KARNATAKA'S POWER SECTOR: SOME REVELATIONS

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COMMON BELIEFS RE: KARNATAKA'S POWER SECTOR

• IPS consumption excessive -- 1/3 to 1/2 of total
• T & D losses are relatively smaller -- about 1/5
• Major power and energy shortages
• IPP’s mega-projects will solve problems
COMMON BELIEFS RE: KARNATAKA'S POWER SECTOR (CONTINUED)

• Subsidies are cause of KEB’s financial problems
• No solution of generation and distribution possible through public sector
• KEB’s employees are inefficient
• Generation performance has deteriorated

KEB’S 1994-95 METERED CONSUMPTION

• ONLY 42% OF THE GENERATION IS METERED
• ONLY HT, LT, COMMERCIAL, AEH AND DOMESTIC LIGHTS AND FANS ARE METERED
KEB’S 1994-95 NON-METERED CONSUMPTION

- TOTAL NON-METERED CONSUMPTION = AVAILABILITY - TOTAL METERED CONSUMPTION
- AS MUCH 58% OF THE GENERATION IS NOT METERED
- IPS, BHAGYA JYOTI (BJ), PUBLIC LIGHTING (PL) AND MUSS ARE NOT METERED

KEB’S 1994-95 NON-METERED CONSUMPTION

- ONLY SUM OF CONSUMPTION BY IPS, T & D, BHAGYA JYOTI (BJ), PUBLIC LIGHTING (PL) AND MUSS IS KNOWN
- INDIVIDUAL COMPONENTS OF SUM MUST BE GUESSED OR ALLOCATED
- IN PARTICULAR, IPS AND T & D MUST BE GUESSED
IPS CONSUMPTION (1994-95)

- IPS CONSUMPTION = NUMBER OF IPS X CONSUMPTION/IPS/YEAR
- IPS CONSUMPTION (KEB) = 960,165 IPS X 7,600 KWH/IPS/YEAR = 7,297 MUS = 37.3% OF AVAILABILITY
- IPS CONSUMPTION (IEI) = 960,165 IPS X 5,250 KWH/IPS/YEAR = 5,040 MUS = 25.8% OF AVAILABILITY

IPS CONSUMPTION AS PER IEI

- BOREWELLS -- 12,000 KWH/IPS/YEAR
- OPEN WELLS -- 2,000 KWH/IPS/YEAR
- CANAL BEDS -- 5,000 KWH/IPS/YEAR
- IN 1994-95, 64% OPEN WELLS + 31% BOREWELLS + 5% CANAL BED IPS
- WEIGHTED AVERAGE = 5,250 KWH/IPS/YEAR
IPS CONSUMPTION AS PER KEB (IEI’S GUESS)

- BOREWELLS -- 10,400 KWH/IPS/YEAR
- OPEN WELLS -- 2,000 KWH/IPS/YEAR
- BETWEEN 1991-96, 33% OPEN WELLS + 67% BOREWELLS
- WEIGHTED AVERAGE = 7,610 KWH/IPS/YEAR

T & D LOSSES

- KEB’S OVER-ESTIMATION OF IPS CONSUMPTION --> KEB’S UNDER-ESTIMATION OF ITS T & D LOSSES
- KEB’S ESTIMATION OF 1984-94 T & D LOSSES --> SUSPECT BECAUSE T & D LOSSES DECREASING WITH LT LOADS INCREASING
T & D LOSSES (CONTINUED)

- T & D LOSSES (KEB) = 3,635 MUS = 18.6% OF AVAILABILITY
- T & D LOSSES (IEI) = 5,946 MUS = 30.4% OF AVAILABILITY

T & D LOSSES (CONTINUED)

- T & D LOSSES = TECHNICAL LOSSES + COMMERCIAL LOSSES (= THEFT)
- IF TECHNICAL LOSSES = 20% THEN COMMERCIAL LOSSES (= THEFT) = 10%
DEMAND

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

DAILY LOAD CURVE

• DAILY LOAD CURVE --> MORNING PEAK (MP) + EVENING PEAK (EP) WITH MP < EP
• IF EP IS MET, THERE SHOULD BE NO TROUBLE WITH MP
• THEN, WHY SOMETIMES KEB LOAD SHEDDING IN MORNING BUT NOT IN EVENING
DAILY LOAD CURVE

• KEB DOES NOT KNOW WHAT MAKES UP ITS DEMAND AT ANY TIME OF DAY
• KEB DOES NOT KNOW HOW MUCH DEMAND DUE TO ELECTRICAL DEVICES (MOTORS, WATER HEATERS, LIGHTS, ETC.)

KARNATAKA'S AVAILABLE CAPACITY 1994-95

• INSTALLED CAPACITY = 3,485 MW
• LESS NON-FIRM CAPACITY (IRRIGATION REQUIREMENTS) OF 8.72% = 3,181 MW
• LESS UNFORESEEN OUTAGES (SPINNING RESERVE) OF 5.47% = 3,007 MW
• LESS MAINTENANCE PROTECTION OF 11.47% = 2,662 MW
KARNATAKA'S AVAILABLE CAPACITY 1994-95

- NON-AVAILABLE CAPACITY = 823 MW
- RESERVE MARGIN = 23.61%
- FIRM AVAILABLE CAPACITY = INSTALLED CAPACITY - NON-AVAILABLE CAPACITY = 3,485 MW - 823 MW = 2,662 MW

TOTAL AVAILABLE OR FIRM CAPACITY

- STATE’S AVAILABLE OR FIRM CAPACITY = 2,662 MW
- STATE'S SHARE OF CENTRAL CAPACITY = 510 MW
- TOTAL AVAILABLE OR FIRM CAPACITY = 3,172 MW
### 1994-95 Available Capacity vs Highest Peak Demand

- **Total Firm Capacity** = 3,172 MW
- **Highest Peak Demand** = 3,155 MW
- **But in 1994-95, no restriction on demand & no energy or power cuts**
- **Hence, no shortage of firm (and installed) capacity**

### 1994-95 Available Energy vs True Energy Requirement

- **Firm Net Energy Available** = 20,124 GWH
- **True Energy Requirement** = 19,740 GWH
- **But, in 1994-95 --> no suppression of demand**
- **Hence, no energy shortage**
ABSENCE OF POWER & ENERGY SHORTAGES IN 1994-95

- Operational hours of hydro stations showed:
  - Planned outages = 10.5%
  - Forced outages = 3.4%
  - Idle hours = 6.2%
  - SO, hydro stations idled when firm capacity > demand

ABSENCE OF POWER SHORTAGE IN 1994-95

- Peak demand came close to the firm capacity (> 2,850 MW) only for less than 31 hours (0.36%) in the year
- Very far cry from the constant claim of power crises
WAS THERE A SUPPLY-DEMAND "CRISIS" IN 1994-95?

- There was no energy or power crisis in 1994-95 because
  - Demand < Firm Capacity
  - Energy Requirement < Availability
  - Hydro Stations were idled for 6% of the time
  - Peak Demand approached Firm Capacity for less than 1% of the time

1994-95 CAPTIVE GENERATION SETS

- TOTAL CAPACITY OF CAPTIVE GENERATION SETS > 1,000 MW
  = ABOUT ONE-THIRD OF CENTRALIZED INSTALLED CAPACITY
  BUT, THEY REMAIN IDLE FOR AS MUCH AS 73% OF THE TIME
HARNESSING OF CAPTIVE GENERATION SETS

• 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 HARNESSSED

PERFORMANCE OF GENERATING STATIONS

• MU/MW WAS ABOUT 4.7 IN THE 1960s AND 1970s BUT DROPPED AFTER 1980 TO 3.9

• AND PLF WAS OVER 60% BEFORE THE 1980s BUT REDUCED TO 30-50% AFTER 1980
GENERATION PERFORMANCE DETERIORATION?

• DECLINE OF MU/MW & PLF OF HYDRO STATIONS NOT DUE TO THE INEFFICIENCY OF THE GENERATING STATIONS

• SUPPLY (GENERATION) HAS TO BE ADJUSTED TO DEMAND

• PLANT PERFORMANCE IS BETTER JUDGED BY THE AVAILABILITY OF STATIONS

SUPPLY

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

IPS SUBSIDY NOT BEING REIMBURSED TO KEB

• GOVERNMENT GAVE KEB ONLY RS.269.3 CRORES (40%) GRANTS, ETC. VS SUBSIDY OF RS.666.5 CRORES ON IPS
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

HUGE SAVINGS POSSIBLE ON COMMERCIAL T & D LOSSES

- ABOUT RS.190 CRORES SAVINGS ARE POSSIBLE ON COMMERCIAL T & D LOSSES
- THESE LOSSES MAKE KEB'S NET REVENUE NEGATIVE
- BY AVOIDING THEM, KEB CAN BECOME FINANCIALLY VIABLE
- INCREASING THE REVENUE FROM IPS WILL GREATLY IMPROVE VIABILITY.
T & D LOSSES HAVE MAJOR FINANCIAL IMPLICATIONS

- T & D LOSSES NOT EXPLICIT IN KEB BALANCE SHEETS
- MONETARY VALUE OF T & D LOSSES = (ELECTRICITY LOST BETWEEN AVAILABLE ENERGY AND ENERGY SUPPLIED) X (AVERAGE EXPENDITURE PER KWH OF AVAILABLE ENERGY)
- TECHNICAL T & D LOSSES CANNOT BE REDUCED BELOW AN UNAVOIDABLE MINIMUM (SAY 20%)

IS KEB EXTRAVAGANT?

- PURCHASE OF POWER --> 50% OF KEB’S COSTS
- COSTS OF PURCHASING POWER INCREASED AFTER 1990-91
- WILL INCREASE EVEN MORE AFTER NEW EXPENSIVE PLANTS COME ON STREAM
COSTS INCURRED BY KEB ON ITS EMPLOYEES

- SALARIES, ETC. --> ONLY ABOUT 20% OF THE TOTAL COSTS
- COST PER EMPLOYEE ROSE IN STEP WITH WPI UNTIL ABOUT 1983-84
- THEN ROSE MORE RAPIDLY THAN WPI PARTICULARLY AFTER 1988-89

PRODUCTIVITY OF KEB'S EMPLOYEES

- OUTPUT HAS INCREASED BETWEEN 1972-73 AND 1993-94
- CONNECTIONS/EMPLOYEE --> FROM 42 TO 128 (3.04 TIMES)
- CONNECTED LOAD/EMPLOYEE --> FROM 49 KW TO 179 KW (3.65 TIMES)
- ENERGY SUPPLIED/EMPLOYEE --> FROM 108,000 KWH TO 256,000 KWH (2.37 TIMES)
CAUSE(S) OF KEB'S FINANCIAL MESS

• Cross-subsidy > Subsidy to IPS -- subsidies not root cause of KEB's financial problems
• HT + LT + AEH categories cross-subsidize IPS (and trivially BJ and non-AEH)
• Net Surplus Revenue (Cross-subsidy - Subsidy to IPS) < T & D Losses; hence, T & D losses are responsible for KEB's financial problems

• KEB's costs are 50% power purchase and 20% salaries
• KEB's salaries have risen in step with WPI up to about 1983-84
• Productivity of KEB's employees has risen from 1972-73 to 1993-94
• KEB's power purchase costs have jumped with every new source
WHO ARE THE WINNERS?

- Farmers owning IPS
- Politicians/Parties championing these farmers
- Some individuals in KEB make IPS connections a lucrative proposition
- Manufacturers/suppliers of equipment to overcome defective supply

WHO ELSE ARE THE WINNERS?

- KEB blames IPS for its technical & commercial shortcomings
- “Shortages” facilitates malpractices
- Decision-makers use “shortages” to justify their power-expansion policies (foreign private power, trips, etc.)
WHO ARE THE LOSERS?

- HT, LT and Commercial consumers providing cross-subsidy and suffering cuts, load-shedding and/or defective supply
- Non-AEH households
- Unelectrified households

SHAPE OF THINGS TO COME

- **Worst Case 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
- **Worst Case Scenario II**: Industry will de-link from KEB when tariffs exceed costs of captive generation -- KEB will be left with no- or low-tariff customers
WHAT IS A CRISIS IN THE POWER SECTOR?

- A "NO-SOLUTION REGIME"
- A SITUATION IN WHICH
  -(a) NO IMMEDIATE MEASURES WILL REMEDY THE SITUATION
  AND

THE WAY FORWARD

- Package of Realistic & Small Measures: 11 Institutional + 5 DSM + 8 SSM
- Institutional Measures will rescue KEB and KPC
- DSM+SSM package will provide about 1,600 MW
INSTITUTIONAL MEASURES -- REDUCTION OF KEB OUTFLOWS

- reduction of IPS subsidies
- reduction of KEB's debts
- reduction of commercial T & D losses (theft)
- reduction of arrears

INSTITUTIONAL MEASURES -- INCREASE OF INFLOWS TO KEB

- grants from government to reimburse IPS subsidies,
- (b) an increase of wheeling revenues
- (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
INSTITUTIONAL MEASURES -- IMPROVEMENT OF THE DATABASE

• 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
• annual auditing of electricity consumption by major consumers

INSTITUTIONAL MEASURES -- LOAD MANAGEMENT METHODOLOGY

• the rationale for, and the extent of, load shedding and
• load dispatch from hydroelectric-thermal-diesel generation mix.
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
DEMAND-SIDE MEASURES

• (1) PEAK SHAVING
• (2) EFFICIENT LIGHTING
• (3) SOLAR WATER HEATERS
• (4) EFFICIENT IPS
• (5) EFFICIENT MOTORS

Solar Water Heaters

• 100 litres/day unit for 4-person family --> Rs 10,000 + average of Rs 1,500 for extra piping
• Replaces 2 kW electric geyser used for 2.2 hours/day
• 1,320 KWH/year (Rs. 1,980/year at Rs. 1.50/KWH) saving = 5.8 years payback
LAWS RE: SWHs IN ISRAEL

• “No new building in which there is a system or installations for supplying hot water shall be built unless the system is a solar installation”

LAWS RE: SWHs IN JERUSALEM

• “If the roof is large enough for a number of solar boilers equal to the number of apartments in the building, an apartment owner may, without the consent of the other apartment owners, install in a reasonable place on the roof of the cooperative house which is common property, a boiler for the solar heating of water, and to install in a reasonable manner the installations relating thereto and the pipes for transporting the water to his/her apartment (provided certain provisions are fulfilled).
DEMAND SIDE MEASURES

<table>
<thead>
<tr>
<th>DEMAND SIDE MEASURE</th>
<th>SAVING OF ENERGY (GWH)</th>
<th>SAVING OF POWER (MW)</th>
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<tbody>
<tr>
<td>CFLs - DOMESTIC</td>
<td>210</td>
<td>130</td>
</tr>
<tr>
<td>CFLs - COMMERCIAL</td>
<td>50</td>
<td>10</td>
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<tr>
<td>SOLAR WATER HEATERS</td>
<td>250</td>
<td>270</td>
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<tr>
<td>IMPROVED IPS</td>
<td>780</td>
<td>320</td>
</tr>
<tr>
<td>IMPROVED MOTORS</td>
<td>410</td>
<td>110</td>
</tr>
<tr>
<td>TOTAL SAVING</td>
<td>1700</td>
<td>840</td>
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SUPPLY-SIDE MEASURES

- (1) ENVIRONMENTALLY SOUND HYDROELECTRIC PROJECTS
- (2) REDUCING T & D TECHNICAL LOSSES
- (3) CAPTIVE GENERATION
- (4) SUGAR COGENERATION
- (5) COGENERATION IN OTHER INDUSTRIES
SUPPLY-SIDE MEASURES

- (6) BIOMASS-BASED RURAL ENERGY & WATER SUPPLY UTILITIES (REWSUS)
- (7) SMALL HYDEL
- (8) WIND
- (9) PHOTOVOLTAICS

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<tr>
<th>SOURCE</th>
<th>GENERATION ENERGY (GWH)</th>
<th>GENERATION POWER (MW)</th>
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<tbody>
<tr>
<td>SMALL HYDEL</td>
<td>460</td>
<td>200</td>
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<tr>
<td>SUGAR COGEN</td>
<td>900</td>
<td>200</td>
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<tr>
<td>WIND</td>
<td>100</td>
<td>50</td>
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<tr>
<td>CAPTIVE GENSETS</td>
<td>1200</td>
<td>270</td>
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<tr>
<td>TOTAL</td>
<td>2660</td>
<td>720</td>
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ALTERNATIVE OPTIONS: DSM & SSM

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<tr>
<th>OPTION</th>
<th>ENERGY (MU)</th>
<th>POWER (MW)</th>
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<tbody>
<tr>
<td>DSM</td>
<td>1,700</td>
<td>840</td>
</tr>
<tr>
<td>NES</td>
<td>2,660</td>
<td>720</td>
</tr>
<tr>
<td>TOTAL</td>
<td>4,360</td>
<td>1,560</td>
</tr>
</tbody>
</table>

REAL LONG-TERM SOLUTION

- shifting to the New Energy Paradigm (NEP)
  - emphasis on energy services (rather than energy consumption)
GOAL --> SUSTAINABLE ENERGY

Realistic and Small Measures

PLUS

New Energy Paradigm
(Mind-set/Approach)

KARNATAKA'S POWER SECTOR:
SUMMARY OF RECOMMENDATIONS

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DEMAND

• Quantify consumption of all KEB consumer categories (particularly IPS consumption, Technical and Commercial T & D losses & Theft)
• Energy Audit of HT & LT

SUPPLY

• Ensure that investments on supply expansion are backed by appropriate investments on T & D
• Ensure adequate funds for system improvement to reduce T & D losses
SUPPLY

• Develop **annual** strategy (preferably computerized) for dispatching different sources of supply (hydro, thermal and diesel and imports)

SUPPLY-DEMAND MATCHING

• Publish hourly demand values on an annual basis to determine relationship between demand and firm capacity and between energy requirement and availability
SUPPLY-DEMAND MATCHING

• Publish information on Captive Generation Sets (installed capacity and utilization)

• Incorporate Captive Generation Sets in supply mix

SUPPLY-DEMAND MATCHING

• Obtain disaggregated data on operational hours of power plants (planned and forced outages and idle hours)

• Avoid PPAs that force cheap hydro and/or thermal plants to be backed down/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

TARIFFS

• Give IPS choice between cheap unreliable power and priced reliable power
• Implement tariff increases with improvements of efficiency because consumers are concerned with expenditures rather than with tariffs
TARIFFS

• 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

ESSENTIAL RESTRUCTURING TO RESCUE KEB

• Independent autonomous regulation
• If government obliges power sector to serve social goals (of access, affordability, etc.), it must compensate for any resulting losses
ESSENTIAL RESTRUCTURING TO RESCUE KEB

• Corporatization to liberate KEB from government and make KEB run on commercial lines
• Independent private power generation
• Transparent democratic functioning

DECISION-MAKING RE: LOAD SHEDDING

• July 1 = Next monsoon (June 15) + a safety margin of 15 days
• Generation that can be expected up to July 1 from each station (hydro, thermal, etc.) in the state + Estimates of imports from other states and Central stations = Grand Total
• Average daily availability (MU/day) = Grand total / Number of days left to the next July 1
DECISION-MAKING RE: LOAD SHEDDING (CONTD.)

- Expected daily requirement (MU/day) = Previous year's average daily consumption + a 10% annual escalation

DECISION-MAKING RE: LOAD SHEDDING (CONTD.)

- If the expected daily requirement > the daily availability, then Load Shedding
- If the expected daily requirement < the daily availability, then no Load Shedding
FOLLOWING RESTRUCTURING COMPONENTS ARE NOT ESSENTIAL

• Removal of **all** subsidies
• Privatization of (i.e., divesting) generation facilities
• Privatization of Transmission
• Privatizing (i.e., handing over) distribution to private sector

INSTITUTIONAL MEASURES TO RESCUE KEB

• INCLUDE FOLLOWING ELEMENTS BEING URGED BY THE WORLD BANK
• (1) AN INDEPENDENT AUTONOMOUS REGULATORY AGENCY
• (2) TARIFF REVISION SO THAT THE NET REVENUES ARE POSITIVE
• (3) CORPORATIZATION SO THAT KEB RUNS ON COMMERCIAL LINES
• (4) INVOLVEMENT OF INDEPENDENT PRIVATE POWER GENERATORS
IS TOTAL RESTRUCTURING PACKAGE OF WB ESSENTIAL FOR SEB REVIVAL?

• NO! REVIVAL DOES NOT APPEAR TO REQUIRE
• (1) REMOVAL OF ALL SUBSIDIES TO USERS
• (2) PRIVATIZATION OF ALL GENERATION
• (3) PRIVATIZATION OF T & D
• (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
• Emphasize energy services (rather than energy consumption)
INTEGRATED RESOURCE PLANNING (IRP)

- Evolve a Least-Cost Mix (Package) of Centralized and Decentralized Generation and Efficiency Improvements (equivalent to Supply Expansion)
- Integrated Resource Planning is essential

ELECTRICITY IS CRUCIAL

- (1) A WAY OF IMPROVING THE QUALITY OF LIFE
- (2) AN INPUT TO INDUSTRIALIZATION AND AGRICULTURAL DEVELOPMENT
- (3) A PROVIDER OF SERVICES
THE POWER SECTOR IS TOO IMPORTANT

• TO BE LEFT TO ELECTRICAL ENGINEERS AND ELECTRICITY ORGANIZATIONS (KEB, KPC, ENERGY MINISTRY, ETC.)

• EDUCATION, SCIENCE AND TECHNOLOGY INSTITUTIONS, LEGISLATORS, MEDIA, PUBLIC INTEREST GROUPS, NGOS, USER GROUPS FROM INDUSTRY, COMMERCE, ETC., VILLAGE-LEVEL INSTITUTIONS MUST BE ALSO BE INVOLVED