

## Meeting India's Energy Needs

■ Dr. M.N. Buch

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The entire nuclear power generation programme is based on the premise that it is the cleanest form of energy because there are no emissions, nuclear power stations do not add gaseous or particulate matter to the atmosphere, there is no carbon generation and there are no mountains of fly ash such as one finds in a coal based thermal power station. The only danger is Chernobyl type explosion which released radioactive material, or a Three-Mile Island type of melt down which, fortunately, was contained. Then, of course, one had Fukushima in which the nuclear power station was wrecked by a tsunami and it is only the heroic sacrifices by dedicated Japanese engineers which prevented this mishap from being converted into a disaster which would have devastated Japan.

Our activists and even a section of scientists have questioned the present government's policy of entering into a nuclear pact with the United States of America and adopting an aggressive programme of nuclear power generation. Kudankulam in Tamil Nadu, a proposed power station in Maharashtra and now a nascent proposal for a power station in Mandla District of Madhya Pradesh have all given rise to public protests on grounds of safety. The Prime Minister and his government have assured the nation that a nuclear disaster cannot repeat itself in India because of the design and construction of our nuclear power plants. The Atomic Energy Commission, Nuclear Power Corporation and government scientists all concur. However, a group of scientists, some of them very distinguished and associated with nuclear energy projects have expressed their doubts and this has been seized upon by activists to oppose the nuclear power plants. Government has stated repeatedly that coal and gas deposits are finite, the process of generation of power by use of these fuels is highly polluting and, therefore, contributes to global warming, hydel projects are opposed by activists who do not want our mountain rivers to be harnessed for environmental reasons, thus shutting out a clean source of power and alternative energy sources, solar power, and wind power have a limited role because their energy conversion quotient is very low. The plant load factor of a solar plant is between 15 and 20 percent. By a process of reductio ad absurdum we are left with no alternative but nuclear energy, says our government.

The whole debate centres around the absolutely unavoidable need to increase our generation capacity if India is to modernise. If power is viewed as a commodity, then as in the case of all commodities, there is both a demand and supply of the commodity. Our present approach to electricity is focused only on supply because it is taken as given that demand will ride a rising curve and that if India is to modernise demand must be made to rise very sharply. That scenario leaves us with no option other than increasing our generation capacity. Depending on finite resources there is bound to come a time when we cannot increase power supply and then we would run into a massive problem of a demand driven economy being brought to a halt because the supply side has failed.

Is electricity necessarily a commodity? Is it not a convenience? Before power traction came on the scene travel was a function of the human muscle, animal power, water power and wind power which moved sailing ships. Many things which we take for granted today were not available, but there was an ecological equilibrium the value of which we have never taken into

account. I fully agree that we cannot revert to the pre-automobile engine era and that this convenience, electricity, has become more than a convenience, more than a commodity because it has become a vital necessity. Let us, therefore, accept that we need electrical power for its electronic application. Once this is established, then the question arises from where will we obtain this power? Unfortunately we have not really seriously looked at the demand side. Electricity is a prime mover, which is defined by the Chambers Twenty-first Dictionary as “the force that is most effective in setting something in motion”. That means that the more cumbersome, more inefficient a thing which is to be set in motion is, it will require a much larger quantity of the prime mover, in this case electricity. Traction motors largely use electricity as the prime mover. Let us take the case of a ceiling fan whose motor uses between 60 and 100 watts of power. If the motor were to be made so efficient that it consumes only 10 watts, we would have a 600 percent saving on power, on a ceiling fan. Multiply this by crores of ceiling fans in use in a hot tropical country and the mind cannot even grasp how much power would be saved by this one improvement. Take every other motor, whether it be the traction motors of a railway train, the motors which drive heavy machinery in an industry, the motors which drive pumps which lift water for irrigation and one would find that by substantially improving the conversion factor of power to motion one could probably make do with about the half power we generate today. We could then concentrate on making our power stations more efficient, increase the plant load factor to almost a ratio of 1:1 and also in the process reduce pollution from these power plants to an acceptable level. It is only after this new equilibrium is established that we should think of more forms of application of electricity and, therefore, additional power generation.

I am not a scientist but have seen how Japanese scientists took the old valve radio set, transferred the circuitry to a button size transistor and gave us a radio set about the size of a pack of playing cards and transformed the entire information technology scene. Today semi conductors, the micro chip, the integrated circuit allow all sorts of equipment to function on a 1.5 volt battery and have eliminated the need for continuous mains supply to these appliances. I have suggested to the Indian Institutes of Technology that they should have a very strong research programme which looks at power demand and then comes up with solutions which reduce demand as suggested above. The research would not be glamorous because it will deal with such mundane items as submersible pumps for lifting water from a tube well. It will not drive a Ferrari or a Lamborghini. It will be used by common cultivators, but such research would transform the entire power scenario in India and the world. Will any of our institutes of technology take up the challenge? My humble submission is that the route to the Nobel Prize does not necessarily lie in fundamental research. Applied research which takes electricity and makes it a truly thrifty servant of man can also lead to a Nobel Prize.

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