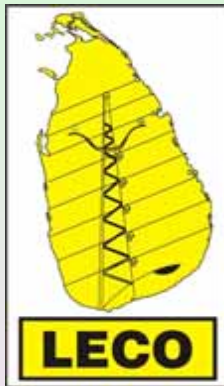


Distribution System Loss Reduction



Presentation by:

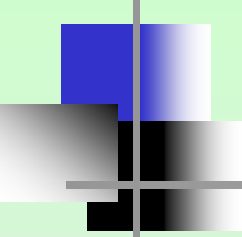
Y.L.Farook

System Development Manager

Lanka Electricity Company (Private) Limited

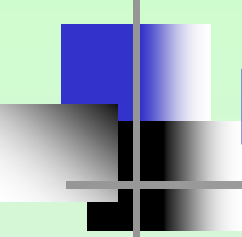
Sri Lanka





Distribution System Loss Reduction

- History – LECO
- History-D/Losses
- Technical Losses
- Non-Technical Losses
- Key Challenges and Overcoming Them
- Good Practices To Reduce D/Losses
- Cost and Benefits



History - LECO

- **Electricity Supply in Sri Lanka**
- **Problems in “LGA” Distribution**
- **Birth of LECO**
- **Shareholders**
- **Mission**
- **Objectives**

Supply in Sri Lanka

Dept. of Govt. Electrical Undertakings

Ceylon Electricity Board

	Before 1969	1969	
Generation	DGEU	CEB	
Transmission	DGEU	CEB	
Distribution	DGEU (80%) LGA (20%)	CEB (80%) LGA (20%)	CEB (85%) LECO (15%)

Local Govt. Authority

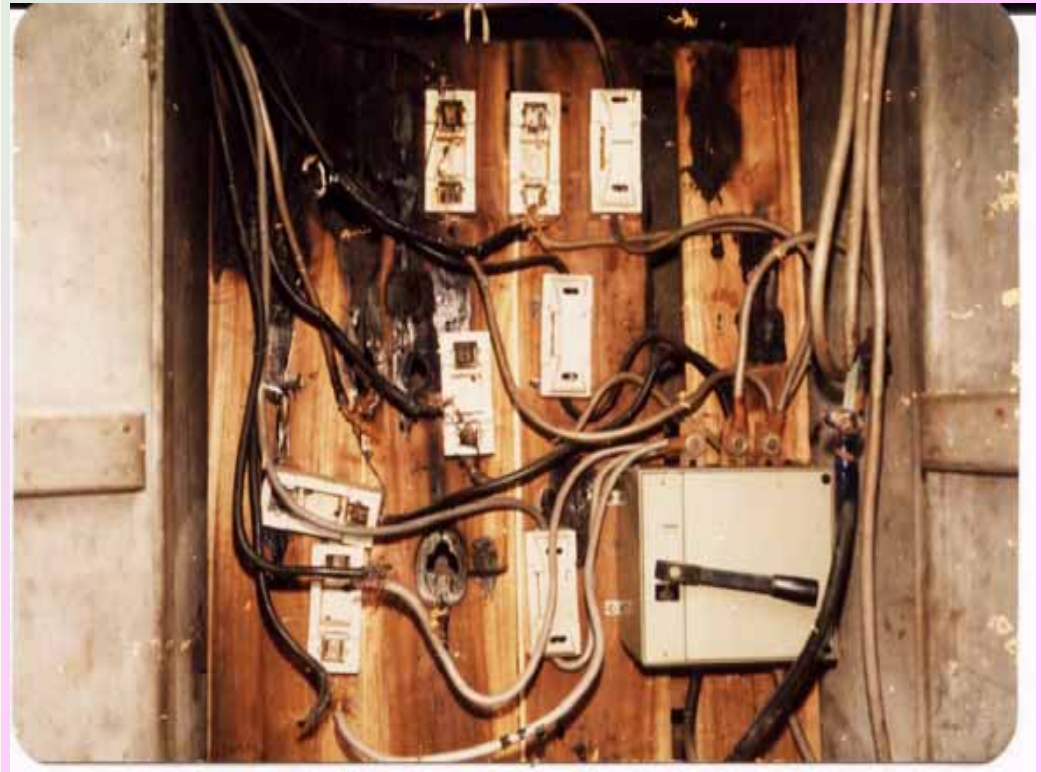
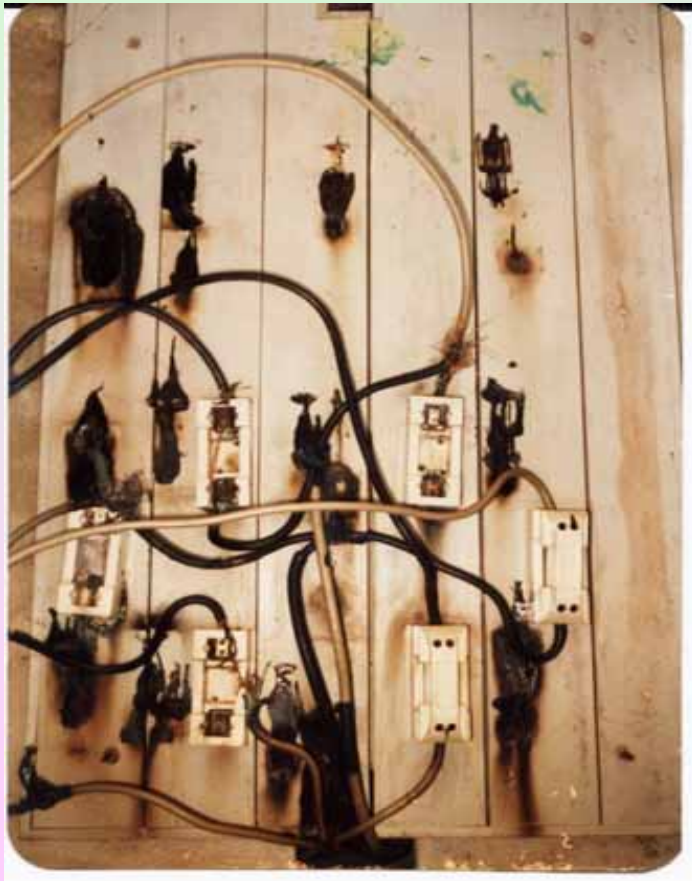
Lanka Electricity Company



Problems in "LGA" Distribution

- **Delay/inability to provide new connections**
- **Electricity losses - some over 40% !!**
- **Low voltages - 70V recorded Vs 230V**
- **Debts to CEB – Over 7 months in some cases**
- **Lack of capital for development**
- **Overall, poor & deteriorating customer services**

Deteriorated "LGA" Distribution System



Deteriorated "LGA" Distribution System (Contd...)



Deteriorated "LGA" Distribution System (Contd...)



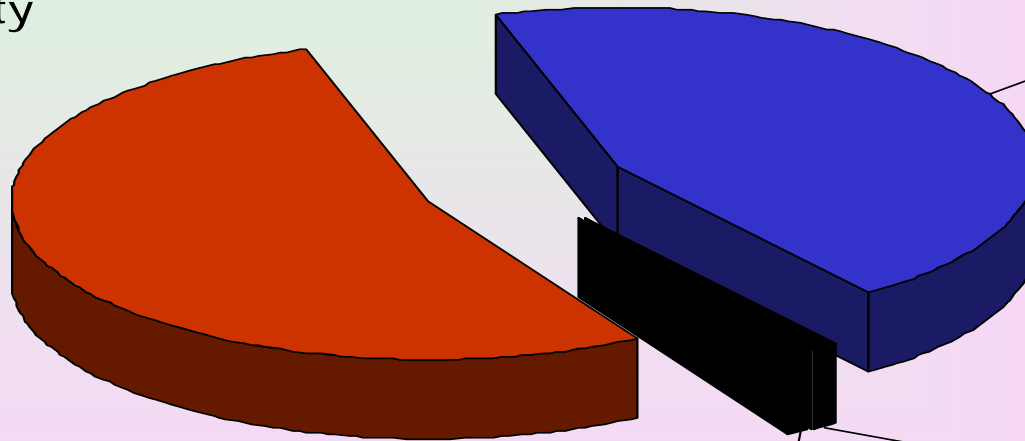


Birth of LECO

- **Govt. appointed Committee to report on:**
“Improvement of Electricity Distribution in Local Authority Areas”
- **Recommended formation of an Electricity Distribution Company with CEB participation.**
- **LECO was incorporated on 19th September, 1983.**

Shareholders

Ceylon
Electricity
Board
54%



General
Treasury
44%

Urban
Development
Authority
1%

Local
Authorities
1%



Mission Statement

**To be the best in the Electricity
Distribution industry and to contribute to
develop a Competitive Electricity industry
in Sri Lanka for the benefit of Electricity
Consumers**



Corporate Objectives

- **Delivering a quality electricity supply at least cost to our customers**
- **Strengthen our position in the electricity distribution by a continuous commitment to raising service standards by teamwork and by improved customer relationship.**

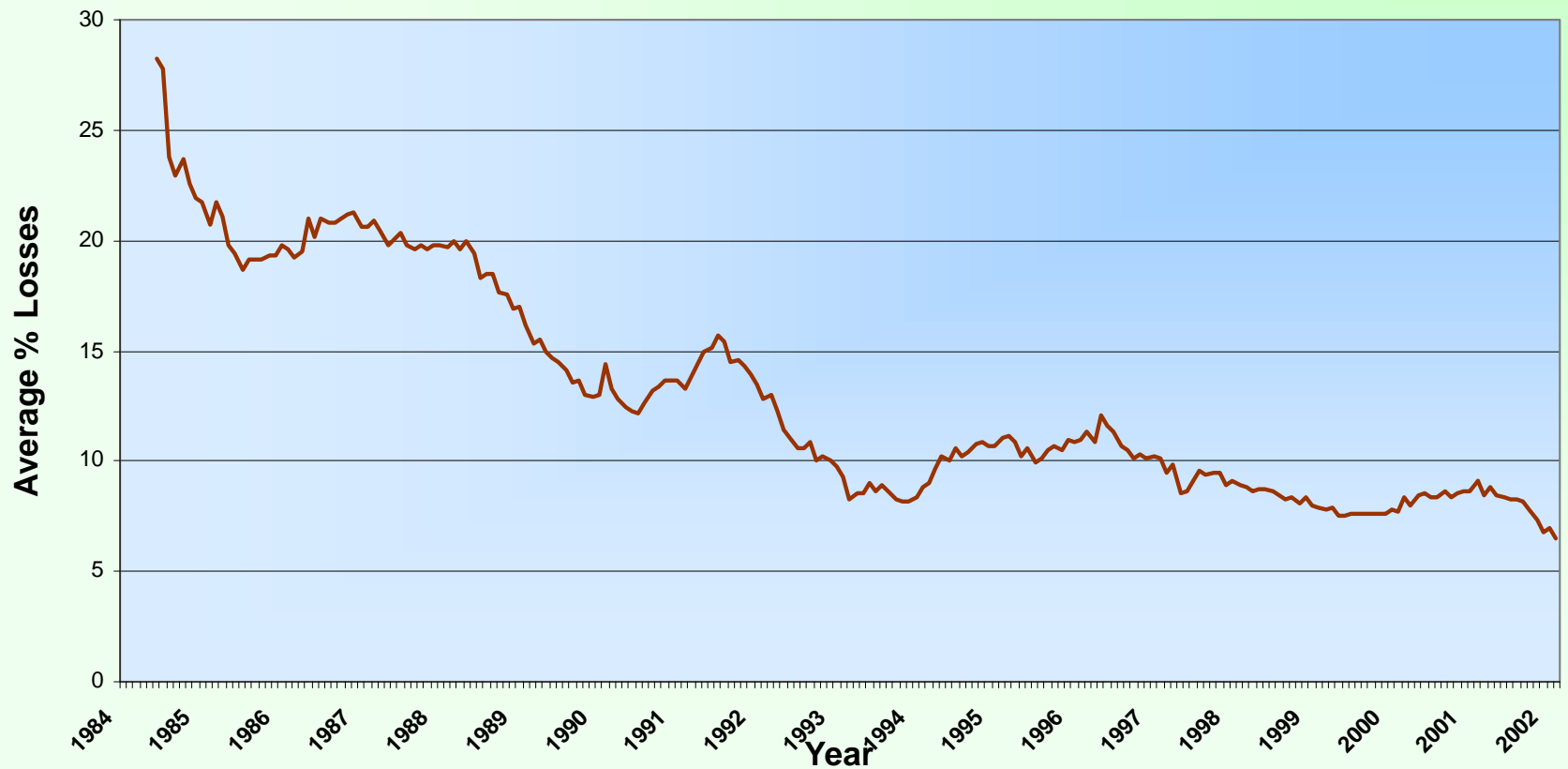


Corporate Objectives (Continued)

- **Ensure growth and strategic placement of the company by proper management of its assets**
- **Train and motivate employees to achieve higher goals**
- **Rewarding our investors with adequate returns, through sound investment and management**

History – Distribution Losses

History of LECO Distribution Losses





Technical Losses

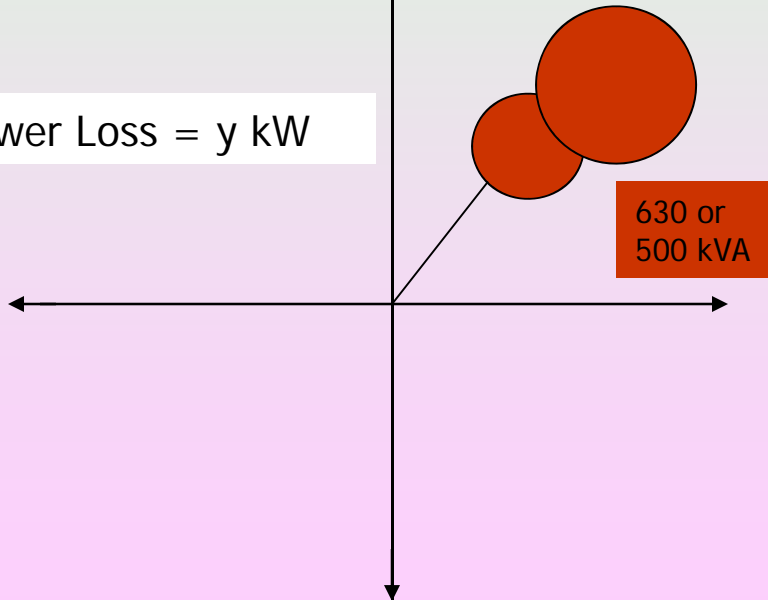
- **Selection of Distribution Transformers**
- **From Longer to Shorter LV Feeders**
- **Standardization of Conductor Sizes**
- **Load Flow Study**
- **Load Balancing**
- **Voltage Regulation**
- **Power Factor**

Selection of Distribution Transformer

Higher Capacity Transformers

Voltage drop = x volts

Power Loss = y kW

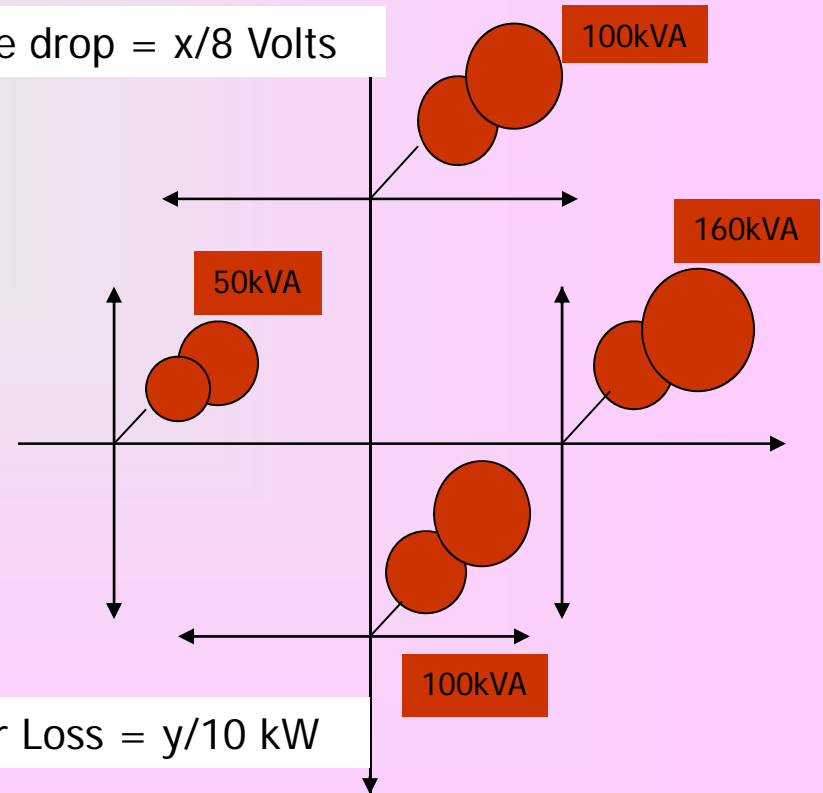


Longer Feeders

Smaller Capacity Transformers

Voltage drop = $x/8$ Volts

Power Loss = $y/10$ kW

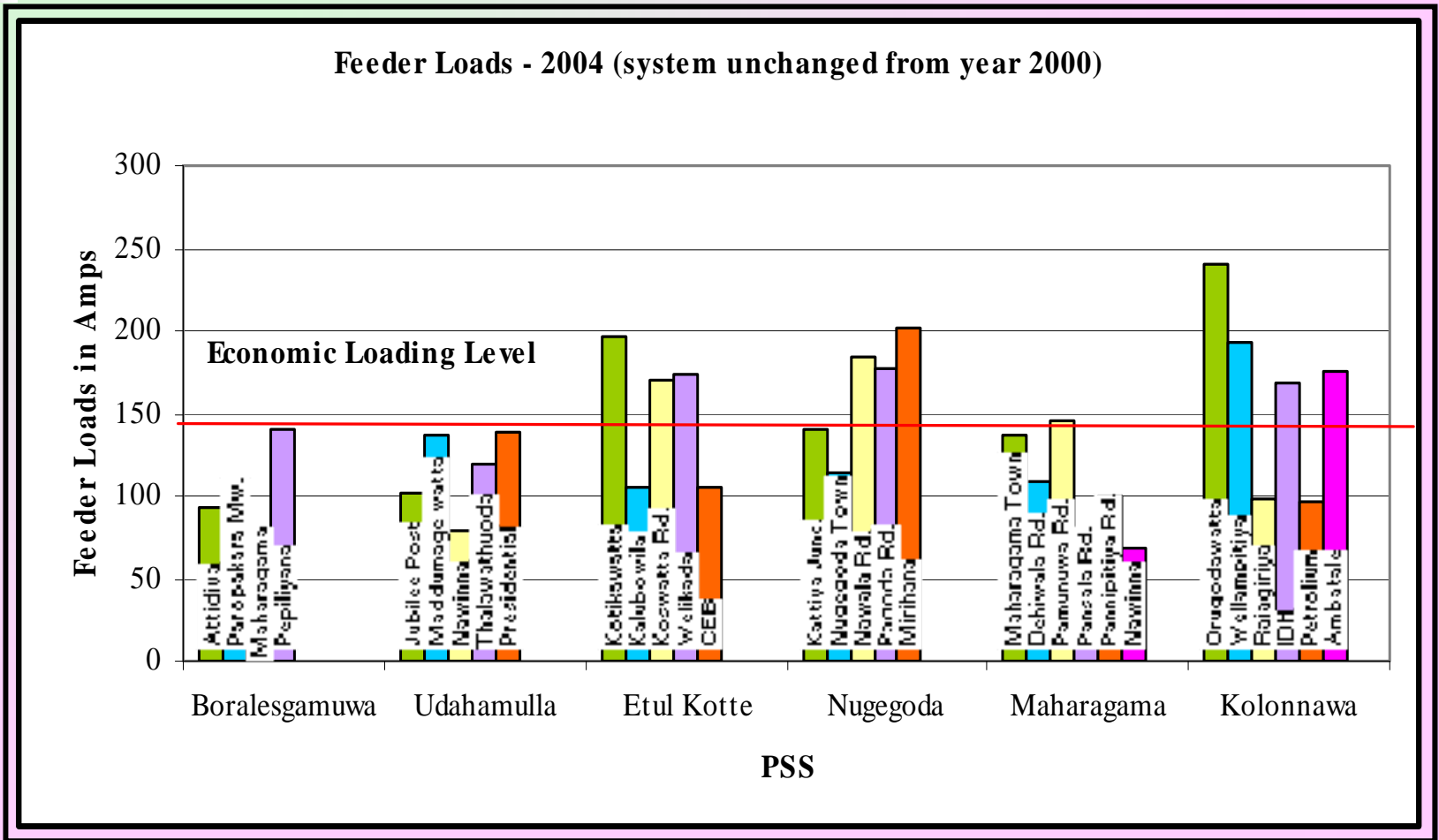


Shorter Feeders

Standardization of Conductor Sizes

System Voltage	Conductor	Configuratio	Size (mm2)
Express Feeder 33kV	3 Phase O/H	ACSR	175
Express Feeder 33kV	3 Phase O/H	AAC	250
Feeder -11kV	3 Phase O/H	AAC	150
Distributor-11kV	3 Phase O/H	AAC	100
Spur-11kV	3 Phase O/H	AAC	60
Distributor-LV (400V)	3 Phase O/H	Bundled AAC	70
Spur-LV (400V)	3 Phase O/H	Bundled AAC	50
Service -LV (400V)	3 Phase O/H	4 Core AAC	25
Service -LV (400V)	3 Phase O/H	4 Core AAC	16
Service -LV (400V)	3 Phase O/H	4 Core AAC	10
Service -LV (400V)	1 Phase O/H	2 Core AAC	16
Service -LV (400V)	1 Phase O/H	2 Core AAC	10

Load Flow Studies





Power Factor

- Current is minimum at Unity Power Factor
- Reactive component will cause an increase in current resulting increase in real power losses
- For large inductive loads, demand-side compensation is necessary
- Maintain the system closer to Unity Power Factor



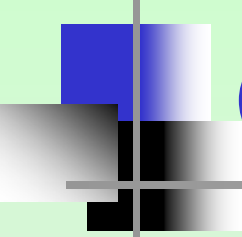
Non Technical Losses

- PURCHASES AND BULK SALES Vs ESTIMATED
- ENERGY AUDIT – RETAIL SALES
- STREET LIGHTING
- QUALITY METERS
- READING ERROR
- METER TESTING
- ELECTRICITY THEFT
- A CUSTOMER/EMPLOYEE FRIENDLY BILLING SYSTEM



Billing System - Billing

- BILL IDENTIFICATION-
TRANSFORMER, WALK-ORDER, REVENUE
OFFICER WISE
- INSTANT BILLING
- COMPUTE SALES, READ TRANSFORMER
METER, ESTIMATE LOSSES
- IDENTIFY LOSS CONTRIBUTING
TRANSFORMER AREAS FOR ENERGY AUDIT
- MONITOR REVENUE OFFICERS'
PERFORMANCE



Billing System – Revenue Collection

- Appoint Collecting Agents
- Update Payment Data Daily
- Bill Enquiry over Phone
- Issue Disconnection Notices
- Issue Disconnection Orders
- Disconnect Supply
- Reconnect
- Bad Debts – Recovery by Legal Action



Key Challenges and Overcoming Them

- INVESTMENT
- ACCOUNTING AND MONITORING
- IMPLEMENTING
- SUSTAINING



Good Practices

- SELECT LOW CAPACITY TRANSFORMERS AT LOAD CENTERS
- MAINTAIN SHORT FEEDERS
- CONVERT ALL SINGLE AND TWO PHASE SYSTEMS TO THREE PHASE SYSTEM
- SELECTIVELY USE ABC CONDUCTORS IN LV SYSTEM
- MAINTAIN BALANCED LOAD
- CARRYOUT LOAD FLOW STUDIES ANNUALLY
- STANDERDIZE CONDUCTOR SIZES
- OPERATING VOLTAGE > DECLARED VOLTAGE



Good Practices (Continued)

- MAINTAIN SYSTEM CLOSER TO UNITY POWER FACTOR
- COMPARE PURCHASES AND BULK SALES AGAINST ESTIMATED
- CARRYOUT MONTHLY ENERGY AUDIT
- ESTABLISH EMPLOYEE AND CUSTOMER FRIENDLY BILLING SYSTEM



Good Practices (Continued)

- INSTALL ACCURACY METERS AT PURCHASING AND BULK SALES POINTS
- TEST METERS ANNUALLY - PURCHASING AND BULK SALES POINTS
- CONTROL METER READING ERROR
- STREET LAMP CONSUMPTION INTO BILLING SYSTEM
- PROVIDE MANUALS FOR KEY PROCESSES



Cost

- Investments
 - PROJECT – 1 US \$ 24 M
 - PROJECT – 2 US \$ 49 M
 - PROJECT – 3 US \$ 23 M
- Not only for Loss Reduction but for Reliability Improvement and Administrative and Institution Building aspects as well



Cost

- COST TO OVERCOME TECHNICAL LOSSES – HIGH
- COST TO OVERCOME NON-TECHNICAL LOSSES – LOW
 - COMPUTERISED BILLING SYSTEM
 - ACCURACY METERS
 - TEST EQUIPMENTS
 - EMPLOYEE COST



Benefits (Financial)

- HIGHER RETURN ON INVESTMENT
 - > 8% return on NFA, ADB covenant
- INCREASED OPERATING MARGIN
- ABILITY TO PAYBACK LOANS
- APPRECIABLE DIVIDEND TO SHAREHOLDERS
 - 5% IN 1994, 10% IN 1995, 25% IN 1999 & 2000




Other Benefits (Economic & Social)

- CONSERVATION OF ENERGY RESOURCES
- INCREASED PLANT CAPACITY
- SAVING ON CAPITAL COST
- ENHANCED ELECTRIFICATION
- LOW ELECTRICITY TARIFF
- SAVING ON FOREIGN EXCHANGE
- HEALTHY ENVIRONMENT

Distribution System Loss Reduction

BENEFITS ARE NOT ONLY TO THE UTILITIES BUT FOR THE NATION AS WELL





Distribution System Loss Reduction

Thank You