'Better late than never': India gives power sector a big push

by Ramtanu Maitra

After almost four decades of planned economy with government monopolization of the power generation and distribution sector, India's installed power capacity today hovers around 65,000 megawatts. Peak available power, always less than installed capacity, is more like 40,000 MW. More importantly, at the user end, the amount of power supplied drops sharply because of transmission and distribution losses. In this, India has one of the worst records in the world, losing as much as 20% in transmission and distribution—compared to 5.3% in Japan, or 4.7% in West Germany. It is widely believed here in India, though, that this cannot be entirely attributed to "technical losses," but instead is actually due in part to illegal tapping of power by unscrupulous individuals.

Theft and losses, like the ever-elusive "black money" (unaccounted-for cash which floods the country), will in all likelihood remain very high. In the end, it is only a whipping boy. The real problem, recognized of late by the planners after years of stoic resistance, is the absolute paucity of actual power generation capacity in the country. Since 1985, when the Seventh Five Year Plan was put into implementation, a lot of dust has been raised about the need to enhance India's electrical power generating capacity. Investors, both foreign and domestic, have pointed in no uncertain terms to the power cuts and brownouts as a major deterrent to increasing investment.

Now, as India braces to face the long hot summer months, and news of power cuts is pouring in from various parts of the country, serious efforts are afoot to catch up with the shortage of electric power generating capacity. But decades of benign neglect of this vital sector has made the task enormous and long-term capital requirements massive. The failure to remove the bottlenecks to more rapid introduction of nuclear power, in particular, means that even the present push, if fully carried through, will still leave the country with a very serious energy deficit.

Ambitious plans

The Seventh Plan, implemented by the Rajiv Gandhi administration, though formulated earlier, called for new installed capacity to the tune of 22,245 MW by 1990—the largest increment for any five year plan ever executed. With a bit of luck, adequate finance, and a lot of effort, it is expected that most of the target will in fact be met (leaving aside 1,000 of 1,500 MW due to "slippage").

The commitment of the present administration to increased electrical power generation is reflected in the Eighth Plan (1990-94), now in the draft stage, and the government's long-term plan for the year 2000. According to the draft Eighth Plan, India would like to install another 38,000 MW of power generation capacity in the next five years—about 70% more than the Seventh Plan and twice the targets for the Sixth Plan (1980-84). (As a footnote, one might add that in the Sixth Plan, the gap between target and achievement was 5,440 MW—almost 28% of the target.)

A longer-term plan calls for the installation of a total of 177,000 MW by the turn of the century. What this means is that *every year*, beginning in 1995, India will have to install new capacities of 14,000 MW—the amount installed during the *entire* Sixth Plan.

Besides the promise, there are also indications that serious efforts are being made to mobilize the finances to meet this target. The conference of Ministers of Power of the various states on Jan. 23-24 recommended participation of the private sector in power generation. The government has also sought World Bank assistance for seven power projects (in addition to 14 ongoing projects to which the Bank has provided some assistance) that will add a total generating capacity of 7,580 MW.

More to the point, the present administration is pushing seriously for higher economic growth, and is aware of the need for increased power capacity to make that possible.

Years of neglect

At the time the First Five Year Plan (1952-56) was put into execution, India had less than 5,000 MW of electrical power for a population of 450 million. It should have been evident that increased electrical power was a virtual prerequisite for efforts at nation-building. Yet the first two five year plans do not reflect this concept. The first two plans together plotted an addition of 4,800 MW of power over a ten-year

period—and, in the event, 1,450 MW, or 30% of the target remained uninstalled due to "slippages." Such "slippages" have accumulated over the decades to add up to a significant 19,000 MW, or almost 30% of today's installed capacity (see **Table 1**).

The neglect of the power sector in India is not evident from the raw figures alone—which show an uneven but nonetheless distinct growth, in part because of the low initial base. But to understand the futility of such a slow rise in generating capacity, one has to look at the thrust of planning in the early days following India's independence from the British Raj. The first three five year plans concentrated on developing heavy industries such as steel making, heavy machinery, and rolling stock for transportation, which consume large amounts of electrical power. Power generating capacity in those days was usurped to run these huge behemoths, albeit intermittently and inefficiently.

Next to nothing was left for the downstream industries necessary for industrial development, and other sectors. For example, the agricultural sector, which consumed about 21% of the power generated in 1986-87, consumed a meager 10.7% in 1970-71. In the early 1950s, when the first three five year plans were being chalked out, consumption of electrical power by the agricultural sector was negligible, and was not thought to require any particular boost. Similarly, domestic consumption, since most of India's hinterland was doing without an iota of electricity, was also a paltry 8.8% in 1970-71 (see **Table 2**).

The impact of such lopsided planning, paying scant attention to the power sector except as an adjunct to heavy industry, is exemplified in the state of Bihar in eastern India. As of 1985-86, Bihar, with a population close to 65 million, had an installed power generation capacity of 1,594 MW. At 95 Kwh per capita, it is one of the lowest in the eastern region, but higher than in any state of the northeastern region (see **Table 3**).

In fact, since the vast majority of the population do not use any electricity at all, per capita consumption figures are misleading. In Bihar, per capita consumption of electricity is doubly meaningless. Bihar possesses two large steel mills (at Jamshedpur and Bokaro), which produce one-third of India's pig iron and steel. The state also supplies 36% of the nation's coal from its vast coal mines, and possesses a massive heavy engineering factory and the largest railway workshop in Asia, among other industrial showpieces. Most of the 1,594 MW of installed capacity in the state goes to keep these industrial installations going.

Outside of these facilities, the power situation remains as bleak as ever. After four decades of planning for social equality, the large number of small sector entrepreneurs are living a worse-than-impoverished life, using the primitive tools due to lack of electrical power. In spite of the fact that this small-scale industrial sector is a major employment provider and contributes about 50% of India's total industrial output, a

TABLE 1
Slippages in installation of power generation capacity

Plan	(Years)	Target (MW)	Achieved (MW)	Slippage	Slippage as % of target
First	(1952-56)	1,300	1,100	200	15.4%
Second	(1957-61)	3,500	2,250	1,250	35.7%
Third	(1962-66)	7,040	4,520	2,520	35.8%
Annual	(1967-69)	5,430	4,120	1,310	24.1%
Fourth	(1970-74)	9,264	4,579	4,685	50.6%
Fifth	(1975-79)	12,499	10,202	2,297	18.4%
Annual	(1980)	2,813	1,799	1,014	36.0%
Sixth	(1981-85)	19,666	14,226	5,440	27.7%
Seventh	(1986-90)	22,245	11,344*	—	—

Source: *Power Scenario,* AIEI.

*First three years' figures.

TABLE 2
Percentage of electricity utilization*

Year	Domestic	Commercial	Industrial	Agricultural	Other
1970-71	8.8%	5.9%	67.6%	10.2%	7.5%
1975-76	9.7%	5.8%	62.4%	14.5%	7.6%
1980-81	11.2%	5.7%	58.4%	17.6%	7.1%
1985-86	14.0%	5.9%	54.5%	19.1%	6.5%
1986-87	14.2%	5.9%	52.5%	20.7%	6.7%

Source: *Economic Survey, 1988-89,* Government of India.

*Utilities only.

TABLE 3
Distribution of installed capacity* (in megawatts)

Region	Total capacity as of March 31, 1980	Total capacity as of March 31, 1985
Northern	8,248	11,838
Western	7,834	12,937
Southern	7,207	10,358
Eastern	4,866	6,567
Northeastern	334	791

Source: Planning Commission, Government of India.

*Utilities only

policy has been adopted which keeps this sector perpetually on the edge of disaster. To this vast multitude, power cuts mean nothing.

High cost of no power

In the 1950s, Dr. Homi Bhabha observed, in response to critics of the government's large investments in nuclear technology, that "no power is more costly than no power." Unfortunately the message was subsequently lost on the planners, whose policy failure, excused under the all-engulfing blanket of "financial constraints," has created a highly vulnerable economic situation. India has come to depend on the monsoon not only for the success of farmland productivity, but also for its industrial sector. It is not that India depends solely, or even heavily on hydropower for electricity (see **Table 4**). In fact, 73% of installed power generation capacity (including non-utilities) is non-hydroelectric. But in a state of perpetual shortage, that 26% of hydropower is a critical margin. Any additional shortfalls in electric power because of a reduction in hydropower generation causes a great deal of instability.

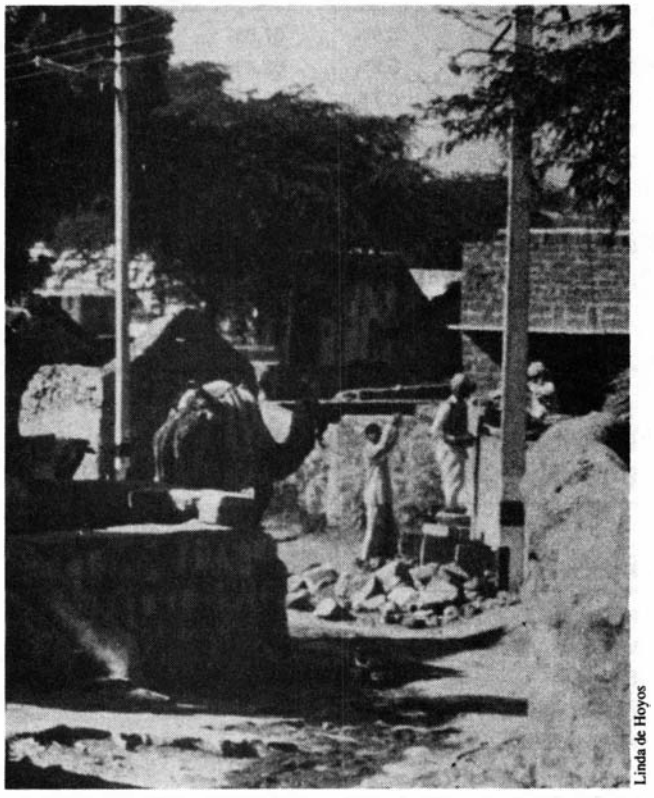
Recent reports indicate that power cuts have been in full fury in the southern states. The chairmen of the State Electricity Boards of the southern region met in April and expressed their grave concern over the power shortage. Besides the fall in reservoir storage levels in the south, the current shortfall is attributed to the inadequate coal supply to the Ramagundam Thermal Power Station in Andhra Pradesh due

TABLE 4
Installed energy-generating capacity mix*

Plan	Hydro	Thermal	Nuclear
End of First Plan	35%	65%	—
End of Second Plan	41%	59%	—
End of Third Plan	46%	54%	—
End of 3 Annual Plans	46%	54%	—
End of Fourth Plan	42%	54%	4%
End of Fifth Plan	41%	57%	2%
End of Annual Plan	40%	58%	2%
End of Sixth Plan	34%	63%	3%
End of three years of the Seventh Plan	32.2%	65.	2.5%

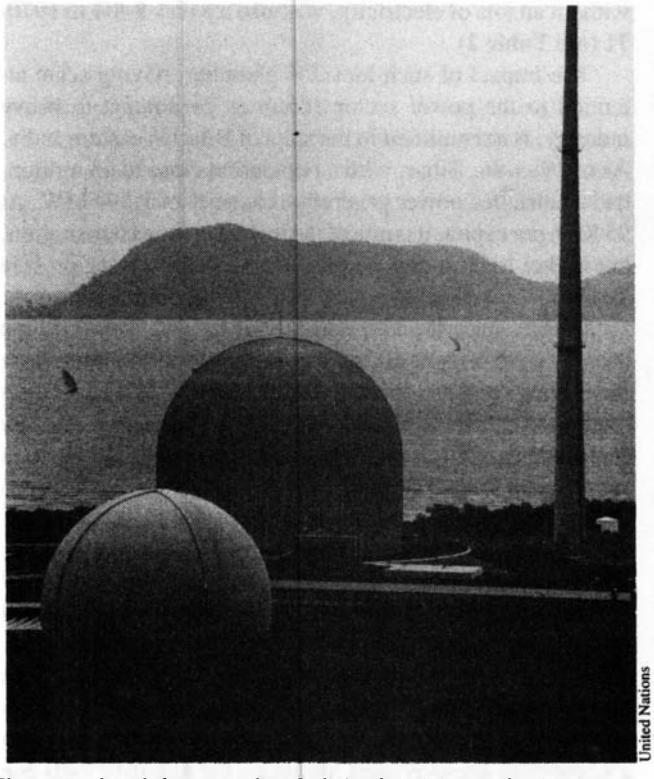
Source: Department of Power, Ministry of Irrigation and Power, Government of India.

*Utilities only



Linda de Hoyos

The vast majority of India's rural population does not use any electricity at all. The government's Eighth Five Year Plan, now on the drawing boards, is an ambitious effort to tackle the problem.



United Nations

The optimal path for expanding India's electricity production is nuclear energy, but the current program is putting too much emphasis on non-nuclear plants. Shown here is the Bhabha Atomic Research Center in Trombay, India.

TABLE 5

Plant load factor of thermal plants for three eastern region states

State	1980-81	1984-85
Bihar	31.4%	30.5%
Orissa	34.0%	32.2%
West Bengal	42.1%	36.5%
All India (avg)	44.6%	50.1%

Source: *Economic Survey*, Government of India.

to a work strike in the coal mines, and the continued shutdown of the two-unit (230 MW each) nuclear power station at Kalpakkam. All four states in the southern region—Andhra Pradesh, Karnataka, Kerala, and Tamil Nadu—will have to undergo severe power cuts in the coming months, officials have announced.

It is difficult to estimate the financial losses that industry and agriculture have had to bear in any given year due to power cuts. No study exists which rigorously calculates the work-time lost due to power shutdowns nationwide. Many industrialists, on the recommendation of the powers-that-be, install captive power plants to keep production going. In Tamil Nadu, for example, the textile industry, consisting of 237 mills employing 131,000 workers directly and another 3.5 million indirectly, has opted to depend heavily on captive power. According to one report, 55% of Tamil Nadu's textile industry's power consumption now comes from captive power. This has been done to protect the large workforce who, if laid off, have to be paid a large sum as retrenchment compensation.

Small diesel generator sets of 2 MW capacity or less have proliferated in recent years, adding to capital costs and idle capacity of industries. According to one estimate, about 5,000 MW of power is generated through these diesel generators today.

Serious constraints

Now there is hope that all this may change. But the fact remains that even attaining the 177,000 MW goal for the year 2000 will not solve the problem by itself. In the first place, installed capacity—i.e., the boiler plate number—means very little if the plants are not kept in good working condition, or are not provided with adequate feedstock every day of their working life, or if the plant workers fail to realize that adequate wages are directly tied to attaining the desired productivity. The performance of India's power plants, at least most of them, leaves a lot to be desired in all these areas.

This is particularly significant because many of these plants are already old, and a number of them will be very old by the time the 21st century comes along. The plant load factor, which provides a rough estimate of a plant's functioning, of power plants varies widely from one part of the country to another. In Bihar, for example, power plants on average work with a plant load factor of 31%, as opposed to the national average of 52% (see **Table 5**).

Second, the distribution of installed power capacity at present is wildly uneven from one state to another. While a resident of Delhi consumes about 550 kwh of power—a large part of it borrowed from neighboring states—residents of some states in northeastern India make do with less than 30 kwh on average. This huge difference indicates that unless future power generation, distribution, and consumption are made more or less equal throughout India, power shortages will continue to haunt parts of the country. It is a predicament that is aggravated by the fact that there is no central transmission grid, and thus no scope for shifting power from one end of the country to another as needed. Under such conditions, relatively power-short areas of the country will remain less attractive to investors generally, reinforcing the backwardness in those areas with all the broader repercussions (see **Table 6**).

Third, the Indian program is putting too much emphasis on non-nuclear thermal power plants. Out of the 38,000 MW envisaged for the Eighth Plan, 9,000 MW will come from hydro, 28,000 MW thermal (including 4,600 MW from natural gas), and 750 MW from nuclear fission. By the year 2000, power generating capacity using nuclear fission is estimated to be 10,000 MW—less than 6% of total capacity. Nuclear power has much to recommend it, especially since

TABLE 6

Per capita electricity consumption: some sample states (in kilowatt-hours)

State	1970-71	1980-81	1985-86
Haryana	98.2	212.9	247
Punjab	158.6	314.9	423
Rajasthan	49.8	98.9	140
Uttar Pradesh	60.2	87.4	118
Maharashtra	158.4	272.3	313
Bihar	65.1	76.1	95
Orissa	95.1	116.0	130
Kerala	75.6	101.2	140
Tamil Nadu	129.5	190.5	213
Assam	21.6	34.2	53
Manipur	5.1	5.9	32
Meghalaya	NA	30.8	76

Source: *Highlights of Power Supply Industry in India*, Central Electricity Authority of India, 1987.

*Utilities and non-utilities

India is one of the few developing countries to have fully mastered the technology indigenously. But perhaps the most compelling reason for pushing nuclear much harder is the cost of such heavy dependence on coal as is presently envisioned.

Coal versus nuclear

India's coal supply has an inordinately high ash content, making it a relatively inefficient energy source from the beginning—quite apart from the highly polluting quality of coal burning, made worse by its low quality. Moreover, the coal supply is concentrated in the eastern part of the country. Coal for power requires bulk mining, washing, and transportation, as far as 600-700 miles from the pithead in certain cases. It also requires highly efficient upstream capabilities of infrastructure and disciplined manpower. It will also require "dedicated" railroads to transport coal from the pithead to the power plant.

In reality, neither India's coal mining operations nor the railroads are efficient enough to handle such bulk material on a daily basis. Over the years, India's railroads have deteriorated, and very few new lines have been installed since 1970 (less than 3% of existing capacity, in fact). India's passenger traffic on the major routes is too heavy, as the network has not been extended enough to serve as more than a main artery.

Unless the railroad network is extended and the quality of wagon movement upgraded significantly, the massive movement of coal to service the power program will simply jam up the entire rail system. Under present circumstances, for instance, long stretches of railroad remain submerged and unusable for weeks when flood-waters from the tributaries of the Ganges, Brahmaputra, and some other rivers overflow following heavy monsoon rains. This particular situation is deteriorating every year, as very little attention has been paid to the rivers and mountains of the country.

To reduce dependence on coal-fired power plants, with the enormous costs indicated above, India would do better to put a greater emphasis on building nuclear power plants. Nuclear plants can be installed where extensive rail networks cannot be established because of difficult terrain—for instance, in northeastern India. Even with the present difficulties and cost of installing nuclear plants, they have proven completely cost competitive with coal-fired plants that are not located at or very near the pithead.

A 1979 *EIR* study of India's economy found that the optimal energy development path would have to make nuclear power the priority for rapid expansion over the medium term, even while doubling thermal power capacity in the relative short term. The *EIR* study, a 20-year economic perspective, set a 230,000 MW target for generating capacity in the year 2000, 80% of it nuclear. That target represents the electrical power capacity that would be required to provide a standard of living for the entire population equivalent to present-day industrial economies.

Du Pont, ICI behind the 'ozone' scare?

by William Engdahl

Significant evidence points to the fact that the recent campaign to ban CFC compounds (chlorofluorocarbons) for allegedly being "ozone killers" is a carefully orchestrated and well-financed hoax designed to allow a tiny handful of chemical multinationals to cartelize and extend their control over the world chemicals trade into the next century. At stake is control over a market for CFCs and related products which could easily total $120 billion per year in the next decade.

On May 2, representatives of some 80 nations meeting in Helsinki, Finland under auspices of the United Nations Environment Program, solemnly endorsed a call for a complete ban on CFCs by the year 2000, less than 11 years from now. While some member states of the U.N. group called for establishing a global fund to be administered by the U.N. ostensibly to "help Third World nations develop the technology necessary to produce alternatives to CFCs," Britain's "practical" Environment Minister Nicholas Ridley bluntly attacked the idea, saying he preferred "bilateral" aid instead.

What he did not say was that Imperial Chemical Industries (ICI) is advising the Thatcher government on its "anti-ozone" strategy.

The chemical 'cartel'

Today, 13 companies worldwide produce the bulk of an annual 1.14 million tons of CFCs, most for refrigeration, air conditioning, and use as solvents in sensitive electronics manufacture. Du Pont, which patents its CFC under the trademark Freon, is the world leader, making 25% of the total, U.S. Allied Chemical is number two, with Britain's ICI tied to a French maker, Atochem (Elf Aquitaine), with 10% each. These four companies control about 60% of world supply. Significantly, these same four leading producers are now spearheading the campaign to ban CFC use!

Is this an expression of genuine concern for the welfare of the environment, or for the imaginary threat from the naturally ocurring hole in the polar ozone cover? A spokesman for ICI admitted in a recent discussion that ICI is almost finished with a big new plant in Runcorn, Great Britain, which will produce ICI's "ozone friendly" HFC-134a alternative, beginning in 1991. A second plant to make the new chemical is under construction in the United States. ICI's Denys Henderson says the company has already spent hundreds of millions on the development of the "ozone friendly" chemical. "We are absolutely confident this is 'ozone