

WATER AND ENERGY

By

Engr. Muhammad Jabbar¹

IN PAKISTAN WATER AND POWER ARE INTERDEPENDENT. Pakistan is exposed to double whammy, suffer water shortages as well as power supply, which adversely affect both our agriculture and industry. Pakistan's agriculture depends heavily on irrigation. Its water resources are not only finite but also exhaustible. Development of additional potential through storage facilities is essential. Without requisite water supply food and fibre deficits would be irrecoverable.

Water also flowing through the following hydel stations generate energy. At present from this source (Table-1), about 6741 MWs are obtained.

TABLE-1			
HYDEL STATIONS IN OPERATION			
Sr.	PROJECT	STORAGE¹ CAPACITY (MAF)	INSTALLED CAPACITY (MW)
1.	Tarbela	6.67	3478
2.	Raised Mangla	7.39	1000
3.	Warsak	RoR*	243
4.	Chashma	0.25	184
5.	Ghazi Barotha	RoR*	1450
6.	Khan Khwar	RoR*	72
7.	Allai Khwar	RoR*	121
8.	Jinnah HPP	RoR*	96
9.	Upper Jhelum Canal	RoR*	97
	TOTAL		6741

1 : 2012

* : Run-of-River

The Country is facing power crisis due to shortage of power for most part of the year. The last few years have witnessed a considerable addition to thermal power capacity, both in the public and in the private sectors. Presently about 13849 MW, plants are in operation (Table-2).

1. General Manager (P & D) WAPDA (Retired).

TABLE -2 THERMAL POWER		
TYPE OF GENERATION	CAPACITY (MW)	SOURCE (FUEL)
Public Sector Power Plants (GENCOS)	4764	Oil 8000 m. tons Gas 3415 mm cfd
Independent Power Producers	9085	Oil 190000 m tons Gas 830 mm cfd
TOTAL	13849	

We do not have sufficient funds to buy fuel (Table-2) to generate thermal power. How can we progress? Thermal power is no answer.

Based on the present generation capacity, the hydel: Thermal mix in the country is 32:68, which is almost the reverse of an ideal hydel-thermal mix, which should be 70:30, for over all economic development of Pakistan. The next several years are expected to see considerably more thermal additions in the private sector. The Generation mix is gradually tilting in favour of thermal. The share of cheaper hydel power is reducing. The coming years may witness an increasing impact on consumer prices. A spiraling rise in prices seems imminent. There will be plenty of thermal power available in the country but whether it would be accessible to the common people is a question mark ! It is an 'Out of the frying pan into the fire' situation.

At present only the following hydel power projects (Table-3) of a total capacity of 1227 MW are under execution.

TABLE -3 MAJOR PROJECTS UNDER EXECUTION HYDROPOWER PROJECTS			
Sr. No	NAME OF PROJECT	HYDROPOWER (MW)	PROGRESS / COMPLETION
1.	Duber Khwar (Kohistan, KPK)	130	2014
2.	Rehabilitatin of Jabban Hydropower (Malakand KPK)	22	2014
3.	Golen Gol (Chitral, KPK)	106	2015
4.	Neelum Jhelum (Neelum, Muzaffarbad AJK)	969	2016
	TOTAL	1227	

The Almighty has gifted Pakistan with abundant hydel resources, with large rivers flowing down the Himalayas and Karrakurram heights from the World's largest glaciers, as a free Bounty of Nature. The water, while flowing in the course of these rivers has negligible energy potential all by itself unless harnessed by making special arrangements.

It is indeed a pity that our power shortage should be met with thermal power rather than the cheaper hydel alternative. At present the following hydel projects (Table -4) are available for immediate construction.

TABLE-4		
PROJECT	RIVER	CAPACITY (MW)
Diamer-Basha	Indus	4500
Bunji*	Indus	7100
Dasu*	Indus	4320
Lower Spat Gah*	Spat Gah	496
Lower Palas Valley	Chor Nullah	665
Kalabagh	Indus	3600
Keyal Khwar	Keyal Khwar	122
Phandar	Chhashi Gol	80
Lawi		69
Kohala	Jhelum	1100
TOTAL		22052

*: Run-of-River

With at least 29188 MW of more hydel power (Table-5), waiting to be harnessed on the main streams, rivers and the side valleys, we have yet a long way to go. With so much of hydro potential (59208 MW), is it not a pity that we still opt to pay so much for electricity !

TABLE-5		
HYDEL PROJECTS ARE UNDER STUDY		
PROJECT	RIVER	CAPACITY (MW)
Akhori Dam	Off Channel	600
Munda Dam	Swat	740
Shyok Dam	Shyok	690
Tungus	Indus	2100
Yulbo	Indus	2800
Upper & Middle Palas Vally	Chor Nullah	555
Upper & Middle Spat Gah	Spat Gah	778
Patan	Indus	2800
Chitral-Swat Diversion	Chitral/Swat	2000
Dudhnial	Neelum	960
Thakot	Indus	2800
Other Hydel Project	Rivers/Streams	12365
TOTAL		29188

Perhaps, we the engineers have not played our role well. We have not been able to tell the nation that our power generation characteristics are peculiar. We have conventionally had a hydro dominated power system. Our rivers that feed the hydro electric plants have very wide seasonal variations. In summer months, there are very high flows making available to us all the power that the stations could produce. On the contrary, in dry months particularly in January when the canal system is closed for annual maintenance, we face a very high power shortage. More shortage occurs in May when the reservoir at Tarbela falls to its lowest level. For a certain parts of the year we are facing long load shedding. It was not very prudent for us to transfer the impact of occasional power shortages to the productive industrial sector in order to save the domestic sector from the inconvenience of load shedding and thus put the national economy at stake. If the nation decides to remain insulated against such short periods of power shortage, it has to pay for it. However, there are two options;

- a) One is to cater for the occasional power shortages by building more thermal stations and
- b) The second is by building large reservoir hydroelectric projects so that river flows in dry months improve to an extent that may provide adequate power for almost the entire year.

Unfortunately, we have chosen the first option and are thus facing an onslaught in terms of high electricity costs. Little did the nation realize that by denying itself the opportunity to available cheap hydel power through large reservoir projects, which could bring them stable power supply, it has landed itself into trouble for which there is no immediate and easy solution. The moral of the story is that "We Asked For It".

The engineers as a community failed in their duty to portray the correct picture, timely and adequately. It devolves around the engineering community to convince the nation that the development of large reservoir-based hydel power projects is the proper solution in our quest for cheap and stable supply in order to achieve our cherished goal of becoming an 'Asian Tiger' and beyond.

HYDEL SITES

The list of the hydel projects is long, with a gigantic capacity of more than 59208 MW, but most of the projects like Bunji (7100 MW) Patan (2800 MW) Kohala (1100 MW), Lower Palas Valley (665 MW), Lower Spat Gah (496 MW), Dudhnial (960 MW), are all run of the river with, at best, diurnal pondage. That means more power and energy during summer months and much less during the water short periods. Projects like Dasu (4320 MW) and Thakot (2800 MW) have the support of upstream reservoirs (Diamer-Basha 8.1 MAF). We need large reservoir projects to be appropriately added to absorb and smoothen the seasonal stream-flow fluctuations. If not, we will have to continue with filling of valleys (shortages) in the annual load curves during low water months with expensive thermal power. Our system cannot sustain more distortions in seasonal availability. Our immediate focus, therefore, devolves around large storage power projects to be soon followed by smaller, low gestation schemes with diurnal pondage.

Run of the river projects may have to wait till at least more than one reservoir and nuclear generation capacity satiating the base load have been added.

While our hydroelectric resources are plentiful (59208 MW), we are not equally fortunate to have very many large water storage sites. Mangla (5.8 MAF), Kalabagh (6.1 MAF), Diamer-Basha (8.1 MAF), Shyok (5.9 MAF) and even Tarbela (11.6 MAF) provide only medium sized storages. We therefore, need to optimally and prudently develop our limited number of storage sites to obtain maximum benefits both in the power and the water sectors.

CONCLUSIONS

Although it is not intended to go into any deeper discussion, suffice it to say that this nation is known for rising to the occasion. All large projects are known to require sacrifices by a certain section for the overall national objectives. It has been so in the past. Mangla Dam and Tarbela Dam are cases in point. As a matter of fact, Chashma Barrage is more prominent an example of sacrifice for far lesser benefits. It is possible to demonstrate that Kalabagh Dam may have less adverse effects than those apprehended in certain areas and non at all in some others. Kalabagh dam project requires immediate attention to develop a national consensus. One cannot conceive of becoming 'any tiger' unless we build storage dams and firm up hydel power with additional hydel storage and keep thermal support to the essential minimum.

RECOMMENDATIONS

The following brief recommendations are made;

1. Thermal power support cannot entirely be done away with. However, the share of the thermal capacity, based on imported fuel should only be kept to a minimum for as long as practically possible.
2. Diamer-Basha Dam must be started immediately.
3. Immediate steps be taken up to develop a national consensus for the early construction of the Kalabagh dam project.

A broad based committee of professional engineers which may be headed by some eminent engineer with political prominence and may include, amongst others, all former WAPDA Chairmen with engineering background, eminent engineers from all the four provinces, particularly with relevant experience and some co-opted core professionals. The committee may take time for a dispassionate review of the whole scheme in a professional manner and convince itself before proceeding to develop a national consensus.

Time is of the essence, for both recommendations at serial 2 and 3 above. Every day matters. If we do not realize this and rise to the occasion, we shall be committing a blunder of catastrophic proportions. It may be remembered that **God Almighty in His Infinite Mercy Forgives the Mistakes of Individuals but He may not be as Merciful in the Case of such enormous blunders at the National Level.**