Technological Issues in Demand Side Management
Expected Growth Of Electric Energy Demand

- **Rest of World**: 150% Growth
- **Asia**: 300% Growth

TWh/Yr

- 1995
- 2020

Asia

Rest of World

0 500 1000 1500 2000 2500 3000 3500 4000

1995 2020

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Industrial Power Costs Worldwide

US Cents / kWh

2.5 MW supply, 40% Load

Japan > India > China > Germany > Austria > Italy > Portugal > Belgium > Spain > UK > Ireland > France > Netherlands > USA > Greece > Israel > Australia > S.Korea > Denmark > Finland > New Zealand > Norway > Canada > Sweden > S. Africa
Current Shortages in Western Region
(Source: energylineindia.com)

<table>
<thead>
<tr>
<th>Shortfall Estimated by WRPC</th>
<th>Mar 08</th>
<th>Apr 08</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maharashtra</td>
<td>5016 MW</td>
<td>5417 MW</td>
</tr>
<tr>
<td>Gujarat</td>
<td>3581 MW</td>
<td>4112 MW</td>
</tr>
<tr>
<td>Goa</td>
<td>47 MW</td>
<td>11 MW</td>
</tr>
<tr>
<td>W Region Overall</td>
<td>11441 MW</td>
<td>12041 MW</td>
</tr>
</tbody>
</table>
Demand Side Management – Present Status

- Demand side management has come to mean tracking of consumer billing thru various methods including GPS
- The main aim is energy accounting so that all consumers are metered and billed
- Due to various reasons utilities do not have accurate information about the energy supplied and revenue collected
- Consequently all efforts are focussed on that area in distribution
Demand Side Management of Load

- Utilities carry out DSM thru penalties and incentives in tariff structure
- Penalties are levied for exceeding contract demand
- Low PF is also penalised and high PF is incentivised
- Consequently, customers play safe and contract for more than required KVA
- Others with genuine need may have to rely on DGs
Demand Side Management of Load

- Existing OFF LINE monitoring system suffers from many disadvantages:
  >> Measurements are carried out thru devices storing data with a periodicity of 30 minutes which imposes severe limitation on the parameters to be monitored.
  >> This data has to be physically accessed from meter every month by a meter reader who downloads this storage and only at the month end it enters the system.
  >> This method only enables imposition of penalties and does not contribute to load management in real time.
  >> The system can only do post mortem or operate post facto.
Role of DSM in GDP Growth of 8.50% in 10 years

- 12.75%pa growth of installed generating capacity
  - Investment in Power Sector
- Macro DSM for Power utility systems
- Micro DSM thru energy efficient load management at factory level - medium & large industrial units
- Energy Efficiency Improvements in Public Utilities and Agriculture must also begin
Value of Energy Efficiency

- One KWH saved thru energy efficiency is said to be eqvt to several times one KWH generated.
- There is no T&D loss.
  - No capital expenditure in generation and transmission.
  - No environmental damage or CO2 emission.
  - Available immediately.
% Energy of Total Manufacturing Cost

- Cem, Alu, Chlor
- Paper
- Steel
- Automobile
- Engineering
- Food
- Building
- Chemicals
- Casting & Forging
- FMCG
## Global Power Productivity 2000-01

<table>
<thead>
<tr>
<th>Country</th>
<th>Electricity Used Bn kWh</th>
<th>GDP Rs. Cr</th>
<th>Mfg Industry Value Add Rs. Cr</th>
<th>Rs / kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Industry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>India</td>
<td>510</td>
<td>179</td>
<td>22,912,416</td>
<td>3,149,952</td>
</tr>
<tr>
<td>China</td>
<td>1,356</td>
<td>452</td>
<td>55,633,488</td>
<td>17,896,128</td>
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<tr>
<td>Malaysia</td>
<td>69</td>
<td>23</td>
<td>4,225,968</td>
<td>1,424,256</td>
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<tr>
<td>Singapore</td>
<td>31</td>
<td>16</td>
<td>4,111,104</td>
<td>1,195,008</td>
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<tr>
<td>Germany</td>
<td>567</td>
<td>284</td>
<td>88,611,312</td>
<td>19,338,528</td>
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<tr>
<td>Japan</td>
<td>1,082</td>
<td>541</td>
<td>198,788,688</td>
<td>49,408,128</td>
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<tr>
<td>Korea</td>
<td>283</td>
<td>127</td>
<td>20,264,016</td>
<td>8,308,224</td>
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<tr>
<td>USA</td>
<td>4,003</td>
<td>2,002</td>
<td>483,132,720</td>
<td>75,196,800</td>
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<tr>
<td>UK</td>
<td>372</td>
<td>186</td>
<td>68,356,512</td>
<td>11,273,136</td>
</tr>
</tbody>
</table>
Demand Side Management – Wider Canvas

- **Energy Efficiency** - not yet being driven by utilities

  Energy Efficiency in designated industries: Pvt sector, Power plants, Railways?

  Energy audits of non-designated industries: Only commercial considerations are relevant

  Energy efficiency in residences
DSM – Wider Canvas

- **Power Quality**
  
  Uninterrupted supply- Problems of alternatives in use by consumers, costs?
  
  Voltage Stability- many industrial users avoid utility power due to fluctuations
  
  Harmonics free voltage
Demand Side Management System

- To infuse necessary dynamism in load management the system should function in real time.
- Input power available as well as consumption pattern should be on line.
- System should be available to supplier as well as consumer.
- Ultimately, it should be an integrated system from Receiving stations to consumer end.
- System should contribute to energy management and conservation for the consumer.
DSM for Utilities

- For dynamic situation in distribution use online monitoring for accounting
- Integrate the system from receiving end to substations, DTs.
- Make it available for supplier as well as consumer by having subsystems
- System to be used for energy management and energy efficiency
Energy Efficiency in Industries

- Some attention for energy productivity in procurement for plant utilities like motors, air compressors, HVAC, pumps & blowers etc.
- All talley plate data determined from ‘standard/controlled/lab’ conditions. Actual operating conditions are always different.
- Subsequently:
  - Motors are frequently rewound
  - Air compressors efficiency goes even lower
  - HVAC efficiency deteriorates

Need for continuous monitoring of energy consumption
Substation Monitoring

- On Line Monitoring of each substation which can provide
  - >> Power from Incomers as well as outgoing feeders
  - >> Energy output from each feeder which can be used for energy / revenue accounting
  - >> System can capture data from feeders and DTs ON LINE thru networking not offline thru MRIs
  - >> System can be extended down the line
System Configuration for Time Interval based

RS 485
RS485 - RS232 Converter
RS232
GSM MODEM

Location 1

1

RS 485
RS485 - RS232 Converter
RS232
GSM MODEM

Location 12

12

RS 485
RS485 - RS232 Converter
RS232
GSM MODEM

Central PC

GSM MODEM

Location 13

13

RS 485
RS485 - RS232 Converter
RS232
GSM MODEM

Location 25

25

RS 485
RS485 - RS232 Converter
RS232
GSM MODEM

GSM MODEM

Location 26

26

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Smart Energy Management
Distribution Monitoring - Advantages

- Energy account reconciliation on daily basis - no need to wait till month end or accumulate large unaccounted gaps.
- Centralisation of system is possible ie data of all substations can be brought to Discom HQ.
- System can provide T&D losses within primary distribution from Main Load despatch stations to substations and DTs.
- System is simple and cost effective.
DSM thru Technology

- Standards and Labelling Program of BEE
- Incentives for Development of Energy Efficient Domestic appliances
- HVAC development
- PF improvement in distribution
Pune Industrial Power Scenario

- 389 Feeders
- 1000 Industries
- 425 MW

- 20% = 85 MW Reduction
  - To meet Peak Demand Shortage
DSM Pilot Hadapsar Indl Area

- Henley, Gits - initial success
- Institute of Toxicology
- 3 more
### Gits Foods Case Study

#### 12 months data

<table>
<thead>
<tr>
<th>Savings</th>
<th>Savings Rs</th>
<th>Investment Rs</th>
</tr>
</thead>
<tbody>
<tr>
<td>By DSM</td>
<td>151,200</td>
<td>140,000 For Recording and Controlling (Metering) Mechanism</td>
</tr>
<tr>
<td>By Illumination Survey</td>
<td>90,006</td>
<td>108,500 For Tube Ligthths</td>
</tr>
<tr>
<td>By Motor Survey</td>
<td>80,833</td>
<td>165,054 For Motor</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>322,039</strong></td>
<td><strong>653,554</strong></td>
</tr>
</tbody>
</table>
Demand Side Management – Delhi case

- To reduce load shedding Delhi Govt made announcement for closing all shops by 7 pm.
- Due to strong reaction from shopkeepers the notice was quickly withdrawn.
- As shops use maximum electricity for lighting it is possible to reduce consumption by use of ‘Lighting Energy Saver’.
- Saving of power by upto 20% in lighting can help in avoiding load shedding for shopping areas.
Thank you
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