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Big Dams Spawn Nuclear Power Plants

During a cycle yatra through Narraada valley in 1990, we were often confronted with the question, Are not nuclear power plants the alternative to big dams? We oppose big dams because they cause submergence and destruction. So, how can we oppose nuclear power plants as well? We do need electricity for progress!

The fallacy of regarding nuclear power plants as alternatives to big dams or coal powered plants is a common mistake and occurs because of the perfectly reasonable assumption that since both generate electricity, one can substitute for the other. The truth, is however, very different. Big dams are the mother of nuclear power plants.

A look at the map can clarify the confusion. Rawatbhata Atomic Power plant was built on the banks of the Rana Pratap Sagar reservoir. There were three other dams built on the Chambal within just fifty kilometres. All with electricity generation as a prime objective and yet not only RAPS-1 and RAPS-2 wore built, they now want to build another six reactors at the same site. Similar in the case of Kakrapar Atomic Power Station. The Kakrapar and Ukai dams were built as a multipurpose hydel scheme on the Tapti in the 1960s. The hydro power generation has been far less than what had been expected earlier. The dams were followed by the Ukai thermal power station and now by Kakrapar Atomic Power Station. Here too, although only one reactor is presently operating and another under construction, the site selection has been done with a provision for four reactors. If the neighbouring population were ever to resign itself to nuclear power, and if the Nuclear Power Corporation were ever to get some extra cash, Kakrapar too would soon sprout two mora reactors.

But nothing illustrates the 'family' relationship of nuclear power plants and big dams better than the case of Kaiga. (See "Kaiga left high and dry" in this issue.) Here the construction of two reactors has been going on at full speed with the consequent destruction of the little bit of tropical rain forest still extant in the Western Ghats but the dam which was to provide the water for cooling the plant has got delayed since the World Bank has withdrawn funding and there is some dispute between the contractor and the Karnataka Power Corporation. (1 never thought that a day would come when I would feel thankful towards the World Bank and dam building contractors, but one lives and learns.)

The fact in that nuclear power plants are thirsty beasts. Huge amounts of water are needed to take away the enormous heat generated within their bowels. A 1,000 MW reactor requires about 50 cubic metres of How per second. This is nearly the flow of a good sized river or a large canal, To reduce the requirement of water, new plants have gone over to the 'closed circuit', where the cooling water is recirculated after cooling in cooling towers. For those systems although the amount of water required becomes much lean (around 3 cubic metres for a 1,000 MW plant) it is still substantial. In times of severe drought, when electricity would be most needed because of the shortfall in hydro generation and the greater need for irrigation, nuclear power plants may become inoperational because of lack of cooling water. This has happened in Prance. Nuclear power plants can thus only be built in the vicinity of large bodies of water and these large water bodies are most easily created by damming rivers.

At the time when dams are planned, nobody, not even the nuclear lobby thinks the imminent appearance of a nuclear power plant in the intermediate future as a 'benefit'. Amongst all the claimed benefits of a dam, power, irrigation, flood control, fisheries, compensatory afforestation, bringing tribals and other displaced beings into the 'mainstream', etc. there is never even a mention that soon the place will become a site for a lovely 'clean', safe and too cheap to meter nuclear power plant. Yet, as we see in all the cases mentioned above, these calculations are made by the policy makers sometimes many years in advance. Kaiga is illustrative, only because perhaps these calculations had not been made and Kaiga was chosen as a site in something of an unusual hurry and thus we have the beautiful prospect of the Nuclear Power Corporation losing Rs 1 crore every day in interest charges while the Karnataka Power Corporation and its contractors haggle over prices.

There is a lesson in all this for antinuclear activists. The proper time to oppose nuclear power plants is before the dam has been constructed. If they can prevent the dam from being built in the first place, nuclear power plants and the almost equally obnoxious coal burning power plants are unlikely to pollute the vicinity. Often small landholding farmers support dams in the hope of irrigation, but if they were to know that irrigation is only a bait while the radiation hook is being readied, they would perhaps be more circumspect in their support for sundry dams of dubious value. Peringome in Kerala is en example of the way governments operate. When they found the opposition to the atomic power plant too hot to handle, talk of the plant was quietly shelved but work has started on the Kakkadavu dam. Once the dam is made, the sword of Democlese would continue to hang over the people of Peringome and Opposing the momentum for the power plant would become much harder.

Surendra Gadekar

Froth the

hat are the alternatives? is a question often thrown at activists opposing any mega project. The question is posed in an unfair manner. The activist is supposed to come with a detailed blueprint with costing and time frames snowing how the 'alternatives' would replace whatever 'benefit' the megaproject was supposed to confer. In the case of power projects, this means accounting for each and every kilowatt with costs worked out to the last paise. It does not help to point out that the lobbies behind the megaproject are paid huge sums of money from the public exchequer to do 'feasibility'studies and impact assessments while the activists have to pay their own passage. It also does not help to point out that the 'experta'advocating the project have invariably been wrong in their cost and benefit calculations in the past. The figures they pop up with so much authority have no relation to reality. The public feels that the activists do not have the proper grasp of the issue which the 'experts'have. Crying about the unfairness of it all, is all that activists most often do.

India is the land of voluntary efforts and one comes across people (even experts) who are willing to give their time and expertise to do these detailed cost calculations with no thought of monetary recompense. Dr. Amulya Reddy and Mr. Girish Sant have done such an analysis with regard to the power generation from the Sardar Sarovar Project. They presented their analysis (with all its gory details and annexures) to the Sardar Sarovar review board. They show that not only are the alternatives environmentally far less damaging and less destructive of people and cultures, they are also much cheaper. Instead of adopting these simple and steps which would reduce demand and help progress towards a more just and equitable society, Mr. Praful Bidwai's article shows what our government is in the process of actually doing—selling the country to foreigners and locking us into extremely expensive power supply.

There is no reason at all why we should not adopt the sensible solutions outlined by Dr. Reddy and Shri Sant to our electricity problems except that they require mobilisation of effort on part of a large number of people and our government is too laiy and corrupt to act, and we are too laiy to force it to act.

Does Sardar Sarovar Make Sense as an Electricity Generation Project?

Amulya Roddy and Girish Sant

The Sardar Sarovar Project (SSP) has both an irrigation and electricity generation component, but this presentation will restrict itself to the electrical part of the project which accounts for 56.1% of the costs and involves a 455 ft embankment that would create a reservoir and lead to the submergence of 240 villages, 40,000 families, 39,000 hectares of land (of which 13,744 hectares is prime forests).

This electrical part of the SSP may be considered to consist of three components:

* **Conventional generation from a 436 ft embankment reservoir**
* **Pumped storage generation from the same 436 ft reservoir**
* **Generation from an 19 ft increment in height to the 436 ft**

Conventional feneration

If one thinks of a hydroelectric project as being based on a waterfall with a high head, then it is important to note that the SSP is not such a project—it is, in fact, a mega-tank where the head is created by the wall or embankment of the tank.

Further, if the downstream canal system is built and in place when the dam is built, than the water can be evacuated from the reservoir as and when required for irrigation and other end-uses of water—and there would be little water available for electricity generation. However, it is envisaged that the canal system cannot be completed before 16 years. *The* situation is quite analogous to many electrical projects where the transmission and distribution are not erected in time to evacuate the electricity that is generated.

This mis-match between the gestation periods of the dam and the canal system has led to the idea of generating electricity from the un-evacuated water. The SSP has two different power stations-a large River Bed Power House (RBPH) of 1200 MW capacity with reversible turbines that can be operated either as pumps or as generators, and 250 MW of conventional generation capacity at the Canal Head Power House (CHPH).

River Bed Power House

The River-Bed Power House is planned to generate electricity in two distinct modes:

* **Conventional (or seasonal) generation from the excess water released through the RBPH into the river below the dam after providing for irrigation needs. A large share of generation at SSP would be provided through this mode of operation. As the canal system is built up and is able to withdraw the water, the capacity for conventional generation goes down—and after 15 years, it will go down to 0 MW in the RBPH and 50 MW in the CHPH making a total of 60MW Thus, conventional generation will decline from a firm initial 439 MW to 50 MW after 16 years. So, in costing the conventional generation component of SSP, it has to be treated as a hydroelectric project with a lifetime of 15 years and a declining capacity during that lifetime.**

* **Pump- back (reversiblo) generation. When excess water is not available for power generation, water stored in a small dam at Qarudeshwar weir is pumped up (by reversible turbines drawing power from the grid) to the SSP dam reservoir at certain times and is allowed to fall back through the RBPH and generate power at other times. This mode is designed to satisfying peak demand for electricity at certain hours of the day, for instance, during the evenings. (About 30% of the original energy drawn from the base-load plants is lost because reversible generator/pumps are not capable of converting the energy with 100 percent efficiency.) In effect, the SSP acta as a "hydel battery" that is charged at night using power from the thermal plants and is discharged to provide power during peak demand.**

Canal Head Power House

The CHPH, with conventional (non-reversible) turbines generates power using water flowing in the canals and excess water during monsoons.

The water required for irrigation paseee through the CHPH and is then stored at the canal head regulating ponds. This stored water can be discharged into the canal depending upon demand. These canal-head regulating ponds spread over 773 hectares facilitate CHPH operation in the peaking mode.

During the monsoons, the water is diverted to the RBPH on a priority basis. The remaining excess water is passed through the CHPH

and then released into the river. This seasonal generation will decline as the irrigation network grows.

Overtly Optimistic Estimate

Both World Bank and Central Electricity Authority have made studies of the electricity generation from SSP. However, both these studies over-estimate the peaking conventional generation on two accounts:

- **1. They assume larger regulated water releases from Narmada Sagar project than is likely to be the case. With the delay in the construction of Narmada Sagar Project, the conventional generation is expected to fall by 25% to 28%. The decline in firm generation is likely to be much more. As a consequence, the pump-back mode of operation will dominate more over conventional peak generation than anticipated.**

- **2. Narmada's water flow has subsequently been estimated to be 17.1% less than the flow assumption adopted at the planning stage. This too will decrease conventional power generation, making increased pump-storage operation necessary.**

The decreased magnitudes undermine SSP's usefulness, to a substantial extent as they would essentially convert SSP into a pumped-etorage plant. For pumped-etorage plants, many other better sites are available with substantially lesser submergence. The 1, 450 MW Pimpalgaon Joge Scheme requires less than 0.5% of the submergence of the SSP and costs about 25% less than SSP.

Sardar Sarovar Pumped Storage scheme has not been compared with other alternative supply schemes such as gas turbines and cogeneration from sugar factories. Demand-side management alternatives have also not been compared- This omission is particularly serious because the evening peak in Indian electricity systems is largely due to lighting, and drastic reductions in peak demand can be achieved by adopting efficient lighting devices.,(See the next article on Alternatives.)

Minimal Benefit From Monsoon Base load Powor

A sharp dip in energy demand describes the monsoon period (from the electricity board perspective). During this time, irrigation pumpsets which account for approximately 22% of average grid load, are virtually unused. Historically; the monsoon season is utilised to take coal based power plants sequentially off-line for maintenance. The drop in demand and the already low plant load factor in the Western grid, offer ample lee-way for removing these plants from service. Thus, peak-demand is the factor limiting the number of plants to be taken off-line simultaneously, not the base demand (which is relatively low).

SSP will produce the greatest portion of its energy during the monsoons. After 15th year of operation virtually all of the conventional generation from SSP will be at monsoon time. Existing base-generation is large compared to base demand, particularly during that period. This fact is evidenced by the unusually high grid frequencies during the off-peak hours of the monsoon (high frequency indicates excess generation). Only a small portion of SSP conventional electrcity generation which coincides with the peak demand will be of any real use. Rupees per kilowatt hour is hence a meaningless value for assessing SSP, since much of the electricity will be produced at times when there is little demand for it.

Submorgoneo Duo to tho Powor Component of SSP.

Though the SSP is a multi-purpose dam project, but at least a part of the submergence can be directly associated to the power component.

The Narmada Water Dispute Tribunal (NWDT) increased the Full Reservoir Level of SSP from 436 feet to 455 feet to capture additional generation of 250 to 350 million units per year. Since the height of 436 feet is sufficient to meet all irrigation needs, the increase in height entails an additional submergence of nearly 10.000 ha which is roughly 27% of the total submergence. The extra energy this additional height will yield (230-350 million units) is less than 10% of the total energy. For this trivial benefit, a tremendous price has to be paid—5 villages and an additional 9,500 hectares will be submerged, mostly in Maharashtra.

For operating CHPH (of 250 MW) as a peaking station, a temporary storage is to be created — the canal head regulating ponds or rock filled dykes. These ponds have water storing capacity of 24.25 MCM (million cubic meters). The area submerged by these ponds will be 773 hectares comprising of 5 villages. The pump-back generation at RBPH is made possible by a similar storage created by Garudeshwar Weir. This weir will submerge land on the banks of the river but no estimate of this submergence is available. Hence, a submergence of at least 10,800 hectares can be directly associated to the power component of SSP. This comes to 7.45 hectares per MW of installed capacity

SSP IN PERSPECTIVE

The SSP power plant, with an in stalled capacity of 1,450 MW, would account for only 5% to 69b of **the** total capacity planned for **the Western** Zone, by year 1997. Capacity **addi-**

tion planning is based on demand forecast studies. Some of the assumption© involved in studies of demand forecasts are erroneous. The latest demand forecast done by Central Electricity Authority (CEA) is the 14th Electric Power Survey carried out in year 1990. This survey assumes peaking availability—(at the bus-bar) of 59.5% for the Western Region by year 1994-95, An availability of 60.36% was already achieved in year 91-92. Further, the survey does not take into account other factors that improve peak availability, such *as* higher availability of new generating plants being added and continued efforts for renovation and modernisation.

Conclusions

There is no justification whatsoever for the negligible generation from the 19 ft; increment in the dam height

Conventional generation declines rapidly to a trivial capacity

The SSP Pumped Storage scheme — to compensate for the weaknesses of the conventional generation — is so intrinsically inappropriate and expensive compared to other options that it is like "throwing good money after bad".

A K.N. Reddy & Girish Sant

The Alternatives

Demand Side Management A Way Out Of The Present. Mess

The fundamental purpose of the power sector is to satisfy demand for the benefits of electricity such as lighting, cooling, etc. Traditionally demand has been met by adding generation capacity The possibility of reducing electricity demand through energy efficiency while providing the same level of benefit has been largely ignored. Throughout the world it is now recognised that Demand Side Management (DSM) or efficiency improvement offers a significant and economical method for demand reduction, in effect diminishing the need for new installed capacity. In fact, saving 1 kWh is equivalent to generating more than 1 **kWh** because **the** saving is at the consumer end separated from the generation end by T & D lines with **their associated T & D losses.**

Iarge Savings from Energy Efficiency

Efficiency improvements can play a major and cost-eflective role in demand mitigation. For example, US. electricity demand was anticipated to follow GNP growth according to J 1973 utility forecasts. In fact, even though electricity service expanded because consumers bought additional appliances, etc., electricity use actually decreased and in 1986, the actual consumption was 50% less (1,160 billion kWh less) than. the projections. It has been estimated that the United states currently saves $169 billion per year as a result of end-use efficiency advancements which began in the mid-**708.** As technology evolves, the opportunities for energy savings Continually expand In 1991 US and Canandian utilities alone invested over Rs. 6,000 crores ($2 Billion) on DSM programs, a growing trend.

Opportunist to Surpass the Wort: The Urgency of Imptemtiitatkm

In the matter of efficiency improvements, India has a comparative advantage over Japan, that US, and Europe. In most Western countries, the cheapest efficiency measures have already been adopted during the last fifteen years as a result of which the efficiency of powre utilisation is relatively high. However, many of these very low-coat efficiency improvements have not yet been captured in India which can therefore enjoy much greater incremental energy savings per rupee spent on conservation measure.

In addition, the highly industrialised countries are hampered by comparatively long lead times in implementing energy efficiency improvements because they still have a largo stock of the less efficient infrastructure and equipment from the past. In contrast, in India, industries are being newly established or expanding, many consumers are purchasing their first appliances, etc, Hence, there is considerable scope for efficiency measures **and** an urgency to adopt them as soon as possible, before a wasteful infrastructure becomes established and inefficient equipment is installed. The savings benefits of efficient infrastructure and equipment **propagate** *over* time as do the losses from inefficient versions. Thus, as the nation's infrastructure is being estab-

Option	Life Cycle Cost Rs/kW	First Cost Rs/kW	Electricity Cost Rs/kWh
Compact Fluorescent Lights	13,852	7,611	0.57
Irrigation Pumpset Rectification	21,827	13,941	0.33
Pumped Storage Schemes	27,860	14,530	1.29
Gas Turbines	30,391	8,660	1.18
Cogeneration in Sugar Factories	35,252	28,380	0.69
Combined Cycle Gas Turbines	35,555	17,507	1.39
Efficiencient Refrigerators	36,094	33,954	0.39
Sardar Sarovar completed on time	37,807	30,301	0.96
SSP with a two year delay	45,746	36,665	1.16
Coa	61,808	31,269	1.29

Life Cycle and First Costs of Various Electricity Options

lished and equipment is being installed, there are unique opportunities to surpass western efficiency levels with relatively little financial outlay.

Costs of Various Options

Least Cost planning is fundamental to achieving the maximum benefit from limited resources. Presently, the Western Region is faced with serious, power shortages although the base-load capacity significantly exceeds base demand. Additional base generation is not needed and ties up additional capital. Therefore, one needs to focus on the cost of adding (or saving) a kilowatt (Rs/kW) of capacity during peak demand time. We have evaluated various energy options according to life-cycle cost and first cost per kW added/saved at the bus-bar. This avoids placing emphasis on the addition of unnecessary base capacity. The table compares the options, ordering them by increasing life-cycle costs. The Rs/kWh costs are also shown although they are not relevant in the case of SSP since SSP provides maximum power during the monsoons when there is the least need for it.

Life cycle Costs and First Costs

The results of the analysis carried out by the author regarding life-cycle costs and first costs of various energy options is tabulated in the table on previous page. Details of the the analysis, and the assumption used can be obtained by writing directly to the author. The assumptions and the calculations are transparent and any body can understand and repeat them. The procedure allows for different assumptions to be made and the resulting costs can be computed directly. All results are given as values for the Western region except Refrigerator efficiency improvements, which are all India figures.

The above table demonstrates that SSP is one of the costliest option for meeting peak demand (only coal power is more expensive). (Nuclear is even more expensive but has not been included in the study—*Editor.* For the same investment as SSP, the total cumulative potential of these other options is approximately 65% more than SSP capacity and they can all be realistically achieved by 1998—that is just a year after SSP is scheduled for completion.

Life-cycle costing forms the core of this approach. All direct costs and credits are accounted for and brought back to their present value. Energy was treated in a similar manner. Where uncertainty was involved in the assumptions, conservative estimates were adopted.

For fair comparison, each energy option is replaced after completing its useful life while accounting for all costs over its life-time. The time horizon for this analysis is equal to the economic life-time of SSP, viz., 34 years. For reality, raw data for the study was extracted from the results of actual energy projects. Accounting for the higher availability factor of new generating plants scheduled by year 1997, it is likely that an overall availability of 64.2% will be achieved. This improvement is equivalent to a reduction of about 1,222 MW on gross generation (at bus-bar).

The first phase of extensive renovation & modernisation efforts have already improved plant performance equivalent to 1,400 MW of capacity nationwide. The resultant cost of saved capacity is only Rs. 0.87 crores/MW Continued efforts are expected to further improve the availability of existing plants. Despite this, the improvement has not been incorporated in the present study because of inadequate data. But, these favourable factors should relieve concerns about the desperate power shortages expected in the near future.

The following sections elaborate on selected DSM options that have proven themselves feasible, quick and inexpensive. Analysis reveals several key advantages of these options over SSP.

Irrigation pump Sots (IPS) Rectification

IPS consumption accounted for 22% of the total Western Zone consumption of electricity (in the year 1991-92). Work, especially in Gujarat (by the Gujarat Electricity Board and the Institute of Cooperative Management, Ahmedabad, demonstrates that 26% energy savings are feasible by simple low-cost rectification measures in IPS. Extensive field experience with IPS rectification has also accumulated. For example, as of 1991 the Institute of Cooperative Management rectifted 5000 pumps using measures which yield from 26-50% energy savings. This work was also taken **over by GEB, which comprehensive DSM schemes have been formulated which take into account technical, financial, and political barriers to IPS rectification.**

Ughtlntf Improvements

Lighting drives the peak load in India, comprising 34% of that demand. As a financially effective and proven means for demand reduction, energy-saving lighting should receive priority attention in energy planning. Compact-fluorescent lamps (CELs), comparable to incandescents in luminosity, use just one quarter the energy of their counterpart while affording many additional benefits. Energy analysis indicates that even with only 25% of the household incandescent bulbs replaced, CFLs have the potential for saving approximately 640 MW of peak power in Gujarat, Maharashtra, and M.P. In a span of 5 to 6 years, a well- planned program can achieve this saving at a cost of Rs.l3,800/kW (this is significantly less than the Rs/kW for SSP).

Refrigerator Efficiency Improvements

Indian refrigerators perform well below world efficiency levels. Remarkable efficiency improvements have been made in many countries. South Korea's refrigerators provide an excellent example for India to follow or even improve on. Over a 7 year period (1980-1987) the energy use of their 165 litre refrigerators dropped 65% from 672 kWh/yr to 240 kWh/yr. A 200 litre Damsh model now produced uses only 90 kWh/year. Refrigerator performances, but similar sized Indian refrigerator use about 540 kWh/yr. The large gap between good and bad refrigerator performance in different countries shows that there is significant room for improvement in India's models.

Currently more than 1.26 million units are produced in India and the production continues to increase at a rate of 10 to 12% per year. The refrigerator stock is expected to grow from its current level of 7 million units to approximately more than 50 million units by year 2010.

Simple modifications in the refrigerator design (refer to footnote for the specific modifications) can reduce consumption up to 24%. These modifications can be implemented immediately by developing an agreement with manufacturers. An overall cost increase of Rs 500/refrigerator is expected for these basic modifications. A delay of jut 6 yearn in implementing simple and immediate refrigerator efficiency improvements, will waste energy equivalent of over 40% of the SSP's production over 34 years of economic life time. These simple efficiency measures, provide an estimated saving of 34% in the refrigerator energy consumption. These measure are implementable in a short time, with immediate results. As seen in the above table, they produce large energy savings at a low cost.

Industrial Efficiency Improvements

The rapidly expanding industrial sector today consumes about 45% of the nation's total electric power.. Energy is a bottle-neck to industrial productivity today. There are many low-cost measures to reduce or minimise energy conservation through efficiency retrofit. The national energy conservation center in Pakistan, Enercon, audited 43 industrial plants. A 22% energy saving is anticipated using only measures with a 6 month payback time or less. Numerous energy audit studies done by the National Productivity Council and other agencies demonstrate similar savings in India.

China's success in industrial energy efficiency advancement is also

worthy of note. A huge energy efficiency program implemented at the central and local level between 1981 and 1985. Investments totaling 10 billion yuan were applied towards the retrofit of existing equipment and the installation of new energy -saving equipment. This efficiency outlay amounted to more than 10% of the total supply-side investment in 1981 and 1982. Since that time, the proportion of efficiency investments in virtually all highly industrialised and some developing nations, has increased substantially.

Other Efficiency Improvements

Reduction of Transmission and Distribution Lossos

There exists significant potential for reducing T & D losses, and in-creasing electricity availability (at the user-end) in Gujarat, M.P. and Maharashtra. A brief summary of the current situation is given below — Korea has been included as an Asian example of low T & D losses. Over the last 20 years, Korea's T & D losses of 25% decreased to just 6% with the aid of a straightforward four- component programme.

Gujarat	*21.7%*
M.P.	*18.9%*
Maharashtra	*16.0%*
Korea	*S.7%*

Average Transmission & Distribution Losses

- Reduction of existing line loads to 75% of their rated capacity
- Addition of needed conductors to accommodate residual load;
- Installation of low-tension and high-tension capacitors to increase power factor levels;
- Utilisation of low loss equipment i.e. current transformers.

As a result of these measures, Korea's transmission and distribution efficiency now betters the US. by approximately 2%.

Fortunately, methods for reducing technical T & D losses are straightforward and do not require any advanced technologies. T % D improvement investments are frequently more cost-effective when compared to the cost of new installed capacity. A World Bank study in Sudan demonstrated that an outlay of Rs. 3 crore for static capacitors would yield a generation capacity savings of Rs 6 crore. The retrofit was intended to correct low power factors in the distribution network, a problem that is common in India.

Maharashtra's T & D system has improved significantly since its high of 17.6% losses in 1989-90, falling to 15% over the 1991-92 period. This encouraging trend is the result of recent loss reduction efforts by MSEB is still under—way (further reductions are expected). Gujarat and M.P. enjoy even greater potential for improvement with their present high T & D losses. The present allocation for T & D investments which is approximately 34% including outlays for lines and equipment, is quite low relative to the 45-55% expenditure of other countries. To gain the benefits of this environmentally benign resource, a larger proportion of the power sector budget — even more than for capacity expansion — must be allotted towards this resource.

Power Plant Tune up

De-rating of power plant capacity and low plant load factors (and plant availability) are common features of the power sector in India (and other developing countries). A1989 World Bank survey of 70 developing countries shows an extra generating capacity of 43 gigawatts (at a cost of about Rs. 150,000 crores) resulting from excess reserve margins due to the features mentioned above. A 1991-92 Economic Intelligence Service study of India reveals an average plant load factor of only 55.3%, demonstrating that existing capacity is significantly under-utilised.

Pakistan has experienced similar problems. A rehabilitation project now under way in Pakistan is designed to restore the original ratings of 15 steam and combustion turbine units providing an additional capacity of 120 mega-watts while halving the forced-outage rate. These benefits are derived with pay-back times ranging from 2 months to two years.

Thermal plants in the three states involved in the SSP realise only a 52.8% Utilisation rate, whereas 70-80% plant capacity factors are typical in other countries. Many opportunities for capacity improvement are available. Some older Indian thermal units have boilers which are not even configured to operate on high-ash coal, the primary, thermal fuel. While it is true that high ash coal use requires some additional maintenance, analysis indicates that in most cases maintenance is considerably more economical **than** equivalent new installed capacity.

A continued effort directed **towards** renovation and modernisation **to** improve the availability of **coat-baaed** thermal plants is now in **progress in**

Inda. In the first phase of this, an investment of Re 1,223 croree is expected to improve plant performance equivalent to adding 1,400 MW capacity (all over India, Rs 0.874 crores /MW of saved capacity). This process is expected to continue in the second phase and will improve availability of old plants above the 1992 level. A preliminary estimate indicates that this will be equivalent to a capacity saving of 1,600 MW (all India). The on going R&M for hydro power stations is expected to save another 846 MW capacity nation-wide.

Since this huge economic resource is in the process of being tapped, it has not been included in the present analysis as an alternative to SSP. But, it must be stressed that demand forecast studies have not recognised the reduced need for capacity additions because of these ongoing measures.

Tims off day Tariffs and Load shifting

Many State Electricity Boards are actively thinking of introducing/strengthening Time-of-day (TOD) metering and two-part tariffs. This strategy encourages energy consumers to shift their load to off-peak hours using a variety of incentives including time-specific tariffs. Once the realistic cost of peak-time energy and off-peak-time (night time) energy is charged to the industrial consumers, sufficient incentive exists for them to alter their usage patterns. A survey of HT industries in Western Maharashtra has estimated that about 2.0% of the normal HT load can be shifted from peak to non-peak hours by managerial solutions, and 0.6% by staggering the timing of industrial operations. An additional 3.0% of the load can be shifted if some investments are made. This amounts to about 400 MW in the western Region by 1997. These measures art typically less costly and more rapidly implemented than capacity addition.

ENVIRONMENTAL & SOCIAL IMPACTS OF THE OPTIONS

Concern about the social and environmental costs of power generation has been increasing world-wide. Whether the source is Urge hydel, coal thermal, or nuclear, experts now recognise that the social and environmental consequences of power generation are large, Usually, these consequences are borne predominantly by the most deprived sections of society.

A kilowatt-hour saved is a kilowatt-hour made?

No!

A kilowatt-hour saved is equivalent to more than 1.29 kilowatt-hours generated at 22.5 % Transmission and Distribution losses.

Environmental Impacts

The environmental impacts of SSP are known to be large, but their over-all effects have not yet been determineil. In the present study, therefore, alternatives to the dam were selected based on their cost and socio-enviroamental soundness. For example, efficiency improvement measures such as T & D loss reductions. IPS rectification and efficient lighting, use neither consumed fuel nor submerge land—their environmental impact is virtually negligible The first cost and life-cycle cost of these measures are also lower than SSP. Pumped-etorage generation typically uses energy supplied by coal plants. Hence the concerns related to coal combustion would also apply to this form of'hydel'generation. This concern also applies to the pumped-etorage mode of operastion at SSP. However the alternative pumped-etorage schemes have every limited land requirements and consequent submergence.

Gas turbine thermal facilities enjoy many environmental benefits over coal thermal plants. Natural gas used in the turbines i» the clennest fossil fuel source. Also, there is little associated thermal pollution and sulphur emission from CCGT plants relative to coal power.

Cogeneration reduces sugar factory emissions because of the higher efficiency of combustion attained. The production in some cased divert bagasse, which can otherwise be used for making hard-board or an biomass. Fortunately, this quantity is disproportionately small compared to the generated power.

Social Impacts

The most adverse social impact of power generation is the displacement of people. The degradation of land and water resources also add to this impact. In comparison to the SSP, the land requirements of the alternative optionn are negligible, and the displacement problem is minimal.

CONCLUSIONS

The economics of the alternative energy options (excluding coal-based thermal power) are markedly superior to that of SSP. The achievable power potential is also many times the potential of SSP Finally the alternatives provide greater environmental and social compatibility and therefore greater societal acceptance. This is a very important bonus in favour of the alternatives apart from their lower financial cost.

Girtih Sant
Amrita Clinic, Alhawalt Corner,
Karve Road. Pune 411004

Kaiga left High and Dry

Commissioning of the Kaiga Atomic Power Plant will be delayed because of a serious crisis in cooling water supply, according to the project authorities. The delay would be inevitable if the dam promised by the Karnataka government across the Kali river did not come up soon, they said.

"Non completion of the dam is the single major hurdle we are now facing," said Mr. Paramahamsa Tewari, Kaiga project director. He said the delay in commissioning of Kaiga would cause monetary loss of Rs 1 crore per day to the Nuclear Power Corporation (NPC).

The atomic power station requires several million gallons of water per hour for cooling and this water is supposed to be drawn from a reservoir created by the 36 meter tall dam to be built at Kagra, a few kilometres from the project site. The plant authorities said that the state-owned Karnataka Power Corporation Limited had agreed to complete the dam in June this year, but the construction work which was suspended ten months ago has not been resumed yet. "The water intake structure and the pump house at the project site are almost ready, but there is no sign of the dam coming up and we may face a crisis in cooling water," said Mr. V. Raghavan, chief construction engineer of the project.

He said that as a contingency measure, water from the river could be directly pumped to the reactors at the time of making the reactor critical. After that the plant will have to be shut down.

NPC officials said Kaiga site was selected because of assured availability of water from the Kali river hyde1 power scheme that envisaged construction of a series of dams in* eluding the one at Kagra.

Withdrawal of the World Bank aid for the scheme and an unresolved dispute between KPCL and its contractor over revision of rates are said to be the reasons for work stoppage at Kagra dam. Mr. Tewari said the NPC chairman has taken up the matter with the Karnataka authorities and hoped that the dam would be completed without further delay.

Meanwhile, workers yesterday (1st February, 1994) poured the last bucket of concrete on the dome of unit-1 of Kaiga signaling the completion of almost all the civil works of the first of six 235-mw reactors in the midst of a jungle, 35 km east of the scenic Karwar coast.

Mr. Tewarisaid subject to the availability of coohing water, unit-1 will be ready to deliver power from June 1996 and the second unit will be commissioned six months later.

"Soil investigations for two more reactors (unit-2 and 3) are already on," according to Mr. N. Rajasabai, station superintendent of the project who dismissed as "baseJess" reports that KAPP hud uprooted people and destroyed virgin forests. We cut 10,000 trees but have already planted 150,000 saplings elsewhere and the entire project required shifting of just 85 families," Mr. Rajasabai said. All the displaced families have been given houses in Karwar "and one member from each family has a job at KAPP," he said.

According to Mr. Tewari only 50 hectares of forest land had been used by the project so far, and another 70 hectares will be taken up when all the six reactors are built In contrast he said, the Kali river scheme for generation of 1400 MW "will submerge 100 times more forest area."

Mr. Tewari said environmental clearance for the four additional reactors had already been obtained and soil investigations were on. He said Rs 650 crore had so far been spent and the cost of the project was being revised upwards.

Mr. Tewari said Kaiga reactors are the first to have "a massive structural concrete wall" that acted as a third barrier against any leak and added to inherent safety. Power reactors elsewhere in India have only two concrete walls.

Newsreport in Times of India February 2, 1994

Editor's Note:

I found the most interesting part of the report to be the information about the nuclear authorities' willingness in case the dam is not built, to just make the reactor critical and then to shut it down. What this action would do is that it would ensure the bonuses for quick construction to engineers and construction workers, though the plant would not produce any electricity. It would also pollute the reactor irremediably. This contemplated action illustrates the 'patriotic' priorities of our nuclear establishment rather well.

Also I found Mr. Tewari's comment about the submergence caused by the dams to be very funny Here the man says just a second before that if the dam is not built the nuclear plant would have to be shut down, and yet he does not consider the submergence due to the dam to have any relation to the power plant Such blinkered vision is indeed characteristic of nucleocrats.

No.3

Environment Versus Development

Amulya K N Reddy

The debate between 'economic development' and environmental welibeing is being conducted in many parts of the world. It is of special relevance to the Third World. In the following, Professor Amulya Reddy puts the argument with special reference to India in the form of a dialogue between an Earth Protecting Mother (EPM) and a Growth Promoting Father (GPF). It has often been the contention of the nuclear lobby that while environmental considerations may be all right for the developed countries they are a luxury' for a poor nation, which is trying to 'catch-up with the West Dr Reddy shows not only how it is possible, but also why it is necessary to protect the Earth.

EPM: All over the world, the growth of energy use is leading to rapidly increasing environmental degradation. Local and regional habitat is being ruined by urban atmospheric pollution and acid rain. Accumulation of greenhouse gases in the atmosphere has raised the spectre of global warming and an uninhabitable earth.

QPF: Don't lay the blame for the increase in greenhouse gases on developing countries like India. This increase was caused predominantly by the industrialised countries through their voracious appetite for fossil fuels to generate electricity and run their vehicles. Even today, they contribute 58 per cent of the annual carbon dioxide emissions.

EPM: That is true, but even if the industrialised countries stabilise their emissions, India and other developing countries will-if they pursue present patterns of energy consumption-produce significant increases in concentration of greenhouse gases.

GPF: All this talk of global warming is on|y a tactic of the industrialised countries to divert us from our mission of development. The fact is that India is only a minor contributor to the global atmospheric changes—it accounts for only about *2.5* per cent of the total annual carbon dioxide emissions into the atmosphere. Acid rain is largely Western problem. Environmental degradation brought about by energy projects in India is negligible and not worth worrying about.

EPM: Not so! Our hydroelectric projects have been responsible for submergence of prime forests, the displacement of people from the submerged areas, their resettlement after deforestation in the catchment areas of reservoirs and the resulting soil erosion In Karnataka, for instances 42 per cent of the 203,913 hectares of prime forest lost between 1956 and 1984 has been due to power and irrigation projects. As for coal-mining, it devastates the countryside. Anyone who lives near coal-based thermal power plants knows the tremendous atmospheric pollution that they produce.

GPF: If there is to be progress, we cannot avoid the environmental consequences of energy consumption. After all, development requires economic growth which in turn depends upon the consumption of energy. India requires massive increases in the consumption of energy in order to promote development and ensure progress.

EPM: Do not equate development with growth (in the volume of goods and services). Whether socio-economic change is to be deemed as development or not depends upon what goods and services constitute growth and which sections of society benefit from these goods and services. Mere economic growth that does not result in ihe satisfaction of basic human mods (starting with the needs of the neediest!) is a mock-cry of development.

GPF: But, you must admit that the standanl of living in a country depends upon its per capita energy consumption (PCEC). Peopic like you who oppose major increases in energy consumption are in fact preventing improvements in the standard of living.

EPM: Your view, which is indeed conventional "wisdom", is being challenged more and more because it treats energy as an end in itself. In fact, what people need its not kilowatt hours, tonnes of coal and barrels of oil but illumination, warmth, transportation, etc. Energy is only a means to the end of providing services, performing useful tasks and satisfying human needs. Hence, the true meaaure of development is the level of energy services (the amount of light, heat, motive power, etc) and the distribution of energy services (which determines who are the beneficiaries of energy). In order to advance development, the level of services must be increased and the poor must be the principal beneficiaries of energy supplies. For, it is this level of energy services that determines the quality of life and the distribution of services that reveals whether basic needs of the neediest, are being satisfied.

GPF: All that is obvious! The point is, how can the level of energy services be increased without increasing consumption of energy?

EPM: Energy services are provided by end-use devices (stoves, furnaces, lamps, motors, engines, etc.). The level of energy services depends, not only upon the magnitude of energy supplied to end-use devices, but also upon the efficiency with which the devices convert these inputs into useful energy. Hence, increases in the level of energy services can also be achieved with efficiency improvements. One gets twice the illumination with half the consumption of electricity by switching from one inefficient 60 watt incandescent bulb to two efficient 15 watt compact fluorescent lamps.

Are no further Increases In energy consumption necessary In India?

EPM: What is being suggested is that if opportunities for efficiency improvements are systematically identified and exploited, the magnitude of energy demand can come down very sharply. In that situation, energy supplies need not become a constraint on growth and many grandiose centralised energy supply projects become unnecessary. As Gandhi said: "The world has enough for every man's need, but not enough for everyone's greed!"

GPP: Even if energy conservation can achieve a great deal in the present context, India's growing population will compel rapid increases of supplies.

EPM: Supply increases can be minimised! It has been recently estimated that
1) even if India targeted for a level of energy services or activities corresponding to Western Europe in the 1970s (not that such a target is necessarily desirable!), and
2) if the country used for s.ll these activities the most energy-efficient technologies that nre commercial today or near commercialisation,
the Per Capita Energy Consumption would only have to be some three times greater than it was (including biomases energy) in 1978. Hence, efficiency improvements are the silver lining; they radically improve the prospects of achieving significantly higher standards of living: in the country. They may also lead to lower population growth rates since growth rates are generally reduced by improvements in the standard of living.

GPF: Your argument may well be valid for industrialised countries where the PCEC is so high that there is tremendous scope for energy conservation. But, the situation is totally different in a poor country like India where the PCEC is low and there *it* little room for energy conservation.

EPM: You are making the common mistake of confusing conservation with a decreased satisfaction of basic needs. The real thrust of conservation should be towards efficiency improvements. Energy is used very inefficiently in all sectors of the country's economy. Indian industry is largely based on energy-inefficient designs/equipment imported from the industrialised countries during the era of cheap energy. Thus, there are tremendous opportunities for energy efficiency improvements.

GPF: You are misleading us. In the late 1970s and early 1980s, the industrialised countries reduced their rate of growth of energy consumptibn by moving away from energy-intensive industries. But, our country cannot make these structural shifts because it has to industrialise. So, India can't reduce energy consumption in the same way as the industrialised countries.

EPM: Fortunately, India need not find it as difficult to modernise as the industrialised countries because its stocks of equipment are not as large. Hence, we can exploit more easily new technologies that permit dramatic improvements in industrial energy efficiencies. The industrial sector in India is an ideal environment for technological leap-frogging to an energy efficient future.

GPF: That may be, but what can be done about the biomass energy sources (fuelwood, agricultural residues and animal wastes) that account for a large fraction of energy consumption in India?

EPM: Most of this biomass is used in the residential sector for cooking in traditional ways at very low efficiencies. By moving to efficient sources/devices for cooking, the country can release enormous amounts of biomass to establish a major base for renewable energy sources (biogas, producer gas, ethanoi and methanol). Bioraasa-baeed devices such as gasifiers and gas turbines can then play a major role.

QPF: You admit that a given level of energy services can be achieved without changing the present stock of energy-utilising devices —however inefficient it may be—by increasing the input of energy. If so, why are you so much against increasing rate of growth of energy supplies?

The economic argument for reducing ratio of energy to GDP growth rates

EPM: There are powerful economic and environmental reasons for reducing as much as possible the ratio of the growth rate of energy to the growth rate of GDP. Current planning norms used by developing countries assume that the electricity growth rate should be about twice the growth rate of the GDP. To achieve such a growth rate in electricity supplies, astronomical investments are required.

The World Bank recently reported that the developing countries have asked for about $100 billion peryear to pursue current patterns of electricity generation and consumption when only about $20 billion would be available as aid. And India's Eighth Plan proposals demand an expenditure of about Rs. 100,000 crores to increase the electrical capacity by about 38,000 MW. Without* clear idea of where all this capital is going to come from, what is being proposed is absurd. It only proves that present patterns of energy generation and consumption are impossible to sustain from even an investment point of view.

Sustainability requires that the annual bill must be decreased by reducing the coupling between energy and GDP. We must lower the electricity-GDP ratio and get more GDP for lees energy. This can be achieved by efficiency improvements in energy production and consumption. The experience in many countries is that saving a unit of energy is one-third to one-half as cheap as generating it. Efficiency improvements also reduce the unit investment cost (Rs/kW) and the investment bill.

How will reducing the energy-GDP ratio help the environment?

EPM: The alarming increases in energy production and consumption are leading to environmental impacts that are quite serious. Many hydroelectric projects cause the submergence of forests as well as soil erosion in the catchment areas, and waterlogging and salinity increases in the downstream areas. And, coal-based thermal power plants are a major cause of atmospheric pollution.

GPF: You are presenting it as if there are no other supply options. But, there are clean energy sources. You must accept, for instance, that nuclear power does not lead to forest loss. It does not pollute the atmosphere with particulates and emissions that cause acid rain. It is non-polluting as far as carbon emissions and the greenhouse effect are concerned. In feet, it is the answer to both local environmental and global warming problems.

EPM: Don't forget the accident at Chernobyl that polluted vast areas of Europe. As long as we cannot conceive of all the ways in which reactor accidents can occur, we cannot rely solely on automatic safety mechanisms. And the moment we permit operator intervention, we cannot avoid some fool doing a foolish thing. Nuclear power is too unforgiving a technology.

GPF: Maybe the present generation of reactors are unsafe, but don't ignore the exciting developments that are taking place in nucl«>ar technology. Inherently safe reaetors are being designed and will soon be available.

EPM: But, reactor safety is only one of the problems with nuclear power-and in fact, not the main problem. Nuclear plants produce high-level waste which create long-term disposal problems that have not yet been solved. In addition, there is a very close link between nuclear power and nuclear weapons. This link to either direct through the use of power generation as a starting point for weapons production or indirect, through the theft of weapons-usable material. Nuclear power, therefore, is not the answer if we want to save the world, not only from environmental degradation and the potential dangers of global warming, but also from nuclear destruction.

In any case, using less energy is the best way of reducing the impact on the environment. Conservation technologies are the most environment friendly followed by decentralised technologies based on renewable sources of energy (mini- and micro-hydroelectric, btogss and producer gas, gas turbines, solar water heaters, etc. and in the near future, photovoltaic devices).

What must India do?

EPM: India must for economic and environmental reasons, adopt a new set of national priorities that are derived from the objective of need-oriented, environmentally sound and self-reliant development. This development focus determines how benefits

of energy are distributed between sections of society and the extent to which the quality of life of the poorest is improved. Energy planning must acquire an end-use orientation that emphasises energy services rather than energy consumption and take the opportunity for efficiency improvements through new energy technologies.

Whether it is new energy carriers or new end-use devices, there is a tremendous scope for basic research, technology development and innovation which means that Indian science, technology and management have to play a central role. In development oriented to basic needs, the stress has to be on the poor as beneficiaries—this means that scientists, technologists, managers and the people have to work jointly to build the new energy systems of the future. Such a development-focussed end-use-oriented (DEFENDUS) approach makes India's energy future a matter of choice; today this future is viewed as destiny because of present trends.

As a side-effect and a bonus, this approach will prevent the country's energy system from aggravating the global problem of greenhouse gases.

Hope for the new future

EPM: Thus far, the industrialised countries and the Indian elite have colluded in promoting a pattern of growth that is economically unviable, environmentally damaging and golbally disastrous and unsustainable. Now, the industrialised countries are realising that further promotion of these growth patterns can make the earth a veritable hell. Therefore, the industrialised countries might have a stake in sustainable development as a way of protecting the global atmosphere. This is the good news!

GPF: Sustainable development, with its emphasis on the needs of the neediest, may well lie in the interests of the Indian masses. But, it is not in the immediate interests of the lobbies associated with current energy patterns. These lobbies will put their own vested interests above the interests of their masses, of sustainable development and thereby the global climate. Thus, it is very likely that there will be a head-on collision between the Indian elite and the industrialised countries. The elite will talk vehemently about the development versus golbal climate dilemma. And in this context, the resolution of the dilemmas through energy-efficicient futures will not be implemented. Instead, India will continue to be used for the promotion of economic growth and its wretched population will be condemned to adapting willy-nilly to environmental degradation. The custody of the country should remain in the hands of pragmatists who recognise this reality.

EPM: There will no doubt be tremendous opposition to the energy-efficient future that advances sustainable development. But, however difficult it may be to achieve such futures, the fact is that the present growth-obsessed trend is impossible to sustain on economic grounds. Custody of the country should be given to those who will ensure a sustainable future in which people will flourish!

Amulya K.N.Reddy
International Energy Initiative
25/5 Borebank Rd. Benson Town,
Bangalore 660020

The Great Power Scam

Why Foreign Deals Must Be Scrapped

The government has embarked on a dangerous course in the vital electricity sector. Desperate to attract foreign investment, it is offering incentives and terms that are wholly iniquitous and do not even make commercial some. If these projects go through, India will soon have unaffordably expensive, gold-plated power, greatly increase its dependence on imports, cause a huge outflow of foreign exchange and destroy its own equipment-manufacturing sector, besides rendering many industries hopelessly uncompetitive.

If this sounds like an exaggeration, consider the following. The power ministry is about to clear 66 private proposals, including 36 foreign proposal, to invest Rs 88,000 crores in 28,000 Mw. of power (an addition of two-fifthe to the existing capacity) by offering a 16 par cent rate of return and a plant load factor

of 68.5 percent. The price to be paid will cover foreign exchange fluctuations and include guarantees on bilateral loans as well as payments by state electricity boards(SEBs).

Unheard of

Such terms are unheard of anywhere in the world. Typically, the projects in question have a capital cost of Rs 30,000 to 44,000 per kw. which is way above the Eight Plan working group norm of Ra 16,000 to Rs 20,000. They will generate electricity at more than double the present national average cost of Re 1.24 per kilowatt-hour. They also involve an adverse energy, material and foreign exchange balance.

The unseemly haste with which such "white elephant" projects are being pushed through by Union power ministry and some SEBe is exemplified by the manner in which the Central Electricity Authority was recently bullied into clearing five proposals, involving over Rs 13,000 crores, in a single day.

The government has bent over backwards to court foreign firms by offering rates and guarantees which it denies domestic industry; it has also waived debt-equity norms and raised depreciation rates and other terms to a point where the investment carries no risk whatever.

The starkest example of these ill-conceived projects is Enron's at Dabhoi in Maharashtra. This Rs 9,053 crore venture will generate 695 MW by burning imported distillates in the first phase (Rs 2,900 crores), and adding 1,320 MWand converting the whole capacity to liquefied natural gas, in the second. The capital cost works out to Rs 44,000 per kW, compared to under Rs 10,000 for two recently completed BHEL projects (Singrauli and Ghandrapura).

The price to be paid by MSEB to Enron is designated in US. currency in a bixarre form of globalisation: 7.47 cents or Rs 2.39 per kWh. An energy economist, Dr Kirit Parikh, **calculates after taking into account transmission and distribution losses and price escalation that industry will end up paying as much as Rs 4 per unit for Enron's power! This is four times higher than the average rate the Indian consumer pays, and will raise Maharashtra government's deficit to unconscionable levels.**

The whole proposal is so outrageous that even the World Bank has refused to finance it. Dr Parikh estimates that Enron will cause a foreign exchange outgo of between Rs 2,000 crores and Rs 9,000 crores. Besides, it will enforce continuing dependence on an expensive, foreign, petroleum-based resource. Another estimate shows that MSEB will lose Rs 2,000 crores on Enron deal even if it doubled its tariff. On the other four recently-approved projects, the loss at current tariffs would be Rs 4,500 crores.

Mind BotfUng

These are mind-boggling numbers by any standard. They simply spell ruin for the power sector and for Indian industry. Evidently what is involved here is padding of capital costs, an internal rate of return of 30 per cent, exaggeration of (fuel and material costs, and other ingredients of a gigantic scam.

These projects will also effectively destroy a number of Indian manufacturers of power generation and transmission equipment, themselves a major component of the critical capital goods sector. Contrary to propaganda, these are among the most competitve comapnies anywhere. They include BHEL, which World Bank regards as "one of the most efficient enterprises in the industrial sector," for which the effective protection rate Is close to cero" and whose products are on a "par with international standards".

BHEL has already been brought to its knees through systematic discrimination. It will perish if starved of orders. This is true of a number of Indian public and private enterprises as new projects are monopolised by foreign firms which face a domestic recession and have huge unused capacity.

Is there an alternative to such unaffbrdable and irrational power-purchase projects? There clearly is. Even on the extravagant assumption that the demand for power will annually grow at 6.5 per cent, that capacity will have to double in 12 years, and that the public sector will not be able to build more than 2.000 MW a year, it should still be possible to effectively create or save 50,000 MW. Mr R.D. Agha of Thermax Ltd. calculates that, by refurbishing, better maintenance and life extension of existing power plants; by cutting T & D losses by 10 per cent; by using co-generation; and by reducing sheer waste of power, India could save 47,000 MW.

No End to Irrationality

The irrationality does not end here. Once a precedent is set for a cost-plus, 16-per cent-return formula, foreign—and Indian — firms will demand similar terms in telecommunications, oil or fertiliser—with disastrous economic consequences.

So for as power goes, the government has created a scare by making wild demand projections and proceeding to court foreign investors on scandalous terms, with no consideration for the exchequer or for industry. The whole approach represents a retreat from the urgent task of reforming the electricity sector.

There must be more than a policy error here. Given the sheer magnitude of the deals being made, it would indeed be a miracle if no slush funds were involved. It is a fit case for a parliamentary investigation.

PrafulBidwai
The Time* of India December 29, 1993

Vested Interests Push Thailand Nukewards

India Offers Research Reactor

Energy Committee of the Thai Parliament expressed strong determination to push for nuclear power development in the country. The chairman of the committee, Rawi Kingkhamwong said that nuclear power was an option for the country. He lamhasted the House Committee on the Environment for its opposition to nuclear energy, calling the committee's information insufficient. "Many countries are very successful in developing nuclear energy. How come the committee on the environment chose to look at the countries that failed?"

Wiwat Plueksawan, assistant direct of Electricity Generating Authority of Thailand said that siting of Thailand's nuclear power plants would be finalised within this year and it would take two to three years before a decision on nuclear development would be made. From more than 100, the number of sites has already been narrowed down to five and it is quite certain that the power plants will be located in the southern part of Thailand, he said. The southern region has a high potential for nuclear power development as it lies close to the sea, which means ample water is available, he noted. Mr Wiwat said, however, that public acceptance was the most significant factor as to wheiher the country goes nuclear or not.

India has offered to export to Thailand a nuclear research reactor under the safeguard of the International Atomic Energy Agency.

Bangkok Pott
January 26,1994

| Letter Box

I was shocked reading news of nuclear cooperation between Thailand and India. The worst thing is that the nuclear center research reactor will be built at the place which is just 10 km. from where I work. They are now just under our noses.

Recently, one of the Canadian nuclear companies came to present their project to the Thai army. Nuclear companies know that soldiers will be their good supporters. They know that if any important decision needs to be made, the army is the next most influential force after the king. They understand us well enough.

We are now trying to raise a campaign against this reactor and also against nuclearisation of our country. We need to collect information on the issue. We dont know much about nukes. Only handful of people have a real understanding.

We would like to request that you send us books on the issue which you think would be useful for us. Please send us also information regarding the Indian use of nuclear power. Or, if you can write the articles on "Lesson from Indian Nuclear Power", it will be tranlated into Thai and then published.

We would also like to request other antinuclear groups to help us with information.

Eddie'

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