region/state up to the likely date of project completion.

...

4.1.4 Aspects to be appraised

...

vii. Justification of the Project: The Authority examines the need/ justification of the project from anticipated power demand (both energy and peak) and reasonability of tariff of energy generation.
(Emphasis added)

5. The above extracts highlight the following points:

- The 2013 concurrence has expired and the project developer will need to obtain a fresh concurrence based on revised costs and the changes in demand-supply situation.
- The DPR for seeking a fresh concurrence would need to be filed in accordance with the January 2015 Guidelines mentioned above and hence would need to provide detailed justification for the project after considering power from all potential sources and supply-demand considerations on all India and regional basis.
- The proposed project should either be included in the National Electricity Plan or its tariff should be economically attractive enough for it to be considered otherwise.

Based on the publicly available data, it is not clear if any fresh concurrence has been issued. The proposed project is not mentioned in the latest Nation Electricity Plan published in January 2018, and as this submission argues in the following paras, the tariff is likely to be much higher than the available alternatives and thus, it makes little economic sense to allow the proposed project.

³ http://www.cea.nic.in/reports/others/hydro/hpa1/guidlines_dpr_he_ver5.pdf

Explicit undertaking from beneficiaries after making them aware of potential cost increases is essential

6. The MoP is the apex ministry and is responsible for the overall policy direction for the power sector. But any decision pertaining to contracting of capacity need to be approved by the concerned electricity regulatory commission after conducting a detailed analysis of demand supply situation and comparing cost of the proposed generating station vis-à-vis all possible alternatives to ascertain that it is the least cost option. In this regard, the Rule 8 of Electricity Rules 2005 states as follows:

8. Tariffs of generating companies under section 79- *The tariff determined by the Central Commission for generating companies under clause (a) or (b) of sub-section (1) of section 79 of the Act shall not be subject to re-determination by the State Commission in exercise of functions under clauses (a) or (b) of sub-section (1) of section 86 of the Act and **subject to the above the State Commission may determine whether a Distribution Licensee in the State should enter into Power Purchase Agreement or procurement process with such generating companies based on the tariff determined by the Central Commission.***

7. As power from the proposed project would be contracted by electricity distribution companies (discoms) of beneficiary states, it is the concerned State Electricity Regulatory Commissions (SERC) that would need to decide the need and prudence of the proposed project. Only pursuant to a clear order in this regard from the respective SERC(s) can any further steps with respect to the project development be considered. At present, since the beneficiaries are not known it is not clear if such a process has been undertaken. Even if such process has been undertaken in 2013, in light of the recent developments and the increase in the tariff of the proposed project on account of delay of 6 years, a fresh undertaking from the concerned SERC(s) is essential before taking any further steps.

Need to evaluate demand-supply situation and consider alternative sources

8. One of the prerequisites for any capacity addition decisions is to undertake a detailed demand supply estimation and to evaluate all the possible alternatives, so that the least cost and most economical option can be selected. It is for this particular reason that the fact sheet that is to be submitted as a part of the forest clearance process has a specific question such as: *“Justification for locating the project in the forest area giving alternatives examined and reasons for their rejection.”*
9. As per the fact sheet for the concerned project uploaded in April 2020, the response to the above question is as follows:

“The capacity addition requirement during 12th plan on All-India basis is 75,785 MW comprising of 9,204 MW from Hydro sector. The likely Hydro capacity addition of 9,204 MW during 12th plan includes 4,177 MW in North East Region (NER) and Sikkim (2,810 MW capacity additions in NER and 1367 MW in Sikkim). This includes 2,710 MW for Arunachal Pradesh. Also, the capacity addition requirement during 13th plan is 93,456 MW, comprising of 12,006 MW from Hydro sector. Arunachal Pradesh state plans to harness its enormous natural resources like forests and hydro power and exploit its mineral wealth to usher in an era of economic development. Considering the Projected Hydro capacity addition programme during 12th plan (9,204 MW) & 13th plan (12,006 MW) (Source: CEA), new schemes have to be taken

up immediately and implemented to derive timely benefits. The most important source of power development in the north-eastern region is Arunachal Pradesh and other sister states.

Considering the growth of peak demand and anticipated addition of generating capacity in the state, the region and the country, and also from the current status of development of hydro power potential of Arunachal Pradesh, it is pragmatic that earnest efforts are made for developing the hydro power sector of the state. Implementation of Etalin Hydroelectric Project of 3097 MW capacity would contribute significantly towards meeting this objective. The project is viable not only due to the reasonable tariff of Rs. 4.91-1st year tariff & Rs. 4.32-tariff for 35 years but also because the project is run of the river scheme and affects no other projects or catchments. The project has the support of the local populace and has no major environmental issue. In addition, it has remarkably favourable geological conditions for the region.”

10. The above response to such a crucial question in the fact sheet is not just outdated but also totally irrelevant. It cannot be a mere oversight that even in 2020 the project proponent has failed to update its response since 2013. Even then, there is absolutely no specific detail which makes a case for the proposed project. Apart from some general statements about the country's power situation in 2012, there is nothing of relevance in terms of justifying the need or appropriateness or cost competitiveness of the proposed project in 2020. Such careless manner of dealing with important issues concerning the very need and purpose of the proposed project underscores the grave apathy and lack of seriousness in engaging with such crucial processes. The fact that such a response is allowed to be filed is in itself a mockery of the process and we hope that the FAC and the MoP will take serious note of this lapse and take appropriate action in this regard.
11. While the 13th plan itself never materialised and the proposed project is not mentioned in the latest National Electricity Plan published by the CEA in January 2018. Thus, no national level planning process has considered the said project. Even assuming though not admitting that the project were a part of any such a broader national plan, in order to consider actual implementation, it would still be essential to undertake a thorough demand-supply analysis of the concerned beneficiary states to understand whether this kind of capacity addition is necessary and whether it is also economical considering other potential alternatives.

Economically cheaper and environmentally benign alternatives are readily available

12. Hydropower capacity addition is often justified on the grounds of its flexibility and ability to meet peak demand. However, such a general feature of hydropower capacity cannot be the basis for locking in huge public investments without validating whether such benefits can be achieved through other cheaper means. In this regard, it is pertinent to note that even the existing hydropower capacity is not being utilised most effectively. As per the Forum of Load Despatchers India report on “Operational Analysis for Optimization of Hydro Resources & facilitating Renewable Integration in India”⁴ there is a potential of 4200 MW of additional

⁴ <https://posoco.in/download/fold-posoco-report-on-operational-analysis-for-optimization-of-hydro-resources/?wpdmdl=14168>

peaking support from the existing fleet of hydro generation at national level. Such least cost options need to be fully explored before locking any new resources.

13. Another truism regarding desirability of new hydropower capacity is its role in the grid integration of renewable energy sources, which are intermittent in nature. This is true in theory, but desirability of any new hydropower project also needs to be seen in the context of its huge resource requirements, high costs and adverse social and environmental impacts. Excessive costs of new hydropower capacity are rendering it as a non-economical option for managing intermittency of renewable energy sources. This is illustrated by the following points.
14. The report published by the MoP titled “*GREENING THE GRID: Pathways to Integrate 175 Gigawatts of Renewable Energy into India’s Electric Grid, Vol. I—National Study*” says as follows in this regard:

Availability of Hydro Neither Helps Nor Hinders RE Integration

*Table 31 summarizes the results of the 100S-60W scenarios with low and high hydro. High hydro generation displaces fossil based plants (mostly coal), leading to lower costs and emissions. Low hydro generation has the opposite effect, with a higher impact to costs, indicating the use of more expensive generation relative to what was displaced in the high-hydro year. **However, RE curtailment has a negligible change across all sensitivities, indicating that these weather years do not significantly help or hinder RE integration. The reason for this null result is that hydro generation, even when changed significantly, stills only accounts for a small change to the total generation mix. (Emphasis added)***

15. Similarly, in its draft report aimed at finding out the least cost optimal generation capacity mix for 2029-30⁵, the CEA model finds that no new Hydro capacity is needed till 2029 beyond the capacity that is under construction and considered in the National Electricity Plan, 2018. Below is the relevant extract:

*From the results, it is observed that the capacity expansion for coal based plants is not significant as compared to the solar and wind capacity addition. **The model selects battery energy storage system from the year 2026-27 onwards, due to the reduction in cost of solar, and battery energy storage system. Model has not selected any new hydro and nuclear power plants apart from already planned projects.** It is seen that renewable energy sources (solar + wind) installed capacity will become 440 GW by the end of year 2029-30 which is more than 50% of total installed capacity of 831 GW. (Emphasis added)*

16. Interestingly, the same CEA report referred above assumes “cost trajectory for battery energy storage system is assumed to be reducing uniformly from ₹7 Cr in 2021-22 to ₹4.3 Cr in 2029-30 for a 4 hour battery system which also includes an additional cost of 25% due to depth of discharge.” Such battery system coupled with solar PV or wind would be a much cheaper alternative to the proposed project, which is supposed to provide peak support of only 3 hours on daily basis. In fact, the latest LBNL report⁶ titled “Estimating the Cost of Grid-Scale Lithium-Ion Battery Storage in India” suggests that the prices of solar PV system plus

⁵ http://cea.nic.in/reports/others/planning/irp/Optimal_generation_mix_report.pdf

⁶ <https://eta.lbl.gov/publications/estimating-cost-grid-scale-lithium>

battery storing 25% of the PV energy could be around ₹ 3.94/kWh in 2020, ₹ 3.32/kWh in 2025, and ₹ 2.83/kWh in 2030. These tariffs are cheaper than the levelized tariff of this project of ₹ 4.32/kWh computed in 2013 without accounting for the delay of six years. As highlighted below, the levelized tariff of the project after accounting for the delay of 6 years and using a more realistic estimate for e-flows would be in the range of ₹ 7 to 9 /kWh. A recent development that underscores this point is the bid discovered by the Solar Energy Corporation of India (SECI)⁷ for supply of round the clock power from renewable energy (RE) source of 400 MW at a levelized tariff of around ₹ 3.60/kWh and first tariff of just ₹ 2.90/kWh. Additionally, it needs to be noted that unlike the battery systems, the peak generation estimated from the proposed project is subject to actual flows, and hence is much less reliable while being far costlier.

17. In short, at a time when prices of renewable energy and battery storage systems are falling sharply and rapidly, it would be highly imprudent to lock-in investments in a project which has very high costs, long gestation period, severe environmental impacts, and serious performance uncertainties. Therefore, based on the existing demand-supply projections and considering the other more economical options, there seems to be absolutely no merit in investing in the proposed project.

Potential increase in the cost of the proposed project due to time overruns

18. Delays in commissioning leading to huge cost escalation is a defining feature of Indian hydropower sector. As per the quarterly report no.100 of the CEA regarding the status of hydropower projects as of March 2020 hydropower capacity of 11,975 MW is under construction and on an average these projects have been delayed for about 100 months or 8 years, though some of the projects are delayed for more than a decade. Table 1 shows the break-up of this capacity as per ownership. As per the said CEA report, the costs of these projects are estimated to have been approximately doubled, which in fact is an underestimate, as the latest revised cost estimates for about 15% of these projects totalling to capacity of 1821 MW is not available. Also, cost estimates for the remaining capacity are not upto date, many have not been updated since 2014-15. In spite of such long delays, not much progress has been made in most of these projects. Even in a best-case scenario they would be commissioned only after 6-7 years, so the costs are likely to increase much more.

Table 1: Time and cost overruns for hydropower projects under construction as reported by the CEA for March 2020

Sector	Capacity#	Average delay in no of months	Total Cost overrun Rs Cr	Increase over proposed cost
Centre	7,005	106	34,711	106%
State	1,682	93	6,124	80%
Private	1,466	108	12,904	148%

Source: www.cea.nic.in/reports/others/hydro/hpm/qlv100.pdf

The capacity indicated above is excluding 1821 MW for which cost overrun information is not available.

Note: The cost overruns are estimates and do not reflect the actual increase in the costs of the project, which is bound to be much higher than this considering further construction time and delays. As the updated cost figures are not available in case of many of these projects, even these estimates do not reflect the real increase in costs as on March 2020, which is likely to be higher.

⁷ <https://www.thehindubusinessline.com/economy/seci-tender-gets-bids-to-supply-round-the-clock-renewable-power-at-290-a-unit/article31540398.ece>

19. On the issue of delays, it is interesting to note that in its submission to the CERC in response to the public process conducted for formulating the 2019 tariff regulations⁸, the promoter of the proposed Etalin project, i.e. EHEPCL has submitted as follows:

It is known fact that Hydro Projects takes 10-12 years for completion in best scenarios without surprises (3 years investigation and DPR, 1.5 years in CEA, 1.5-2.5 years in Environment & Forest, 4-6 years of construction). This time is twice/thrice to construction of Thermal Projects and 5-10 times for construction of solar projects.

It is evident from the submission that delays in commissioning are implicitly assumed, but their actual cost impacts are not explicitly accounted for in the project proposals. As noted by the FAC, the proposed project is already delayed by more than 6 years. As per the project DPR, the preconstruction activities were supposed to be completed by October 2015 and project should have been commissioned by September 2022. If these timelines were followed, the project cost was estimated to be around ₹ 25,296.95 Cr. However, since even the preconstruction work is also not complete, further time and cost overruns are inevitable.

20. Further, as also noted by the FAC, even in 2013 this was a fairly expensive project with capital cost of more than ₹ 8 Cr/ MW and first tariff of around ₹ 5 / kWh. In absence of any fresh estimates for cost escalation from the project developer, a simple calculation to estimate the potential impact on tariff on account of the delay in commencing construction of the proposed project is presented below. For the purpose of this calculation, two scenarios have been considered as follows:
- a. **Scenario 1** assumes that much of the preconstruction work has happened and the project is able to initiate construction work by say, October 2020 and then complete the same as per the original schedule of 7 years, without any further delays or surprises. In this scenario, the project would be commissioned by September 2027.
 - b. **Scenario 2** assumes that preconstruction work of 43 months starts off in March 2020 and the project gets commissioned by 2031, assuming the same original schedule of 7 years, and without any further delays or surprises.
 - c. In order to calculate the cost implications for both these scenarios, the original cost which was at 2011 prices, has been adjusted to 2020 price level. Based on the assumptions mentioned in the DPR, escalation rate of 6.76% p.a. in Civil Works and 4.95% p.a. for Electromechanical Works over the re-estimated cost has been applied to calculate the total hard cost.
 - d. Debt equity ratio of 70:30 is considered and interest expenditure, financing and interest during construction is calculated based on the assumptions made in the DPR.
 - e. Tariff has been computed in accordance with the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2019.

⁸ http://www.cercind.gov.in/2019/draft_reg/StakeholdersDraft%20Tariff%20Reg2019/41_EHEPCL.pdf

Table 2: Estimated Tariff on the basis of Completed Cost

Particulars	As per DPR	Scenario 1	Scenario 2
	SCOD 09/2022	SCOD 09/2027	SCOD 09/2031
Total cost of Civil and E&M works with escalation Rs Cr	18,832.77	24,788.15	32,928.90
Total Financing Charges Rs Cr	35.42	35.42	35.42
Total Interest during Construction Rs Cr	6,428.77	8,461.71	11,240.64
Total cost including IDC and financing charges Rs Cr	25,296.95	33,320.27	44,239.96
Total Generation MU	12,991.52	12,991.52	12,991.52
Cost per MW installed Rs Cr/MW	8.17	10.75	14.27
Levelised Tariff (with free power to state) Rs/kWh	4.32	5.93	7.88
Tariff in the First Year Rs/kWh	4.91	6.70	8.91

Source: Project DPR and calculations made by the authors.
SCOD stands for scheduled commercial operation date

21. Further, the tariff for the power from the proposed project is likely to be even higher, as the DRP has calculated the energy generation using ad hoc figures for the environmental flow, or e-flow. E-flows are the flows mandated to be released by the project into the river to maintain its ecology, even as large proportion of the river flows are diverted away for power generation. Such e-flows are mostly not available for power generation (except, as in the case of Etalin, when they are released through a very small capacity turbine). The MoEFCC has mandated on a thumb-rule basis how much e-flow has to be released by a hydropower project, unless project specific studies are carried out. In case of Etalin, the ad hoc e-flows used in the DPR to calculate the energy generation are much below the MoEFCC recommendation; not only that, they are also much lesser than those recommended by the project specific study for Etalin carried out later by the Central Inland Fisheries Research Institute (CIFRI). If we calculate the design energy using the e-flows recommended by CIFRI, generation will be lesser by around 480 MU. Table 3 shows the impact of that on various tariff figures after accounting for reduction in generation of 480 MU.

Table 3: Revised tariff estimation using energy generation based on the e-flows recommended by CIFRI

Particulars	All figures in Rs/kWh		
	As per DPR SCOD 09/2022	Scenario 1 SCOD 09/2027	Scenario 2 SCOD 09/2031
Levelised Tariff (with free power to state)	4.32	5.93	7.88
Levelised tariff (with free power to state) with correct e-flows	4.46	6.16	8.18
First year Tariff	4.91	6.7	8.91
First year tariff with correct e-flows	5.16	6.96	9.25

Source: E-flows study by the Central Inland Fisheries Research Institute (CIFRI) for Eatlin project is used for estimating impact on generation. Impact on tariff is estimated by authors, refer Table 2 and point no 20 for assumptions.

Note that releasing the mandated e-flows through a dam-toe turbine, as is planned right now, is problematic from an e-flows point of view, as this blocks the sediment flows, which are important for maintaining the ecology and aquatic flora and fauna. Hence, it is likely that this will be disallowed, and so the design/salable energy will decrease further, increasing the tariff even more. This factor has not been considered in our estimates.

22. As can be seen from Table 2 and Table 3, even in the most idealistic situation of no further delays and no increase in IDC beyond the level assumed in the original DPR, the capital cost and hence the tariff of the project (at the bus bar) is extremely high. Actual delay in construction and commissioning is likely to be much more and that will significantly increase the already high cost. In addition to this high tariff, depending on the location of load centres of the beneficiaries, another 50-60 paise/kWh will get added on account of transmission charges. As against this, the rates of power from alternative sources such as wind, solar and battery systems as discussed above, are much lower even today and are expected to drop further in the coming years. These alternative sources are also environmentally more benign and have much shorter construction period, typically 24 to 30 months and their modular nature reduces financing costs. Thus, based on economic considerations there seems to be absolutely no merit in investing in the proposed project.

Risks for the buyers are much higher than those for the generator

23. According to the CERC 2019 tariff regulations, if the actual energy generated by a hydropower station is less than the design energy for reasons beyond the control of the generating company, then the generating company is compensated in the subsequent year(s). However, for the years when energy produced is greater than the design energy, the generating company keeps the additional revenue. In short, the entire down-side of hydrological risk is borne by the electricity consumers, while all the up-side benefits are kept by the generating company.

24. Such skewed distribution of risks and rewards results in the lack of an economic incentive for using 'realistic' hydrological data or 'optimum' designs for dams and hydropower plants. As it happens, several dams are delivering electricity benefits much lower than the estimates, which indicates there is a problem. Table 4 and Table 5 show the extent of under-performance relative to the design energy. Table 4 shows that only 11 percent of the hydro projects meet or exceed the design energy. Table 5 shows that more than 50 percent hydro projects have a 90 percent dependable energy production that is not even half of the projected level.

The data below highlights that the risk of not realising the estimated generation from the proposed project would be borne by the electricity consumers alone. As already highlighted in point no 21, the generation estimated in the DPR is likely to be an overestimate.

Therefore, any claims from the proposed project in terms of meeting peak or overall energy requirement need to be considered with extreme caution.

Table 4: Share of Under-Performing Hydro Projects

Particulars	No of projects	Share of total (%)
Total number of projects	246	
Number of projects analysed	215	
Projects which were not analysed because of non-availability of data or misleading data	31	
Actual 90% energy greater than Design Energy	24	11%
Actual 90% energy less than Design Energy	191	89%

Source: Unpublished Analysis by South Asia Network on Dams, Rivers and People (SANDRP), 2012

Table 5: Level of Under-Performance of Hydro Projects with 90% Point less than Design Energy

Level of Under Performance (Percentage ratio of Actual 90% Energy/Design Energy)	No of projects		Share of total (%)
0-9	18	119	55%
10-19	16		
20-29	36		
30-39	25		
40-49	24		
50-59	24	72	33%
60-69	13		
70-79	9		
80-89	15		
90-99	11		

Source: Unpublished Analysis by South Asia Network on Dams, Rivers and People (SANDRP), 2012

Note: While this table deals only with those projects where the 90 percent point is below the design energy, the share of total in the last column is the share of all 215 projects that were analysed.

25. With respect to sale of hydropower on merchant basis, the project developer of the proposed Etalin project in its submission to the CERC mentioned above, has stated as follows:

*Hon'ble commission may refer to **Hydro Policy 2008** wherein it was specifically mentioned under 10.1 (f), "In order to enable the project developer to recover the costs incurred by them in obtaining the project site, he would be **allowed a special incentive by way of a Merchant Sale of up to a maximum of 40% of saleable energy**".*

*However in present scenario; the average **market clearing price for 2017 is ranging between 2.5-3.0 Rs./kWh which are way less than the present day Tariff of Hydro projects** as such the provision of recovery of upfront cost for obtaining the project sites is eventually failed in present circumstances.*

...

*Moreover, **DISCOMS are more inclined to short term PPA and are reluctant to have Long term PPA for Hydro Projects. 60% Long term PPA is mandatory for Hydro Projects. Unless these Long Term PPAs are in Place In present circumstances, it becomes difficult for revival of Hdyro Projects.***

(emphasis added)

26. As is evident from the above submission of the project developer of the proposed project, the issue of inability to sell hydro generation at market determined prices is of special significance and it becomes particularly relevant if the buyer of power for the proposed project is a trading company such as PTC. It highlights the fact that the tariff of new hydropower projects is way higher than alternative sources and therefore not competitive.
27. On the issue of reluctance of the Discoms to buy expensive hydropower, following points need to be noted:
- As per the tariff regulations of almost all state regulatory commissions, discoms are required to buy least cost power. Thus, a rational decision making process would rule out any abnormally high cost capacity addition, unless there are reasons other

than mere economic considerations, which need to be factored in. Also, if such non-economic considerations do play a role in deciding a particular project, then it would follow that instead of the concerned state discom's consumers, taxpayers should bear such costs. In any case, it would be safe to assume that a rational regulatory process will prohibit discoms from contracting excessively high cost capacity, especially when cheaper alternatives are readily available.

- b. In the past, several capacity addition decisions including those pertaining to some hydropower projects, have been undertaken based on unrealistic cost assumptions that made them seem like lucrative options. However, when the real costs became apparent, the Discoms and the concerned state governments have been forced to rethink such decisions. It is not surprising that the Uttar Pradesh government cancelled power purchase agreements (PPAs)⁹ with a cumulative capacity of 7,040 MW in 2017 and in 2019 the Andhra Pradesh government had terminated 21 high-cost PPAs¹⁰. In case of Hydropower projects, the recent examples of termination of the high cost Maheshwar project by Madhya Pradesh government and reluctance of Punjab and Rajasthan Discoms to buy the high cost power generated by Teesta III are particularly worth noting. See the excerpts below:
- c. Relevant extracts from the Maheshwar termination order dated 18th April 2020

9. Further and without prejudice to the above, it is submitted that the utility of the project conceived in the early 1990 with PPA signed on 11.11.1994 to provide cheap and affordable power to the consumers of the State of MP has today effaced and eroded completely as it is a known fact that the indicative tariff for power sale from the project (including additional capital expenditure for completion) will be in the range of Rs.18 per unit and above. The design energy of the project has further declined, as noted by the Task Force, with lapse of time, making the project further unviable. The GoMP and MPPMCL agreed during the HLC deliberations and even in Task Force discussions for a capped tariff of Rs. 5.32 per unit for entire life of the project. The likely tariff of the project is abnormal and very high, much beyond the initial estimations or the agreed capping, considering prevailing power market scenario and therefore to purchase power from the Project by MPPMCL shall be at the cost, expense and burden of the general consumers of the State of MP as the entire power purchase cost is a pass through to the consumers. In other words, power purchase from the Project (if assuming it is completed in the next few years) shall lead to an extra burden on the consumers of the State. Therefore, the continuation of the instant PPA (along with amendments) with SMHPCL is also against consumer and public interest.

- d. Relevant extracts from the CERC Order dated 9th January, 2020 in Petition No. 249/GT/2016¹¹ concerning determination of tariff of Teesta III Hydro Electric Project (1200 MW) for the period from the actual COD (28.2.2017) to 31.3.2019

⁹ <https://www.financialexpress.com/economy/uttar-pradesh-government-cancels-7-ppas-for-7040-mw-projects-sans-fuel-linkage/695379/>

¹⁰ <https://www.thehindubusinessline.com/specials/india-file/ap-casts-its-shadow/article30326456.ece>

¹¹ <http://www.cercind.gov.in/2020/orders/249-GT-2016.pdf>

*The Respondents 7 to 10 (Rajasthan discoms) vide its reply affidavit dated 8.3.2017 have submitted that the implication of time & cost overrun may not be allowed to the Petitioner as part of tariff. **The Respondent has also submitted that the Govt. of Sikkim may be directed to pay tariff for 12% of free power initially agreed, considering the fact that the cost of the project had escalated by 2.5%.** The Respondents have added that the Petitioner, being a Govt. Company, it was for the Petitioner and the Govt. of Sikkim to actively pursue the matters relating to grant of forest clearance. They have further stated that **there is no mandatory compensation admissible for the delay on account of force majeure and in case of continuation of force majeure for a period of 12 months or more, there was an option available to the Petitioner to initiate termination of PPA. As the Petitioner chose to proceed with the implementation of the project, despite force majeure, it had elected to implement the project without any monetary compensation for the delay.***

*Respondent No. 3 PSPCL vide its reply affidavit dated 27.4.2017 has submitted that with the time overrun of 64 months, the cost overrun sought for is more than double the original project cost. **The Respondent has submitted that it is not open to the Petitioner to complete the project with substantial delay in the year 2017 and then seek to enforce the obligations on the Respondent to purchase power.** The Respondent has stated that **in the absence of approval of PSA by Punjab State Electricity Commission, the question of the Respondent purchasing electricity or scheduling the same does not arise.** The Respondent has added that its participation in the present proceeding is not to be considered as waiver or an agreement (express or implied) that the Respondent has agreed to purchase electricity or is under a binding obligation to purchase power from the project of the Petitioner at the tariff to be determined by this Commission.*

- e. The issues raised by the discoms with respect to Maheshwar and Teesta III are very relevant for the current discussion. As highlighted by these discoms, when unavoidable delays take place and the project costs rise steeply, the project developer has the option of invoking force majeure provisions to terminate the contract within 12 months of such developments. This would free up the financial and other scarce resources locked in by the project and the proposal should be considered only when such force majeure constraints have been addressed. This is especially crucial considering the fact that there is no legal mandate on the buyers to compensate the project developer, if it chooses to continue project construction in spite of such events.
- f. Based on this experience and considering the high likelihood of the discoms terminating any such excessively high cost contracts in future, it would be highly imprudent to consider the present project without seeking an explicit undertaking from the concerned beneficiaries regarding their intention to buy this electricity, in spite of the likely delays and further cost increases. Such undertaking should be obtained after making the concerned parties fully aware of all the potential delays

and cost increases, so that they can evaluate all their options before getting locked into such high cost investment decisions.

Ensuring complete transparency in dealing with decisions involving huge public investments and increase in tariff burden for electricity consumers

28. The issues raised by the FAC are at the root of the need and prudence of the large-scale public investment that would be entailed in constructing and commissioning the concerned project. Lending and financing of most power projects is done by public financial institutions such as Power Finance Corporation (PFC) and Rural Electrification Corporation (REC), and the project developers, as in the case of the present project, is assured regulatory certainty of both revenue from sale of power and return on investments. Considering this, it becomes obvious that the issue regarding need and viability of the project which affects several stakeholders, including the electricity consumers who would bear the cost of this power, should be decided transparently. Therefore, any response in this regard filed by the MoP or the Central Electricity Authority (CEA) to the FAC should be made public along with all the underlying assumptions and data that may have been considered while arriving at such a response.
29. Since the decision to construct the project would affect electricity tariff, it is important to undertake due public process before locking in such huge investments. For such process to be meaningful, crucial information pertaining to the project should be made public. This includes details such as:
- a. Detailed Project Reports and concurrence issued by the CEA,
 - b. Revised cost estimates (considering the delay of 6 years),
 - c. Financial details (lenders, interest rates, loan agreements, etc.),
 - d. Energy sale agreement (ESA) or power purchase agreement (PPA), and any other relevant regulatory orders and data.

Summary and conclusion

30. Based on the above discussion we submit as follows:
- The proposed project has not been considered in the latest national planning process and without undertaking a thorough and scientific demand-supply analysis of the concerned beneficiaries, no further decision regarding the project can be taken.
 - The proposed project is highly costly and is already delayed by six years. Further delays during construction are bound to make it costlier.
 - Cheaper alternatives such as solar PV and/or wind combined battery storage systems can be used to meet the same energy requirement much more reliably and at a much lower cost. These alternatives are also more desirable from environmental perspective. Thus, there is no economic rationale for allowing the present project and hence it should be scrapped with immediate effect.
 - Any inputs given by the MoP or the CEA in response to the issues raised by the FAC should be made public along with all the underlying assumptions and data.
 - In spite of its apparent short-comings, if present the project proposal is considered further, then it should be done only after undertaking a due public process.