Power crises and their impact on the economy

by J. Varnakulasinghe

That the country's hydro supply system would, despite the provision of storage, need to be backed up by thermal plant if power cuts are to be avoided was recognised in the late 1950s during the construction of the Laxapana Hydro Complex (LHC). It was decided therefore to construct a 100 MW* thermal plant early. However, only 50 MW of oil fired steam turbine plant was established at Kelanitissa in the early 1960s.

*(I MW = 1000 kilowatts)

In the late 1970s, when the Mahaweli Hydro Complex (MHC) was being designed, the shortfall in thermal back-up became obvious and 6 x 20 MW gas turbines and 4 x 20 MW diesels were installed at Kelanitissa and Sapugaskanda respectively. More importantly, it was decided to build a 300 MW coal fired base load power plant by 1992, and design some of the MHC power stations for providing peak load power.

The shift to a Long Term Least Cost Generation Plan resulted in viewing the Coal Plant as a long term option, and continuing with hydro development and providing thermal back-up by commissioning diesels and gas turbines. The first thermal plant that this Plan recommended - on the assumption that 3730 GWh* of hydro would be available annually - was adding 40 MW of diesel generators at Sapugaskanda in the early 1990s.

***(1 GWh = one million units or kilo Watt hour)**

But the 40 MW plant became operational only in 1997. Planners have claimed that if this plant had come on stream on time, the power cuts of 1996 could have been avoided. If this assertion and the basic assumption - that 3730 GWh of hydro will be available annually - are true, the obvious means of avoiding power cuts is to provide plant strictly to the Plan.

But before looking at whether the 40 MW diesel plant would have spared the nation the power cuts of 1996, it is necessary to look at the power cuts of recent years, and the availability of 3730 GWh of hydro annually.

Table 1 sets out some details about the duration and the extent of the power cuts that have been imposed since 1980. It shows that power cuts have largely been imposed in the early part of the year. Further, that the power cuts of 1996 were by far the worst both in duration (170 days) and in severity (18%).

SEE TABLE 1

Table 1 also shows that 372 GWh were cut in 1996. But to get the total shortfall in CEB generation during the power cuts in 1996. it is necessary to add 152 GWh of self generation (units generated by the bulk consumers for their own use and paid for by the CEB). This gives a total of S24 GWh. But in 199S the CEB anticipated having to meet a demand of 5260 GWh in 1996. If the anticipated demand had to be met the shortfall would have been 883 (5260 - 4377) GWh. Suffice it to say here that a 40 MW plant could not possibly bridge any such shortfall for running a 40 MW plant at full load for the 8760 hours of the year - an impracticable proposition -will not generate even 372 GWh.

TABLE 1

Year	Power Cuts GWh	Period	Days	GWh/ day	Generation GWh/day	Cut	Year
1980	50	May - July	70	0.7	4.6	15 %	1668
1981	86	Feb. - June	111	0.8	5.1	16 %	1872
1983	17	Nov. - Dec	61	0.3	5.8	5 %	2114
1984	20	Jany - Feb	38	6.5	6.2	8 %	2261
1987	42	Aug. - Sept.	50	0.8	7.4	11 %	2708
1992	46	April - May	41	1.1	9.7	11 %	3540
1996	372	Mar. - Sept.	170	2.2	12.0	18 %	4377

The question of whether 3730 GWh of hydro is available annually needs close scrutiny for it provides a clue as to why power cuts have been frequent, why they largely occur in the early part of the year, and how they may be avoided. Table 2 sets out the half yearly and annual hydro and thermal generation in GWh, and their totals for the period 1992 to 1998.

SEE TABLE 2

Table 2 shows that in six out of the seven years, hydro generation was less in the first half than in the second. Further in four out of the seven years hydro generation in the first half was less than 186S GWh - half of 3730 GWh which the Plan assumes will be available annually.

Thus the assumption in the Plan that 3730 GWh will be available annually is not true. What is, and needs must be taken account of - in preparing any generation plan on the basis that hydro provides the base load - is that hydro availability is variable from year to year and more importantly that hydro availability is variable between the first and second half of each year, the first half generally having a lower availability than the second. As the Plan does not adopt this realistic approach of the availability of hydro, purchasing thermal power plant on the basis of the Plan will not guarantee freedom from power cuts.

TABLE 2

Year	Jany. To June H	T	July to Dec. H	T	Annual H	T	Total
1992	1075	608	1826	29	2901	637	3538
1993	1726	183	2069	00	3795	183	3978
1994	2094	32	1995	244	4089	276	4365
1995	2082	251	2434	18	4516	269	4785
1996	1548	568	1703	558	3251	1126	4377
1997	1417	904	2031	559	3448	1463	4911
1998	1887	821	2000	869	3910	1690	5600

It would be fair to say therefore that those who designed the MHC were prudent enough to recognize that hydro could not continue to provide base load power and that a coal plant was needed. The need continues and the sooner it is met the better.

The Cost of the 1996 Power Crisis to the Nation

The total amount generated, for meeting the electricity demand in 1995, was 4783 GWh, and the rate of increase in demand at the time averaged 10 %. Thus, the demand for 1996 to 2000 was forecast by the CEB on the basis of these figures. But, in 1996 the total generation - CEB, Private and Self-generation - only amounted to 4S29 GWh and severe power cuts had to be imposed.

Table 3 sets out the demand as forecast by the CEB in 1995 for the subsequent years, the actual generation in 199S, 1996, 1997, and 1998, and on the basis of the 12% growth rate, between 1997 and 1998, the projected demand for 1999 and 2000. The table also gives the difference between the CEB original forecast and the other annual figures.

SEE TABLE 3

The difference between the GWh demand in 1997 and 1995 (5007 - 4783) shows that over these 2 years the supply industry has grown by just 4.S%. The difference column also suggests that the loss in anticiapted growth will not be made good in the near future - not even if the growth rate remains as high as it was in 1997/1998.

As far as can be ascertained no previous power crisis has so severely impeded the growth of the demand for electricity.

Moreover, as the per capita consumption of electricity - the kWh demand per head of population - is an index of economic development, there is hardly any doubt of the adverse effect of the 1996 Power Crisis on this country's economic growth. Hence every effort needs must be made to ensure that there are no more power crises.

A fair estimate of the cost to the nation of the 1996 Power Crisis is the cost of the total units 'not supplied'. Such a unit is reckoned to be between five to ten times the price of a unit sold. Because of the sustained effect of the 1996 power crisis on the growth of the supply industry and consequently on the growth of the economy, it is not unreasonable to assess the cost to the nation of a unit not supplied in 1996 at ten times its sales price, which in 1996 was Rs. 4. This makes 1 GWh not supplied in 1996 to be Rs. 40 million.

TABLE 3

Year	CEB Forecast GWh	Generated GWh	Projected GWh	Difference GWh
199	--	4783	---	---
199	5260	4529	---	731
199	5790	5007	---	783
199	6370	5600		770
199	7010	---	6260	750
200	7710	---	7004	706

Table 3 indicates that the number of units generated in 1996 was 731 GWh less than what the CEB had anticipated it would have to generate in that year. But, as the system losses are about 18%, the number of GWh that the CEB anticipated it would have to supply but did not supply to consumers works out to 600 GWh. Thus the cost of units not supplied due to the power cuts in 1996 works out to Rs. 24 billion - about the cost of a 300 MW coal power station. Even if it is deemed that a unit not supplied should be taken at S times the cost, the impact of the 1996 power crisis would be a substantial Rs. 12 billion,

(The writer is a Chartered Engineer, a Fellow of the Institution of Engineers Sri Lanka, with wide knowledge and experience of the Electricity Supply Industry having worked in Sri Lanka and in the UK.)