Status of Electric power generation in India with special emphasis on Hydropower expansion

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Abstract: India presently suffers from a major shortage of electricity generation, though it is the world's fourth major energy consumer. Power cuts are common throughout India and the resulting failure to satisfy the demand for electricity has badly affected India's economic growth. India's electricity sector may be divided into renewable and nonrenewable energy sectors. In renewable sector, Hydro power, Wind Power, Solar Energy, and Biomass energy are key players. In terms of nonrenewable sector - fuel, coal and nuclear power contributing major share in India’s Power generation. There are major obstacles for Coal, Fuel and Nuclear Energy based Power industries when compared to hydroelectric power generation. India's electricity sector faces lot of challenges such as poor infrastructure and high cost of production to harness India's coal bed shortage of natural gas, less availability of nuclear resources etc. A large part of Indian coal reserve is of low calorific value and high ash content which affects the thermal power plant's potentiality. Though India's nuclear power generation effort satisfies many safeguards and oversights: its biggest challenge is to address the public and policy maker perceptions about the safety of nuclear power, particularly after the Fukushima incident in Japan. But the recent tragedy occurred in the month of June 2013 at Uttarakhand which was recently devastated by massive landslides and flash floods killing hundreds of people also a contributing menace for the continuance of many constructed and under constructed hydroelectric projects in Himalayas.

Keywords: Hydropower, Electricity, Renewable Sector, Nuclear Energy

Introduction:
India has vast hydropower potential of over 84,000 MW at 60% load factor, out of which, Brahmaputra, Indus and Ganges basins contributing about 80%. Out of this total, India has harnessed only about 15% so far, another 7% under various stages of development and the balance 78% remains un-harnessed due to many issues and barriers. Hydropower has immense benefits and has been brought forward as a favored option for power generation over the last decade as it involves no extra foreign exchange outgo. It is free of inflation and also Environment friendly. Hydropower projects support socio economic development of remote areas as the project site is developed. Hydropower is cost effective and renewable form of energy. It has additional benefits like irrigation, flood control, tourism etc. Therefore this paper highlights the present challenges and obstacles that are being faced by Indian hydroelectric power industry and possible remedies to expand the hydroelectric sector by giving top priority in the coming years.

Hydropower in India:
India is blessed with enormous amount of hydroelectric potential and ranks 5th in terms of exploitable hydro-potential on global scenario. As per assessment made by Central Electricity Authority, India is endowed with economically exploitable hydro-power potential to the tune of 1, 48, 700 MW of installed capacity. India’s hydropower system is divided into five major provinces namely, the Northern region, Western region, Southern region, Eastern region and North-Eastern region, with each region facing separate issues. While the Eastern and North-Eastern regions are power abundant, the Northern and Western regions have greater power demands. The hydropower potential is largest in NE region with 98% of it still untapped. Northern, Eastern, Western and Southern regions have 79%, 77%, 23% and 33% unexploited hydropower potential respectively. A large part of the hydroelectric projects are concentrated in North-eastern states by virtue of the availability of water and required topography but the demand for power in these areas is not significant. In broad review there are technical, financial and environmental issues that are contributing factors for the hydropower development in India as illustrated below.

Technical issues:
For any Hydroelectric Project irrespective of the location, there are many technical issues which are to be addressed on top priority. To expedite early execution of hydroelectric projects in India, feasibility and detailed Reports based on survey to be prepared for any geological uncertainties. Survey & investigation for geological and Geotechnical parameters and analysis of geological, geomorphological, geo-electrical, hydrological data etc. should be done at the time of preparation of a Project feasibility report itself in order to minimize the impact of risks. Most of the Hydroelectric projects spend less money towards the technical reports prior to construction stage. Geological hazards to be predicted and analyzed based on the preliminary investigations to avoid delay and disruption during the construction stage.
Technical constraints due to intricate geological nature of the project sites, Dam safety and security is a matter of utmost importance, failure of which can cause grave environmental disaster and loss of human life and property. Therefore proper scrutiny, inspection, operation and maintenance of structures are essential to ensure for safe functioning.

The hydroelectric sector needs to develop a set of capable civil engineers/contracting agencies with technical and the management expertise to conceptualize and develop a project of the required scale. Most of the Project contractors are selected on lowest bid basis giving less importance to their technical efficiency. The transparent system of selection of contractors based on their technical status will be helpful in resolving any disputes that may arise during the execution of the project.

In a recent case the Supreme Court ordered to ascertain whether existing and under-construction hydropower plants and projects in Uttarakhand contributed to the flood disaster that hit the state in June 2013, and expressed their concern over large number of power projects on the Ganga and its tributaries without scientifically assessing their cumulative impact.

It is, therefore, necessary to conduct detailed investigations with the latest state of the art technology and prepare a detailed report by considering all the issues to build confidence in the national/international developers to take up the execution of projects at the same time, continuous monitoring of the safety issues should be taken up on top priority before initiating the project.

**Infrastructural issues:**

Most of the Hydroelectric projects are located in the Himalayan mountains by virtue of the availability of water. The approachability is bit difficult for preliminary investigations and also for construction of the project. Many proposed hydroelectric projects do not have proper infrastructure like road accessibility etc. it is very difficult to conduct the preliminary investigations also by deploying the men and equipment to such places where there is no accessibility especially in hilly terrains. Besides that, construction of transmission lines is expensive and time consuming especially when the transmission of power has to be carried out through very narrow land available between India and Bangladesh.

There are long interruptions on account of land acquisition for the project especially if the projects are situated in more than one states as water is a state subject. The process of land acquisition rules and regulations are different from State to State. Hence, the Central Government should amend Land Acquisition Act and include hydro power projects in the priority list and the State Governments should be convinced to provide land to the project authority in agreed time frame to facilitate the rehabilitation for shifting properties and personnel.

Problems like delays in obtaining environmental clearances, land acquisitions and rehabilitations need to be addressed on fast track mode on a single window clearance for hydroelectric projects. It should however, be ensured that there exists no compromising attitude towards environment and safety issues.

The issues raised in the development of Hydro Power Sector are always mentioned in a similar fashion. The main issue today which has stalled the development of approx. 40,000 MW of hydro power in the state of Arunachal Pradesh alone has been the problem of law and order. Due to rampant violence by local people on the project related issues and personnel have made the developers scared even to enter the state. This issue has resulted in the huge price escalation of the project cost and unnecessary delay even at the stage of investigation. This also adds up in the gestation period of a hydro power project. Central government and state authorities should seriously look into the problem and provide concrete measures to resolve law and order problems in such cases.

**Financial issues:**

Project report preparations for Hydroelectric projects are time consuming and much expensive when compare to thermal power. There are lots of parameters to be studied, analysed and concluded especially when the construction is involved in underground. Heavy initial investment is needed for construction of approach road and other infrastructural setup.

Absence of long tenure loans makes it difficult for private investors as the private developers are finding it difficult to enter into PPAs (power purchase agreements) with states due to the uncertainties in the project. Developers do not have full control over the project cycle and face time and cost overruns on account of factors usually beyond their control. These factors are largely responsible for cost increases and in finally it becomes difficult to estimate the cost of completion of the project.

The respective state governments should take the burden of construction of accessible roads for investigations, as the development of hydro projects generates economic and commercial activities around the project site and results in economic benefit to the State.

There is also a need to address the security problems in troubled areas where the projects are infested by militancy and terrorist activities. Government should take care of all these measures especially at the investigation and construction time. Once the project is completed and in the production stage the responsibility may be transferred to the developer.
Government has planned to achieve 50,000 MW of additional power by the end of 11th Plan period. Hence, the incentives such as benefits/concession in custom duties and local levies/taxes on project components are to be extended to the developers. The lease rent on the land where the forest is diverted for a hydro power project needs to be discussed with the State Governments as land is a subject matter of the particular state.

Environmental issues:
Because there are number of hydroelectric projects constructed or being constructed in India especially in North-West and North-East, understanding the ecosystem and habitat issues is plays vital role. Examining these issues, however, needs to be done in a broad context for three reasons.

First, no two hydroelectric projects are exactly alike, and many are very different. Thus, while issues can be examined in general terms, one should not draw conclusions that all or even most projects have similar environmental impacts.

Second, while this discussion focuses on hydroelectric projects, one should not conclude that all dams are used to produce electricity. Most dams are used for purposes such as irrigation, flood control, and water treatment. Further, many dams support a combination of activities. For example, Dibang Hydroelectric Project in Arunachal Pradesh is constructed for irrigation, flood control, and the production of electricity.

Third, this section does not provide detailed information about a host of other activities that can significantly impact a river’s ecosystem and the species that rely on it for survival. Examples of other non-hydropower related impacts include grazing, logging, agricultural activities, mining, land development, and the harvesting of fish. Determining the relative impact of these activities versus hydroelectric projects is very complex and the subject of ongoing debate.

Over the last two decades, decisions on many hydropower projects have been affected by controversy about the environmental issues. As far as the main environmental issues are concerned for, there are three major factors that should be addressed

a. Enhance the economic equity among citizens.
b. Protecting the lives and property of citizens from floods and droughts.
c. Securing the rights of citizens with respect to expropriation of land to be inundated.
d. Protecting the environment concerning air, land, water and biodiversity.

Some or all of these issues are competing and sometimes conflicting. The interests of the communities are either positively or negatively affected by hydropower projects and the economic, social and environmental benefits and impacts need to be carefully analyzed on a case-to-case basis before proceeding with projects.

Conclusion:
Hydropower has immense benefits and has been brought forward as a preferred option for power generation over the last decade. Abundant potential of hydropower development in India with relative independence from international market like oil prices, hydropower involves no extra foreign exchange outgo. Hydropower is a no-inflation power as Water is the raw material for power generation and it is free of inflation and environment friendly.

Hydropower projects will definitely replace all other renewable and nonrenewable resources if some of the problems like Technical constraints Inter-state disputes and long tenure loans to the private entrepreneurs are properly addressed. Government should promote small and mini hydroelectric projects by strengthening the role of public sector and private sectors in taking up new hydro projects. It is suggested that the promoters should be selected on the basis of their competence and experience and not considering alone on the basis of premium.

References: