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NEED AND PROSPECTS OF ALTERNATIVE ENERGY SOURCES IN NORTH-EAST INDIA

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Infrastructure development is an essential precondition for economic growth. Infrastructural sector is further decomposed as economic and social infrastructure. Whereas, the social infrastruture sector consists of education, health, sanitation facilities and economic infrastructure sector includes basic industries and energy sector like transport facility, manufacturing industries and energy sector. As an input, the energy sector warrants the priority for the functioning and the development of most of the economic activities. This is also, evident from the fact that during last eighth Five Year plans, the energy sector has been a single most important sector, where largest amount of finances are invested, which resulted in significant development of this sector in India.

As an average, twenty six percent of the Indian populations (of about 950 million) live in urban areas. There energy needs are met by non-commercial and commercial sources. A sizable share of the requirements of the rural households is met by non-commercial sources like fuel wood, agricultural residue, animal waste and human and animal power. These resources are steadily getting replaced by commercial fuels.

The total energy supplies (commercial and non-

commercial) increased from 82.72 MTOE (million tones of oil equivalent) in 1950-51 to about 291 MTOE in 1990-91. This development is very significant as energy supply increased by 352% during this period, with the average annual rate of growth of 8.7%. In this total supply of energy, the share of non-commercial fuels has declined from 74% to 41%. Fuel wood alone accounts for 65% of the non-commercial energy consumed. As far as the commercial energy supplies are concerned, coal continues to be the main primary source.

The elasticity of final consumption of commercial energy with respect to gross domestic product (GDP) measures the proportionate amount of energy used to marginal increase in GDP. Lower the coefficient of elasticity reflects the efficient use of energy. This coefficient of elasticity has declined from 1.37 during 1979-80 to 0.82 in subsequent decade mainly due to changing technologies. There have also, been significant changes in the sectoral pattern in the use of commercial energy. The share of industrial sector increased from 39.8% in 1953 to 57.0% in 1980 and then declined to 50.4% in 1990. The share of agricultural sector grew steadily durinng this period from 1.70% to 6.10% and 9.00% in decades 1950-51, 1980-81 and 1990-91 respectively. The services sector share declined from 46.2% to 23.50% in 1980 and then marginally increased to 24.50% in 1990.

Considering among various types of fuels, the share of coal decreased steadily from 79.60% in 1953 to 39.00% in 1990 and that of oil and gas rose from 17.1% to 43.40% and that of electricity from 3.30 & to 17.60%. The geological coal reserves, according to latest available estimates is about 196 billion tonnes, which is around 5.70% of the world reserves. These coal reserves are distributed mainly in Tamilnadu, Rajasthan, Pondicherry and Gujrat. The coal being extracted and utilised by Thermal power

generation plants.

At present, the assessment of hydro-power potential is 600 billion units, which amounts to 84,000 Mega Watts (MW) at 60% load factor. It is significant to note that out of total hydal potential nearly 14% has been so far developed and another 7.00% is being developed through mini/micro/small hydel schemes. Another source of conventional energy is oil and natural gas in the form of geological reserves of hydrocarbons are at 21.31 billion tonnes of which 61.00% are off shore and 39.00% on land. Out of which, the established geological reserves are only 5.32 billion tonnes. It is stipulated that half of the reserves represent natural gas of which only 12% has been established. Nuclear power, as a promising source of energy, in near future could only possible with fast-breeder technology. At present potentiality of nuclear power is very limited in India.

As far as the non-conventional sources of energy are concerned, solar energy is abundant, wind energy is estimated potential as about 20,000 MW. There is also some scope for exploiting geo-thermal, ocean thermal and tidal energy at certain location. Extensive afforestation at village level in rural areas, can meet the local biomass requirements.

Table-1 reveals that energy supply is continuously growing, but increasing energy supply shortage suggests that energy demand is growing with much faster rate than energy supply. This shortage is further aggravated when the difference between peak load power supply and power demand is varies between 15.00 to 20.00%. This increasig trend in power consumption poses a serious challenges for future.

Table-1: Energy Supply Shortage : All India

Year	*Energy (mu)*	*Shortage in %*	*Peak load (MW)*	*Shorage in %*
1989-90	19,611	7.9	6,727	16.7
1990-91	21,072	7.9	6,834	15.5
1991-92	22,542	7.8	9,008	18.8
1992-92*	19,199	8.5	10,051	19.4

** up to December, 1992*

According to the estimates of future projection demands, energy requirement would be 824 billion units by 2006-07. The production requirements of coal and hydro-carbons would also grow accordingly, but limited reserves and exploration put major challenge for planners. This fact become more important as energy is going to play a major role in achieving faster economic growth in future. This calls for a deeper analysis for developing the alternative sources of power generation, which could suggest an economically viable and optimal solution. In this connection the need to explore the potential of 'non-conventional' energy sources very vital and relevant.

The high construction cost of power units and the problem of un-interrupted supply of inputs (like coal), off late forced the planners to look for alternative source of energy. In general, it is accepted undisputedly that the thrust now should be on mini and micro hydel power projects and non-conventional sources particularly solar, because, in most of the parts of country there is ample sun-shine almost throughout the year. One of the estimate suggests that entire energy requirements of the country can be met provided proper technology developed to trap and use the solar energy. If harnessed economically, solar energy can provide a ready and environmental friendly

alternative source of domestic fuel.

WIND ENERGY

Wind energy is a viable alternative source of energy. The harnessing technology of wind energy is simple. The strike of the blowing wind on specially designed blades of windmill's rotor causes both to rotate. This rotation which is the mechanical energy when coupled to a turbine, drives the generator. This is most suited to the Indian sub-continent which is a high wind zone with energy potential estimated at around 20,000 MW, according to Ministry of Non-conventional Energy sources.

Wind energy plant has a gestation period of just about five months. Once the wind turbine is commissioned, generation starts and owner gets power free as the energy input is free of cost. This shows that wind power generator is economically viable project. On the contrary, in conventional source of energy generation, the hike in fuel prices increase the cost of production. Besides, maintenance of machinery and limited running time add to unit cost of power. The five to ten year gestation period of these system affects economical viability in the form of high opportunity cost, as investment is blocked for too long without results. In diesel power generation, along with price fluctuation, country has also pay price in terms of foreign exchange in term of import bill, when most of the advanced technologies and heavy and sophisticated machinery is imported at internationally competitive price.

Following are the advantages of wind power energy plant over conventional system:

(i) Low gestation period

(ii) Cost free power after commissioning the plant.

(iii) Flexible power supply as installing wind turbines is

flexible as each generator's capacity is relatively small.

(iv) Cheaper power generation as less recurring and maintenance expenditure.

(v) Installing 1 MW wind power plant costs about Rs. 3.6 crores, with pay back period is as low as seven years, with average life of 20 years. Cost of power generator is 40 paise per unit, almost one-third cost than conventional source.

SOLAR ENERGY:

Solar energy is a dependable, low maintenance, stand alone source of renewable energy in the regions where sunlight is available during the most of the part of the year. For this purpose, it is need to operate and install with solar photo voltaic power plants. The plant has arrays of solar modules in series, which is useful in meeting peak load demands.

One of the major difficulty to the commercialisation of photo voltaic is its high initial cost. But, continuous research effort has made it possible to reduce the cost from Rs. 1,200/- per peak watt (WP) in 1970 and stabilised around Rs. 160 at present. This system is specially useful for rural electrification and can successfully supply power for lighting, commuity television sets and water pumping for drinking water and micro irrigation. India has great potential for solar energy, which is estimated of the order of 5×10 raised to the power 15 KWHR/YEAR but total energy generated through installed solar thermal devices at present is less than 130 million KWHR/YEAR till 1991-92.

Department of Non-conventional energy (DNES) has taken many steps to popularise the non-conventional source of energy. In year 1991-92, Department of Telecommunication

install about 25,000 SPV systems for powering rural radio telecommunication system. In 1993-94, establishment of decentralised SPV power systems with array sizes ranging form 2 to 10 KWH, for water pump programme and for solar lantern scheme (10 watt module with seven watt lamp).

Further, the Indian Renewable Energy Development Agency (IREDA) has recently come out with a scheme under which IRDEA would join hands with state governments and to private sector companies with a mandate to develop wind power estates in different parts of the country. The share holding pattern for the firm would be 24%, 25% and 51% of the IRDEA, state government and the private sector, respectively. As an incentive accelerated depreciation allowed on equipment cost and facility of soft-loan-window.

Solar energy generates power which may be used for widening applications for example for PV lantern, rural radio telephone, shallow well pumping system, micro irrigation for farmers, deep well pumping system, power plants, micro-wave receiver stations, which usually on hill tops. With all the above applications and many more are development stage. But it is evident that PV power is playing an increasing important role as a technical and economical source of energy for rural electrification. Hence, all efforts and incentives to promote the manufacture and use of photo voltaic power should be provided.

Status of Renewable Energy Sources in North-East India

Table-2 reveals some of the features of the trends of power consumption in North-eastern region from 1970-71 to 1992-93. The per capita power consumption is continuously increasing significantly in all the NE states. This shows the growing need of power consumption in

this area, at the same time, level of per capita consumption is much lower that of 'All India' average, through out the twenty years period. This phenomena could be explained partially by low level of economic activities based on power. In future, the scene is expected to change for better, then demand for electricity will grow faster and will further generate the scope for renewable energy sources in this region. Along with other states of India, the activities and encouraging policies of DNES, New-Delhi, are popularising renewable energy technologies in N.E. states.

Table-2: Per capita consumption of electricity in North-Eastern Region (in KWH)

State	*Arunachal Pradesh*	*Assam*	*Mani-pur*	*Megh-alaya*	*Mizo-ram*	*Naga-land*	*Tri-pura*	*All India*
1970-71	—	24	5	—	—	8	5	90
1980-81	15	34	6	31	7	32	13	135
1984-85	32	46	26	61	24	65	25	167
1985-86	32	53	34	76	32	67	28	178
1986-87	34	51	48	83	26	56	29	191
1987-88	45	71	60	84	41	65	35	203
1988-89	55	63	57	98	49	67	41	216
1989-90	58	78	80	108	57	70	51	236
1992-93	12	91.0	140.4	159.4	126.1	100.0	83.9	330.6

Source : The power Scenario, New Delhi, April, 1991.

Table-3 to 5, show the state-wise break up of renewable energy technologies installation till March'91. Biomass and solar energy sources are more popular in this region, where wind energy source is yet to develop. Deals of bio-technologies are given in table-3, Micro level family type biogas are installed, in the highest number in Assam,

followed by Mizoram and Manipur. Nagaland and Tripura are having least number of biomass plants. Biogas plant in the form of improved chulha (IC) is very popular in Assam and Meghalaya. Whereas, IC scheme is yet to develop in Manipur. Solar energy technologies are also picking up the ground in North-Eastern India, (Table-4) Tripura and Nagaland are prominating in generating power through solar power plants. But, Mizoram, Sikkim and Assam are yet emerge on the map of the states which are utilising the solar energy for power generation. Solar energy source are also, being applied for street lighting, solar pumps, for domestic and community lighting systems in the villages. Tripura and

Table-3: State-Wise Break up of Bio Renewable Energy Technologies Installations (upto 31.03.91)

	Manipur	*Meghalaya*	*Mizoram*	*Nagaland*	*Sikkim*	*Tripura*	*Assam*	*Arunchal Pradesh*
Biogass CBP/ IB P/NBP	—	—	—	—	—	—	1	—
Family type biogass plants	416	219	711	124	539	164	9748	52
Biomass gasifiers	—	2	—	1	—	—	—	2
Improved Chulhas	2156	10200	7694	7000	18597	5971	101357	6042

Source : Basic Statistics of North-Eastern Region, 1995 : North-Eastern Council, Ministry of Home Affairs, Government of India, Shillong.

Table-4: State-Wise Break up of Solar Energy Technologies Installations (upto 31.03.91)

State	*Street lighting no of villages*	*Solar Pumps*	*Community lighting system*	*Domes-stic lighting*	*Power Plant (KWP)*
Manipur	30	2	—	—	4.00
Meghalaya	25	25	—	210	2.50
Mizoram	41	7	1	85	—
Nagaland	38	15	3	8	6.00
Sikkim	28	2	3	20	—
Tripura	52	113	122	225	11.70
Assam	20	69	—	—	—
Arunachal Pradesh	30	14	14	50	2.00

Source : as of Table-3.

Meghalaya are the states who are most capitalising the use of solar energy technologies. Solar energy can also, be utilise for Water heating system. The Urja water heating system trough solar energy is vary popular in Meghalaya, followed by Mizoram, but Sikkim is not any of the available technique for water heating either at community level or domestic level (Table-5). It may concluded from above observations that the use of non-conventional sources in north-eastern India is in its developing stage and there is much more scope for improvement qualitative and quantitative use of non-renewable energy sources in these states.

Table-5: State-Wise Break up of Water Heating Technologies Installations (upto 31.03.91)

State	*Urjasrams*	*Solar*	*Domestic*	*Solar Stills*
Manipur	—	200	12	21
Meghalaya	—	732	2	—
Mizoram	—	70	—	—
Nagaland	—	—	—	—
Sikkim	—	20	9	—
Tripura	2	—	—	25
Assam	—	—	—	56
Arunachal Pradesh	—	—	—	20

Source : as of Table-3

Formation of New Policy

New policy seeks to increase the share of renewable energy in overall energy balance. Target is also, fixed to ensure 'electricity for all' in next fifteen years. Efforts will also be done to ensure substitution of petroleum based fuels with renewable energy. This would also, help in reducing level of environment pollution. Private sectors are encouraged in this sector to increase competitiveness. It is hoped that all these policy measures would definitely new thrust to develop non-conventional energy sources in NE region in particular and in nation as whole.