Success Stories in Distribution Reforms at CESC Limited
CESC Limited

Warmly welcomes delegates to Kolkata
Kolkata – a rich History

- Started as a British trade settlement in 1690 by Job Charnok, an agent of the East India Company.
- There were three large villages along the east bank of the river Ganges, named, Sutanuti, Gobindapur and Kalikata.
- In 1756 Siraj-ud-daullah, Nawab of Bengal, attacked and captured the city from the British.
- In 1757 Robert Clive recaptured the city from Siraj-ud-daullah on the battle field of Plassey.

The Royal Bengal Tiger
• In 1883, Calcutta became the **capital** of British India, and the first governor general was Warren Hastings.

• Till 1912, Calcutta was the capital of India, when British moved the capital city to Delhi.

• In 1947, after partition, Calcutta became the capital city of the state of West Bengal.
Kolkata – a rich Heritage

Home of famous people:
- Art
- Cinema
- Education
- Freedom Fighters
- Literature
- Philanthropy
- Science
- Social Reform
- Sports, Theatre

Swami Vivekananda
Ramkrishna Paramhansa
Iswar Chandra Vidyasagar
Jagadish Chandra Bose
Satyen Bose
Jamini Ray
Bankim Chandra Chattopadhyay
Saurav Ganguly
Sarat Chandra Chatterjee
P.C.Sorcar
Leander Paes

Rabindranath Tagore
C V Raman
Mother Teresa
Amartya Sen
Monuments, Memorials, Museums …
The Story of Electricity in the City of Kolkata

First demonstrations of electric light
The first demonstration of electric light in Calcutta was conducted on 24 July, 1879 by P W Fleury & Co. In 1881, 36 electric lights lit up a Cotton Mill of Mackinnon & Mackenzie.

The first license
The Government of Bengal passed the Calcutta Electric Lighting Act in 1895.
- The first license covered an area of 5.64 square miles.
- In 1897, the Calcutta Electric Supply Corporation Limited was registered in London.

The first thermal power plant in India
On 17th April 1899, the first thermal power plant of The Calcutta Electric Supply Corporation Limited was commissioned at Emambagh Lane, heralding the beginning of thermal power generation in India.
- The electrification of Calcutta took place 17 years after New York and 11 years after London.
Soon, electric fans took Calcutta by storm

Calcutta Tramways switched to electricity from horse drawn carriages in 1902.
The Story of Electricity in the City of Kolkata

**Growth beyond expectation**
The demand for power grew beyond expectation. Three more stations were started: Alipore in 1902, Ultadanga and Howrah in 1906.

**1912 - Cossipore Generating Station commissioned**
Replaced the four power houses by one.

**Street lighting**
1914-1916: 1000 candle power Keiths lamps were installed on Corporation Street and Chowringhee.

**1926- Southern Generating Station commissioned**
Underwater cables to Howrah

Jute mill owners showed interest in the new power. The Calcutta Electric Supply Corporation laid cables under the pontoon bridge on the Hooghly.

Tunneling the Hooghly - a marvel in engineering

A tunnel was constructed under the river Hooghly in 1931. This was 690 yards long, 6 feet in diameter and 90 feet underground and still remains a marvel in engineering.

1940 - Mulajore Generating Station commissioned and still in service!

1950 - New Cossipore Generating Station (130 MW) commissioned
DC was widely used – even now, the demand is about 15 MW.

We had the world’s largest DC Meter repairing shop.

Mercury Arc Rectifiers

Motor Converters
Load Shedding

From the early 1970's, load shedding became a household word, the intensity increasing steadily till 1983 when CESC was allowed to set up a 4 x 60 MW Generating Station at Titagarh.

London Head Office shifts to Calcutta

In 1970, the control of the Company was transferred from London to Calcutta. In 1978 it became a rupee company with the new name - The Calcutta Electric Supply Corporation (India) Ltd.

The RPG association adds new vitality

CESC's association with RPG, one of India's top industrial houses, began in 1989, when Mr. R P Goenka was inducted into the Board of Directors.
More Generating Stations added:
1990 – 2 x 67.5 MW at Southern
1998 – 2 x 250 MW at Budge Budge

Current Generation Capacity
CESC now has 5 Thermal Power Plants – of which 2 are ISO 9002 certified - and the total installed capacity is 1065 MW.

ISO Certification in Distribution
• Central Regional Office
• Metering
• SCADA & Communications
Profile of RPG Enterprises

- **Rs. 6,400 Crores Group Turnover**
- **Amongst India’s top business houses**
- **63,000 Employees**

- **Power**: CESC Limited, Noida Power Company Limited, RPG Cables, Raychem-RPG, KEC International Ltd., RPG Transmission Ltd etc.
- **Tyres**: CEAT, Phillips Carbon Black
- **Communications**: RPG Netcom, Sprint RPG, RPG Cellular, RPG Paging Services etc.
- **Life Sciences**: RPG Life Sciences Ltd., Harrisons Malayalam
- **Retail**: HMV (=Saregama), Music World, Spencers, Food World, RPG Guardian (Health & Glow) etc.
Joint Venture between Greater Noida Industrial Development Authority & RPG Group


- Demand ~ 50 MW
- Area ~ 335 sq kms
- Consumers ~ 17,000
- Industrial sales ~ 72% (94% revenue)
- Rural sales ~ 23% : 118 villages : Cluster Supply – “less LT”
- 1100 Agricultural Pump Sets energized by NPCL
CESC Limited – A Snapshot

- Licensed Area: 567 Sq Kms
- Operating in Kolkata & Howrah
- Installed Generation Capacity: 1065 MW

Year ending 31.3.03:

Units Sold: 5557 MU

System Met: 1281 MW

T&D Losses: 18.48 %

Energy Generated ~ 78%
Energy Imported ~ 22%

HT Consumers: 1626
LT Consumers: 1.83 Million
Areas of Distribution Reforms

- Loss Reduction
- Modernization Initiatives
- IT-Driven Distribution
- Responsive Consumer Services
- Reorientation, restructuring, cost cuts, tariff
- Improvements in Metering, Billing and Collection
COMMERCIAL & ENGINEERING OPERATIONS THROUGH

- REGIONAL OFFICES: 6
- COMMERCIAL REVENUE DISTRICTS: 70
- MAINS (ENGINEERING) DISTRICTS: 10
- CASH OFFICES: 38

567 Sq Kms
Mains Districts Marked

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CESC Limited
Energy Sales in 2002-2003

Total Sales = 5557 MU excl Energy supplied to WBSEB
Total Consumer = 1,877,939 incl 1626 HT

In FY 2002-03:
- 4% Sales growth
- 72,000 new LT connections
- 35 new HT consumers

**Domestic 41%**
- Consumers = 1,532,252
- Sales = 2253 MU

**Industrial 32%**
- Consumers = 60,791
- Sales = 1790 MU

**Commercial 18%**
- Consumers = 283,875
- Sales = 1028 MU

**Others 9%**
- Sales = 486 MU
- Consumers = 1,021

Jute Sector accounts for about 10% of total sales

HT Sales: 42%
LT Sales: 58%
High Tension Consumers

- Majority at 6 kV
- Some at 33 kV, 20 kV & 11 kV

<table>
<thead>
<tr>
<th>Category</th>
<th>No of Consumers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial</td>
<td>672</td>
</tr>
<tr>
<td>Commercial</td>
<td>490</td>
</tr>
<tr>
<td>Residential</td>
<td>347</td>
</tr>
<tr>
<td>Public Water Works &amp; Pumping Stns</td>
<td>101</td>
</tr>
<tr>
<td>Calcutta Tramways Co Ltd</td>
<td>12</td>
</tr>
<tr>
<td>Metro Railway</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>1626</strong></td>
</tr>
</tbody>
</table>

As on 31.03.03

About 42% Energy Sales is to HT Consumers
Over last 10 years: About 35% increase in Sales and System Demand

- HT to LT Sales Mix
- LT Sales increasing, HT Sales dropping.
Increasing trend has been arrested - in fact showing a decline after FY 00-01

T&D Losses in FY 02-03: 18.48%
- Technical Losses ~ 11.7%
- Commercial Losses ~ 7%

**COMMERCIAL LOSSES:**
- Theft & Pilferage
- Hooking/ tapping
- Meter Tampering
- Metering Errors
- Billing Errors

Most of it is due to *theft & pilferage*, estimated at about 6% now. Recent legislative changes have helped to arrest this loss.
The CESC Network

FY 02-03:
Sales = 5557 MU

T&D Losses: 18.48%
• Technical Losses ~ 11.7 %
• Commercial Losses ~ 6.8 %

Salient Features:
- Predominantly underground system
- Almost 100 % Metered
- System Load Factor ~ 63-65% - No significant change

- Legacy 6 kV Network – Loss is about 4% here! Shift to 11 kV.
- HT sales dropping, LT sales increasing – affecting losses.

Some DC Network still exists

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CESC Limited
Adequate Network Growth – “less LT”

Network expansion:

- Focus on increasing Distribution Transformers instead of LT AC Lines
- New/upgrade to 11 kV system

### Substations

<table>
<thead>
<tr>
<th>Substations</th>
<th>Nos</th>
<th>MVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>132 / 33 kV</td>
<td>32</td>
<td>1897</td>
</tr>
<tr>
<td>33/11/6 kV</td>
<td>157</td>
<td>2313</td>
</tr>
<tr>
<td>11/0.4 kV &amp; 6/0.4 kV</td>
<td>4262</td>
<td>1386</td>
</tr>
</tbody>
</table>

### Lines (UG+OH)

<table>
<thead>
<tr>
<th>Lines (UG+OH)</th>
<th>Ckt Kms</th>
</tr>
</thead>
<tbody>
<tr>
<td>132 / 33 kV</td>
<td>296</td>
</tr>
<tr>
<td>33 kV</td>
<td>1019</td>
</tr>
<tr>
<td>11 kV &amp; 6 kV</td>
<td>3444</td>
</tr>
<tr>
<td>LT</td>
<td>9258</td>
</tr>
</tbody>
</table>
Load Management

Centralised Load Management
For 132 kV and 33 kV System
SIEMENS “SINAUT-LSA” SCADA System

- 16 RTUs
- 3 MMIs
- Over 4000 signals
  - 1000 status
  - 3000 measurands

Communications over
- Copper
- Optical Fiber
- Microwave radio

Imminent plans:
- Energy Management System
Monitors and Controls
Unmanned 33/11 kV and 33/6 kV Substations

Very cost-effective system and software developed in-house

20 Systems commissioned till date
Geographical Information System

From ROLTA-Intergraph

- **Automated Mapping**
  - Landbase maps

- **Facilities Management**
  - Facilities maps

- **Over 400 Maps (32”=1 mile) scanned and vectorised**

- ** Seamlessly Integrated**

- **Database Integration**
  - FRAMME/ Oracle
  - Rule Based

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Switchgear Modernization

- Mostly Indoor Switchgear in 6, 11 and 33 kV. Also, Indoor 132 kV and 33 kV GIS.

- After 1986, VCBs and SF6 breakers used – about 60% now.

Transformers

**Power Transformers**

*Upto 75 MVA, 132/33 kV*
- On-line Filtration
- Dissolved Gas Analysis

**Distribution Transformers**

*Enhanced specifications over BIS*
- Temp Rise & S.C. Tests done
- HRC Fuses both on HT and LT
- HT Isolator, Link Arrangement

**Dry Type Transformers**
Cables

Mostly underground network.

Acknowledged expertise in cables, jointing, fault-location

132 kV & 33 kV XLPE cables introduced 8 years ago.
Power Factor Correction

About 350 MVAR of reactive compensation

- On 33 kV network ~ 110 MVAR
- On 6 kV network ~ 140 MVAR
- On LT network ~ 100 MVAR

Power Factor in CESC System

- At 132 kV & 33 kV ~ 0.92 – 0.93
- At 6 kV ~ 0.85 – 0.90
- At LT ~ 0.8
Dual protection schemes for reliability

Extensive use of Numerical Relays for:

- multiple functionalities
- disturbance recording
- self monitoring

Use of Digital Protective Relay Interfaces
In-house developed Electronic Products

- Temperature Scanners
- Special Transducers & Recorders
- Remote Tap Change Controllers
- DC Overcurrent Relays & Ampere-Hour Meters
- Live Line Detectors
- Optical Isolators & Special Power Supplies
Intelligent Static Meters

All HT & bulk LT Consumers – almost zero meters errors because Intelligent Static Meters/ MRIs used – no Meter Books or Data Entry.

Class 0.5 Accuracy

Such meters account for ~ 50% of Units sold.
very low failure rate
more tamper-evident

Besides meeting all relevant Standards (IEC 521 etc), the salient features of such Meters are:

- Magnetic suspension bearings – less friction, longer life.
- Plastic Register drums and gear-wheels – less friction.
- Rivetless lamination stacking – for uniformity of magnetic circuit.
- Moulded polycarbonate transparent cover and base – enhanced visibility to detect tamper.

40 % of the 2 Million meters in circuit are now of this type.
Seals

On Meter Body

- Holographic paper seals – difficult to duplicate
- Steel wire with copper ferrules – last longer, impression clear.
- Seals affixed by Manufacturers

On Terminal Plate

- Lead Seals

In 2003:

On Service Cut-Out

- Paper Seals – numbered and signed
Changes in Legal Framework

Increasing empowerment to tackle the menace of theft and pilferage:

- Government of West Bengal sanctioned amendments to our “Conditions of Supply allowing Disconnection without Notice for consumers believed to be pilfering electricity

- From 15th July 2002, The Indian Electricity (West Bengal Amendment) Act 2001 was promulgated for theft/pilferage of electricity:
  - Now a cognizable and non-bailable offence
  - Jail for a term of 3 months to 5 years. Apart from unmetered charges, monetary fine between Rs 5000 to Rs 50,000/=
  - Constitution of Special Courts
  - Constitution of Electricity Utility Protection Force

Relentless anti-pilferage drive is yielding results.

- Reinforcement of the “Loss Control Cell”
- Wide media campaign – hoardings, banners, audio/video spots
**Meter Readings**

- **Monthly Meter Readings** – 600 Meter Inspectors
- **40 % of LT Meters** are “Superior Quality”
- **100 % of HT Meters** are Static Intelligent Meters
- **80 % of Units sold** are metered through Superior/Static Meters

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**LT Meters**

- Electromechanical Meters
- Noting Reading in Meter Book
- Data Entry on PC

**HT Meters/CT-Operated LT Meters**

- Static Meter
- Load Profile, Piferage Detection
- Readings using MRI

Trials with Handheld PC

Bill

Billing System At IT Dept.

CESC Net
**LAN at each Cash Office**

POC Terminals (cash colln.)

- Supervisor’s PC

**Cheque Payments**

POC with MICR Reader

**At Treasury Controlling Office**

- Reconciliation
- Bank Lodgement
- Return Cheque Processing
- Manual Stubs

**At IT Dept**

- Data Entry

**Daily**:  
- Payment Validation
- Sorting
- Debit DPS/ Retd Cheques
- Accumulation in Pool File

**Monthly**:  
- Payment Extraction
- Payment Matching

---

**Bar-coded Bills**

**Computerized Abatement Files from ROs**

**ECS Payments Bill Jn**

**Advance Payments CRES**

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**Payment-side Manual Forms from Regional Offices**:  
- Abatements
- DPS Waiver
- CC Marker
- Single Month etc.

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**CESC Limited**
First Computerized Billing system in India - 1973

In-house developed software:
- Time tested validations and filters

Hardware:
- Sun 4500 Series Servers

RDBMS:
- Oracle 8i

Transaction Downloads to Regional Office Servers for rapid Consumer Service
Information Technology – Catalyst for Performance Improvement

Extensive Company-wide IT & Telecommunications Facilities

**Applications**
- Engineering Applications
  - Voice Communications
  - Data Communications
  - SCADA
  - GIS
  - Protection
- Commercial Applications
  - Billing/ SBU Data Flow
  - ERP
  - Cash Net, Bill Net
  - Intranets: RPG, CESC
  - E-mail

**Network**
- FOTS, Radio: PDH/SDH, X.25
- Gigabit Ethernet (TCP/IP)

**Physical**
- Fibre Optic Cables, Digital Microwave, Copper Wires
OF Network Systems

- 300 Kms of Fibre Optic Cables laid
- Primary and H.O. Multiplexers
- Used for voice, data and protection signaling
- Over 20 OLTE Stations commissioned
- Most are 34 Mbps PDH
- SDH Ring under implementation

Multiplexers

Gigabit Ethernet
LAN/WAN – CISCO products

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CESC Limited
Digital Microwave System

60 Channel TDM/TDMA
Digital Microwave Radio System

For Voice & Data

X.25 WAN
Multiple Interconnected Applications

SUN E450  PC Array
REGIONAL OFFICES

Cash Offices

SUN E450  Informix RDBMS
METERING DEPT.

SUN E450  SOLARIS 2.7, ORACLE 8.1.5 / COBOL
Bill Processing

TERMINALS

INTERNET

Also, ERP Applications

Multiple Interconnected Applications

SUN E450  SOLARIS 2.7, ORACLE 8.1.5 / COBOL
Bill Processing

TERMINALS

INTERNET

Also, ERP Applications
ERP Implementations

Finance
- Accounts Payable
- General Ledger
- Retirement Benefit Management System

Legal Case Management System
- Legal Systems Operations & Reports
- Interfaces to Commercial, Mains, Corp Services

Materials
- Procurement
- Issues
- Inventory Management

Loss Control Cell
- Database & Operations
- Functional & MIS Reports
- Interfaces to Commercial, Mains, Corp Services

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CESC Limited
Intranet/ Internet for Employees

**CESC Net:**
- Consumer records
- Bills
- Consumption Patterns
- Departmental databases

**RPG Net:**
- E-Mail
- News
- Information
Bill Information on the Web

www.cescltd.com

Features:

- Latest billing information
- Last 3 years billing information
- Billing complaints
- Service quality complaints
- Pilferage reporting
- Power consumption guide
- e-supply
- Safety guidelines
- Cash collection centers
- Fault reporting centers
- On-line payment
Focus: Consumer Service

- 6 Regional Offices, 10 District Offices
- Consumer Grievance Cell
- Customer Perception Study
- Bill delivery by Courier
- Cheque Drop Boxes

- 24/7 Service Centers
- Fleet of Mobile Units with VHF sets
- Call Center: “1912”
- Special Cell for HT Consumers
- Web Site

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The Bill seeks to:

1. Create a liberal framework of development for the power sector
   • Forcing Competition
   • Performance Standard, Monitoring and Penal Consequences

2. Replaces the three existing legislations, namely:
   1. Indian Electricity Act, 1910
   2. The Electricity (Supply) Act, 1948

Details in: http://www.powermin.nic.in
Looking Towards the Future

_Sweeping Changes are taking place in the Utility Business_

**Focus Areas:**

- Customer Retention – more responsive services
- Setting and meeting Key Performance Indicators such as:
  - Mean time to LT Complaint (supply Restoration)
  - Plant Availability Factor
  - O&M Expenses
  - Consumer Satisfaction Index
- Lowering Tariff by enhancing internal efficiency

The new “mantra”

“To be more efficient, reduce costs, become consumer responsive, or perish”
Thank You