

Energy Crisis: Let us first evolve a method of approach*
by Masood Hasan

Energy is becoming increasingly expensive. The exploding demand for energy, both in Pakistan and throughout the world will continue to force the cost of energy up and will result in recurring shortages. Increased costs for energy and unpredictable supplies of fuel have created a new dimension in business management.

Many companies are finding that an organized energy conservation programme can hold down both energy use and energy costs without disrupting planned production. It has been repeatedly demonstrated in the USA that conservation measures can reduce energy use by 15 to 30 per cent, or more, with justifying cost savings.

We see startling energy conservation achievements reported in USA through such simple plant maintenance and operation practices such as reducing or eliminating unnecessary lighting, turning off equipment not needed at night or over week-ends, optimizing maintenance schedules to keep equipment operating properly, planning production schedules to minimize energy use, and improving quality control to eliminate wasted processing. This potential for energy conservation and the equally startling reductions in energy use made possible through cost reducing capital projects must be fully and quickly realized if we are to contain the disruptive explosion in energy demand.

We are well aware that a policy or strategy is only as good as its physical implementation. This means that not only must there be good communication downwards but equally there must be reliable feedback in the reverse direction so as to monitor for purposes of control. Of course this presupposes there is a coherent policy in the first instance. It would appear that an effort is being made to formulate an energy policy when we consider our import bill for oil consumes about 50% of our export earnings, this reflects a measure of the problem.

The problems presented by the high costs of energy are of recent origin, hence there is hardly any precedent or model to adopt, which means we have to do our homework ourselves. In any case you cannot have your homework done by proxy and expect to know all about it. But it would appear that many of us prefer not to do any homework at all. This is all because we cannot achieve anything without striving. Striving means making observations of nature and attempting to recognize patterns. Since we are dealing with man made systems which are large and complex and there is tremendous interaction between its various constituent parts, it becomes difficult to predict what the system will be exposed to in the future. This means calculations based on less than the whole will just not do.

Since this appears to be the case, our method of approach must reflect this. Since the means for executing any programme is through a man made organisation, an examination of the man made structure and man made operating methods is necessary.

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The very fact that we are afraid of looking into the administrative/executive aspects is indicative of the fractured thinking which needs to be done away with.

Industry accounts for a major part of the national use of energy, has a tremendous opportunity for energy conservation. As a part of the approach the relevant ministries should prepare programme guides for the country to assist in establishing an on-going energy conservation programme. The key steps should be listed for the implementation programme and the means for identifying energy conservation opportunities by industry be worked out.

Parts of this strategy would be the dissemination to the smaller users as to how to get about conservation. Independent Pakistani agencies should be encouraged to work out the modus operandi. The various aspects should include identification of:

- Engineering data and factors pertinent to energy conservation. Financial analysis
- procedures for evaluation purposes.
- Sources of information acquisition/assistance in energy conservation activities.
- Employee involvement participation suggestions and examples.
- Energy flow measurement related equipment selection and basic measuring methods.
- Safety and health consideration.
- Bibliography including translations in Urdu.

It should also be possible to work out packages for various types of industries. However some of the above may be going into more detail than is required at the present.

This also means we must be attuned to accepting change, if only on account of our lack of control over the environment. Many a time it must be recognized that what seemed to be truths may have at best been little more than half truths. While we may not be involved in fruitful research and development of science and technology. It would be as well to recognize their relationship: starting with the know---why pure research is the maker possible, followed by oriented fundamental research: the maker probable. Applied research which is programmed, the maker-to-happen and it is then development which is the maker-to-work through know-how, which is technology.

If the few concepts brought out above mean anything then their application will raise questions such as:

- Is it not the government that has to initiate anything really worthwhile with reference to development?

Integration

- If there is such a thing as deleterious academic fragmentation, does the governmental structure with reference to energy also present unnecessary difficulties in obtaining a seamless integrated picture?

- If a plan cannot ensure for effective execution and effective control what should be done?
- Doesn't looking for new approaches mean sticking one's neck out and with our penchant for taking cognizance only of the sins of commission (and not omission) there is little to motivate creative thought?
- Does "Control" have to move away from its present penal connotation (law and order thought to introducing flexibility in the system to keep the course of development righted all along?

Application of technology may mean yesterday's solution are irrelevant to the problems of today, so what sheet anchor can be got hold of?

The systems approach using science and technology in planning, designing, installing and maintaining new forms of organisation to meet new problems is necessary. Fortunately there are techniques for applying knowledge from the older branches in effective combination to solve multifaceted problems, this frequently involves innovation. Technology does involve the application of knowledge of nature, which in turn influence the development of that knowledge which affects the economic, political, military, educational, artistic and social spheres in the country. Any policy to ensure movement in the direction of our energy problems should consider the downstream requirements of the above. Assuming something is done about it then it would appear the following should be considered.

Pakistan's energy requirements should be analysed on a macro level for the whole country taking into consideration all available forms of energy, including nuclear; Newer forms of energy---such as solar energy and wind power should be carefully examined and analysis be carried out to determine to what extent these can be utilized and in what areas of the country. (It may be interesting to note that to replace 10,000 barrels of oil per day would require 300 square miles of grain crop to make ethanol for gasohol, 600 windmills with 100 ft blades---in USA two out of three have already fallen down---or a dam half the size of Hoover Dam to generate the same amount of energy).

Coal

Power generation from low grade coal in the southern part of the country should be examined. Two large stations each generating at least 500-1000 Megawatts could be set up, if necessary as joint venture with a foreign country (or firms). This could be in the private sector and the energy produced sold to WAPDA or KESC at rates to be negotiated, which could give the private entrepreneur a fair return.

In view of the likely shortage of national gas and shifting of power generating to furnace oil, arrangements should be made to make this commodity available in the middle and northern parts of the country. A practical method of achieving this is to use the existing PARCO line to pump crude oil and set up a suitably sized Refinery at the other end of the pipeline ie... near Multan. This would help in meeting the

demand for deficit products including Furnace Oil. This should be done on an urgent basis.

Renewable sources of energy based on bio-mass utilization should also be examined, benefiting from the rather extensive work done in other countries and excessive dieselisation should be discouraged as this trend has already spread world-wide and heavy shortages of this commodity will be felt world-wide.

In a few years time the difference in price of Gasoline and Diesel (is already marginal in the USA) will narrow. Developing agricultural countries like Brazil and Philippines, which historically made diesel available at much lesser price than gasoline through subsidies and differential taxes, have now reversed this trend and are gradually reducing this differential. This will help rationalize the consumption of gasoline and diesel which should be more in line with the quantities available in a crude through simpler processing.

The concepts of the refining industry should be reviewed. Refineries should be viewed more as "energy complexes" rather than mere splitters of crude oil. All forms of energy---including low level available in the refineries as well as surpluses should be converted to electricity and tied up with the national grid. By the same token setting up mini-energy complexes should also be investigated side by side with maxis, in order to cut down transmission losses.

A vigorous conservation programme should be launched and proper tax incentive provided to promote it.

The price of energy should be reviewed and brought as close to the alternate values of each other as far as possible in order to discourage disproportionate use of an artificially priced energy source.

Mandatory energy audit by independent agencies should be initiated. The energy audit should be as important as a financial audit in order to stop wastage of energy. The role of both internal and external audit should be defined.

Books/pamphlets on the pattern of two world War II publications---The Efficient use of Fuel and Steam---put out in the U.K. should be written to suit local conditions on a sectoral basis and be written in Urdu. The quickest and best way would be to entrust the work to an independent body. The real benefit that from the application of ideas brought out is the discipline it forces on the human to think-through problems, attempting to quantify through measurement.

A National Industrial Energy Conservation Council should be formed to recommend, guide and supervise energy conservation programmes. The Council should also collect data to determine the energy content of a product produced in Pakistan. The possibility of bringing in improvement can also be considered from the point of view that without additional training or education, Pakistanis abroad measure up to

the international average if not better. They are several times more productive when abroad. They fit into someone else's strategy at the tactical level very well. This means we need to examine our indigenous strategies seriously, in a way to ensure our citizens becoming more productive at home. There has to be an awareness that things can be different from what they are, that existing methods are inadequate to provide acceptable solutions.

Comprehension

Government personnel must comprehend that the process or method of providing a service is not an end in itself but it is an activity oriented towards alleviating the problems of the people. If they do not possess such a comprehension, innovation cannot take place. The innovative process involves drawing analogies---which should be quite familiar to us---between dissimilar phenomena. In the USA in 1965 an investigation was made by the Department of Defence to determine what clicked (or didn't) in the 1945-63 era to bring in cost of effectiveness in a range of 20 systems, examined by 13 teams with MIXED government, industry and non-profit corporation scientists. They concluded that advancing technology was much more in the area of minor improvements than in major scientific discoveries. This study concentrated on invention itself. Another study indicated that invention arose out of developing knowledge that has been generated 30 years or more earlier including magnetic ferrites, the video tape, oral contraceptive pill and the electron micro-scope. Little wonder, that Bondi in his 21st Stevenson Memorial Lecture at the London School of Economics (1972) in "International Collaboration in Advanced Technology" reiterated that the essential features of any advanced technology project is that it does not contain any very advanced parts. That they are not systems meant to try out untried gadgetry. The advance lies in making them work together and the problems are less technical but more---involving formal coordinative skills as against progressing entirely through personal push/cooperation (which is clearly the characteristic of a one-man show).

It is much easier to go into the design details from an energy conservation point of view of say an effective thermo-compressor for solvent stripping through the novel use of a supercritical flow thermo-compressor, which reduces costs and allow us both solvent and solute to be recycled.

It would appear that what appears simple ends up by becoming complex. Since the complexity is man made it is up to us ie those with a comprehension of local conditions to generate local answers for local progress, if only for the reason we have to live with the consequences of actions taken in the country.

/Energy Crisis