ALL INDIA SEMINAR 17-18 NOV 95, IE(I) CAL

(11)

IMPROVED CAPACITY UTILISATION BY EXCHANGE OF POWER BETWEEN EASTERN REGION AND NEIGHBORING REGIONS

MAHENDRA KUMAR * S.K.SOONEE **

1. INTRODUCTION

Eastern Region has been operating under severe constraints on availability of Power for last two decades. Generating Capacity was planned on the basis of the PROJECTIONS given by the constituents, at times artificially inflated. In this process, a number of generating stations have come in the Central and State sectors during last two years. Generating capacity already commissioned, under the process of stabilization and likely to be synchronised by March'96 are given below at table -1.

TABLE-1

GENERATING CAPACITY IN EASTERN REGION

Constituent	As on 31.10.1995						Addition by March 1996		
	Under Commercial Operation			Under Stabilisation					
	Thermal	Hydro	Total	Thermal	Hydro	Total	Thermal	Hydro	Total
NHPC	1520	0	1520	1210	0	1210	710	0	710
[illegible]	2010	144	2154	0	0	0	210	0	210
BSEB	1308	182	1488	210	0	210	210	0	210
OSEB	870	1272	1842	0	0	0	210	0	210
[illegible] ining with Associates]	3325	70	3395	0	0	0	0	0	0
DVC	0	31	31	0	0	0	0	0	0
TOTAL	8831	1679	10510	1420	0	1420	1340	0	1340

* does not include the import of power from Bhutan and Captive Power Station operating in synchronism with Eastern Grid.

Due to uncertainty in availability of power, industrial growth could not take place in this region during the long gestation period of generating stations. Such liquid developments in the growth of load and generating capacity has put Eastern Grid in a condition of surplus power as well as energy. This paper deals with the opportunities available for exchange of power with other regions in such surplus condition alongwith the associated commercial issues.

2. LOAD PATTERN IN ER

Eastern Region is rich in heavy industries. Majority of heavy industries have their own captive generating stations, some of them even inject power into the grid.

Agriculture load is also quite low comparing to other regions in India and is estimated to about 6 to 7% of total demand. Railway traction and mining are two major consumers in the category of heavy industries constituting about 20% of total demand. Domestic and commercial load constitutes major share of demand in E.R. Due to high time sensitivity of domestic and commercial loads, peak - off-peak ratio in ER is quite high (of the order of 1.5:1). Due to low share of agriculture load, much of margin is not available for flattening of peak like that in other regions. Typical Daily Load Curve for Eastern Region is given below at figure-1.

3. SURPLUS POWER IN ER AND COST THEREOF

Of late, Eastern Grid is operating with minimal constraints. Actual demand pattern during this period gives more accurate information about the daily load curve and the level of peak demand compared to the projections given earlier by various constituents. Based on Availability Factor of 200 MW units in service, estimated availability of power and demand for the year 1996 - 97 is given in table-2.

TABLE 2

DEMAND AND AVAILABILITY IN EASTERN REGION DURING 1996-97

HRS.	AVAILABILITY				DEMAND
	THERMAL	GAS	HYDEL	TOTAL	
00 01	6762	150	250	7162	4316
01 02	6762	150	250	7162	4341
02 03	6762	150	250	7162	4266
03 04	6762	150	250	7162	4330
04 05	6762	150	250	7162	4474
05 06	6762	150	250	7162	4775
06 07	6762	150	800	7712	5125
07 08	6762	150	800	7712	5264
08 09	6762	150	800	7712	5248
09 10	6762	150	855	7767	5252
10 11	6762	150	855	7767	5173
11 12	6762	150	250	7162	4966
12 13	6762	150	250	7162	4839
13 14	6762	150	250	7162	4505
14 15	6762	150	250	7162	4584
15 16	6762	150	250	7162	4743
16 17	6762	150	250	7162	5230
17 18	6762	150	1630	8542	6320
18 19	6762	150	1630	8542	6511
19 20	6762	150	1630	8542	6546
20 21	6762	150	1630	8542	6320
21 22	6762	150	1630	8542	6181
22 23	6762	150	450	7362	5318
23 24	6762	150	250	7162	4552

* Additional General Manager, POWERGRID, ERLDC, Calcutta
** Senior Manager, POWERGRID,ERLDC, Calcutta

Eastern Region has poor hydro-thermal mix. For the generating units on bar, present hydro-thermal mix is about 1:6.2 which will go further down to 1:7.3 by March.'96. After use of hydro power for peaking purposes to the extent possible (excluding the rainy season), surplus power available in ER is shown in figure-2.

Majority of 110 MW and lower size thermal generating units are quite old and operating at de-rated capacity. These units are not able to back down without oil support. Wherever required, backing down has to be done mostly on the 200 MW and 500 MW units. It is also found to be economical to back down the generation at large size units upto oil support level rather than backing down at smaller units with oil support.

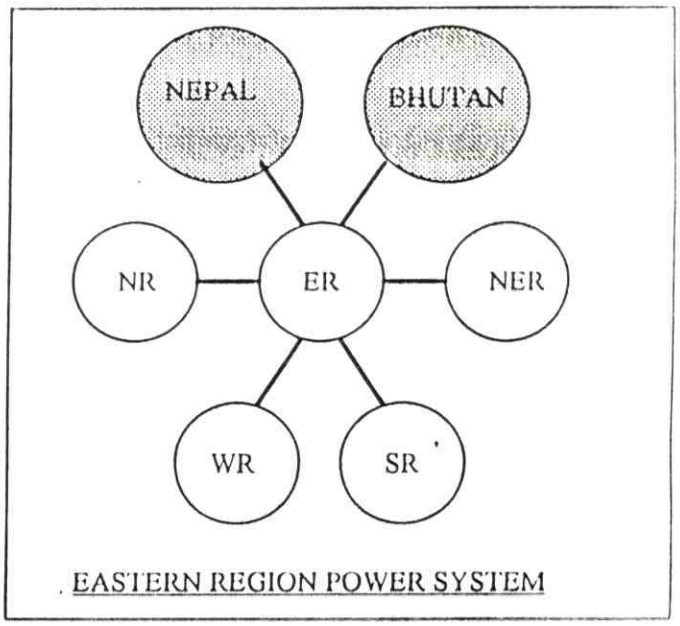
Under such circumstances, cost of extra power generated in ER is equivalent to the incremental cost of 200 MW and larger size units which may be of the order of 30 to 40 paise per unit. On a number of occasions, frequency is higher than 50 Hz. even after backing down all the 200/500 units to oil support level. In such cases, incremental cost is even lower than 30 paise per unit.

Tariff for supply of power by NTPC is a two part tariff. NTPC receives the payment for fixed charges on monthly basis (approx. Rs. 100 crore/month) depending upon availability and has no relation with the actual generation. Only variable component towards the fuel cost varies with the level of generation. For the Central Transmission System owned by POWERGRID, monthly charges are mostly fixed. Therefore, collective liability of the region i.e. all SEBs for the generation of surplus power is equal to the variable charges in the range of 30 to 40 P/unit.

4. OPPORTUNITIES FOR EXPORT OF POWER

Eastern Grid is the only Grid in India privileged with inter-connection with all the four other regions and two neighboring countries.

Demand supply position in no two regions is similar. Southern Region is short of energy almost round the clock for 8-9 months in a year. Due to high share of agricultural demand, SR is surplus in power during rainy season under the normal monsoon condition when the agricultural demand goes down drastically. At the moment, NER is also short of power for 6-7 months in a year. NER is surplus in power during the off-peak hours of rainy season when hydro reservoirs are in the spill over condition. This is a situation of zero cost surplus power during off-peak hours for monsoon period.



EASTERN REGION POWER SYSTEM

Existing transmission capacity of the interconnection of ER with various regions is briefly as under.

	Existing Lines	Voltage Level	Capacity(MW)
ER - NER	Birpara-Bongaigaon	220 kV S/C	200
ER - SR	Balimela-U.Sileru	220 kV S/C	200
ER - WR	Brajrajnagar-Korba	220 kV D/C	350
ER - NR	Dehri-Mughalsarai	220 kV S/C	400
	Karmanasa-Mughalsarai	132 kV D/C	
	Garwa-Rihand	132 kV D/C	

Intra-regional transmission system in ER is strong enough for supply of power to NER and SR upto the level of transmission capacity of the interconnections. However, any significant export to NR is not possible due to the weakness of BSEB system coming between the Central Transmission System and the point of interconnection with NR. Interconnection with WR can be used with certain limitations.

Further augmentation of the following inter-regional transmission system is in different stages of planning/implementation.

	Future Lines	Capacity(MW)	Type
ER - NR	Biharsharif-Sasaram	2 x250 MW	H V D C
ER - SR	Joypore-Gazuwaka	500 MW	H V D C
ER - NER	Malda-Bongaigaon D/C	800 MW	400 kV AC
	Birpara-Bongaigaon 2nd circuit	200 MW	220 kV AC

5. COMMERCIAL MECHANISM

As per the present tariff agreement, SEBs are purchasing power from central sector generation on the average cost basis. This average cost of central thermal stations varies according to the plant load factor. Whenever these

stations are required to back down due to low demand in grid, average cost of generation per unit goes up. For all the constituents as a team, incremental cost of generation is only the incremental cost of central power stations. Sale of energy at any price above the incremental cost of such large size power stations is the profit for the region as a whole which is shared by all partners.

However, SEBs are required to pay on the average cost basis for all the central thermal/hydro power stations, transmission charges and transmission losses. On the above principles, total energy cost is coming in the range of Rs.1.80 for the newly coming power stations. With the present commercial mechanism, whereas the true incremental cost of power in the region is of the order of 30 to 40 P per unit, it gets distorted to about Rs.1.80 per unit as seen by the SEBs. Therefore, it does not appear to be economical to them to export power at a price lower than this cost plus some margin. SEBs in other regions may be willing to buy power at average cost plus transmission charges as above only if it is a committed power on round the clock basis and they are always short of power.

Eastern Region is excessively surplus during off-peak hours. Only the SEBs in extreme difficulty will be willing to buy the off-peak surplus power of Eastern Region at the average rate like Assam or Andhra Pradesh Electricity Boards. Even such SEBs may not draw power with slightest opportunity available not to do so. In the surplus power condition as ER is entering now, sale of power on ECONOMY EXCHANGE basis may be the only alternative. For this purpose, Eastern Region must find the true incremental cost for surplus power and the quantum of surplus power to open negotiations for export of power. Average cost concept provides a wrong market signal and works against the interest of the constituents.

6. PRIORITIES FOR EXPORT

Highest priority may be given to long term contracts for one year or more with such regions/SEBs that are short of capacity and are prepared to take power on round the year and round the clock basis. Two important points arise to protect the commercial interest of both the agencies :

1. The importing agency should import the contracted power round the clock even if they have to back down their own generation (except for emergencies like load throw off or some disturbance).

2. The exporting agency should export the power by sharing the difficulties during unforeseen outages in its own area.

Contracts as above could be on the average cost plus basis that may protect the interest of both the agencies.

Second priority could be given to explore possibilities for sale of surplus power at any rate higher than the incremental cost. Such opportunities could be explored even with such agencies that are not short of power but could buy it for replacement of costlier power.

7. CONCLUSION

With entry into the era of surplus power, Eastern Region can no more depend upon export of power to other regions on the terms and the price dictated by it. Time has come when Eastern Region may go into micro economics of system operation and opportunities for export of power. It should come out of the concept of average cost based tariff and determine true incremental cost of power/energy during different hours of the day. Opportunities should be explored for export of power to other regions on a committed basis for long term contracts that could be based on average cost, and for short term contracts for surplus power on incremental cost principle. This would help the Eastern Region and the country as a whole in optimum utilization of the existing resources and the State Electricity Boards will be able to reduce the cost of power to them on the overall basis.

***

DAILY LOAD CURVE FOR EASTERN REGION

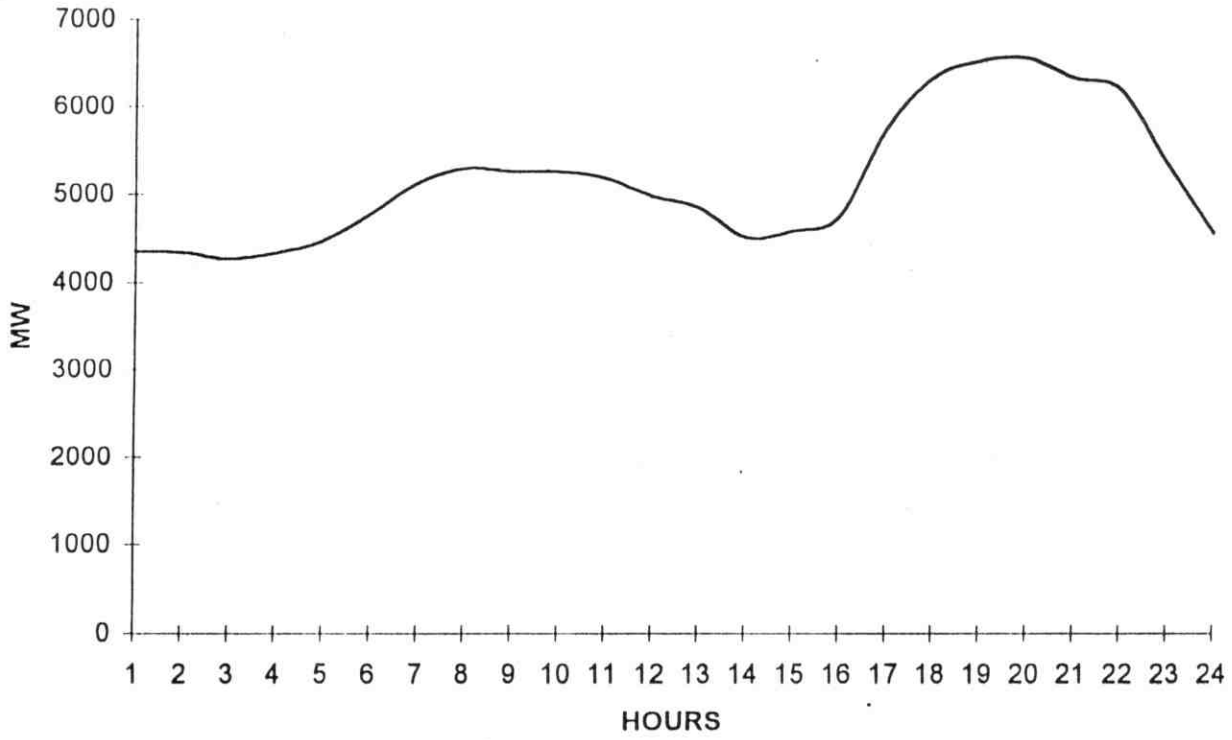


FIGURE-1

DEMAND AND AVAILABITILY

EASTERN REGION 1996-97

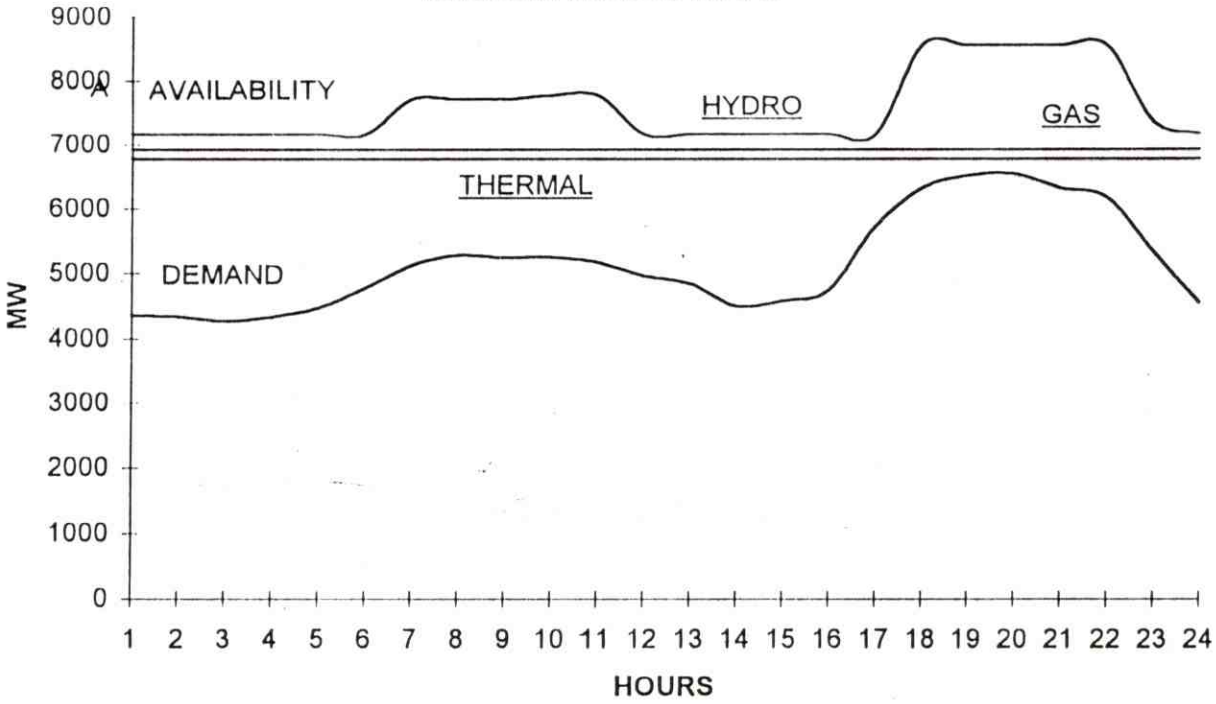


FIGURE-2