Challenges of Electricity Sector in a Developing Economy

Maharashtra Case Study

23rd April 2009
Discussion Points

- Indian Power Scenario
- MSEDCL profile
- Challenges faced
- Steps taken
- Financial Performance
- Way Ahead
Indian Power Sector

- Installed Generation Capacity ~140 GW
- After United States, China, Japan, Russia, and Canada, India ranks Sixth in terms of Electricity Generation.
- Electricity Generation – 0.7 Trillion Kwh (2006-07)
- Per Capita Consumption – 665 Kwh/Yr (2006-07) (China – 2,444 Kwh, USA – 13,000Kwh)
- Shortages (Energy ~ 8.5%, Peak ~ 15%)
- Rapidly Expanding – GDP growing by around 7 – 8%. Per Capita consumption expected to quadruple by 2020.
**Maharashtra**

- Maharashtra – 2\textsuperscript{nd} largest state in India in terms of area as well as population

- Maharashtra consumes 12,500 MW electricity against India’s total of around 100,000 MW. Per capita consumption of 1000 Kwh against India’s average of 665 kwh

- **Electricity Distribution utilities in Maharashtra**
  - BEST (1500 MW)
  - Reliance Energy (1000MW)
  - Maharashtra State Electricity Distribution Company (10,000MW)
MSEDCL’s Profile

- Largest Electricity Distribution Utility in India. Supplies 10,000 MW, which is approximately 10% of India’s Electricity
- Area: 308,000 Sq. Km / 40615 Villages / 457 Towns.
- 15.6 million Live Consumers.
- Annual revenue US $ 4.5 Billions
- No of 33/11kV and 22/11 kV Substations = 1843 Nos.
- High Tension / Low tension Lines = 720,000 Km.
- Distribution transformers = 283,000 Nos.
- Administrative Structure: 11 Zones / 40 Circles / 586 Sub Divisions, 70,000(+) Employees/20,000 engineers
Power Sector Reforms in Maharashtra

- No license for Generation
- Entry of private sectors in generation, transmission, and distribution
- Long term power purchase only through competitive bidding and with the approval of regulator
- Mandatory Open Access for consumers and generators
- Trading in electricity
- Tariff determination by regulators – max 16 % return on equity allowed
- Gradual elimination of cross subsidy
- Strict Anti-theft provisions
Erstwhile Maharashtra State Electricity Board (MSEB) unbundled into 4 companies on June 6, 2005.
Problems Inherited

- Shortage of power more than 3700 MW
- **Peak shortage 23.1% . Energy Shortage 18.1 %**
- High Distribution Losses (2004-05: **34.72%**)
- Low Collection Efficiency - 89%.
- Inadequate Distribution Infrastructure.
- Forced power cuts from 7 to 14 hours every day
- Lack of Employee Motivation.
Strategies adopted

- Improving economic viability:
  - Distribution loss of 34% makes any power project completely unviable.
  - Reduction in distribution loss is must.
  - Collection of bills, action against defaulters, disconnection etc.

- Manage Power Gap: Demand side management
  - Sectorwise Power supply
  - Load shifting
  - Energy conservation

- Consumer Satisfaction

- Capacity addition
  - Generation
  - Transmission
  - Distribution
Improving Economic Viability

- Energy Accounting & Accountability
- Photo Meter Reading/Billing.
- Strict Collection norms and disconnections
- Theft Control
- Amnesty schemes
Improving Economic Viability

- Metering of all 9339 feeders & feeder wise EA carried out.
- Metering of 150,000 distribution transformers completed.
- Monthly Energy Accounting at Division / Feeder / DTC level.
- Target for each Division / Subdivision for LT loss reduction (Monthly performance review).
Improving Economic Viability: Management and Technology Measures

- Established our own State Wide Area Network, up to date consumer database of over 15 million consumers
- Consumer monitoring: billing, consumption pattern, payments, disconnections
- Communication with employees – monthly news letters, SMSes, emails
- Incentive and Disincentive scheme for the employees for loss reduction
- Concept of profit centres – Loss reduction and collection of revenue as a part of their annual performance review
- Strict disciplinary action against delinquent employees.
- Speedy disposal of vigilance cases and strict action against defaulters.
Metering

- Meter is a Cash Box for any Distribution company
- Over 5 million old meters replaced in three years.
- Monitoring of reading 16 million consumers meters was a challenge
- Complaints of meters not being read, under or over reporting, manipulations
- Consumers complaints/ dissatisfaction
Photo Metering

- Photo Metering: To address Billing complaints: wrong meter reading/more consumption
- Digital Photograph of Energy Meters is taken & photo image is pasted on energy bill & Billing as per meter reading in photograph
- Meter tampering also photographed & proper action against theft is taken
- Consumer billing complaints have reduced
- 9 million Consumers covered
Accountability has increased.

Errors in meter reading are avoided.

Past consumption pattern can be checked in the new bills.
Massive Theft Control & New Connections Drive
### Yearly Energy Balance

<table>
<thead>
<tr>
<th>Particulars</th>
<th>FY: 2006-07</th>
<th>FY: 2007-08</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input to MSEDCL</td>
<td>69718</td>
<td>73400</td>
<td>3682 (5.7%)</td>
</tr>
<tr>
<td>Total Sales</td>
<td>49147</td>
<td>57206</td>
<td>8058 (16%)</td>
</tr>
<tr>
<td>Distribution loss</td>
<td>20569</td>
<td>16194</td>
<td>-4375.73</td>
</tr>
<tr>
<td>% Distribution loss</td>
<td>29.50 %</td>
<td>24.09 %</td>
<td>-5.41 %</td>
</tr>
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</table>

Distribution loss reduction achieved is 7.63% in Last 2 Years
## Present Energy Balance (April to October)

<table>
<thead>
<tr>
<th>Particulars</th>
<th>FY: 2007-08</th>
<th>FY: 2008-09</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input to MSEDCL</td>
<td>41395</td>
<td>42174</td>
<td>779 (2%)</td>
</tr>
<tr>
<td>Total Sales</td>
<td>31880</td>
<td>34112</td>
<td>2232 (7%)</td>
</tr>
<tr>
<td>Distribution loss</td>
<td>9515</td>
<td>8062</td>
<td>-1453</td>
</tr>
<tr>
<td>% Distribution loss</td>
<td>22.99%</td>
<td>19.12%</td>
<td>-3.87%</td>
</tr>
</tbody>
</table>
## Distribution Loss Reduction

<table>
<thead>
<tr>
<th></th>
<th>Year</th>
<th>2005-06</th>
<th>2006-07</th>
<th>2007-08</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution Loss Reduction</td>
<td>31.72%</td>
<td>29.50%</td>
<td>22.06%</td>
<td></td>
</tr>
<tr>
<td>Collection Efficiency</td>
<td>95.62%</td>
<td>94.07%</td>
<td>97.90%</td>
<td></td>
</tr>
<tr>
<td>AT&amp;C Loss Reduction</td>
<td>34.72%</td>
<td>33.69%</td>
<td>23.85%</td>
<td></td>
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</table>

**Revenue Enhancement** - Average monthly revenue increased from US $ 220 Millions to US $ 320 Millions.

1% reduction in loss = Gain of US $ 30 millions per annum
Meeting Power Gap: Demand Side Management

Peak shortfall of around 5000 MW

- Uninterrupted power supply to industries, essential services

- Separate agricultural feeders: Guaranteed 8 hours of electricity to Agricultural Water Pumps

- One Staggering holiday in a week for Non-continuous industries

- Shifting of load through TOD tariff

- 3 to 7 hours of pre-declared forced power cuts in areas based on distribution losses and collection efficiency
CL and MW load derived from MUS (sale) for the year 2007–08.

Connected Load MW

Mus

Others

Others

Comm.

Comm.

Resi.

Resi.

Agri.

Agri.

Ind.

Ind.

5%

7%

6%

5%

27%

17%

23%

32%

39%

39%
CL and MW load derived from MUS (sale) for the year 2006–07

Connected Load MW

Mus

Others 8%

Comm. 4%

Resi. 16%

Agri. 29%

Ind. 43%

Others 5%

Comm. 6%

Resi. 28%

Agri. 22%

Ind. 39%

Others 8%

Comm. 4%

Resi. 16%

Agri. 29%

Ind. 43%
CL and MW load derived from MUS (sale) for the year 2005–06

Connected Load MW

Mus

Others 8%
Agri. 24%
Comm. 5%
Resi. 18%
Ind. 45%

Others 5%
Agri. 23%
Comm. 6%
Resi. 28%
Ind. 38%
Demand– Supply Scenario

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<tr>
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</thead>
<tbody>
<tr>
<td>MW</td>
<td>MW</td>
<td>MW</td>
<td>MW</td>
<td>MW</td>
<td>MW</td>
<td>MW</td>
<td>MW</td>
</tr>
<tr>
<td>Peak Demand</td>
<td>11425</td>
<td>11357</td>
<td>12749</td>
<td>14061</td>
<td>14749</td>
<td>15689</td>
<td>15859</td>
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<tr>
<td>Availability</td>
<td>9004</td>
<td>9315</td>
<td>9704</td>
<td>9856</td>
<td>9700</td>
<td>10412</td>
<td>10987</td>
</tr>
<tr>
<td>Shortfall</td>
<td>2421</td>
<td>2042</td>
<td>3045</td>
<td>4205</td>
<td>5049</td>
<td>5277</td>
<td>4872</td>
</tr>
</tbody>
</table>
Energy Conservation initiatives

- Awareness campaign
- Energy efficient pumps
- Promoting use of CFLs
- Power factor corrections: Installing capacitors in the network
- Association with Indian Bureau of Energy Efficiency, Lawrence Berkley National Lab
Distribution Franchisee (DF)

- Concept introduced first time in country by MSEDCL
- Promoting policy of Public Private Participation (PPP) through Franchisee model.
- Input based distribution franchise model.
- DF: Appointed by MSEDCL to purchase & distribute electricity in franchisee area.
- DF to charge tariff as per MERC’s tariff order only.
- DF expected to reduce distribution losses & increase collection efficiency.
- DF to carry out capital expenditure for the area.

Bhiwandi handed over to M/s. Torrent Power on 26th Jan 2007.
Capacity addition

- Long gestation period
- Fuel linkage
- Land
- Environment concerns
- Commercial Viability

Approximately 10,000 MW capacity addition tied up. Will get added in the next five years.
Consumer Satisfaction
Consumer satisfaction

- Infrastructure Upgradation plan costing US $ 3 Billion initiated. To be completed within three years.

- At 15 Municipal Corporation areas Call Centers established (Pune, Kalyan, Bhandup, Nagpur, Akola, Amaravati, Nashik, Dhule, Jalgaon, Ahmednagar, Kolhapur, Sangli, Solapur, Nanded, Aurangabad).

- To improve the supply related complaint handling process and enhance the customer servicing capabilities: – Toll Free No. 18002 333435.

- Single coordinating agency not only with customer but also to monitor the operational resolution of the complaint within MSEDCL.

- To ensure that escalations happen at the prescribed time to the right personnel.
Consumer services

- Data Centre is established at Head Quarter.
- LT Consumers Bills can be viewed on Website.
- On line payment facility
- Energy bills can be obtained through e-mail.
Consumer Services

- Bill printing with digital photo image of meter – 90 lakh Consumers covered.
- At office level communication & decision support through E-mail.
- SMS – Bill information through SMS.
- Registered mobile holder consumers can get power failure/interruptions information through SMS.
## Financial Accounts of MSEDCL

### MAHARASHTRA STATE ELECTRICITY DISTRIBUTION COMPANY LIMITED

#### REVENUE ACCOUNT

<table>
<thead>
<tr>
<th>SR.NO</th>
<th>PARTICULARS</th>
<th>2005-06 (10 Months) (Audited)</th>
<th>2006-07 (Audited)</th>
<th>2007-08 (Audited)</th>
<th>% Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>INCOME</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Revenue from Sale of Power</td>
<td>13628</td>
<td>18864</td>
<td>20158</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Other Income</td>
<td>623</td>
<td>887</td>
<td>840</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL INCOME</strong></td>
<td>14251</td>
<td>19751</td>
<td>20999</td>
<td></td>
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<tr>
<td></td>
<td><strong>EXPENDITURE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Purchase of Power</td>
<td>11950</td>
<td>16277</td>
<td>17006</td>
<td>81.4%</td>
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<tr>
<td>4</td>
<td>Repairs and Maintenance</td>
<td>215</td>
<td>416</td>
<td>526</td>
<td>2.5%</td>
</tr>
<tr>
<td>5</td>
<td>Employee Costs</td>
<td>1272</td>
<td>1922</td>
<td>1795</td>
<td>8.6%</td>
</tr>
<tr>
<td>6</td>
<td>Administration and General Expenses</td>
<td>94</td>
<td>148</td>
<td>273</td>
<td>1.3%</td>
</tr>
<tr>
<td>7</td>
<td>Depreciation</td>
<td>416</td>
<td>502</td>
<td>539</td>
<td>2.6%</td>
</tr>
<tr>
<td>8</td>
<td>Interest and Finance Charges</td>
<td>319</td>
<td>572</td>
<td>660</td>
<td>3.2%</td>
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<tr>
<td></td>
<td><strong>Sub Total A</strong></td>
<td>14267</td>
<td>19837</td>
<td>20801</td>
<td>97.5%</td>
</tr>
<tr>
<td>9</td>
<td>Other Debits</td>
<td>83</td>
<td>237</td>
<td>519</td>
<td>2.5%</td>
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<tr>
<td></td>
<td><strong>Sub Total B</strong></td>
<td>83</td>
<td>237</td>
<td>519</td>
<td>2.5%</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL (A+B)</strong></td>
<td>14350</td>
<td>20075</td>
<td>21654</td>
<td>100%</td>
</tr>
<tr>
<td>10</td>
<td>Provision for Doubtful Debts etc.</td>
<td>204</td>
<td>283</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Prior Period Charges</td>
<td>0</td>
<td>-473</td>
<td>319</td>
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<td></td>
<td><strong>TOTAL EXPENDITURE</strong></td>
<td>14555</td>
<td>19885</td>
<td>20904</td>
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<td></td>
<td><strong>SURPLUS/(DEFICIT)</strong></td>
<td>-303</td>
<td>-134</td>
<td>117</td>
<td></td>
</tr>
</tbody>
</table>
Where are we?

- Peak Shortage 3709 MW. (23.1%)
- Energy Shortage: 18.1%
- Distribution Loss: 34.72%
- Loss - US $ 200 million.
- Inadequate Distribution Infrastructure.
- 7 to 14 hours of power cuts

2005

- Peak Shortage - 4700 MW. (25.1%)
- Energy Shortage: 21.5%
- Distribution Loss - 21.09%
- Profit - US $25 million
- Infrastructure projects costing US 3 Billion underway.
- 3 to 7 hours of Power cuts

2009
Way Ahead – Distribution

- Distribution loss to be brought down to 15%.
- Collection efficiency to be improved to 100%.
- All old meters beyond 10 and more years of service to be replaced.
- Centralized MIS system to be in place for better information flow from sub-division to corporate office.
- Geographical information system to be commissioned for mapping distribution network in major cities.
- AMR (Automated Meter Reading) for 20,000 revenue intensive consumers to be introduced.
- AMR for over 9000 HV feeders to be introduced.
- Reliable and affordable power supply with up gradation and modernization of the existing infrastructure with investment US $ 3 Billion
Way Ahead – Generation

- Hydro

- Green Energy
  - Wind
  - Biomass

- Nuclear energy
  - Presently constitutes only around 3% of total electricity.
  - Limited and depleting Coal reserves
  - Green House effect, High ash content in Indian coal and other environment concerns
  - Recent 123 agreement
  - Nuclear energy – only viable option for India’s long term bulk energy needs
Thank You