

Futuristic Approach of Utilisation of Hydropower in India

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Abstract:

Hydro power is a renewable source of energy used in most parts of the world. India is very rich in hydropower potential. It is the only clean and renewable source today making significance in the world of power production. With the rising economic growth and income level India is bound to have higher demand for electricity supply. India presently has an installed power generation capacity of 284,303 MW (2015) inclusive of Hydropower which is 42,623 MW (2015). The situation is highlighted by the peak power deficit—shortfall in supply of power when the demand is maximum—was 5.2% in year 2013-14. With the fast depleting natural resources, it becomes mandatory that we increase the use of Renewable Resources for Power generation. When Thermal power in 2007 was 64% of the total generation and Hydro power was 26% and in 2015 instead of the thermal graph falling and Hydro power rising we see a different picture. In 2015 thermal has grown to 70% and hydro has fallen to 15%. Hydropower is such a good source for power why do we see the graph falling every year?? The amount of land submergence required for large Dams is the biggest concern where the Forest Act and the Environment Act also offer rigidity towards the same. Relative to so much submergence arises another major problem of Rehabilitation and Resettlement. Climatic changes and other negative effects of fossil fuel for power generation are growing concerns and therefore driving the expansion of hydropower around the world. The Reservoir based hydropower projects have also come under criticism due to carbon dioxide and methane emissions beyond acceptable limits. Ecological and many more issues that are preventing Hydro power as becoming the major source of electricity generation. In this paper we will review the major issues faced due to large hydropower plants and why they are not termed as Renewable sources.

Keywords: Hydropower, Rehabilitation, Resettlement, Sustainability, Submergence.

I. INTRODUCTION

Hydro power is a renewable, economic, non polluting source of energy. Hydro power plants have the ability for starting and stopping load variation, and play an important role in the development of energy. They are cheap source of energy to lower the cost of power system development which is important for energy security of the country. It takes about 10 years for developing a large size hydro project plant from planning to Commission. For betterment of development of hydro power plant the ministry of power introduced the national policy on hydropower development in 1998. Total installed capacity of power generation in India on 30th March-2015 was 271,722 MW, where through thermal it is 188,898 MW and hydel generation was 41,267 MW and through renewable sources 4055.36 MW. India is blessed with vast natural resources with significant hydropower potential in the world. In terms of usable potential as per the latest data India has 36 GW of installed hydro power capacity, where an additional 13 GW is under construction. This Sports the total capacity which is yet to be tapped at around 67% of the potential 93%. The total potential in the north region is yet to be tapped primarily in the Brahmaputra river Basin this is in contrast to the southern and western region where more than 65% of the potential has already been used. The government has taken a number of initiatives to prioritize hydropower development however there are some issues in implementation of policies and regulations there by declining the share of hydropower in India. Energy mix since 1966 there are various factors such as environmental concern land acquisition problems rehabilitation issues long clearance and approval procedures geological surprises natural calamities and major ecological issues.

II. ROLE OF HYDRO POWER IN PROMOTING ECONOMIC GROWTH

If we look at India's generation we will find that the power generated by the thermal sector is around 68% where the Hydel power is around 17% and other Renewable Sources are 13% and nuclear is 2%.

- 1) **SUSTAINABILITY** - It is a clean power with no GHG emission and it contributes to irrigation and flood control.
- 2) **AVAILABILITY** - Quick ramp up and ramp down the ability to meet peak demand and fluctuations.
- 3) **AFFORDABILITY** - Inflation free generation cost reducing over the time and long economic life.

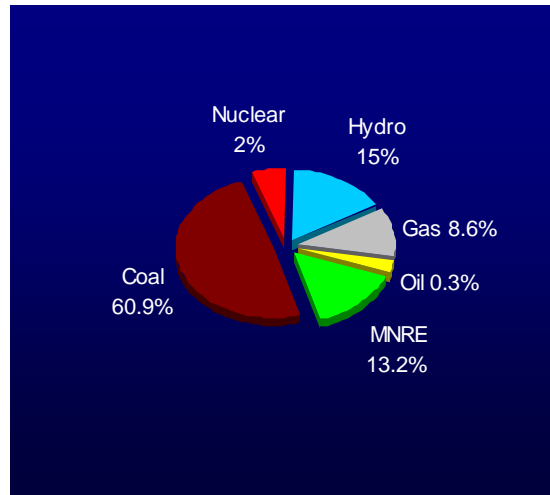


Fig 1: Sources of Electricity in India by Installed Capacity

III. CURRENT CHALLENGES

1. HYDRO POWER PLANNING - We have seen planning for hydropower in India has been oriented towards individual project therefore exposes limitations for sustainable development of the entire basin interstate disputes another aspect which hinders river basin development is a lack of interstate agreements and disputes on water sharing the supplies. Punjab and Haryana and Mullaperiyar Dam conflict between Kerala and Tamil Nadu are examples of such disputes.

2. LAND ACQUISITION- Land acquisition is amongst one of the core issues for hydro power projects causing suspension and delay in construction. The 120 year old prevailing act of land acquisition for public purpose where the term public purpose has not been clearly defined. The new law that came into effect from January 2014 attempts to address social inequities. There is a serious concern in finding an optimum solution between the land losers and the developers. Rehabilitation comes up as one of the major issues in hydropower development.

3.1 CASE STUDY ON REHABILITATION

A case study of the Sardar Sarovar Dam and the problems faced by the affected people. The Sardar Sarovar Dam is expected to impound water to the full Reservoir level of 455 feet .It will submerge 37,000 hectares that is 92,500 acres in 3 states of Gujarat ,Maharashtra and Madhya Pradesh. The canal and irrigation systems aggregate to 75,000 kms submerging 85000 hectares equivalent to 2,12,500 acres. Number of displaced people approximately 1,52,000 persons according to government records about 27000 families residing in 245 villages in these 3 states, in Gujarat 23, 590, Maharashtra 13,500, Madhya Pradesh 1,15,000 In addition about 1,40,000 farmers were affected by the canal and irrigation system. It also displaced tenant farmers in Gujarat. Farmers and people living downstream also number in thousands and in the backwater zones were affected. Afforestation and development displaced hundreds of families these figures reveal the magnitude of direct and indirect dislocation. No one knows the exact figures. As per government records the cost benefit ratio is positive most of the exercises have been conducted without fully accounting for social and environmental costs.

1. The .Narmada water disputes Tribunal that is NWDT award of 1978 gave its report on R&R based on critical minimum requirement of resettlement for the displaced it was a breakthrough as it made provisions far beyond those of earlier projects where only cash compensation often under value was provided. It stated that-Regaining of living standard as enjoyed prior to displacement.
2. To be relocated as complete village units or families as far as possible.
3. Integrated within a community where they are resettled.
4. Appropriate compensation and adequate rehabilitation infrastructure.
5. Choice of state.
6. Rehabilitation must be well in advance of project construction.
7. The master plan of resettlement should be ready India early stages of the project including identification of the land and setting up of Rehab villages.

3.2 THE GROUND REALITY-

Till date there is no master plan ready where it was required to be ready by 1981 as pointed out by the Ministry of environment and forest in their clearance report 1987. The Five Member Group in their reports in 1994-1995 pointed this out. The so-called plan prepared by the authorities is no master plan for many reasons.

1. It has no mention of the total number of families affected by the Sardar Sarovar Project.
2. The project will affect at least 10 lakh people due to reservoir, colony, canal, sanctuary, compensatory afforestation, catchment area treatment, downstream fisher people, etc.
3. The authorities were expected to survey exactly how many families are affected by this project, then notify category-specific R&R policies.
4. The action plans detailing the R&R process schedule, including identification and acquisition of irrigable, agricultural land, setting up of “rehabilitation villages”, etc. should have been prepared too.
5. It does not estimate exactly how much of land and other resources would be required to resettle this large number of PAFs.

IN GUJRAT

Colony affected	950 PAFs in 6 villages
Submergence affected	4600 PAFs in 19 villages
Canal affected	1,69,493 PAFs owning land titles out of these 24,000 will lose either whole or major chunk of their land holding and become landless or marginal farmers.
Shoolpaneshwar Sanctuary affected	38,000 PAPs in 104 villages
Downstream affected	10,000 PAFs making their livelihood fishing in the 150 kms stretch of river downstream of the Sardar Sarovar dam
Drainage affected	Large areas will be required for drainage. Just for the main drains in Zones 4-13 it is estimated that 18,000 hectares of land will have to be acquired and those losing land will have to be compensated. (Estimates for other areas not available)
Compensatory afforestation / Catchment area treatment	There is no estimate for the number of families being affected by these environmental protective measures. (approximately 3000-5000 tribal families)
Secondary displacement due to loss of lands to resettlement sites	There is no estimate for the number of families being affected due to this.

(Note: PAF: Project Affected Family. PAP: Project Affected Person.)

IN MADHYA PRADESH

Submergence affected	33014 PAFs in 193 villages (Balance as on today – 30,000 +)
Compensatory afforestation / Catchment area treatment	There is no estimate for the number of families being affected by these environmental protective measures. (approximately 3000-5000 tribal families)
Secondary displacement due to loss of lands to resettlement sites	There is no estimate for the number of families being affected due to this. In a number of cases it has been seen that land is being acquired from adivasi / dalit families.
Submergence affected	3300+ PAFs in 33 villages (balance as on today approximately 2000)

IN MAHARASHTRA

Compensatory afforestation / Catchment area treatment	There is no estimate for the number of families being affected by these environmental protective measures. It is being carried out in at least 49 adivasi villages in Akrani tehsil and many villages in Akkalkua tehsil of Nandurbar district over adivasi lands. (approximately 3000-5000 tribal families)
Secondary displacement due to loss of lands to resettlement sites	This is a serious issue here. The PAFs are being relocated in adivasi lands where the rights of the original adivasis who have been living there have not been recognized. This has led to serious conflict and even the death of two original inhabitants at one of the R&R sites.

3.3 CURRENT SITUATION OF REHABILITATION AND RESETTLEMENT

Those displaced by the Kewadia colony in 1961 are still to be offered a suitable R&R policy to help them regain their previous life standard. This inspite of the recommendation to that end by the World Bank in 1985, Five Member Group in 1993 and Shri. Saxena after the 15th Field visit of the R&R Sub-group of NCA in 1995 that, there should be a rehabilitation package for them.

85,123 hectares of land will be needed to be acquired for the construction of the main and branch canals. (This does not include land going under the distributory system). For those affected by the canal, there exists a policy where they are entitled to only ½ hectare land which itself is unjust, but to date not a single canal-affected PAF has been rehabilitated.

There exist 38,000 adivasis in the 104 villages forced to give up their traditional lands and resource base. They will be displaced “voluntarily” without their land rights having been settled yet. The GoG still has no policy for them nor does it enlist them as PAFs.

There is no policy for the 10,000 fisher people whose livelihoods are going to be lost since the river will virtually dry up from the dam to the sea. They too are not counted as PAFs nor is there any rehabilitation package for them.

No survey of those families affected by compensatory afforestation, catchment area treatment, secondary displacement, etc. has been conducted and no rehabilitation package is being offered to them. The PAFs of the first village, Mokhdi are yet to be resettled. There still remain 100 families awaiting rehabilitation. In other villages of Gadher, Makhadheda, Antras, Kunda, Hapeshwar, etc. many families have either not shifted out or have returned.

Another serious issue is of falias (hamlets) of many villages not being declared in the submergence area or being affected as Tapu (island) though they are at a lower altitude than the other submerging falias and villages. The Budni falia of village Turkheda is the lowest falia of this village but is not declared while the falias above have been resettled. This falia has 350 families. Two other falias of this village, Handlabari and Baskariya are facing the same problem. The case of Kunda falia of Kadada with 90 families is the same. Another falia of the village Shulpan is in the same situation.

Those already resettled too are facing immense problems especially due to uncultivable lands being allotted to them. In one year of its being the Grievance Redressal Authority received about 15000 complaints and over 9000 complaints were land related. The PAFs have been allotted land that has dabh grass, is waterlogged, encumbered, fragmented land and many have received less than the land entitled to them. There are many cases where PAFs have been given possession slips but no land. The most blatant violation of the NWDTA is that of the community resettlement clause. GoG has dispersed the PAFs of the 19 submerging villages in over 180 R&R sites! There are thousands still remaining to be resettled. For them the Government of Gujarat would have to firstly, survey and make a list of all those affected, then the Government would have to propose R&R packages for them. For them then the Government of Gujarat would need huge amounts of agricultural land and other resources

3.3.1 Current Situation of R&R, Land in Madhya Pradesh:

There is no irrigable agricultural land available in M.P. for resettlement of PAFs. This is a very serious issue considering that the maximum displacement due to submergence is in this State i.e. 33,014 families. Thousands of hectares of land are required for their resettlement. The then Chief Minister of Madhya Pradesh, Shri Digvijay Singh had categorically stated that there is no agricultural land available as of today. While PAFs in Madhya Pradesh settling in Madhya Pradesh would require not less than 10 to 15000 hectares, GoMP refers to 4000 hectares, said to be the land that can be made cultivable but not available.

GoMP, due to not having land, are either pushing people to go to Gujarat, or for accepting cash compensation

Due to faulty level and baseline surveys the extent of submergence and the scale of displacement has been grossly underestimated. According to official records 33014 PAFs in 193 villages will be affected. The people are of the opinion that at least 45000 PAFs in more than 193 villages will be affected. Land records have to be updated before submergence.

3.3.2 Current Situation of R&R, Land in Maharashtra:

There are massive problems being faced by those already shifted to the R&R sites. As of today there is no sufficient land for the resettlement of all the remaining PAFs from Maharashtra. As against 45000 hectares required (as per NBA data), only 318 has shown as available, in their latest affidavit, which too is available on the ground. Rest is left to location and purchase of private land.

Many PAFs at the R&R sites are yet to receive legal land title for the land allotted to them, even after 6 years of shifting to the site. Therefore the situation now is that inspite of giving up their rights over the land and other resources in their original villages they are yet to be given rights over the land where they have been relocated.

Those who have been allotted uncultivable lands (stony, rocky, naala land, stumps, weeds, shrubs, etc.) are faced with the situation where the Government is simply refusing to change these uncultivable lands and re-allot them with cultivable lands. This has given rise to a situation where they have problem of survival

Hundreds of families still remain to be declared but have been shifted here. They are yet to be allotted land. They have raised this issue a number of times and have filed their complaints but the Government has refused to take any decision in this matter. They have no life support systems due to which their survival is getting progressively impossible

PAFs still do not have full ownership rights of the lands allotted to them in the R&R sites. Not a single acre of land has been provided with irrigation facilities in this R&R site. This is a blatant and flagrant violation of the NWDTA which stipulates that the PAFs be provided suitable cultivable and irrigable lands in resettlement with irrigation facilities.

With regard to all the above problems it is seen that the Government is showing no interest in alleviating the severe problems faced by the PAFs.

1. There is no land for the remaining PAFs to be resettled. The balance number of PAFs in Maharashtra would be around 1700 to 2000 and at least 5000 hectares of irrigable agricultural land will be required. Some of the major factors influencing the land requirements:
2. Underestimation of PAFs due to faulty level and baseline surveys. There are 757 application claims to be declared still pending.
3. Inaccurate level surveys leading to omission of 'tapu' villages and those villages becoming socially unviable units. Egs. Bamana, Maal, Savaria, Bilgaon, Khardi, Atti, Keli, Teenismaal, Chinchkhedi, Roshmal, Dhutal, etc.
4. The settlement of land, which remains to be done in most of the submergence villages, would result in an increase in PAFs and their land holdings.
5. Adoption of a uniform and just R&R policy by the three States.
6. Adoption of a more realistic cut-off date from 1-1-1987 to the date of displacement. Whoever is more than 18 years old as of that date would be classified as major son and entitled to rehabilitation package.
7. A large quantity of land would be required for allotment to those PAFs who have been shifted but not allotted land, or have been allotted partial/complete uncultivable lands, less lands, etc.

3.4 Inference

Land is required not only for those PAFs who are yet to be resettled but also for those who have been resettled but have been allotted uncultivable lands, less lands or have not been allotted lands at all. A minimum of 5000 hectares will be required to resettle PAFs. With regard to rehabilitation of those affected by submergence, it is seen that the process is infested with intrinsic structural problems stemming from lack of just R&R policy, suitable agricultural land, commitment on the part of the Governments to resettlement PAFs completely so as to regain their life standards prior to rehabilitation. The prevailing situation in the three States clearly establishes that PAFs at not only EL 90m but even at EL 80m and below are not fully rehabilitated. There are at least 3500 families at EL 90m in their villages on their traditionally owned lands and forest, who would be affected by submergence. There are others evicted, relocated at sites but not rehabilitated. All these stand a clear witness to the violation of NWDT Award. The granting of land rights, updating of land records (especially in the adivasi belt), conducting of level and baseline re-surveying and hence, the re-estimating the actual number of PAFs has to be done. Till all the categories are recognized as project affected and action plans for their resettlement are not formulated and executed, there is no possibility of free and fair resettlement.

No master plan for resettlement and rehabilitation of PAFs is ready as yet although it was directly, indirectly stipulated in the Award that such a plan should be ready by 1981-82. The violation of the NWDTA has already taken place with homes and land of tribals' having been submerged and still no resettlement in sight So the biggest question is Hydropower but at what cost????

3. FINANCING: Finding an optimum balance between Bankability and Affordability is often a challenge. Although operating costs are minimal and project life is longer than thermal, it needs long tenure debts (more than 20 years) availability in Indian capital market. The technical challenges and cost overrun often put Financers in additional risk.

HIGH CAPITAL COSTS-

Capital cost of hydro projects ranges between 60 mn to 80 mn INR/MW compared to 30 mn to 50 mn INR/MW for thermal plants. Hydro projects require higher costs and greater complexities in design n engineering and social and environmental impact.

LONG CONSTRUCTION PERIODS-

Most hydro power projects take at least 5 to 6 yrs to construct, therefore increase interest during construction. Higher risk premium on financing charges.

4. RESERVOIR SILTATION: When water flows it has the ability to transport particles heavier than itself downstream. This may negatively affect the reservoir capacity and subsequently their power stations, particularly those on rivers or within catchment areas with high siltation. Siltation can fill a reservoir and reduce

its capacity to control floods along with causing additional horizontal pressure on the upstream portion of the dam. Eventually, some reservoirs can become full of sediment and useless or over-top during a flood and fail.

5. RESERVOIRS METHANE GENERATION: Some reservoirs in tropical regions produce substantial amounts of methane. This is due to plant material in flooded areas decaying in an anaerobic environment, and forming methane, a greenhouse gas. According to the World Commission on Dams report, where the reservoir is large compared to the generating capacity (less than 100 watts per sq mts of surface area) and no clearing of the forests in the area was undertaken prior to impoundment of the reservoir, greenhouse gas emissions from the reservoir may be higher than those of a conventional oil-fire thermal generation plant. In boreal reservoirs of Canada and Northern Europe, however, greenhouse gas emissions are typically only 2% to 8% of any kind of conventional fossil-fuel thermal generation. A new class of underwater logging operation that targets drowned forests can mitigate the effect of forest decay.

6. RESERVOIR SAFETY: Because large conventional dammed-hydro facilities hold back large volumes of water, a failure due to poor construction, natural disasters or sabotage can be catastrophic to downriver settlements and infrastructure. Dam failures have been some of the largest man-made disasters in history. The Banqiao Dam failure in Southern China directly resulted in the deaths of 26,000 people and another 145,000 from epidemics. Millions were left homeless. Also, the creation of a dam in a geologically inappropriate location may cause disasters such as 1963 disaster at Vajont Dam in Italy, where almost 2000 people died. Smaller dams and micro hydro facilities create less risk, but can form continuing hazards even after being decommissioned. For example, the small Kelly Barnes Dam failed.

Geological surprises during actual construction cannot be ruled out. This unpredictable geology is more pronounced in the Himalayas where most of the Indian hydropower potential lies. These add to construction risks. In 1967, causing 39 deaths with the Toccoa Flood, ten years after its power plant was decommissioned. During the 11th plan capacity addition multiple projects such as Tapovan Vishnugad (520MW) in Uttarakhand and Rampur(412 MW) in Himachal have been delayed due to technical challenges.

7. DOWNSTREAM AQUATIC ECOSYSTEM: Hydroelectric projects can be disruptive to surrounding aquatic ecosystems downstream of the plant site. Changes in the amount of river flow will correlate with the amount of energy produced by a dam. Water exiting a reservoir usually contains very little suspended sediment, which can lead to scouring of river beds and loss of riverbanks.^[48] For fish migration a fish ladder may be required. For fish going through a high head turbine is usually fatal. Reservoir water passing through a turbine alters the downstream river environment. Downstream changes to the water temperature and dissolved gases have adverse effects on some species of fish.

ENABLING INFRASTRUCTURE -

A no. of Hydro power projects are located in Remote areas in states which do not have adequate demand for electricity. Here requirement for infrastructure for power evacuation is needed. There are certain challenges for development of transmission network. Identifying beneficiaries in advance and developing excess evacuation capacity. Load factor for hydropower project is typically less than 50% as a result capacity is underutilized therefore higher transmission costs. These projects also need road network development, bridges etc which increase cost in turn cost of power generated and affect project viability and sustainability.

Eg – The associated transmission system for evacuation of Kameng (600 MW on Alakhnada river near town of Shrinagar. Power is estimated at Rs 11,000 million about 50% of the cost of the power generation.

IV. BENEFITS OF DAMS

- 1. Water Supply:** Large quantities of appropriate quality water is required both for domestic and industrial purposes. Large urban areas depend greatly on water stored in dams and reservoirs for various purposes. Water is stored during high rainfall and is used at the time of low rainfall. This is especially important in dry areas of the world.
- 2. Meet the rural agricultural demands:** Large quantities of water are required all over the world for meeting the needs of agricultural irrigation. Irrigated lands all over the world contribute a major part of food production, thus making irrigation the need of today's farmers. Dams and reservoirs are required in sufficient numbers to supply sufficient quantities of water, especially to arid and semi arid regions of the world.
- 3. Dams help in flood control:** Excessive precipitation in an area results in floods, which causes huge loss to life and property in the low lying areas of a river where the flood water flows. Dams and reservoirs are effective and can be used to maintain water levels in a river. The flooding downstream of water can be temporarily stored in a dam and released later when it is required.
- 4. Production of hydropower:** Energy is the most important determinant of the socio-economic development of any country. It is beneficial to use a kind of energy which is clean, dependable,

efficient, and renewable. Hydroelectricity fulfills the above mentioned requirement and dams are an effective means of producing this kind of energy.

5. **Local navigation:** Local inland navigations is an excellent sport, but natural river conditions, like currents, changing river levels, and snowfall, create major obstacles and problems for local inland navigation. Dams can effectively be used for controlling the levels of water in a river where inland navigation is carried.
6. **Recreational activities:** The reservoir made possible by constructing a dam presents a beautiful view of a lake. In the areas where natural surface water is scarce or non-existent, the reservoirs are a great source of recreation. Along with other objectives, recreational benefits such as boating, swimming, fishing etc linked with lakes are also given due consideration at the planning stage to achieve all the benefits of an ideal multipurpose project.

V. STEPS TO BE TAKEN TO FACE CURRENT CHALLENGES OF LARGE DAMS

1. Benefit sharing framework

Benefit sharing is a commitment by the government and the developer to share the monetary and non-monetary return with the project affected people. An appropriate mechanism ensures social equality and also countries National strategy with the local needs.

Social and environmental impact needs to be given importance instead of treating them like legal formalities. The process needs to be participatory involvement of project affected people and their consultation needs to be carried out to smoothen out differences and get social consent. Joint consultation is the best method to solve out social issues. The project developers need to open more technical training centre in the neighborhood of the project which will in turn help to get public acceptance as well as skilled labor while local residents get employment opportunities. Similarly developers can open health clinics schools and amenities for local residents which will have minor impact on the cost of the project but major impact on the social side.

2. Facilitating investment and financing

In order to attract investments for hydropower projects it is very important to address the concerns of the developers as well as the consumers and most importantly the project affected people. A time bound clearance policy needs to be made for the accountability of delays, the required changes in the new land acquisition law needs to be made for speedier project implementation addressing issues and insuring the rights and interests of the land losers.

3. Governance Framework

The Nation needs to have strong policy framework and specific strategies for accelerating hydropower development. Efficient government coordination reduces unpredictability for potential investors. The Government of India needs to ensure the interstate agreements of water sharing, in order to avoid any disputes. Basin wide hydrological simulation model needs to be developed under the guidance of Central Electricity Authority that is the CEA and the Central Water Commission that is CWC, understand the effects of one project on another. This will reduce project risk and to understand better how one project might affect the other. Planning forum needs to be constituted to discuss infrastructure such as Access roads, transmission lines, which can help lower the overall cost of hydro sites. It should be done keeping in mind the optimal development of river Basin and insurance project allocation on inter-state river according to optimal development plan of river Basin

There is a large gap between demand and supply of electricity, which can be filled by developing large and small hydropower projects. There is large potential available in this sector which needs to be tapped. During peak time, hydro power stations, which accept and reject load almost instantaneously, can meet peaking power demand in no time and provide quick control of frequency by load-generation balance and thus maintain proper frequency. Conventional hydro plants with storage provide peaking power and pumped storage schemes provide load during off peak hours and generate peaking power. Therefore, to meet the country's energy demand at a faster pace, development of mega hydropower projects are required, which warrants the need of innovative practices in construction aspects integrating project management, engineering and quality management tools and techniques along with

Imbibing suitable mitigation measures addressing the flip side of hydro sector, as key to success for making up the past generation loss, as far as possible, keeping complete focus on solving the above mentioned problems and trying to make hydropower plants more successful in future.

Climate change and other negative effects of using fossil fuels for power generation along with growing concerns over energy security are driving the expansion of hydropower around the world. It's time India does that too and the test, though, is to salvage the under-construction projects as a first-step towards overturning the overtly negative investment sentiment towards hydro projects

VI. CONCLUSION

The government can formulate rules and regulations so that a balance can be created between the out sees of the upstream and the beneficiaries of the downstream who have land more than a certain limit. A sharing ratio can be divided so that the out sees can be benefited because the beneficiaries will finally get much more benefit due to the increase production of crops and an increase in groundwater and irrigation facilities. This is also a part of command area development.

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