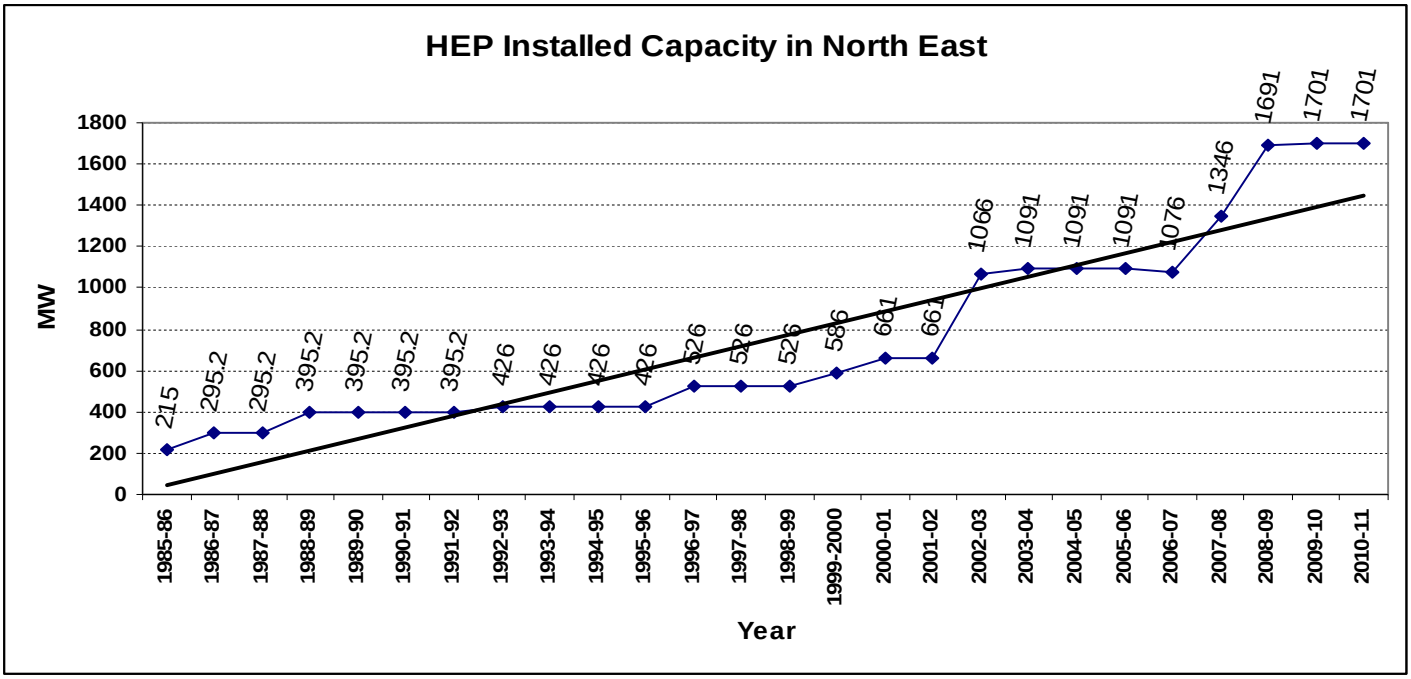
Large Hydro Power Projects in North East India

Dismal power generation performance

North East India is being seen to have huge hydropower potential, up to 60 000 MW or more. A huger number of large hydropower projects are under construction and various stages of active consideration. This has lead to a large number of questions on issues ranging from governance to environment, social and economic issues. The projects are also likely to worsen the coping capacity of the people of the region in the climate change perspective, considering the dependence on natural resources, including forests, rivers and biodiversity, all of which will be adversely affected by the proposed and under construction projects. Considering the geo-seismic situation and fragile, erosion prone mountains in the Eastern Himalayas, the high silt laden rivers, the appropriateness of large hydro projects come under additional doubts. A huge movement is going on in Assam, Arunachal Pradesh, Manipur and other areas of the region in view of the very serious nature of downstream impacts, including the change in flood characteristics of the rivers due to these projects. Poor appraisal and poorer compliance are characteristics of such projects in India and the situation is worse in North East India.

In this context, it would be relevant to see what has been the hydropower generating performance of the existing hydropower projects. Here we have tried to do such an assessment. All figures used here are from the Central Electricity Authority, Government of India's premier technical monitoring body in power sector. Figures have been taken from either CEA website, or from CEA publications or have been obtained under the Right to Information Act.

The total installed capacity of large hydropower projects in North-East is 1701 MW in the year 2010-11, while it was 215 MW in1985-86. The following chart shows how the capacity is increasing in the region over the past 25 years. The graph is already steep compared to rest of India and is likely to get steeper considering the large number of projects under construction and in pipeline.



Arunachal Pradesh The installed capacity of Hydro Power Projects (HEPs) in the state is 423.5 MW, out of the projects in Arunachal Pradesh, only Ranganadi (405 MW) is large HEP, which is under Central Sector (NEEPCO) and rest are small HEPS. In State Sector, Arunachal Pradesh has no large HEPs (more than 25 MW installed capacity) while it has four small HEPs. These projects are Tago (4.5), Nuranang (6), Kambang (4) and Sippi (4).

In the table below we have provided an analysis of the large HEPs of the state in terms of best and worst performance in terms of Million Units (MU, one unit equals one kilowatt-hour, or power that 1 KW can generate if operated for an hour) per MW for the stated period for which the project has been operating in last 25 years since 1985-86. The projected 90% dependable figure is also given. The projects are given techno economic clearance based on this projected 90% dependability figure, with the promise that the project will generate that much power in 90% of years. We have assessed

the actual 90% dependable generation based on actual generation figure and then compared that with the promised 90% generation and based on this, we have assessed the % under performance. The last column gives % years in the study period in which the actual generation is greater than the promised 90% dependable generation. This figure should be 90% or higher. This description of the table is valid for each of the states of North East region for which analysis is given below.

In the case of Ranganadi project, the second largest operating hydro project of the region, the % is ZERO, the project has NEVER achieved generation level which it should have achieved in 9 out of 10 operating years. This is indeed dismal performance.

Project (Installed Capacity)	No of data years	Best - worst Performance (MU/MW)	Average Performance (MU/MW)	Design 90% dependable generation (MU)-A	Actual 90% dependable generation (MU)	% Under Performance	% years when actual generation more than A
Ranganadi (405)	10	4.05 - 0.47	2.94	1876	958	48.93	0

ASSAM The installed capacity of Large HEPs in the state is 325 MW, among them, the Karbi Langpi (100 MW) is in state Sector (APGPCL) and Kopili (NEEPCO) is in Central Sector. The 90% dependable generation figure for Karbi Langpi looks low when compared with other such projects. This makes its performance look rather charitable. The project has been operating only for four full years so far. The longer operating Kopilli project is under performing by huge 44.5% compared to its promised generation figure.

Project (Installed Capacity)	No of data years	Best - worst Performance (MU/MW)	Average Performance (MU/MW)	Design 90% dependable generation (MU)-A	Actual 90% dependable generation (MU)	% Under Performance	% years when actual generation more than A
Karbi Langpi(100)	4	4.95 – 4.00	4.29	390	407	+4.36	100
Kopili (225)	23	6.53 – 2.61	4.16	1153	569	44.49	28.57
Total(325)	**23**	**6.53 – 2.61**	**4.17**	**1543**	**976**	**36.75**	**-**

Manipur There is one Large HEP in the state, which is NHPC's Loktak (105 MW). The project has performed below the promises by over 17%.

Project (Installed Capacity)	No of data years	Best - worst Performance (MU/MW)	Average Performance (MU/MW)	Design 90% dependable generation (MU)-A	Actual 90% dependable generation (MU)	% Under Performance	% years when actual generation more than A
Loktak (105)	26	6.72 – 3.57	4.93	490.29	405	17.35	69.23

Meghalaya The installed capacity of four lage HEPs, the largest number in the region in the state is 206 MW. In addition, Umiam ST- II (18) and Umtru (11.2) are in state Sector (MeSEB). Two of the four projects are heavily under performing and the rest are performing close to the promised generation. Overall performance of the state is pretty dismal with over 35% under performance.

Project (Installed Capacity)	No of data years	Best - worst Performance (MU/MW)	Average Performance (MU/MW)	Design 90% dependable generation (MU)-A	Actual 90% dependable generation (MU)	% Under Performance	% years when actual generation more than A
Kyrdemkulai (60)	26	3.42 – 1.95	2.65	118	134	+13.56	92.3
Umiam ST- I (36)	25	8.92 – 1.31	3.63	128	129	+0.78	88
Umiam ST- IV (60)	19	4.09 – 00	2.57	324	118	63.58	0
Khandong (50) - CS	26	5.84 – 0.34	4.02	242.63	146	39.83	19.23
Grand Total (206)	**26**	**3.77 – 2.13**	**3.18**	**812.63**	**527**	**35.15**	**-**

Nagaland The installed capacity of HEPs in the state is 99 MW, out of which Lokkim-RO is small HEP and comes under state sector. The only large HEP in the state is Doyang (75 MW), which is under Central Sector (NEEPCO). Even though the 90% dependability figure for the project is low, the project is heavily under performing compared to even this lower promised generation figure.

Project (Installed Capacity)	No of data years	Best - worst Performance (MU/MW)	Average Performance (MU/MW)	Design 90% dependable generation (MU)-A	Actual 90% dependable generation (MU)	% Under Performance	% years when actual generation more than A
Doyang (75)	10	3.57 – 1.59	2.55	227	141	37.89	40

Tripura The installed capacity of huge Gumti HEP, which is a storage dam with live storage capacity over 250 Million Cubic meters, is 15 MW. This project comes under state sector. The project has very low 90% dependability generation figure and there is no wonder that the project is able to achieve generation close to that figure.

Project (Installed Capacity)	No of data years	Best - worst Performance (MU/MW)	Average Performance (MU/MW)	Design 90% dependable generation (MU)-A	Actual 90% dependable generation (MU)	% Under Performance	% years when actual generation more than A
Gumti (15)	24	4.67 – 2.4	3.46	38	40	+5.26	95.65

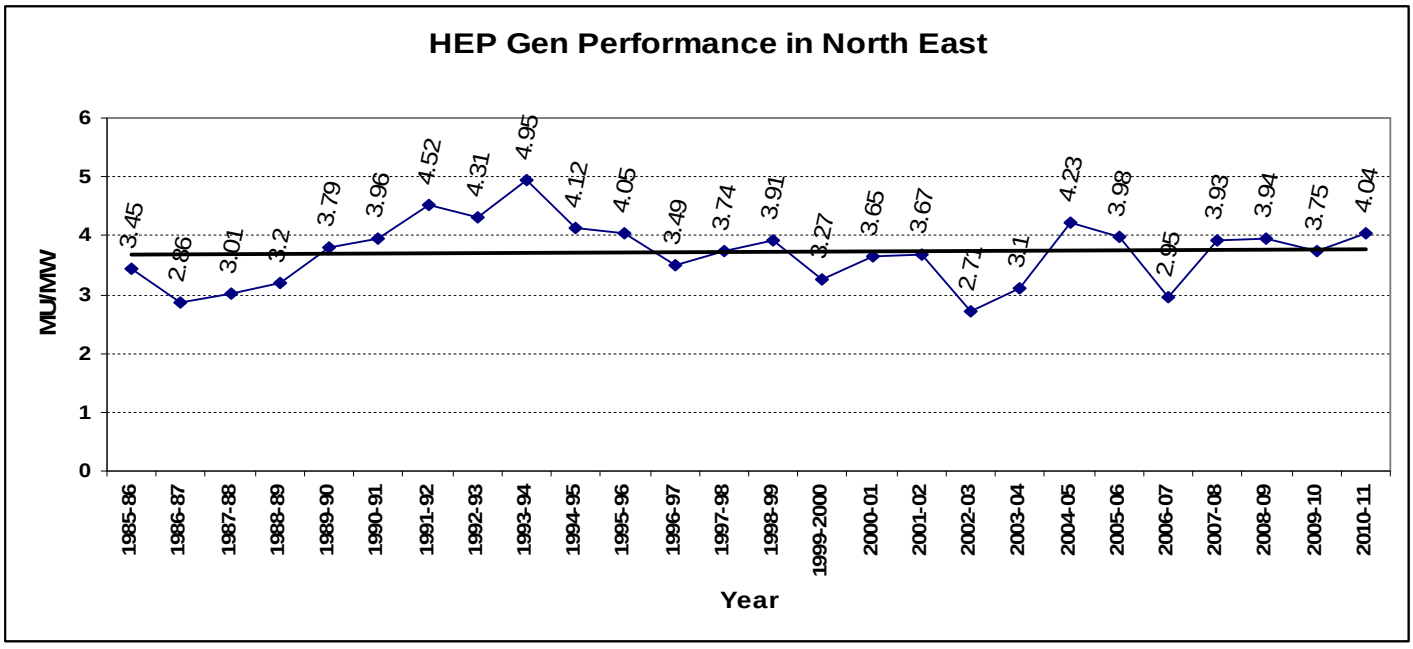
However, it should be added that this dam is a fit case for decommissioning, considering the small installed capacity for a dam that has submerged 4634 ha of land in Raima Valley in South Tripura district bordering Bangladesh. As Subir Bhowmik says, “This was one of the most fertile valleys in otherwise hilly state, where arable flatland suitable for wet rice agriculture is so scarce.” He went on to narrate how the project was fiercely opposed and was also catchment for insurgency groups subsequently. If the dam is decommissioned, Tripura will not suffer power problems as Tripura already has operating gas based power capacity of 232.5 MW, which is far in access of the requirements of the state. At least 25000 tribals can be resettled in the land that would be available if the dam is decommissioned. In fact in the last state elections, this was a major election issue which was endorsed by all except the ruling alliance. It is high time this dam is decommissioned.

Sikkim The installed capacity of HEPs in Sikkim is 602 MW. Rangit (60) and Teesta (510) are large HEPs, which are under Central Sector (NHPC) and rest are small HEPS. Sikkim has the highest hydropower installed capacity among all the NE states and also has the largest number of under construction hydro projects among all the North East states. Sikkim State Sector has L Lagyap (12 MW), U Rognichu (8 MW), Moyangchu (4 MW) and others (8 MW).

Project (Installed Capacity)	No of data years	Best - worst Performance (MU/MW)	Average Performance (MU/MW)	Design 90% dependable generation (MU)-A	Actual 90% dependable generation (MU)	% Under Performance	% years when actual generation more than A
Rangit (60)	11	6.18 – 3.35	5.50	349	304	12.89	33.33
Teesta (510)	4	5.15 – 3.70	3.62	2573	2598	+0.97	66.66
Total (570)	**11**	**6.18 – 3.35**	**5.26**	**2922**	**2902**	**0.68**	**-**

Mizoram has no Large HEPs.

Regional Analysis In the graph below we have plotted the MU power generated per MW installed capacity for all the projects of the states of North East India for the last 25 years. Even though the graph is flat, we can see that the generation in recent years has been below 4 MU/MW, about 19% below the peak of 4.95 MU/MW reached in 1993-94. The 90% dependability figure for the state is 4.65 MU/MW, as can be seen from the able that follows, and in the entire 25 years period, the state has crossed this figure just ONCE, when it should have achieved it for at least 22 years. It is clear that the power generation performance in the state is pretty dismal and it is not improving for the last 25 years.



In the table below we have given a glimpse of state wise performance of large hydropower projects in the North East States, taking the analysis from the state wise details above.

Project (Installed Capacity)	Best - worst Performance (MU/MW)	Average Performance (MU/MW)	Design 90% dependable generation (MU)-A {MU/MW}	Actual 90% dependable generation (MU)	% Under Performance
Arunachal (405)	4.05 - 0.47	2.94	1876 {4.63}	958	48.93
Assam (325)	6.53 – 2.61	4.17	1543 {4.75}	976	36.75
Manipur (105)	6.72 – 3.57	4.93	490.29 {4.67}	405	17.35
Meghalaya (206)	3.77 – 2.13	3.18	812.63 {3.95}	527	35.15
Nagaland (75)	3.57 – 1.59	2.55	227 {3.03}	141	37.89
Tripura (15)	4.67 – 2.4	3.46	38 {2.53}	40	+5.26
Sikkim (570)	6.18 – 3.35	5.26	2922 {5.13}	2902	0.68
Total (1701)	**4.95 – 2.71**	**3.72**	**7908.92 {4.65}**	**5949**	**24.78**

It is clear that only 4 of the 12 projects of North East generate at projected 90% dependability or higher. The total capacity of these 4 projects is 221 MW, which is less than 13% of the region's hydro installed capacity of 1701 MW. So 87% of installed capacity and 67% of projects generate at less than the promised generation level. It may be noted that the underperformance has nothing to do with the age of the project, even the not so old projects like the 405 MW Ranganadi and the 75 MW Doyang HEPs are hugely underperforming. For the region as a whole, the under performance is around 25%, and if we see the generation figures of last few years, we see no improvement.

The trouble is that this kind of analysis is not even being done by the concerned agencies at the state or the central level, leave aside making any attempts to improve this performance. It may be better for the state and central governments, operators and those others advocating more hydro projects in the region to rather try and understand the reasons for this huge under performance and see how this can be improved. There are two broad categories of reasons why this is happening. Lack of proper repair and maintenance, lack of attempts are optimization of generation (e.g. in case of multiple projects on the same river) and lack of catchment area treatment to reduce the siltation, is one group of reason, if tackled properly this can improve performance. Second group of reason is related to flawed appraisal, decision making and governance mechanisms due to which unviable projects or capacities have been set up. For the projects that have already been set up, this may not help immediately, except in cases like Gumti, where it can help take decisions for decommissioning. However, lessons learnt from such analysis can help achieve better decisions in future. It would be better for all concerned to follow this path rather than pushing more hydro projects in the region, which will only worsen the situation for the people of the region.

Even on Supply side options for the region, there is the excellent example[1] of the Anjaw district in Arunachal Pradesh, where, through the help of four sub MW (less than a MW) capacity hydro projects operating, five sub-MW hydro projects under construction and one 16 MW hydro project would make the district surplus in power generation. NE India has a huge scope for such sub MW projects, which is appropriate for the region, considering the dispersed populations. Such projects would still have some local impacts, though hugely lower scale compared to large projects. And the impacts of such small projects are easier to assess and compensate and adopt to. In such projects, local communities can also be partners from planning to operation stage and these will have much lower footprint from the climate adoption capacity point of view and also biodiversity and natural resources point of view. No serious attempt unfortunately is being made to pursue this path.

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[1] See: http://timesofindia.indiatimes.com/city/guwahati/Anjaw-shines-in-hydro-power-sector/articleshow/11333208.cms