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Sustainable Harnessing of Hydropower Potential in Arunachal Pradesh: Progress and Constraints

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ABSTRACT

Hydropower potential of Arunachal Pradesh is enormous. The state is basically tribal dominated. The lifestyle of the people is fast changing. The resource base of the state is not sufficient to meet the aspiration of the people. In that context hydropower has come as a boon to the economy of the state. Nearly 133 Memorandum of Understanding were signed between the power developers and the Government during last few years to harness power. It has resulted in public protest and stoppage of many projects. In that context the present attempt has analysed the different dimensions of the issues and suggested few measures such that power potential is sustainably harnessed for a better future.

KEY WORDS

Hydropower, harnessing, economy, progress, constraints

Introduction

Arunachal Pradesh, the largest State in the North Eastern part of India, is home to 26 major and 126 small tribes belonging to Indo-Mongoloid groups. With a population of 13.5 lakh (2011 census) and a density of 16 persons per square Km of area, it is a sparsely populated State. The State was earlier known as North East Frontier Agency (NEFA) and kept under the Ministry of External Affairs. After the Indo-Chinese war in 1961, the NEFA was taken back from Ministry of External Affairs and placed under the Ministry of Home. The State participated for the first time in parliament election in 1977 and the statehood was granted in 1987. Thus, the State is a late starter in the development process.

The state has witnessed many changes overtime. It is a State which had almost zero literacy at the time of independence, achieved a literacy rate of over 64 percent in 2011. The societal structure also witnessed a fast transformation. Dependency on barter is replaced by monetary exchange and demand for cash has increased. People are moving out from rural to urban areas for a better life. As a result, the demand for means of non-agriculture livelihood is fast rising. To cope with rising aspirations and fast changing life style of the people, the demand for modern jobs is rising while the production base of the economy is not changing as much. Primary sector's share in NSDP fell from 59.19 percent in 1970-71 to 31.09 percent in 2004-05, while the secondary sector's share rose from 20.33 percent to 25.42 percent and the tertiary sector's share increased from 20.48 percent to 43.50 percent during the same periodⁱ. As per the latest RBI estimateⁱⁱ, the share of Agriculture and Allied sector in NSDP further declined to 29 percent while that of Industry and Service stood at 8 and 63 percent respectively in 2009-10. Clearly, it is a 'service driven economy with low production base'. It has reached a situation where public expenditure as percentage of GSDP has shot up from 68.89 percent in 1991-95 to 87.24 percent in 2005-09ⁱⁱⁱ largely following from the immense pressure on government for employment generation. On the other hand, the dependency on the Central Government is more than 85 percent while the State's own revenue is just around 14.5 percent of its aggregate revenue. In this context, the realization of the State's enormous hydro power potential has great significance both for revenue generation and employment creation.

Sr No	Basin	Potential	% share to the state potential	Project allotted		Allotment as a % of potential	CPSU		Independent Private Power developers			
				No	Allotted installed capacity (MW)		No	Allotted installed capacity (MW)	% share of CPSU in the allotment	No	Allotted installed capacity (MW)	% share of Private developers
1	2	3	4	5	6	7	8	9	10	11	12	13
1	Tawang	2057	3.61	13	2942.90	143.07	1	1500.00	50.97	11	1442.90	49.03
2	Kameng	6183	10.84	43	4855.50	78.53	2	1720.00	35.42	41	3135.50	64.58
3	Dikrong	560	0.98	8	313.00	55.89			0.00	8	313.00	100.00
4	Subansiri	12123	21.26	14	8948.00	73.81	3	2515.00	28.11	11	6433.00	71.89
5	Siang	17308	30.35	33	7677.00	44.36			0.00	33	7677.00	100.00
6	Lohit	7679.5	13.47	9	7282.00	94.82			0.00	9	7282.00	100.00
7	Dibang	10977	19.25	11	9550.00	87.00	1	3000.00	31.41	10	6550.00	68.59
8	Tirap	140	0.25	2	50.00	35.71			0.00	2	50.00	100.00
	TOTAL	57027.5	100.00	133	41618.40	72.98	7	8735.00	20.99	125	32883.40	79.01

Source: Computed from the data as given in the Official website of Department of power, Government of Arunachal Pradesh

Table 2: Allotment of different basin to different agencies

6	Dibang	10977
7	Lohit	7679.5
8	Tirap	140
	Total	57027.5

Source: Hydro power Policy 2008", Arunachal Pradesh Gazette, No 104, Vol XV, Nov 20, 2008.

This is precisely what has motivated us to take a closer look into the recent initiatives of the State government for exploiting the State's enormous hydro power potential and certain issues arising there from.

Hydropower Potential of the State

There are different estimates of hydropower potential in Arunachal Pradesh. The Central Electricity Authority and individual power developers have estimated the total hydropower potential of the state at over 57000 MW and the potential for small and micro hydel project at around 1600 MW^{iv}. The Hydro Power Policy-2008 of Government of Arunachal Pradesh has identified five river basins, namely Kameng, Subansiri, Siang, Dibang Valley, and Lohit as the prime sources of hydropower potential in the State (Table-1). The policy has also indicated the presence of mountainous terrain and large forest area (82 % of the geographical area) in the State.

Given free power of 12 percent from the developers as per the power policy of the State, on full realization of hydro potential, the state would earn around Rs 8959 crore per year (assuming a lower price of Rs 3.08 per Kilo watt hour^v). This is around 271 percent of GSDP in 2008-09. At the investment requirement of Rs 7.39 crore per unit (MW)^{vi}, the exploitation of the full potential will require Rs 421230 crore at 2010-11 prices. This comes to 139 times of the GSDP of the State in 2008-09. Therefore, it is simply not possible for the State government to make this magnitude of investment in the power sector. The State government has, therefore, invited both the private and the Central public sector to invest for power generation in the State.

MOUs Signed for Exploitation of Hydropower

Accordingly, the State government has signed 133 Memorandum of Understandings (MOUs) with different agencies to develop **32883.40 MW** power in the state (Table-2). As per the MOUs signed, the private developers have got a share of 79.01 percent as against the public sector undertakings' share of 20.99 percent in the total hydro power potential exploitation of the state. In terms of number, private developers have got 125 projects while CPSU only 8 projects (inclusive of one to NEEPCO's Ranganadi Project).

Historically, the Arunachal government signed the first MOU with NEEPCO, a public sector company in 1987 for generation of 405 MW at the Ranganadi Project which was commissioned in 2002. The State government signed MOUs with six more PSUs till 2006 for generation of 7580 MW. Since then, the State government shifted its strategy in power generation by involving private developers in a big way (Table-4). Out of the total potential in the State, 72.98 percent is allotted to different developers. Table 2 shows that Siang basin has the highest share (30.35 %) in the total potential of the state followed by Subansiri and Dibang. In terms of allocation, 100 percent has gone to private developers in Siang, Lohit, Tirap and Dikrong. In Tawang basin both the public and the private sectors share almost equally while in other basins like Kameng, Subansiri, and Dibang the private sector claims more than 60 percent. It should be pointed out that one notices some anomaly in the data put up by the State government in its web site. For example, the allotment made to the CPSUs and those to the private developers exceed the potential in Tawang basin by 43 percent (see columns 3 and 6 of Table -2).

Table 1: Hydropower potential of different river basin

Sr No	Name of the Basin	Probable hydro potentials (MW)
1	Tawang	2057
2	Kameng	6183
3	Subansiri	12123
4	Dikrong	560
5	Siang	17308

Table-3: Trend in MOUs signed

Year	No of MoUs signed with	Number	Units (MW) is allotted
1987	PSU	1	405
1999	PSU	1	600
2002	PSU	1	2000
2006	PSU	4	4980
	Non Listed*	4	4300
	Listed*	6	6550
	Total	14	15830
2007	Iso certified	1	90
	Non Listed*	21	5362
	Listed*	13	625
	Total	35	6077
2008	Non Listed*	28	1864
	Listed*	9	4909
	Total	37	6773
2009	Non Listed*	16	467.4
	Listed*	10	4382
	Total	26	4849.4
2010	Non Listed*	14	2143
	Listed*	4	2941
	Total	18	5084

Source: Computed from the data as given in the Official website of Department of power, Government of Arunachal Pradesh.
*The listed and non-listed companies are computed by the authors after putting the name of the developers in the website of Bombay Stock Exchange.

Credentials of the Private developers

Out of the allotment made to the developers with which the Arunachal government signed MOUs in recent years, 80.81 percent was made in favour of private developers and only 19.19 (20.99 inclusive of NEEPCO's Hoj project) per cent was allotted to CPSUs (Table-3). Promoters listed with Indian stock exchange have got a share of 44.71 percent of the allotment, while unlisted companies have claimed a share of 35.88 percent. In terms of number of MOUs signed unlisted companies have cornered 62.41 percent. What emerges is that the private sector developers are given top priority in development of hydro power sector in Arunachal Pradesh. More important, with a share of 35.88 percent in allotment and 62.41 percent of MOUs signed, the unlisted small producers have a strong presence in hydropower generation. Needless to add, listed companies have a better business credentials. So while signing MOUs, credentials factor did not receive due consideration.

Table- 4: Standing of Private promoters with whom MOUs signed and their respective Share

Sr No	Nature of the promoters	No of MOUs	% share	Allotted Units (MW)	% share
1	Public sector undertakings (excluding the NEEPCO's Hoj project)	7	5.26	7985	19.19
2	Listed with Indian stock exchange*	42	31.58	18609	44.71

3	Non-Listed companies*	83	62.41	14934.4	35.88
4	Non listed but ISO certified*	1	0.75	90	0.216
	Total	133	100.00	41618.5	100.00

Source: Computed from the data as given in the Official website of Department of power, Government of Arunachal Pradesh.
*The listed and non-listed companies are computed by the authors after putting the name of the developers in the website of Bombay Stock Exchange.

Trend in MOUs signed with different promoters (1987 to 2010)

Work Progress

The hydropower policy 2008 has a provision of payment of upfront premium by the promoters to the government, before signing MOUs with the promoters. The rates are scheduled as shown in Table-5.

Table 5: Rate of payment of upfront premium

Project capacity	Minimum upfront premium
25-100 MW	Rs 1 lakh per MW
101-500MW	Rs 2.5 lakh per MW
501-1000 MW	Rs 3.5 lakh per MW
1001-2000MW	Rs 5 lakh per MW
2000 MW and above	Rs 6 lakh per MW

Source: Hydro power Policy- 2008, Arunachal Pradesh Gazette, No 104, Vol XV, Nov 20, 2008.

Salient Features of Hydro power Policy 2008, Arunachal Pradesh

- Giving 1% free power to the local area development fund and 12 percent to the state government by the power promoters.
- The developers shall deposit 0.1 % of project cost (maximum Rs 10 crore) as Project cost monitoring and evaluation fee to the state government.
- The developers shall provide 100 units of free electricity to the project affected families or the market value of the same for a period of 10 years.
- The developers shall bear 10 percent of the state government share in the Rajiv Gandhi Grameen Viduitikaran Yoyana (subject to various redial distance limit).
- In various categories of jobs there shall be reservation for the Arunachalee people.
- All the projects are of BOOT type, i.e Built, Own, Operate and Transfer basis. In other words the developers shall build, own , operate the project and after 40 years they are supposed to transfer the project to the state government in operative condition.

Considering the above provisions, the state is going to be immensely benefitted from the projects.

Following the hydroelectricity policy of 2008, developers are supposed to pay the processing fee of 0.5 lakh and upfront premium at the rate as given in Table- 5. Calculating the payment liability for 89 private developers' projects with capacity above 25 MW on the basis of the rates given in Table-5, the upfront premium liability is worked out at Rs. 1582.18 crore (Table-7). (The Central Public undertakings and the project

capacity of less than 25 MW are excluded. The latter is governed by small hydroelectricity policy of 2007). Against the estimated upfront premium liability of Rs. 1582.18 crore, the State government has actually received only Rs 1217.09 crore as upfront premium (Table-7).

Table 6: Upfront premium received.

Year	Amount (Rs Lakh)
2005-06	1488
2006-07	4072.25
2007-08	34720.85
2008-09	51962.76
2009-10	22916.98
2010-11	16870.47
Total	132031.31

Source: Computed from the data as given in the Official website of Department of power, Government of Arunachal Pradesh

Table 7: Upfront payment Liability

Sr No	Capacity range (MW)	No of MOU signed	Total capacity (MW)	Processing fee and upfront premium received (Rs Lakh)	Payment liability as per 2008 policy (Rs Lakh)	Difference between column 5 and 4 (Rs Lakh)
	1	2	3	4	5	
1	25-100	57	3500.5	3384.66	3500.5	115.84
2	101-500	13	4057	14349.7	10142.5	-4207.2
3	501-1000	10	8250	18548.8	28875	10326.2
4	1001-2000	4	5500	22994	27500	4506
5	> 2000	5	14700	62432	88200	25768
6	Total	89	36007.5	121709.2	158218	36508.84

Note: ** Data refers to 89 projects where MOUs were signed and upfront premium received between 2005-06 and 2009-10. It excludes (5 no of projects) the NEEPCO's Ranganadi stage-I, Kameng,, Pare,; Energy Development Co.Ltd's Margingla Lower HEP; and NHPC's Subansiri lower, as data is not available.
Source: Computed from the data as given in the Official website of Department of power, Government of Arunachal Pradesh

It can be observed that the difference between the payment actually received by the State government on account of upfront premium and the liability that should accrue to developers under the Arunachal Pradesh Hydro power Policy 2008, is worked out at Rs 365.08 crore. This shows that the developers have not paid the full premium and are paying in installments. This is one indication that developers are not satisfied with the progress of the project processing and therefore not coming forward to pay the full liability.

The latest report of Central Electricity Commission indicates that as on 31-12-2011, out of 50 hydropower projects under execution in India, only 4 projects are in Arunachal Pradesh (Table-8). This lends support to the argument that only four projects in Arunachal Pradesh are under execution and likely to be completed by 2016-17. It is gathered from an official source that except for

the four projects mentioned in Table-8, all other projects are at the stage of survey or public hearing. The public response to the rest of the projects including Subansiri Lower is not encouraging.

In course of public hearings, people have voiced a number of public grievances. Their proper understanding would not only bring out the major concerns but might also throw some useful insights for evolving an appropriate strategy for utilization of this important natural resource for overall development of the State.

Table 8

Sr No	Name of the project	Capacity (MW)	Implementing agency	Current status
1	Pare	110	NEEPCO	Commissioned*
2	Demwe Lower	1750	Athena Demwe Power	2016-17
3	Subansiri Lower	2000	NHPC	Likely to be commissioned by August 2022*
4	Kameng	600	NEEPCO	Commissioned*
Total in Arunachal (4 projects)		4460		
All India (50 projects)		15065		

*Speech of the Honourable Governor of Arunachal Pradesh on 26-1-2021 on Republic Day.

Public Concerns relating to Hydropower Project

Public agitation has stalled Subansiri project undertaken by NHPC since mid November 2011 leading to a loss of Rs 6 crore per day. There is protest against Jaypee group's Siang project resulting in postponement of public hearing around four times. Vehement public protest is reported against 15 projects in Tawang. Recently the Northeast Students' Organisation (NESO) has also threatened massive movement if the Dams are constructed without the consent of local population. The issues raised by different organizations can be summed up as follows:^{vii}

- (1) Issue of high seismic zone-The entire state lies in high seismic zone-V which, according to experts, is not suitable for Big Dam.
- (2) Demographic tension- In the construction process there will be high influx of outside population as construction workers (Table-9). In the Dibang project for example, more than 5000 outsiders are estimated to flow in as construction workers into the Idu Mishimi area which has a population of only 11000. This is true for other projects also. Such large influx is widely perceived as threatening the identity of local population.
- (3) Possibility of tension between tribes- As the state is sparsely populated, the quantum of displacement is not likely to be large.

Table 9: Likely Impact of Some Projects on Socio Economic Dynamics

Sr. No	Name of the project	Estimated Capacity (MW)	Estimated power Generation per annum (Million Units)	Total affected population	Immigrant Construction workers	Total land required (Hectare)	Proposed forest land Acquired (Hectare)	Expenditure on Environment Management (Rs Crore)
1	Lower Siang	2700	13236	13394	8000	6360	5246	932.33
2	Tawang (Stage II)	800	3694	3599	1500	452	376	118.48
3	Dibang	3000	11330	1877	5000	5827	5136	377
4	Demwe Lower	1750	NA	1349	NA	1589.97	1409	267
5	Talong Londa	225	NA	199 families	1500	485	195	NA
6	Gongri	90	NA	16 families		48.18	0	1.1
7	Tirap	48	NA	NA	910	744	744	89.57
8	Naying	1000	NA	4186	3000	644	644	126.64
9	Hirong	500		881	4240	492	312 (private forest) + 61.77 community land	111.83
10	Pappu Valley	48	NA	2676	NA	27.98	5.07	11.36

Source: EIA Reports of various power projects as available in the website of Pollution Control Board of Arunachal Pra

For example, Lower Siang project with a power generation capacity of 2700 MW is likely to displace around 13395 persons living in 32 villages. But the real concern relates to rehabilitation of displaced people by the project in the areas inhabited by other tribes. There is an apprehension that this would give rise tension between tribes. For, it is difficult on the part of one tribe to live with other tribal groups in a harmonious way because of their differences in language, culture and other social traditions.

(4) Many of the locals feel that the Environmental Impact assessment Reports prepared by different agencies have not fully assessed the downstream impact of the project and these were not shared with the local population during the survey phase of the project. They come to know about the project only at the time of actual construction. For example, the survey work of Debang project was started in 1992 but the people came to know about it only in 2007. Such happening naturally arouses public anger. Some people feel that Draft MOUs should have been made public before it is finalized^{viii}.

(5) There is also a feeling that many of the environmental Impact Assessment Reports have deliberately put the number of project affected people as less than 250 so as to avoid the applicability of National Resettlement and Rehabilitation policy.

(6) In many of the public hearings a perception has emerged that the people are not against exploiting hydropower but they are for sustainable development that does not hamper their livelihood, culture and identity.

(7) The experience of Hoj project even after its commissioning is not good for the villagers living along the downstream of Pare River. It is because sudden discharge of water without any prior warning has caused damage to many human lives and property.

(8) None of the Environmental assessment Reports^{ix} has taken into account the customary rights of the people over natural resources.

(9) 80 percent of the total land required to be acquired for the four mega projects as mentioned earlier is forest land. Even the relatively smaller project, such as Talong Londa, forest land forms 40 percent. Apprehension arises when private land acquired is less than the forest land affected. In such cases, where does the developer get land for afforestation? If the idea is to use degraded land for afforestation, it does not look feasible since such land is mostly used for Jhum cultivation as a source of livelihood. In a situation such as this, future afforestation programme of the developer will not be operationalised.

There is also concern about undervaluing in EIA Reports the impact of hydropower projects on wildlife. For example, the EIA reports^x in respect of projects in Kameng, Lower Subansiri, Middle Siang, Tipaimukh, and Dibang tend to assess poor impact on wildlife^{xi}. Again, some EIA reports seem to understate forest land by excluding forest land under community ownership on the ground of their being classified as community land. To cite an example, Gongri EIA report assessed the need for afforestation of only 4.5 hectares of land when the

project has proposed to acquire around 45 hectares of land large part of which is presumably forest land. The budgeting technique also looks dubious if nearly 90 percent of the total budget for conservation of Biodiversity is allocated for 'anti-poaching measure'. In short, the issue of biodiversity has not received as much attention in the EIA reports as it deserves.

What is the way out?

Most of the above are undoubtedly legitimate concerns of the people. At the same time harnessing its enormous water resources for power generation is a road to a higher trajectory of growth and prosperity for the State which is characterized by the following. First of all, the State has a fragile geo-socio- economic system. Nearly 95 percent of the total area of the State is under hilly terrain leaving precious little for agricultural development. But the State is identified as one of the world's five Biodiversity hot spots. On the other hand, 76 percent of the villages/habitations have population less than 250 necessitating larger resources for basic service provisioning. Nearly 52 percent of the households do not own any agricultural land and are directly dependent on forest. More than 90 percent of the households live in Katcha house and only around 48 percent of the villages are electrified in the State. All this suggests three important points: the development of the State is very challenging; the cost of providing basic services is resource-intensive and the State is, therefore, in dire need for resources for development which harnessing water resources for hydropower generation can provide. How to resolve this conflicting situation?

As it appears from the public hearings, the people are not averse to hydropower generation per se but insist on sustainable development impacting little on their means of livelihood, environment, culture and identity. This means that while designing and implementing the hydropower projects, one has to be sensitive to their concerns and address them appropriately. Proper public

awareness and education as to the possible benefits to the locality in terms of township development and basic service provisioning coupled with credible evaluation of impact analysis could take away much of the apprehension and distrust of the people. The challenge of harnessing water resources for power generation located in a seismic zone -V has to seek a credible technological solution.

There is also one another important aspect. While there is a lot of enthusiasm for power generation as it appears from the number of MOUs signed, investors will not be as excited to invest on transmission and distribution of power for the benefit of the people of the state because of sparseness of population necessitating disproportionately large investment. Without adequate transmission and distribution networks, power would be generated for evacuating it in national grid while people of the State would starve for electricity. The situation such as this would be a source of huge social tension and contribute to building up public agitation against hydropower generation in the State. It is, therefore, important to ensure power availability for local consumption by developing micro and mini hydro projects. In fact, as noted in the Arunachal Pradesh Development Report^{xii}, 53 small hydropower stations with a capacity of 33210 KW are in operation and another 37 micro and mini hydro projects with a capacity of 58990 KW are at different stages of development. It is important to note that these projects did not provoke any public anger at any stage of the work. There is, therefore, a need for a people friendly and sustainable hydro power development strategy in the State. Such a strategy would call for educating people on possible benefits of hydropower, convincing people on minimal impact on environment by bringing out credible and transparent Evaluation of Impact Reports and sharing with the community the remedial measures proposed against any adverse impact.

- ⁱ Planning Commission (2009), *Arunachal Pradesh Development Report*, Academic Foundation, New Delhi
- ⁱⁱ Reserve Bank Of India, *Handbook of Statistics on Indian Economy 2010-11*, accessed from <http://www.rbi.org.in/scripts/AnnualPublications.aspx?head=Handbook%20of%20Statistics%20on%20Indian%20Economy>
- ⁱⁱⁱ Nayak, S.K and S.S.Ratha.(2008), *Debt Problem of Special category States*, Study Report submitted to the 13th Finance Commission New Delhi.
- ^{iv} Government of Arunachal Pradesh, "Hydro power Policy 2008", Arunachal Pradesh Gazette, No 104, Vol XV, November 20, 2008.
- ^v For detail price please see the price rate for Mumbai as given in the website <http://www.frugal.in/electricitytariff.html>

- ^{vi} Details is taken from **ENVIRONMENTAL IMPACT ASSESSMENT OF TIRAP HE PROJECT**,2011.
- ^{vii} Interim Report of Independent People's Tribunal on Dams in Arunachal Pradesh, 3rd February 2008, New Delhi.
- ^{viii} Views expressed by Nabam Naka Hina, Assistant professor Rajiv Gandhi University.
- ^{ix} Ibid.
- ^x Summary Environmental Impact Assessment of 90MW Gongri Hydro Electric Project at West Kameng District of Arunachal Pradesh, p.12.
- ^{xi} Neeraj Vaghlikar & Partha J. Das(2010) "Damming North East India" Juggernaut of hydropower projects threatens social and environmental security of region", Kalpavriksh, Aaranyakand Action Aid India, November 2010.
- ^{xii} Planning Commission (2009), *Arunachal Pradesh development Report*, Academic Foundation, New Delhi.