

KARNATAKA'S POWER SECTOR: FROM REVELATIONS TO RECOMMENDATIONS¹

COMMON BELIEFS

There are many common beliefs regarding Karnataka's power sector. Irrigation Pump Set (IPS) consumption is excessive (about one third to one half the total). The Transmission and Distribution (T & D) losses are relatively smaller (about one-fifth). There are major power and energy shortages. The mega-projects of the Independent Power Producers (IPPs) will solve all problems. Subsidies are the main cause of KEB's financial problems. KEB's employees are inefficient. The generation performance of KPC has deteriorated. The problems of generation and distribution cannot be solved through the public sector. Against this background, the International Energy Initiative (IEI) carried out a study that resulted in a number of revelations, that is, findings most of which were surprising.

REVELATIONS

Over half KEB's consumption is unmetered. KEB exaggerates IPS consumption and under-reports T & D losses. Theft (so-called commercial T & D loss) is substantial.

In 1994-95, the demand (in MW) was less than the firm capacity, and the energy requirement was less than the availability. Also, the hydro stations were idled for over 6% of the time, and the peak demand approached the firm capacity for less than 1% of the time. Thus, there was no energy or power crisis in that year. Whether this conclusion is valid for more recent years must be decided on the basis of similar analysis.

The total capacity of captive generation sets installed by industry as stand-by sources was more than 1,000 MW in 1994-95, that is, about one-third of centralized installed capacity. However, these sets were used for only 27% of the time. If they are connected to the grid or to selected loads, then a large fraction of their capacity can become available to the state. Thus, a major generation resource has not been integrated into state-level planning.

The decline (since the 1980s) of the electricity generated per unit of installed capacity (million units (MUs) per MW) and of the plant load factor (the number of hours used per year) is commonly attributed to the inefficiency of the generating stations. In fact, this decline is due to the supply (generation) being decreased to match demand. Hence, plant performance is better judged by the availability of stations.

Karnataka Power Sector has no strategy for dispatching present source mix (hydro, thermal and diesel and imports).

The differential pricing (different consumer categories having different tariffs) is such that the HT, LT and AEH categories cross-subsidize IPS (and trivially BJ and non-AEH). Further, the total

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cross-subsidy is greater than the subsidy to IPS that unfortunately is not being reimbursed fully by the government. Thus, subsidies are not the root cause of KEB's financial problems. Unfortunately, the net surplus revenue (cross-subsidy minus subsidy to IPS) is less than the T & D Losses. Hence, it is T & D losses (which are not explicit in KEB balance sheets) that are responsible for KEB's financial problems. Huge savings are possible on commercial T & D losses. By avoiding them, KEB's net revenue can become positive and financially viable. Of course, increasing the revenue from IPS will greatly improve viability.

KEB's costs are 50% on account of power purchase (and have jumped with every new source) and 20% due to salaries. KEB's salaries have risen faster than the WPI after about 1983-84 (before which they rose in step). However, it is important to note that the productivity of KEB's employees has risen over a twenty-year period (from 1972-73 to 1993-94).

SHAPE OF THINGS TO COME

Scenario I: To honour PPAs, cheap hydro and/or thermal plants will have to be backed down/ idled, but even that may not be enough. Scenario II: Industry will de-link from KEB when tariffs exceed costs of captive generation, and KEB will be left with no- or low-tariff customers.

WINNERS AND LOSERS

The winners are the farmers owning IPS and the politicians and parties championing these farmers. Some individuals in KEB make IPS connections a lucrative proposition. Manufacturers and suppliers of equipment to overcome defective supply benefit from the situation. KEB can blame IPS for its technical & commercial shortcomings. Finally, "shortages" facilitate malpractices and encourage decision-makers to justify their power-expansion policies (based on foreign private power, trips abroad, etc.).

The main losers are the HT, LT and Commercial consumers -- they provide cross-subsidy and suffer power cuts, load-shedding and/or defective supply. The poor non-AEH households get hardly any subsidy. And the unelectrified households do not get the benefit of electricity.

THE WAY FORWARD

If a crisis is defined as a "no-solution situation" in which (a) no immediate measures will remedy the situation and (b) no long-term projects will have any immediate impact, there is no crisis in Karnataka's power sector.

The way forward is through a package of realistic and small measures: 11 institutional plus 5 demand side (DSM) or conservation and 8 supply side (SSM) or capacity expansion. The institutional Measures will rescue KEB and KPC. The package of DSM and SSM can provide about 1,600 MW.

INSTITUTIONAL MEASURES

First, there are measures to reduce KEB's outflows -- by reducing IPS subsidies, KEB's debts, commercial T & D losses (theft), and arrears. Secondly, there are institutional measures to increase inflows to KEB through (a) grants from government to reimburse IPS subsidies, (b) an increase of wheeling revenues and (c) season-of-year pricing so that the electricity price is higher in high-demand pre-monsoon months and lower in the post-monsoon months. Third, there are measures to improve the database for decision-making. These would involve the census of IPS in open wells, borewells and canal beds, the annual consumption of IPS in open wells, borewells and canal beds by metering transformers serving IPS clusters and/or IPS, the technical component of T & D losses and the annual auditing of electricity consumption by major consumers. Fourth, there are institutional measures -- involving the development of a load management methodology. In particular, what is lacking, and is essential, is a transparent calculation for load shedding and a strategy for load dispatch from a generation mix consisting of hydroelectric-thermal-diesel-independent power (with power purchase agreements) and imports.

DEMAND-SIDE AND SUPPLY-SIDE MEASURES

The conservation measures include (1) peak shaving, (2) efficient lighting, (3) solar water heaters, (4) efficient IPS and (5) efficient motors. The capacity expansion measures include (1) environmentally sound hydroelectric projects, (2) reducing t & d technical losses, (3) captive generation, (4) sugar cogeneration, (5) cogeneration in other industries, (6) biomass-based rural energy & water supply utilities (REWSUs), and where appropriate (7) small hydel, (8) wind and (9) photovoltaics.

TOWARDS THE GOAL OF SUSTAINABLE ENERGY

In addition to these realistic and small measures -- institutional, demand-side and supply-side measures -- the real long-term solution is to shift to a New Energy Paradigm (Mind-set/Approach) with Integrated Resource Planning (IRP) with an emphasis on energy services (rather than energy consumption).

RECOMMENDATIONS

Demand: Quantification of consumption of all KEB consumer categories (particularly IPS consumption, T & D losses & Theft).

Supply: Development of strategy (preferably computerized) for dispatching different sources of supply (hydro, thermal and diesel and imports).

Supply-Demand Matching: Publication of hourly demand values on an annual basis to determine relationship between demand and firm capacity and between energy requirement and availability. Publication of disaggregated data on operational hours of power plants (planned and forced outages and idle hours). Avoidance of PPAs that force cheap hydro and/or thermal plants to be backed down or idled.

Tariffs: Ensure that tariffs do not exceed costs of captive generation to prevent industry from de-linking from KEB and KEB being left with no- or low-tariff customers. Revise tariffs so that net revenues are positive. Since KEB's power purchase costs (over 50% of KEB's expenditures) have jumped with every new source, estimate impact of new projects on power purchase costs. Ensure that T & D losses are monetized and appear in balance-sheets.

Restructuring: The following restructuring is essential: corporatization to make KEB run on commercial lines (and not as a "department" of government); independent autonomous regulation; scope for independent private power generation; transparent democratic functioning. But, the total restructuring package of the World Bank does not appear to be essential for electricity board revival. In particular, the situation does not appear to require (1) removal of subsidies to all users; (2) privatization of all generation; (3) privatization of T & D; and (4) leaving utilities to the market without imposing on them obligation to serve the community.

Integrated Resource Planning (IRP): It is as suicidal to have gross excess capacity as to have major shortages. With an emphasis on energy services (rather than energy consumption), it is necessary to evolve a least-cost mix (package) of centralized and decentralized generation and efficiency improvements (which are equivalent to supply expansion). Thus, Integrated Resource Planning is essential.

TRANSPARENT & DEMOCRATIC FUNCTIONING

Electricity is crucial as a provider of services, an input to industrialization and agricultural development and a way of improving the quality of life. This means that the power sector is too important to be left to electrical engineers and electricity organizations (KEB, KPC, the Energy Ministry, etc.). Legislators, user groups from industry, commerce, etc., public interest groups, NGOs, village-level institutions, media, education, science and technology institutions, must be also be involved.

KEB'S 1994-95 METERED AND NON-METERED CONSUMPTION

Only 42% of the generation (that of the High Tension, Low Tension, Commercial, All-Electric Homes and domestic lights and fans) was metered. The total non-metered consumption, which was as much as 58% of the generation, is obtained as a residue (the availability minus the total metered consumption). Since the IPS consumption and the T & D losses are not metered, only the sum of their consumption values is known; the individual components of the sum must be guessed or allocated. This fact is the origin of a number of problems.

IPS CONSUMPTION

The consumption by IPS is equal to the number of IPS times the consumption per IPS per year. Whereas both KEB and IEI take the number of IPS in the year 1994-95 as 960,165 IPS, there is a difference in the number used for the annual consumption per IPS. IEI has taken the total IPS in the state to consist of 64% open wells, 31% borewells and 5% canal bed. The annual consumption in these three categories is different because of the depth from which the water has to be lifted. The consumption norms have been taken to be 2,000 kWh/IPS/year from open wells, 5,000 kWh/IPS/year from canal beds and -- 12,000 kWh/IPS/year from borewells. This approach results in a weighted average of 5,250 kWh/IPS/year and an IPS consumption (as per IEI) of $960,165 \text{ IPS} \times 5,250 \text{ kWh/IPS/year} = 5,040 \text{ MUs}$ or 25.8% of availability. KEB has not published its methodology, but it appears to be based on 7,600 kWh/IPS/year leading to 7,297 MUs or 37.3% of availability.

T & D LOSSES

KEB's over-estimation of IPS consumption leads inevitably to an under-estimation of its T & D losses. It may also be noted that KEB's estimation of T & D losses between 1984 and 1994 is suspect because the T & D losses are decreasing even though the low-tension lines and loads are increasing. Whereas T & D losses according to KEB were only 3,635 MUs or 18.6% of availability in 1994-95, these losses were as much as 5,946 MUs or 30.4% of availability according to IEI. Further, the T & D losses consist of technical losses and commercial losses (the electricity board's euphemism for theft). The technical losses can be reduced, but not beyond a minimum. If this minimum is taken to be a conservative 20%, it means that the commercial losses (or theft) must have been about 10%.

DIFFERENTIAL PRICING OF ELECTRICITY

- MAXIMUM PRICE --> RS.5.09/KWH (TEMPORARY CONNECTIONS)
- MINIMUM PRICE --> RS.0.02/KWH (IPS)
- WEIGHTED AVERAGE PRICE --> RS.1.06/KWH
- FAR LOWER THAN THE COST OF GENERATION IN A NEW PLANT SUCH AS RAICHUR V AND VI

NET REVENUE FOR EACH USER CATEGORY

- NET REVENUE = REVENUE REALIZED - EXPENDITURE INCURRED
- HT, COMMERCIAL, LT & AEH --> PROVIDE CROSS-SUBSIDY
- RECEIVERS OF SUBSIDIES --> MAINLY IP SETS (RS.6,900/IPS)
- NON-AEH AND BJ --> TRIVIAL SUBSIDY
- RS.16/NON-AEH HH AND RS.234/BJ HH

- SUBSIDIES NOT RESPONSIBLE FOR KEB'S FINANCIAL PROBLEMS
- IPS LOSSES --> MORE THAN COMPENSATED BY SURPLUSES FROM HT, COMMERCIAL AND LT CONSUMERS
- CROSS-SUBSIDY FROM HT, COMMERCIAL, LT & AEH (RS.878.2 CRORES) > OUTFLOW OF SUBSIDY (RS.689.2 CRORES)
- IPS SUBSIDY --> RS.666.5 CRORES
- KEB SHOULD HAVE HAD AN EXCESS OF RS.196.4 CRORES.

ARREARS & REPAYMENTS

- ARREARS HAVE INCREASED BY RS.66.2 CRORES
- REPAYMENTS OF LOANS --> RS.415.2 CRORES = ABOUT 2.25 TIMES EARNINGS FROM BONDS, ETC. (RS.184.7 CRORES)
- KEB MUST NOT REDUCE ITS NET REPAYMENTS, OR DEBT TRAP

ENERGY "FUNDAMENTALISM"

- EXCLUSIVE FOCUS ON CONVENTIONAL/FUTURISTIC CENTRALIZED TECHNOLOGIES
- OR NON-CONVENTIONAL RENEWABLE/DECENTRALIZED TECHNOLOGIES
- OR ENERGY SAVING OPTIONS THROUGH EFFICIENCY IMPROVEMENTS
- ROLE OF DECENTRALIZED RENEWABLES & END-USE EFFICIENCY IMPROVEMENTS
- DECENTS & EUEIs, SINGLY OR TOGETHER, CANNOT MEET ENERGY REQUIREMENTS
- CENTRALIZED SOURCES ARE ESSENTIAL
- BUT INCORPORATION OF DECENTS & EUEIs IN SUPPLY MIX REDUCES MAGNITUDE OF CENTRALIZED SOURCES REQUIRED