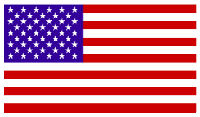

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LAHORE ELECTRIC SUPPLY COMPANY (LESCO) OPERATIONAL AUDIT REPORT

Produced by:

MWP-USAID POWER DISTRIBUTION IMPROVEMENT PROGRAM

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ENERGY II IQC CONTRACT EPP-I-00-03-00006
TASK ORDER 13

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ACRONYMS

ABC - Aerial Bundled Conductor

ACR – Annual Confidential Report

ADB – Asian Development Bank

AEB – Area Electricity Board (former name for DISCO)

AMR – Automated Meter Reading

BFP – Book of Financial Powers

BOD - Board of Directors

BPS - Basic Pay Scale

CDWP - Central Development Working Party

CE – Chief Engineer

CEO – Chief Executive Officer

CFO – Chief Financial Officer

CIS – Customer Information System

COBOL - Common Business-Oriented Language

CP – Commercial Procedure

CPPA -- Central Power Purchasing Agency

CSO – Customer Services Officer

CSR - Corporate Social Responsibility

CT – Current Transformer

CTC – Circle Training Center

CWIP – Construction Work in Progress

D&S – Design & Standards

DISCO – Distribution Company

DISCOs – Distribution Companies

DOP – Distribution of Power

DP – Distribution Planning

ECNEC - Executive Committee of National Economic Council

ELR – Energy Loss Reduction

ERO - Equipment Removal Order

ERP – Enterprise Resource Planning

FDRANA – Feeder Analysis (Software)

FESCO – Faisalabad Electric Supply Company Limited

GENCO – Generation Company

GEPCO – Gujranwala Electric Power Company Limited

GIS – Geographic Information System

GOP – Government of Pakistan

GST – General Sales Tax

GWh – Gigawatt hour

HESCO - Hyderabad Electric Supply Company Limited

HQ – Headquarter

HR – Human Resource

HT – High tension(11kV)

IA – Internal Audit

ICT – Information Communication Technology

IESCO – Islamabad Electric Supply Company Limited

IPP – Independent Power Producer

IT – Information Technology

KALAMZU book – Meter Reading book

Km – Kilometer

KPIs – Key Performance Indicators

kV – Kilovolt

kVA – Kilovolt Ampere

kVAR – Kilovolt Ampere Reactive

kVAR – Kilovolt Ampere Reactive Hours

kW – Kilowatt

kWh – Kilowatt hour

LDC – Lower Division Clerk

LESCO - Lahore Electric Supply Company Limited

LPF – Low Power Factor

LS – Line Superintendent

LT – Low tension, (0.4 kV)

M&T - Metering and Testing

MDI - Maximum Demand Indicator

MEPCO – Multan Electric Power Company Limited

MIS – Management Information System

MVAR - Megavolt Ampere Reactive

MW – Megawatt

MWh – Megawatt hour

MWP – Ministry of Water and Power

NADRA – National Database and Registration Authority

NEPRA – National Electric Power Regulatory Authority

NRECA - National Rural Electric Cooperative Association, USA

NTDC – National Transmission and Dispatch Company Limited

PC - Planning Commission

PDIP – Power Distribution Improvement Program

PEL – Pak Elektron Ltd.

PEPCO - Pakistan Electric Power Company Limited

PER - Performance Evaluation Report

PESCO – Peshawar Electric Supply Company Limited

PPRA – Public Procurement Regulatory Authority

PR – Public Relation

PRO – Public Relation Officer

PTCL – Pakistan Telecommunication Corporation

QESCO – Quetta Electric Supply Company Limited

REA - Rural Electrification Administration, USA

RORB – Return On Regulatory Asset Base

RTC - Regional Training Center

SBP – State Bank of Pakistan

SCO - Service Connection Order

SDO – Sub Divisional Officer

SE – Superintending Engineer

USAID – United States Agency for International Development

USC – Use of System Charges

WACC - Weighted Average Cost of Capital

WAPDA – Water and Power Development Authority

XEN – Executive Engineer

PPRA – Public Procurement Regulatory Authority

PR – Public Relations

PTCL – Pakistan Telecommunications Corporation

SDO – Sub Divisional Officer

SE – Superintendent Engineer

USAID – United States Agency for International Development

USC – Use of System Charges

WAPDA – Water and Power Development Authority

XEN – Executive Engineer

EXECUTIVE SUMMARY

OVERVIEW OF THE PROJECT

Background

Pakistan's power sector is, and has been for many years, beset by significant challenges. These include limited availability of reliable and affordable electric power, aging and inadequate transmission and distribution networks, and utility policies and practices that badly lag behind those of modern utilities elsewhere in the world. Moreover, a current-day, technology infrastructure that can enable efficient, back-office operations such as handling customer service requests is not in evidence.

For a major electric distribution utility like the Lahore Electric Supply Company (LESCO), these deficiencies translate into a level of financial performance that cannot be considered self-sustaining. And financial self-sufficiency is becoming critical. Pakistan's power industry is undergoing sweeping changes, transitioning from wholly Government-owned utilities to fully autonomous companies that will engage in power generation, transmission, and distribution under the Government's aggressive reform agenda. A similar industry structure exists and functions smoothly in many other countries today. In Pakistan's case however, badly outdated policies, procedures and work practices, as well as chronically low levels of investment in utility infrastructure, pose serious barriers to a successful transition.

Purpose

The Power Distribution Improvement Program (PDIP) is a three-year, USAID-financed project designed to facilitate improvements in electric power distribution utilities across Pakistan. The project began in September 2010. The PDIP was designed for implementation in two distinct components:

- **Component 1** consisted of operational audits of each of the eight Government-owned distribution companies (DISCOs). The purpose of these in-depth, operational audits was to establish baseline information that could be used to measure improvement in performance over time. Audits covered governance, operational, financial, human resources (HR), communications and customer service areas and surfaced opportunities for fundamental improvement in all areas. These improvement opportunities are reflected in specific Performance Improvement Action Plans.

- **Component 2** will focus on the execution of the Performance Improvement Action Plans by each DISCO, including implementation of pilot projects to demonstrate a number of key operational improvements and directly measure their value to the utility.

- LESCO has adequate investment through ADB Power Distribution Enhancement Investment Program (Tranche I & II) and World Bank Electricity Distribution & Transmission Improvement Project with major emphasis on transmission system expansion, up-gradation and augmentation. Therefore, PDIP focus is mainly on distribution system (11kV and below) improvement as it lacked investment

MAJOR FINDINGS AND CONCLUSIONS

The operational audit conducted for LESCO during Component 1 provided extensive insights into how LESCO operates and the performance consequences of the company's current approaches and practices. The PDIP team also became acutely aware of deficiencies that obstruct progress toward improvement. Part of the challenge faced by LESCO's management and Board of Directors in seeking to 'bootstrap' overall performance, enhance customer service, and create greater financial self-sufficiency will be to select the *right* actions at all levels, from front-line operations to strategic planning and assign the *right* priorities. This summary of major findings culled from the operational audit findings contained throughout this report is intended to provide a starting point for management consideration.

Table 1 below highlights major findings and conclusions of Component 1 of this project. Additional, detailed findings can be found in Section 2 of this report.

TABLE 1: KEY FINDINGS OF LESCO OPERATIONAL AUDIT

GOVERNANCE	LESCO's governance system has not yet made the transition to a business-like electric utility focus. LESCO remains subject to political intervention, and the Board of Directors has not been empowered to oversee a true corporate entity. Recent reconstitution of the Board of Directors by the Government is a positive step toward greater professionalism and operating autonomy; however, additional changes will be required to enable the Board to exert the strategic influence that the company needs to succeed in the restructured Pakistani power sector and to improve the company's operating and financial performance to more acceptable levels.
ORGANIZATION	LESCO's current organization is structured primarily by geographic area and not along functional lines, the latter having been seen at most modern electric distribution utilities worldwide. Commercial functions responsible for cash flows within the utility should not report to superintending engineers whose responsibilities focus on power system stability and reliability. The current arrangement also creates potential conflicts of interest in the performance of key jobs within the utility.
ENGINEERING	Preliminary loss analysis on fourteen (14) sample feeders using GIS mapping & modeling technique with a load flow software shows that technical loss for LESCO's distribution system is 5.2%. In contrast, LESCO reported total system energy losses of 13.8% in FY2010. If transmission losses were 2.3% as the PDIP estimated, the distribution component of loss would be 11.5%. The difference between the distribution technical loss of 5.2% and a probable total distribution loss 11.5% is a nontechnical (commercial) loss of 6.3%. Accordingly, a strategic opportunity exists for LESCO to reduce its commercial losses and significantly improve its financial performance. LESCO's distribution planning and construction activities are not anchored to an integrated or long-range plan, but to the resolution of recurrent problems resulting from ad-hoc, piecemeal solutions. Construction and maintenance work practices in widespread use among LESCO employees are inconsistent, rely on makeshift and stopgap approaches and suffer from lack of available equipment and transportation access. The consequences of these failures are profound – employee safety is routinely jeopardized as evidenced by the 29 fatalities, including 12 linemen in FY 2010; worker productivity is low; response to customer requests can be exceedingly slow; and equipment failures occur more frequently than necessary. All of these direct consequences have significant financial impacts for LESCO.
FINANCIAL	LESCO's power supply is pooled; that is, LESCO does not have an individual relationship with its power supplier. The amounts LESCO pays for power are consolidated and parceled out to generators without regard to the volume of power actually supplied to LESCO. This puts LESCO, which is capable of paying the unsubsidized portion of the power bill from its own revenues, in the same class as other DISCOs who cannot, and ensures that LESCO cannot take unilateral steps to improve its power supply picture. LESCO's cash flows are impacted significantly by the lack of electronic funds transfer capability on the part of a significant number of organizations

	operating customer pay points. This situation works against the timely receipt of funds necessary to operate the business. As a result, investment in both distribution system assets and employee equipment is hampered by low capital availability and operating performance impacted by poor cash flows. A new, rationalized financial framework – covering both internal and external relationships and transactions – is needed to assure better bottom-line performance.
COMMERCIAL	The entire revenue cycle, from the setup of a new customer account to meter reading to receipt of customer payments and ultimate revenue recognition, remains a highly fragmented and manual process, lacking even the most basic elements of automated processing that were in evidence in other countries' utilities by the late 1970s. The perpetuation of these obsolete business processes and practices at LESCO virtually assures negative cash flow impacts, higher than necessary levels of payment arrearages, low customer satisfaction, and delays in completing even the simplest jobs.
HUMAN RESOURCES	LESCO's corporate culture is akin to that of a government agency in which lifetime employment without performance expectations is balanced by low salaries. This environment makes it difficult for LESCO to recruit skilled candidates for open positions because the best candidates command higher salaries in private industry. As a consequence, LESCO is both overstaffed by any reasonable benchmark, and under-resourced, with a serious shortage of employees with the right mix of technical training, experience and motivation to accomplish its mission. Moreover, the corporate culture requires a complete overhaul to instill in all employees the strategic message that quality of work, responsiveness to customer needs, and constant attention to safety are among the company's highest values.
COMMUNICATIONS & OUTREACH	LESCO's communications and outreach practices are a continuation of the orthodox culture of a public sector organization. Rigid protocols of restricted availability and access to information governed by obsolete modes of communication of manual transfer of circulars and files obscure transition to contemporary corporate culture. Moreover, dismally low penetration of information technology and internal resistance toward digitizing procedures, rules and regulations impede productivity, stifling innovation and service improvements. The overriding influence of PEPCO in undertaking mass media campaigns further skews the overall function of external communication, limiting its role to public relations (PR) only. The resulting lack of proactive consumer outreach has resulted in chronic customer dissatisfaction. Furthermore, effective customer service delivery is hampered by lack of emphasis on building a customer-friendly corporate image.

KEY RECOMMENDATIONS

Table 2 contains key recommendations of Component 1. Additional, detailed recommendations can be found in Section 3 of this report.

TABLE 2: KEY RECOMMENDATIONS OF LESCO OPERATIONAL AUDIT

GOVERNANCE	The recently reconstituted Board of Directors should be given authority to direct the affairs of HESCO. The Board should be empowered to: 1. Set company policies, performance objectives and strategic directions. 2. Adopt bylaws. 3. Name members to its advisory, executive, finance, and other committees. 4. Hire, monitor, evaluate, and fire the CEO and senior executives.
ORGANIZATION	LESCO should consider a new organizational structure designed along functional, as opposed to geographic, lines. Departments should include General and Administration, Commercial Management, Finance, Operations and Maintenance, and Engineering and Planning. The proposed structure will allow the chief executive officer to focus on strategic issues, leaving day-to-day operational management to qualified senior managers. The proposed organizational structure is shown in Figure 7.
ENGINEERING	The operational audit produced a large number of specific recommendations in the areas of loss reduction, mapping and planning, high tension, low tension, and metering. These are detailed in the Recommendations section of this report. One key recommendation that holds the promise to improve many areas of engineering performance is an upgrade to current substation metering that would enable direct reconciliation of customer kWh meter readings on feeders served to a known area total. This would allow the company to identify and target areas where non-technical or commercial losses, e.g., electricity theft or meter fraud, are high and at the same time enhance the quality of load information available to system planners and operators.
FINANCIAL	LESCO's greatest financial vulnerability centers on its relationship with government clients. Given that it is unlikely that LESCO can make significant progress to ensure higher collection rates from this class of customer, the recommended solution is to negotiate tax payment offsets under which unpaid bills are discounted from collections of local and federal taxes. In addition, a new financial framework is needed within LESCO and should include: 1. Updated accounting and internal audit procedures that more effectively serve the needs of the Board of Directors and reflect the new enterprise resource planning (ERP) environment. 2. Improved transfers from external pay points to LESCO bank accounts. 3. Complete implementation of the ERP platform with expanded applications to serve all finance and accounting needs in line with control, management, and financial reporting to the LESCO Board of Directors, National Electric Power Regulatory Authority, and the

	Ministry of Water and Power as needed. 4. Establishment of in-house expertise to support ERP functionality, train LESCO management and staff, and develop new applications. 5. Insurance coverage for buildings, equipment, inventories, and other assets as deemed necessary to eliminate exposure to significant financial loss.
COMMERCIAL	A number of vulnerabilities exist in LESCO's revenue cycle that require immediate and comprehensive attention. Commercial management is the fulcrum of successful electric distribution utilities; if commercial practices and procedures are not carefully designed and implemented with discipline and integrity, the financial viability of the utility will be at risk. LESCO's business processes for customer service/revenue cycle should be systematically improved for increased revenue recovery, improved commercial efficiency, and more effective consumer service with: 1. A census to verify/add consumers. 2. Installation of a new customer information system. 3. Corporate reorganization so that all commercial activities report to the director of consumer services. 4. Updated metering, using automated metering technology where appropriate. 5. Reorganized and updated meter reading routes. 6. Implementation of energy accounting. 7. Design of more comprehensive customer service and consumer awareness programs. 8. Enforcement of meter reading audits and meter inspection programs. 9. Establishment of a program of systematic meter checking, testing, and replacement.
HUMAN RESOURCES	LESCO management should strive to create a corporate environment and employment conditions that enables *all* employees to: 1. Always know what the company's Vision, Mission and Goals are. 2. Understand their roles and responsibilities in the organization and how they contribute to the company's success. 3. Have the appropriate level of authority needed to manage assigned tasks. 4. Have the equipment, support, knowledge and training to succeed. 5. Be fairly compensated for their work with adequate benefits. 6. Feel engaged with their position and the company as their institutional home.
COMMUNICATIONS & OUTREACH	Proactive communication lies at the heart of a corporate service delivery organization. To this end, LESCO needs to accord a more central, well-positioned and well-recognized role to communications and outreach with an emphasis on: 1. Restructuring and empowering the PR Department to spearhead communications and outreach. 2. Developing and implementing an integrated corporate communications and consumer outreach strategy. 3. Integration and adaptation of information and communication technology for fast and efficient inter/intra-departmental communication. 4. Promoting a coherent and strong corporate brand. 5. Developing an annual calendar for developing communications products and conducting public outreach activities for consumer awareness and education on the role of LESCO, energy conservation, theft control, etc. 6. Training relevant staff in basic information technology,

	communications and outreach skills. 7. Supporting the Customer Service Department in developing a friendly and consumer-centric interface. 8. Developing consumer rights information material on consumer complaint handling, etc. 9. Upgrading the website to serve as a platform for convergence and information sharing.

STRATEGIC DIRECTIONS

The value inherent in this report comes from its approach—a thorough and independent operational audit of all key areas of the company—and its candor. By speaking directly and without nuance to the array of problems LESCO faces today, the report lays bare what is wrong and what should be considered by LESCO management to fix it. The obvious downside of trying to address this many problems is that the "forest may be lost for the trees." Several management approaches can help counter this.

Importance of a Strategic Plan

A strategic plan is the best way to manage complex change, overcome complacency, galvanize the organization and gradually alter course. Creating a strategic plan for LESCO, adopting long-term goals, and ensuring that all employees understand them will create a shared awareness and, even more importantly, shared accountability. Every employee should know what is important to the company, where improvement is needed, what they can do to help, and how progress will be measured. Without a strategic plan, it is hard to imagine how management can succeed in addressing the problems highlighted in this report, many of which have persisted for decades. A small number of long-term goals typically form the basis of a strategic plan. Meet an ambitious benchmark for power reliability, achieve a highly favorable customer satisfaction level, or achieve financial self-sufficiency for both operating and investment capital by a certain year – these are typical of goals that have been adopted by other major electric distribution companies around the world.

Benchmarking to Measure Progress

LESCO is in an ideal position to measure its changing performance objectively to judge whether its strategies are working. As one of Pakistani DISCOs, the company can compare its measured performance against a group of its peers within a common industry setting. Suitable benchmarking measures may include typical bill (cost for first 500 kWh of monthly service), ratio of employees to customers served, debt-to-equity ratio, and other widely used utility statistics, which are generally available. Long-term targets for improvement in any area should however come from high-performing utilities of comparable size and customer mix outside Pakistan. Several utility benchmarking organizations routinely publish such data for their subscribers.

CRITICAL SUCCESS FACTORS

Numerous barriers stand in the way of LESCO improving its operating performance and becoming financially self-sufficient. These may include complacency or unwillingness to change, policies that work against new approaches, lack of convincing leadership, or simply inadequate resources. However, some of these barriers carry special importance for a company like LESCO and overcoming them will be critical to success.

Appropriate Use of Technology

LESCO's business processes are based heavily on manual processing, supplemented by information technology components that are legacies of the 1980s. While business procedures themselves may be reasonable, the growth of the utility has outstripped the ability of staff to perform many of the checks and balances built into the manual system, allowing for errors and potential manipulation of results. Moreover, the time required to complete even the most routine customer requests, such as new account setup, is excessive.

It is evident that automation technology can play a major role in helping LESCO to leverage better performance. Processes can be streamlined and job tasks automated. However, the company may currently lack the organizational capability to successfully implement more advanced technologies that are being adopted by leading utilities elsewhere. Employees are not accustomed to learning how to use new systems and adapting their work flows to take full advantage of technology. Familiarity with computers, local area networks, and common desktop software is likely to be severely limited. Procedures that accompany technology-enabled business processes, e.g., backups, system modifications, to insure their robustness may be unfamiliar territory. *Accordingly, failure to allow sufficient time for rank and file employees to assimilate technology changes and participate in the redesign of their own business processes and work practices would put LESCO's technology investments at risk and technology projects could create problems rather than solve them.* In the near term therefore, emphasis should be on widely proven technology solutions that automate manual processes, especially in 'back-office' systems such as customer information and full build-out of ERP. More sophisticated uses of technology can come later.

Fostering a Corporate Culture that Embraces Change

Obviously, setting a course for the future does not necessarily ensure that the destination will be reached, or reached safely. In LESCO's case, nothing short of a dramatic change in corporate culture will be needed. All employees must feel that they are valued corporate assets in whom investments such as training will be made and whose welfare is considered vital. Leading utilities around the world empower their employees to identify problems, help devise solutions and receive recognition and rewards for doing so. These global leaders in the power sector have created cultures in which continuous improvement of work practices is the responsibility of every employee and no problem is too small to receive specific attention. Empowering LESCO's employees to participate meaningfully in the fundamental changes that lie ahead will help spur the move to a new and higher performing corporate culture.

In particular, LESCO leadership, starting with the chief executive officer and Board, must embrace change; accept that incremental improvements will not be enough for the company to keep pace in the rapidly changing Pakistani power sector; and present change to employees as a positive force. To the extent that employees see this leadership, working to address the needs documented in this report will be seen as a welcome, and long overdue, experience for most.

HOW THIS REPORT IS ORGANIZED

The main body of this report is organized in a way that is intended to highlight current challenges LESCO faces and identify actions that can be taken to address them.

- Section 1 provides essential background on the utility industry setting in Pakistan, on Pakistani electric distribution companies in general, and on LESCO in particular.
- Section 2 contains results of the operational audit in all functional areas, with bulleted summaries of findings in the front of each subsection, followed by analysis and discussion.
- Section 3 provides recommendations to address current needs and improve operating performance. Key recommendations have been brought forward to focus attention and facilitate action.
- A detailed description of the PDIP audit methodology is provided in the Appendix.

1. INTRODUCTION

1.1 INTRODUCTION AND OVERVIEW

The Power Distribution Improvement Program (PDIP) is a three-year USAID-financed project designed to facilitate improvements in electric power distribution utilities in Pakistan that was initiated in September 2010. The PDIP was designed for implementation in two distinct components, beginning with operational audits at each of the eight Government-owned distribution companies (DISCOs), and definition of performance improvement action plans for each DISCO. The second Component will focus on execution of the performance improvement action plans for each DISCO, including implementation of pilot projects to demonstrate a number of key operational improvements.

The principal challenge of successful change management for each DISCO lies in transforming the management practices and basic work culture of the utility to make it an effective, efficient and service oriented organization, including reining in its corrupt elements. The process requires that virtually all employees buy-in to the new, progressive vision of the organization, receive training in new methods of work, and have the liberty of putting into practice the new concepts learned. To do this requires the input of intensive, specialized expertise as well as a DISCO management team committed to the change management objective. It also requires the Government of Pakistan (GOP) to create legal and political space for the management of the utility to operate in the most commercially rational manner, especially with full transparency and streamlined funds transfer arrangements within the energy sector.

Key performance improvement targets will be established on a case-by-case basis with each of the participating DISCOs to form the foundation of each respective Performance Improvement Action Plan. Each Performance Improvement Action Plan will be jointly developed taking into account the results of joint self-task force operational audit of each participating DISCO and other participating GOP entity. The purpose of these operational audits is to establish baseline information required to measure achievements under the PDIP and other related programs. The audits will cover the managerial, operational, financial, and customer service situation of each DISCO and include the identification of opportunities and methodologies that will be used to reduce technical and nontechnical, e.g., commercial, losses and improve network, institutional and management, and staff performance.

1.1.1 Background

Industry Environment

Pakistan's power sector is beset by a number of significant challenges. These include the availability of reliable and affordable electric power, modernization of the aging and inadequate transmission and distribution networks, and focusing on effective, efficient system planning, construction, operation and maintenance to achieve business objectives and customer satisfaction. With respect to retailing electric service to consumers, the challenges include control of an increase in unauthorized connections, elimination of collusion between employees and customers to reduce unauthorized use of electricity, and rationalization of retail electricity tariffs; promotion of a cultural change in a more conducive work environment and compensation packages to the employees, and introduction and enforcement of merit based selection of employees. With respect to regulation of service, the challenges include achieving a balance between the business and social objectives, improvement of quality of service and technical performance standards, and introduction of advanced technologies.

The power sector is currently in a state of transition from the wholly Government-owned utilities to fully autonomous companies in power purchase, generation, transmission and dispatch and distribution. Initially, the power sector was run as a monolithic organization under the Water and Power Development Authority (WAPDA). The WAPDA Power Wing provided the line and functional control of the Power Distribution Wing directing the operation of eight area electricity boards (AEBs) in Lahore, Faisalabad, Gujranwala, Islamabad, Multan, Hyderabad, Peshawar, and Quetta. In 1998, WAPDA was restructured along the now familiar lines calling for unbundling of generation, transmission and distribution. The AEBs were converted into stock companies called DISCOs with all the shares held by the GOP, a

regulatory agency was established, and a new entity the Pakistan Electric Power Company (PEPCO) created to supervise the transition to full autonomy of the DISCOs. Twelve years later, the "transition" continues and autonomy remains an objective rather than a reality.

The GOP recently established a transition committee under the deputy chairman of the Planning Commission and is now working on a reform agenda for the entire power sector. The main objective is to achieve a deregulated power sector with independent power generation companies, a central power purchase agency, a transmission and dispatch company, generation companies (GENCOs) and fully autonomous power distribution companies. The National Electric Power Regulatory Authority (NEPRA) is already overseeing and approving the power tariffs and DISCO quality of service. NEPRA is also developing its role as a regulator and considerable capacity building, legal framework and policy reforms will be required to have a fully functional power sector. The roles of different agencies although defined are not properly implemented to achieve a fully functional power sector.

The biggest challenge to the power sector is the increasing burden of fossil-based power generation at high cost. Past policy decisions, intentional or otherwise, established natural gas with fuel oil backup as the primary power generation fuels. The failure to develop additional gas resources has increased the use of the fuel oil component of the mix, and the government decision to protect consumers from the full cost of oil-generated power has resulted in an immense subsidy burden on the GOP. Financing the subsidy was left in part to the DISCOs with the result that a huge (over Rs. 300 billion) circular debt has been created. The continued adherence to building social objectives in the tariff design, huge wastes and inefficiencies, customer noncooperation, lack of resources for system rehabilitation and expansion, lack of a well designed and customer friendly renewable and demand side management program is crippling the power sector as a whole. Major changes are needed to make Pakistan's power sector healthy again.

Challenges Faced by DISCOs

Pakistan's DISCOs were created as independent, state-owned utilities superseding the old AEBs in 1998, with the goal of becoming fully autonomous government corporations after a transition period. While the DISCOs have increased autonomy in comparison with the old AEBs, they do not yet operate as fully autonomous, government-owned corporations. This is indeed one of the objectives of the newly launched electric power sector reform program. Toward this end, the GOP recently dissolved the DISCOs' boards of directors and is in the process of formulating how the new directors will be selected and appointed. Selection of experienced professionals who are able to govern the DISCOs with integrity and impartiality presents one of the principal challenges towards creating highly functioning electric distribution utilities. The DISCOs must operate as independent companies fully responsible for their business activities according to well established business principles. As wholly Government-owned corporations, it is not possible to completely prohibit political impact on the governance and operation of the DISCOs, but political influence needs, nonetheless to be minimized to allow these companies to behave as profit-making, public service corporations.

DISCO retail tariff petitions are presented to NEPRA for review, evaluation, and final approval. NEPRA is a federal regulatory agency tasked with licensing electric power generation, transmission, and distribution companies, as well as regulating quality of service and evaluation and approval of generation, transmission and distribution tariffs. While NEPRA has the statutory authority to approve tariffs, the Ministry of Water and Power (MWP) nonetheless controls the final tariff setting process by notifying the approved tariff to the DISCOs – essentially, the MWP concessionaires through a tariff approval process. Given that the GOP is highly sensitive to any upward tariff pressures, the MWP has not yet approved application of the full cost of service for the DISCOs, nor have they allowed any tariff differences among the various DISCOs, regardless of differences in customer mix.

As a result of the political sensitivity to application of full cost-of-service tariffs, several DISCOs show negative financial results and will not be financially viable until and unless the tariff structure is adjusted to allow for higher revenue collection. Recent increases in tariffs have resulted in limited improvement in the cash flow of some DISCOs, especially the Lahore Electric Supply Company (LESCO), which has a much higher load density and energy sales per km of the distribution network. Application of true cost of service and making profits for reinvestment and better employee and customer care remains one of the principal challenges for the DISCOs.

Due in part to under-recovery of revenues, DISCOs have failed to invest in distribution system upgrades, and suffer from overloaded and deteriorating feeders and distribution transformers, inadequate metering, and outdated technology. Automated asset management has not yet been implemented at any DISCO. Preparation of expansion and rehabilitation projects by DISCO engineering departments is undertaken on an ad hoc basis, rather than as part of an integrated, annual planning process.

The organizational structure of the DISCOs is not conducive to smooth and effective utility operations. The policies and procedures need to be realigned to address process inefficiencies, as well as to introduce checks and balances for data integrity and improved financial controls. Realigning the existing manpower to meet the future private sector utility operations will need to be directly addressed by each DISCO, but will likely take significant effort due to complications with unions and a significant change in organizational mentality. Bringing the DISCO organizational and staffing structure in line with efficient and effective private sector utilities will be a great challenge.

The relationships of the DISCOs to the MWP will, without question, need to be realigned. Ideally, the MWP should establish a board appointment process that is objective, transparent, and nonpolitically aligned, and thereafter monitor DISCO financial health through an arm's length monitoring process. NEPRA, through its regulatory role, will continue to monitor quality of service and tariff-setting in the normal fashion practiced by regulatory agencies throughout the world. DISCO performance should be the purview of DISCO management and their Board of Directors; these are the corporate agents responsible for efficient operation of electric utility operation in well-functioning electric power sector environments, and this pattern would benefit Pakistan.

1.1.2 Purpose of Operational Audit and Improvement Action Plan

The objective of the LESCO Operational Audit was to evaluate the company's performance in engineering, finance, commercial, and human resource (HR) functionality, as well as to gather and evaluate the baseline data and information that will be used to measure performance improvements in future years. With the goal of measuring the achievements under the PDIP, the LESCO audit covered the managerial, operational, financial, and customer service areas and identified opportunities and methodologies that could be used to reduce technical and commercial losses and improve network, organizational, financial and management and staff performance. The Operational Audit provides an objective foundation for LESCO's Performance Improvement Action Plan.

1.2 LESCO PROFILE

LESCO is a wholly Government-owned utility with its headquarters located in the city of Lahore, the provincial capital of Punjab. LESCO is located in the northern part of Punjab. It has boundaries with the Gujranwala Electric Power Company Limited in the north, Faisalabad Electric Supply Company Limited in the east and Multan Electric Power Company Limited in the south. As Figures 1a and 1b illustrate, LESCO territory covers the districts of Nankana, Sheikhupura, Lahore, Kasur, and Okara. The territory encompasses 19,064 sq. km.

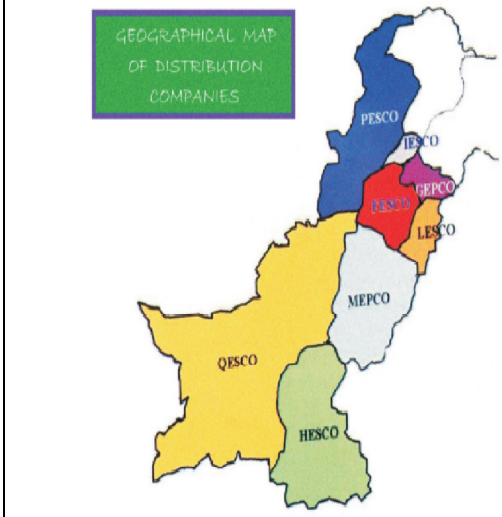


Figure 1a: Location of DISCOs

Source: NEPRA Industry Report 2009

Figure 1b: Service territory of LESCO

Source: LESCO presentation, 5 October 2010

LESCO has 161 subdivisions that fall under 33 operational divisions. On average, about five subdivisions are controlled by each division. There are operation, construction, and meter and testing (M&T) divisions, as shown in Table 3.

TABLE 1.1: LESCO CHARACTERISTICS

No	Description	Value
1	Administrative Districts Served	5
2	Service Area (km²)	19,064
3.	Operation Circles	7
4	Operation Divisions	33
5	Operation Sub-divisions	161

1.2.1 General Description of Market

As on 30 June 2010, LESCO had about 3 million customers. Nearly 81% of these customers are domestic. As indicated in Table 1.2, the other predominant category is commercial. Industrial customers represent about 2% of the total.

TABLE 1.2: LESCO CUSTOMER DISTRIBUTION AS OF 30TH JUNE 2010

NO.	CUSTOMER CLASS	CUSTOMERS	CUSTOMER MIX %
1.	Domestic	2,587,000	81.29
2.	Commercial	476,706	14.98
3.	Industrial	65,695	2.06
4.	Bulk Supply	481	0.02
5.	Tube wells	50,427	1.58
6.	Other	1984	0.06

	TOTAL	**3,182,293**	**100.00**

Source: PEPCO Report on DISCOs Performance Statistics for Year ended June 30, 2010

The distribution of sales is another matter, however, with 38.6% of sales going to industrial consumers and 41% to domestic consumers. From a revenue standpoint, then, industrial kWh sales are very important for LESCO's financial performance.

TABLE 1.3: LESCO SALES FOR 2009-10

No.	Customer Class	Sales GWH	Proportion %
1.	Domestic	5,694	41.02%
2.	Commercial	1,190	8.57%
3.	Industrial	5,360	38.61%
4.	Bulk Supply	391	2.82%
5.	Tube wells	1144	8.24%
6.	Other	103	0.74%
	Total	**13,882**	**100.00**

Source: PEPCO Report on DISCOs Performance Statistics for Year ended June 30, 2010

1.2.2 Statistical Summary and Comparison With Other DISCOs

The performance indicators for which statistical data is available include total losses, unplanned outages, transformers burnt ratio, new connections achievement, and bills adjusted, as shown in Table 1.4.

TABLE 1.4: LESCO 2010 KEY PERFORMANCE INDICATORS

No	Description	Value
1.	Transmission & Distribution Losses	13.8%
2.	Outages	
	Number of Outages	72,199
	Total Outage Time (hrs)	53,562
	Hours per Outage	0.742
3.	Transformer Failure (% MVA)	3.7%

As summarized in Table 1.5 below, LESCO has about 16% market share in terms of the number of customers of all DISCOs. Yet its share in the energy sales is 22% and contribution to revenue collected is 21%. The share of receivables from Government customers is only 6% of the total, whereas the receivables from private customers account for about 15%, in line with the share in the number of customers. LESCO's high tension (HT) and low tension (LT) network is only 9% and 7% of the total length of HT and LT lines under all DISCOs, respectively. The transformer capacity is nearly in the same proportion as the share in number of customers. LESCO is responsible for about 20% of the allocated load and total peak demand of all the DISCOs.

TABLE 1.5: LESCO FY 2010 STATISTICS

Description	All DISCOS*	LESCO	Share (%)

Customers	19,582,224	3,182,293	16.25
Sanctioned Load (MW)	47,855	8,929	18.66
Non-Coincident Peak Demand (MW)	19,288	3,916	20.30
Energy Sales (GWh)	63,660	13,882	21.81
Employees	122,530	19,765	16.13
Revenue (Million Rs)			
- Billed to Customers	488,022	117,297	24.04
- Collected from Customers	517,055	109,345	21.15
Receivables from Customers			
- Private	103,351	15,968	15.45
- Government	58,026	3,403	5.86
Total	161,377	19,371	12.00
Distribution Network			
- HT Line (km)	279,990	24,873	8.88%
- LT Line (km)	205,020	14,419	7.03%
- Dist Trans Capacity (MVA)	32,524	5,780	17.77%

Source: PEPCO Report on DISCOs Performance Statistics for Year ended June 30, 2010
*Nine DISCOs Including TESCO

Of the eight licensed DISCOs, LESCO is the largest company in terms of number of customers, energy sales, allocated load, power demand, revenue billed and collected per km of medium voltage distribution line (HT line).

LESCO reports relatively high collection rates, and comparatively lower line losses. Within the confines of the Pakistan power sector, LESCO is a relatively high functioning electric distribution utility; it has been able to show a profit as measured by its ability to live within the means of the distribution margin (DM) allowed by NEPRA. In a larger sense, all DISCOs contribute to generating staggering losses from the commercialization of electric power, but this is due to the fact that, the increasing cost of purchased power has not been passed on to the consumer due to the GOP's belief that consumers are not able to pay the full cost of electric service.

Nonetheless, there are multiple opportunities for LESCO to achieve improved effectiveness and operational efficiencies. The purpose of this report is to explore LESCO operating practices and procedures, to identify where LESCO should be able to make improvements in operating practices, and to document the specific policies, procedures, and operational practices that will need to be improved to contribute to lower operating costs, and improved overall financial and technical performance.

1.3 OVERVIEW OF PDIP AUDIT METHODOLOGY

The PDIP operational audit process was designed to facilitate data collection and to evaluate functional performance in close collaboration with DISCO management. The approach adopted was to evaluate operating performance by analyzing business processes and practices, and collecting information through one-on-one interviews with DISCO management and employees. The PDIP team not only collected operational data, but also reviewed and evaluated management practices and processes to gain insights that could not be gleaned from statistics alone. For example, a key business process for all electric distribution utilities is the commercial revenue cycle – the means by which meters are read, bills are processed and delivered, revenues are collected, and delinquency notices are delivered.

The operational audit of LESCO followed a process similar to audits undertaken of the other seven DISCOs. The process collected and evaluated data for multiple areas of electric distribution operations, including:

- Governance
- Organization
- Engineering
- Financial
- Commercial
- HR

Comparison of performance indices for LESCO with those of highly functioning electric distribution utilities outside Pakistan highlighted functional processes that require improvement, while consideration of available best practices allowed the PDIP team to identify high impact performance interventions.

A complete and detailed description of the operational audit methodology followed is provided in the Appendix.

2. RESULTS

2.1 GOVERNANCE

2.1.1 Overview

The PDIP team evaluated the structure and activities of LESCO's Board of Directors to understand exactly how the Board was configured and what level of authority it possessed. Key findings and analysis of that review are contained in this section of the report. Unfortunately, on 22 November 2010, all DISCO boards were dissolved by order of the MWP, so many of the PDIP's observations are no longer germane. However, in the interests of identifying potential improvement opportunities, the findings of the review are presented here nonetheless.

2.1.2 Summary of Key Findings

The following are the key findings of the PDIP review of LESCO's corporate governance:

- LESCO's Board has not yet completely fulfilled its governance responsibilities, lacking the expertise and authority to meet challenges facing the company in the changing Pakistani power sector. Board powers are limited and it is unclear whether the Board has the ability to tackle major issues or oversee strategic change.

- The chief executive officer (CEO) has served as a member of the Audit Committee of the Board – an obvious conflict of interest.

- There has been no financial expert either on the Audit Committee or the Board itself, casting doubt on the Board's ability to lead LESCO toward financial self-sustainability.

- Review of Board minutes indicates that matters considered are largely routine, and that there is little evidence of what might be called strategic issues being taken up by the Board.

- Declaring its intention to reduce the influence of the government in DISCO governance and move DISCOs toward greater operating independence, the MWP recently dissolved the LESCO Board from service and appointed a new Board.

- While the new Board appears to provide a better mix of professionals and stakeholders, appointment of the joint secretary of power to the Board is unlikely to advance the stated goal of Board autonomy, high professional standards, or greater operating independence.

2.1.3 Analysis and Discussion

The Board of Directors of each DISCO is governed by the Memorandum & Articles of Association, a document reflecting provisions described in the Companies Ordinance of 1984, as amended. The LESCO BOD consisted of seven members, including the CEO. Because the company is wholly owned by the government, MWP appoints all public directors and PEPCO appoints all private directors according to a formula as follows:

- Four members from the public sector, including the CEO of the utility.
- Three members from the private sector, of which one will be the Chairman.

The Memorandum and Articles of Association require two meetings every fiscal year (FY) with other meetings held at the discretion of the Board. One of the required meetings is a statutory meeting of the Board that is convened after the end of the FY to review and approve various items, including the state of affairs of the DISCO. This meeting is preparatory in nature to prepare Board members for the annual general meeting of the shareholders. It must take place within four months after the end of the FY. The Board has not developed any of its own policies specific to the governance of an electric utility in general,

nor to LESCO in particular, relying on the requirements of the Companies Ordinance 1984 and the Articles of Association of LESCO.

The LESCO Board has chosen to voluntarily govern itself, informally, under the Code of Corporate Governance, a set of governing standards for listed companies. These standards are more stringent and as a result the LESCO Board meets on a monthly basis to ensure that "important Company business can be reviewed and executed in a timely fashion, as well as to keep up to date with important issues pertaining to LESCO operation." A review of Board minutes indicate that matters considered are largely routine; however, pertaining to approvals of procurements and other mundane matters, and that there is little consideration of what might be called strategic issues, which are appropriate for Board consideration.

In reality, Board powers are limited and it is uncertain how well the Board could cope with a requirement to consider strategic issues. For example:

- The appointment and evaluation of the performance of the CEO is perhaps the single most important Board function in most corporations, but the CEO of LESCO is appointed by PEPCO, and is himself a member of the Board.
- Similarly, the entire senior executive cadre of the company is appointed by PEPCO rather than being selected or recruited through a more rigorous qualification process.
- Board members nominated from government agencies were senior in position and therefore older, resulting in short Board tenures and high turnover.
- The Board did not include an individual with financial expertise to serve on the Audit Committee.
- Additionally, the CEO serves on the Audit Committee, which is a clear conflict of interest

In an effort to understand just what powers the Board actually has, the Book of Financial Powers (BFP) was reviewed and discussed with the secretary of the Board, who is also LESCO's in-house attorney. The BFP is a governing document and was approved by the Board in October 2002. The BFP establishes various approval authorities and monetary limits for financial transactions and certain other actions taken by LESCO's management and Board in the operations of day-to-day activities. LESCO has prepared a draft of proposed changes to the BFP to address more efficient approval authorities and adjust monetary limits to reflect the current financial environment. These proposed changes were made with regard to maintaining high corporate governance and internal control standards. This proposal was made in 2008 but has been delayed pending approval by PEPCO. It was the conclusion of the PDIP team that the LESCO Board had relatively little authority over the management of LESCO and could not be considered a true corporate board.

As noted, in a notification from the MWP dated 22 November 2010, all DISCOs, GENCOs, and National Transmission Dispatch Company (NTDC) boards were released from service on the DISCO boards. The order stated the intention to reconstitute the boards "on professional lines" in accordance with the guidelines of the Cabinet Committee on Reforms with special emphasis on representation from consumers. Significant changes include:

- The majority of directors must come from the private sector.
- Ministers/secretaries/Government officials may not be nominated as chairman of the Board.
- Representation from the administrative ministry/division on the board of a DISCO is restricted to one.

This is clearly an action intended to reduce the influence of the GOP in the governance of the DISCOs. The notification should be considered a definitive step toward establishing the DISCOs as more independent public corporations. To serve the DISCOs in a professional manner, the new directors will require training to strengthen their understanding of the role and function of independent boards of directors, as well as training to understand the commercial and technical nature of electric distribution

utilities. PEPCO had previously been involved in board governance primarily as a manpower transition planning authority for the CEO and senior management. In addition, PEPCO also acted as an authority on any proposed new positions at the DISCO. This was a role PEPCO assumed during the transition period after DISCO formation and it never relinquished. DISCOs must be able to manage their own HR requirements.

On 23 December 2010, the GOP reconstituted two boards, LESCO and the Peshawar Electric Supply Company Limited. The LESCO Board is now headed by the present chairman of the All Pakistan Textile Mills Association. Other Board members include a professor from the Lahore University of Management Sciences, former managing director of SSGC and SNGC gas utilities, joint secretary for power of the MWP, former president of First Women Bank Limited, a former member of WAPDA, a former managing director of NESPAK and a development economist of international stature. The remaining Board members are persons representing important stakeholders. The new Board appears to provide a better mix of professionals and stakeholders.

While the appointment of the joint secretary for power to the LESCO Board does not violate the law or the stated objective of limiting representation from the administrative ministry, this action does not appear to create progress toward the stated goal of Board autonomy and professionalism. The joint secretary for power holds the line responsibility at the MWP for supervision of DISCOs and his presence on the Board may reinforce the authority of the MWP in matters brought to the Board. Rather than a step in the direction of reconstituting the Board along "professional lines," this appears to be a step in the opposite direction, increasing government control.

2.2 ORGANIZATION

2.2.1 Overview

The PDIP team analyzed LESCO's current organizational structure for effectiveness and efficiency, from the CEO leadership position to operational units. This review highlighted the fact that LESCO's current organization is largely structured around geographic responsibility as opposed to being structured along functional lines. Leading electric distribution companies worldwide today are organized along functional lines.

2.2.2 Summary of Key Findings

The following are key findings of the PDIP review of LESCO's organizational structure:

- LESCO's CEO manages all headquarter functions and oversees field operations managed by circle superintendent engineers (SEs). As such, the CEO has far too many direct reporting managers and day-to-day operational oversight responsibilities to properly engage strategic issues vital to the long-term survival and success of LESCO.
- LESCO's current organization is structured primarily by geographic area and not along functional lines as is the case with most modern electric distribution utilities.
- LESCO's present structure has commercial personnel reporting to engineering managers. Commercial functions responsible for cash flows within the utility should not report to SEs whose responsibilities focus on power system stability and reliability. This arrangement also creates potential conflicts of interest in the performance of key jobs within the utility.

2.2.3 Analysis and Discussion

The organizational structure employed by LESCO and other DISCOs is designed to employ distribution circles as large geographic management units that are managed as full service utilities – excluding engineering planning.

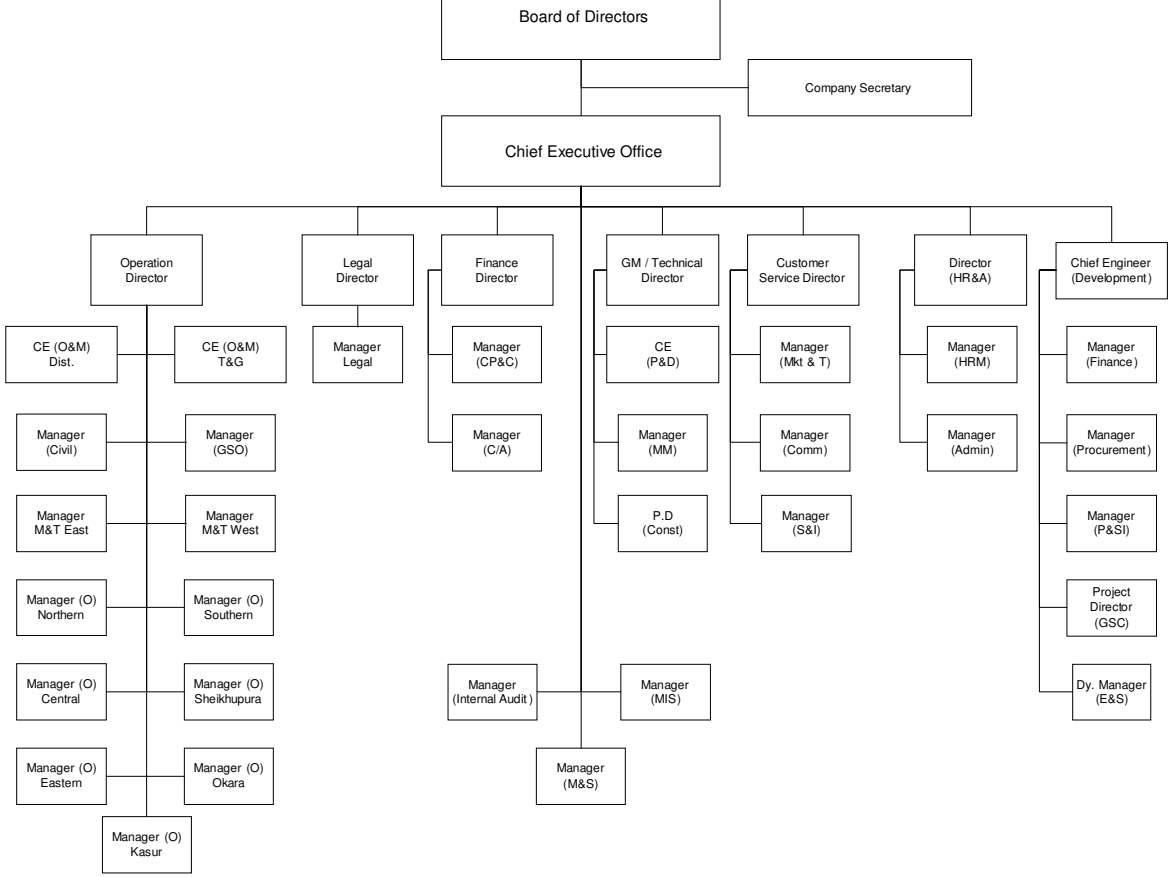
LESCO's CEO responds to the Board of Directors and is responsible for representing the company in the greater Lahore community. He manages all headquarter functions and oversees field operations that are managed by SEs. Divisions are in turn managed by executive engineers (XENs) and subdivisions are managed by sub-divisional officers (SDOs).

SEs are empowered to manage all operational activities except planning and engineering functions, which are managed at the LESCO headquarter level. That is, commercial functions (meter reading, bill processing, and bill delivery), line operations, and connections and disconnections are all supervised by the SE and his staff at the circle, division, and subdivision levels. Payments are made by consumers to designated pay points; DISCO employees do not handle payments from consumers.

This arrangement creates an internal conflict within the distribution circle: since commercial operations are the cash register, so to speak, of any utility, the commercial department should not report to the operations department. The operations department manages the operation and maintenance of physical assets, focusing on availability, power quality and reliability. Commercial operations must be made independent, and allowed to perform efficiently under a management regime that provides better perception of the commercial issues. This is best achieved by managers and staff who have the relevant educational and experiential background, as well as the institutional objectives aimed at optimizing distinct objective functions. Commercial activities have the objective of effectively managing the process of connecting and/or disconnecting services, metering energy consumption, recording consumption data, billing consumers for energy consumed and other services provided, and collecting receivables from consumers. Distribution system operations focus on operating and maintaining the distribution system infrastructure, including recording bulk energy transfers into and out of substations, performing substation and line maintenance, and managing minor system expansion activities.

LESCO's present organizational structure has commercial personnel reporting to engineering managers, circle managers reporting to the CEO, and far too many managers reporting to the CEO. The CEO, whose principal responsibility is to ensure that the DISCO is moving toward progressively effective and sustainable operation, should not be saddled with administrative responsibilities that create a distraction from the chief goals of DISCO financial sustainability. Under the present structure, the CEO has far too many direct reports, including all senior operating staff. That is, engineering planning, DISCO operations, DISCO commercial functionality, DISCO administration, and DISCO financial management should be managed on a day-to-day basis by highly competent managers without CEO involvement, who should only set objectives and review progress toward these higher-level achievements.

Figure 2 illustrates the present organizational structure employed at LESCO.


Board of Directors
Company Secretary
Chief Executive Office
Operation Director
Legal Director
Finance Director
GM / Technical Director
Customer Service Director
Director (HR&A)
Chief Engineer (Development)
CE (O&M) Dist.
CE (O&M) T&G
Manager Legal
Manager (CP&C)
CE (P&D)
Manager (Mkt & T)
Manager (HRM)
Manager (Finance)
Manager (Civil)
Manager (GSO)
Manager (C/A)
Manager (MM)
Manager (Comm)
Manager (Admin)
Manager (Procurement)
Manager M&T East
Manager M&T West
P.D (Const)
Manager (S&I)
Manager (P&SI)
Manager (O) Northern
Manager (O) Southern
Project Director (GSC)
Manager (O) Central
Manager (O) Sheikhupura
Manager (Internal Audit)
Manager (MIS)
Dy. Manager (E&S)
Manager (O) Eastern
Manager (O) Okara
Manager (M&S)
Manager (O) Kasur

2.3 ENGINEERING

2.3.1 Overview

The PDIP review of engineering operations considered four components: transmission system management, distribution system management, mapping and power flow analysis to determine technical and commercial losses, and distribution standards, as described in detail in the Appendix. This section provides the findings and analysis that resulted from this four-pronged engineering review.

2.3.2 Summary of Key Findings

Transmission system management: The following are key findings of the PDIP review of LESCO's engineering operations in the area of transmission system management:

- **Network**. LESCO's transmission network, while heavily loaded and in need of upgrading, is robust and appears to provide adequate service. It is unlikely to be a significant contributor to total system losses or a drag on overall financial performance. In fact, a closer focus on managing the company's transmission assets might yield additional funds for investments in distribution.

- **Losses**. Current estimates of transmission losses appear unrealistically low, suggesting that a problem may exist in transmission-level metering, either at bulk supply points or substations. Differences in the timing of meter reads may also be a contributing factor.

Distribution system management: The PDIP review of distribution system management produced the following key findings:

- **Load forecasting**. A five-year electric load forecast is periodically created by the NTDC using a trend-based method and provided to LESCO for use. This type of load forecast is widely recognized in the industry as being of very little use as it cannot reflect changing conditions or economic conditions. Moreover, five years is widely considered to be too short a timeframe for a load forecast given long lead-times for distribution facility planning and construction. The PDIP team found no evidence that the data needed to prepare a more acceptable end-use or econometric forecast were being collected.

- **Feeder mapping**. Feeder mapping is not carried out on a systematic basis. Each operations subdivision has its own single line drawings of the feeders in its territory, but no geographic maps exist anywhere in the company.

- **Feeder analysis software**. The software used by LESCO for feeder analysis is obsolete and lacks many of the features found in contemporary distribution analysis software, such as direct input of geographic information system (GIS) mapping data, optimization of capacitor placement, analysis of looped systems, modeling of multiple feeders, and graphical presentation of results.

- **National design standards**. Current national design standards do not address congested area construction very well, and this is a significant problem for LESCO.

- **Construction quality**. There are no construction inspectors in the Project Division and projects are self-inspected. Each responsible foreman and line superintendent is supposed to inspect 100% of construction under their responsibility. This approach has the predictable effect of uneven quality of construction. Poles were found to be not properly plumb, transformer platforms not level, and sags of conductors not even.

- **Work practices**. Construction and maintenance work practices in widespread use among LESCO employees are inconsistent, rely on makeshift and stopgap approaches and suffer from lack of available equipment and transportation access. The consequences of these failures are profound: employee safety is routinely jeopardized, worker productivity is low, response to

customer requests can be exceedingly slow, and equipment failures occur more frequently than necessary. All of these direct consequences have negative financial impacts for LESCO.

- **Safety**. Twelve linemen lost their lives while performing company work during FY2010. It is highly likely that improved work practices and safety policies could reduce this number and alter perceptions among the workforce that distribution maintenance and repair work is too dangerous to perform.

- **Meter security**. Meter security was found to be compromised by both the ease with which meter installations can be tampered with and equally vulnerable service drops.

- **Procurement**. LESCO conducts an excessively large number of procurements annually, often for relatively small dollar amounts. Also, procurement practices that are non-standard effectively preclude international companies from bidding, unnecessarily narrowing the competitive field and obviating potential savings.

Distribution feeder mapping and loss segregation: Here are key findings of the review of feeder mapping and segregation of technical versus commercial losses:

- Detailed modeling of distribution system losses (see the Appendix for a full description of the estimation approach used) indicates that technical losses on LESCO's system should be approximately 5.4% of annual energy (kWh), the lowest among Pakistani DISCOs according to the benchmark comparison.

- In contrast, LESCO reported total system energy losses of 13.8% in FY2010. If transmission losses were 2.3% as the PDIP estimated, the distribution component of loss would be 11.5%. The difference between the distribution technical loss of 5.2% and a probable total distribution loss 11.5% is a nontechnical (commercial) loss of 6.3%. This figure is likely to reflect large-scale meter tampering, illegal line taps, and meter-reading fraud aided and abetted by company employees

- **Accordingly, a strategic opportunity exists for LESCO to reduce its commercial losses and significantly improve its financial performance.**

Distribution standards: The following are key findings that resulted from visits by the PDIP team to the offices of the NTDC, which plays a major role in national standards setting:

- Although there is considerable evidence that new distribution system design standards are required for electric service in congested areas, such as the old city of Lahore, no activity is under way to evaluate any changes in standards for this purpose.

- LESCO has requested the development of 400kVA transformers that fit into the same footprint as a 200 kVA unit. The objective of this request is to allow "drop in" increases in capacity without additional HT construction to alleviate distribution transformer overloads. The results of the design approach being followed is likely to be a tremendous increase in losses, equivalent essentially to operating a 200 kVA transformer at double its rated capacity.

2.3.3 Analysis and Discussion

Initial visits indicated that the transmission system, while heavily loaded, and no doubt in need of improvement, was providing adequate service. LESCO has a transmission network totaling 2,284 km of 132 kV and 66 kV line, receiving power from the NTDC at six locations. There are 89 grid substations, 41 of them serving Lahore City. System peak demand is 3,916 MW, a figure that is somewhat suppressed by load shedding. This is a relatively minimal transmission network for such a high demand, and indicates that the network consists mainly of short lines that are likely to be heavily loaded. This is a robust transmission network, and while it probably has issues of its own, is not likely to be a significant contributor to system losses.

LESCO prepares a five-year plan covering the requirements of the 132 kV and 66 kV transmission system using PSS/E, a widely utilized power flow software, to model the system. The main activity in the

LESCO transmission network is the conversion of 66 kV line to 132 kV and the establishment of new grid substations. Total expenditures for the transmission network (STG) amounted to Rs. 3,600 million, as opposed to less than Rs. 900 million for distribution improvements. It is clear that the transmission network is a significant focus for LESCO, a focus that might well be adjusted to provide additional funds for distribution reinforcement.

One issue that was raised early in the discussions is the matter of calculation of transmission losses. During FY2010, losses as calculated by subtracting energy received at grid substation 11 kV buses from that delivered at 132 kV by NTDC averaged 1%. It was felt by LESCO's strategic planning unit that this value was unrealistically low and that a problem existed with metering in the transmission network, potentially either at NTDC delivery points or at LESCO's substations. Metering systems at both points are of varying ages and accuracies, and are manually read at different times. When actual losses are low, minor discrepancies in readings or precision can have a significant impact on losses, which are a small difference between two much larger numbers. Both LESCO staff and the PDIP engineering team feel that this matter should be reviewed. A preliminary estimate of transmission losses using estimated values and a simple model of the system yields a likely transmission loss of 2-2.5%, including loss in grid substation transformers. Resolution of this problem will require a more sophisticated metering system at both the common delivery points from NTDC and LESCO's grid substations.

Notwithstanding the determination of transmission losses, there was no compelling evidence that transmission issues were contributing negatively to the financial performance of LESCO and it was decided early in the assessment to focus effort on distribution issues, which were clearly more demanding.

2.3.4 Distribution System Management Assessment

Planning and Design

Planning and design of distribution lines are carried out in the same department under the direction of a chief engineer (CE) of planning and design-distribution. This department is responsible for planning of expansion and improvements to the distribution system and for designing those improvements so that they can be constructed by the Project Department.

The planning environment at LESCO can best be described as reactive. Distribution planning is carried out mainly in response to problems that have been raised by the operating departments or in response the construction of a new grid substation requiring the rerouting of feeders. Comments on the various components of utility planning are as follows:

Load Forecasting

A five-year load forecast is prepared; however, the NTDC determines what growth percentages to use for the various customer classes and communicates these to the DISCO. No overt efforts to collect load forecasting data, such as population growth, demographics, or historical sales data is carried out by LESCO. Data on sales by consumer class is supplied to the NTDC, but the process is prescriptive once the growth factors have been received, that is the LESCO staff projects demand and energy requirements at the established growth rates, and then subdivides the resulting load among the various grid substations. Nothing further is done with the forecasts.

Mapping

Feeder mapping is not carried out on a systematic basis. Each operations subdivision has its own single line drawings of the feeders in its territory, but no geographic maps exist anywhere in the company. When a feeder enters into an overload situation, defined as exceeding a peak load of 300 amps, or the operating subdivision suspects that a distribution transformer is overloaded, it advises the Planning department. The Planning Department sends its surveyor to track the feeder, using the odometer on his motorcycle and other estimating means to assess length. The resulting track, along with conductor and transformer size information is hand drawn on taped together pieces of A4 paper. The information provided by this map is then used as input to the analysis program. Once the issue that brought the feeder or the transformer to the attention of the Planning Department is resolved, the project is archived and no effort is made to maintain or update the feeder mapping information.

Establishment of a new grid substation is a more complex issue, in that many feeders must be mapped and many analyses done, but the outcome is essentially the same, i.e., no attempt is made to update the feeder information that is collected during the course of the project or to maintain any sort of map database.

System Analysis

The software used for distribution feeder analysis is called Feeder Analysis (shortened to FDRANA), and was developed during the 1980s under a USAID program. It operates in MS-DOS and is capable of analyzing a single feeder and its branches, producing a tabular output that assesses voltage drop and calculates losses both for demand and energy. The software can model capacitors and also functions as a work order generation tool, with a database that can produce a material list for new construction. Produced as it was by USAID, the software has no cost to the utility and any number of users can be accommodated. This can be a problem in that multiple persons may have different versions of the same feeder model, leading to confusion during analysis.

While certainly advanced for its time, the software is currently obsolete and lacking in many of the features found in contemporary distribution analysis software, such as direct input of GIS mapping data, optimization of capacitor placement, analysis of looped systems, modeling of multiple feeders, and graphical presentation of results. The software is also extremely laborious to use, as all input is manual and any changes in the system configuration require the creation of a new case, somewhat limiting the incentive to do alternative evaluations. The limitations of the software result in planning on the basis of problems, rather than multi-feeder area planning and exploration of system alternatives, that could result in sound distribution expansion, operation and maintenance.

The transmission department of LESCO, in common with that of other DISCOs, has a license for PSS/E, the software produced by Power Technologies Incorporated and widely used in the US for transmission system analysis. Some consideration was given to using PSS/E for distribution planning, but this was abandoned due to the complexity of the software and lack of resources to renew software licenses. What is needed is an intermediate solution, that addresses the shortcomings of FDRANA while still being simple to use and low in cost.

Design

Design of distribution facilities is governed by standards published by the former WAPDA in the 1960s. These standards are based on HT lines with bare ACSR conductors serving relatively large (100 and 200 kVA) transformers installed on overhead platforms, which in turn serve three-phase low-voltage networks using bare aluminum conductors. In the case of LESCO, many customers have paid for the installation of dedicated transformers ranging in size from 25 kVA to 630 kVA. In the vast majority of cases these, dedicated transformers are installed in the same fashion as the public use transformers, i.e., on overhead platforms.

The only significant alterations in these standards since they were established have been the introduction of concrete poles. Prestressed reinforced concrete poles were initially approved, but design is moving toward centrifuged poles due to their higher strength and the resulting ability to carry three circuits. An additional change has been the adoption in the 1980s of Osprey (556MCM 18/1) conductor for 11 kV circuits with heavy electrical loading. Osprey has a current carrying capacity of 700 amps (13 MVA) so should provide considerable capacity. In actuality, the majority of LESCO's switchgear is limited to 400 amps per phase by the current transformers in the breakers, hence the need to consider circuit adjustment at 300 amps. This limitation severely limits the usefulness of the Osprey conductor.

National design standards do not address congested area construction very well, and this is a problem for LESCO. LESCO has not sought the support of the NTDC Distribution Standards group in the development of new designs for use in congested areas and has attempted a number of what can only be considered ad hoc fixes. The most unusual of these is the use of 11 kV underground cable suspended on otherwise standard overhead distribution structures with pin insulators as a means of constructing circuits in congested areas. Due to the weight of the cable, there is considerable sag, and it is very unlikely that this construction could comply with any sort of wind loading requirement. The poles appear to be under

significant stress simply supporting the cable. Additionally, lacking protection against ultraviolet rays from sun exposure, underground cable is not recommended for installation above ground.

LESCO has not, however, pursued multiplex or aerial bundled conductor (ABC) LT line solutions for use in congested areas. Instead, it has installed PVC insulated aluminum conductor on standard open secondary. Again, due to the weight and relatively low strength of the conductor, there are considerable sags, so this strategy can be employed only where ground clearances are not an issue.

An example of the ad hoc approach to planning and construction is shown in the picture below.

This is a get-away structure for a number of circuits from the Bhatti Gate substation in downtown Lahore. It is clear that circuits have simply been added over time until the structure is almost completely unmanageable. It is clear that no attempt has been made at making the structure comply with any standards for clearances or engineering consistency. Some circuits use dual cable feeds with connectors tying the cable to the overhead line, while some use wrapped connections. Some of the cables are spliced partway up the pole and insulated only by separation. A major failure in this structure, such as a multi-cable fault, would result in the shutdown of a huge portion of central Lahore, so elimination of such a structure would normally be considered a priority for a planning effort focused on adequacy and service.

Construction

The mission of the Project Department at LESCO is, as stated by the director, that of execution. He emphasized that the Project Department does not do any design nor procurement but that it is responsible for construction of all distribution facilities in the LESCO service area. Projects undertaken by the Project Department fall into three categories.

- Projects funded from LESCO's budget for system improvements and expansion.
- Deposit work paid for by others, such as line relocation required by road widening.
- Village electrification funded by the GOP.

The breakdown by value of project is about 33% for each of the types of project indicated. In FY2010, LESCO's Project Department constructed 1,416 projects at an aggregate cost of Rs. 1,262 million (about

$US 15.0 million), or an average value of about $US 10,000, which makes the projects individually quite small.

Projects come to the Project Department predesigned and with a material list from the Planning and Design Department. The Project Department examines the locale of the project and prepares its own material list for drawing on stores. In many cases, according to staff, the total material requirements for a particular project are not available in stores, sometimes missing only a single class of item (bolts, or D-irons, for example), which then causes a delay in construction.

The Project Department constructs all projects with its own work force, with the exception of the setting of concrete poles, which is contracted out. The division has a total of 724 permanent staff, of which 537 are linemen or line supervisors. Permanent staff is supplemented with day laborers when required. The Project Department is organized into 20 subdivisions under six divisions, which are in turn supervised by a single central circle. Subdivisions are organized essentially geographically.

The Project Department is self-inspecting, i.e., there are no construction inspectors as such. Each responsible foreman and line superintendent is supposed to inspect 100% of the construction, with higher-level officers required to inspect declining amounts of the work. In addition, a consultant has been retained in recent years to carry out an inventory inspection, that is, to determine that the amount of material used in the project is appropriate. This inspection firm does not perform any construction quality inspections.

A field inspection of a recently completed project was carried out to evaluate construction quality. The work was found to be adequate but generally inconsistent. Poles were sometimes not properly plumb, transformer platforms were not level, and sags of conductors were not even. None of the connections were made with connectors, but were wrapped or served, and full tension conductor splices did not use joining sleeves but were served as well. Connections to transformer bushings were makeshift, made up of bits of connector joined by twisted wire rather than any consistent connection method. The use of served or wrapped splices may explain some of the uneven conductor sags, and the use of served connections will certainly contribute to overheating in the future. In general, the construction can only be described as sloppy, lacking in any emphasis on quality. While shortages of material may explain some of the makeshift construction results, there is no excuse for leaning poles or out-of-level transformer platforms.

The team also observed a small line crew transferring LT conductors from an LT-only line with short poles to a new line with taller poles. The crew consisted of a single older lineman on the pole, assisted by two groundmen. The lineman was forced to move the old line by hand, pulling the wire into place manually without any come-alongs or wire handling tools whatever. Without any tackle or wire gripping devices, the groundmen could do nothing to help, and the process was very slow. During this work the transformer serving the area was de-energized, which meant that all the consumers were without power for significantly more time than would have been required had the line crew been properly equipped.

Operation and Maintenance

The fundamental organizational unit for operations at LESCO is the subdivision, of which there are 169 in the company, each serving approximately 20,000 consumers. Operations subdivisions are defined geographically by feeder service areas and are grouped into divisions with approximately five subdivisions per division for a total of 33 operations divisions. Divisions are grouped into circles with approximately five divisions per circle. LESCO has a total of seven operations circles. In addition to the operations subdivisions there are other subdivisions for M&T as well as for construction as indicated above.

The principle activities of subdivision staff are as follows:

- Continuity of supply, or repair of system failures.
- Meter reading.
- New connections, but only for direct reading meters. All indirect reading meters (with current transformers) are installed by the M&T Department.

- Disconnection of defaulters for nonpayment of bills.
- Line maintenance, including line patrol and rectification of problems, as well as measurement of transformer loading.

Each subdivision typically has approximately 100 staff, of whom roughly 55% are assistant linemen, linemen, or line supervisors, 15% are meter readers and bill delivery staff, 5-10% are complaint center staff, and the remainder are managers or other support staff. It was stated that only about half of the linemen could be depended upon to carry out climbing duties due to age, infirmities, and overweight, although this could not be verified.

Each subdivision has a complaint center to receive and log complaints, and at least one lineman per shift to respond to them. The complaint centers receive complaints either in person or by telephone and record the complaint in rough form on notepaper, transferring the information later to a ledger. The two complaint centers visited had computers for recording complaints, but neither was working, so the process of complaint registration was entirely manual.

In the complaint centers visited, the lineman on call was waiting in the complaint center to be dispatched. His tools were inspected and found to consist of a hard hat, leather and rubber gloves, a climbing belt, and a collection of hand tools such as pliers and screwdrivers in a small bag. All items were heavily used and the hand tools were in very poor condition, with taped handles, and dulled and notched cutting edges. The rubber gloves were for use up to 600 V only, but were intact, without punctures or tears. The leather gloves were in very poor condition with holes and wear. If the rubber gloves were actually being used under the leather gloves, it is difficult to see how they could be kept in good working condition, so either the rubber gloves are replaced frequently or they are actually not used very often. The latter is more likely.

In addition to the hand tools, the complaint center had some larger tools, including a grounding set, fiberglass ladders and various switch sticks and tree trimming hooks. The grounding sets were of a design that simply hangs on the conductor rather than being clamped to it, and would not be considered adequate for personnel protection. The ladders were of high quality but in one case were stored on the roof of the building in the sun, which would not be good for their longevity. The switch sticks were generally made with bamboo handles or with pieced-together fiberglass handles. Neither type of handle had a surface finish that would be considered adequate for use on high voltage lines. All of the switch sticks were stored in ways and places that exposed them to damage from other items lying against them. The tree trimming hooks were dull and unlikely to be of any use whatsoever.

Inspection of the HT feeders and transformer installations indicated that none of the fused cutouts had any fuse tubes in them. All transformer "fuses" were made up of pieces of wire with a rock attached to one end. The purpose of the rock is to cause the fuse to hang vertically when disconnected. Discussions with subdivision staff indicated that fuses in standard fuse tubes frequently fail (meaning that the fuses blow) and it is difficult for the trouble call linemen to keep a proper selection of fuses on hand. Using wire instead of actual fuses certainly limits fuse blowing, but in all likelihood, is a significant factor in the over 4% failure rate of transformers experienced by LESCO.

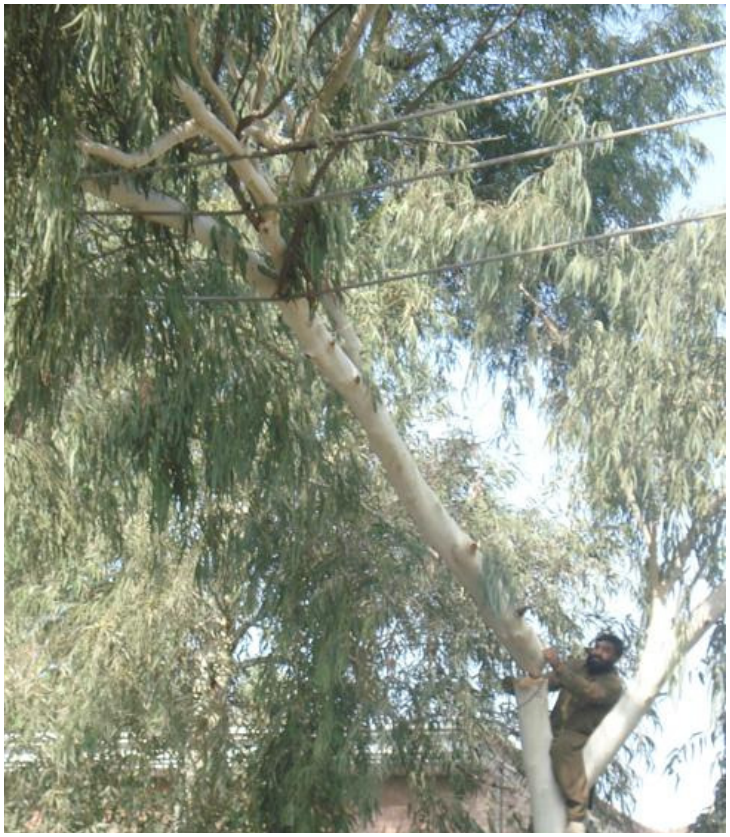
The subdivision usually had one or two light vehicles for general transportation, though it was stated that the complaint center lineman and the meter readers used their own motorcycles or walked. The division office has heavier trucks for transporting transformers and a crane for setting them. Given the shortage of transport, it is understandable that the trouble center lineman carries only his hand tools when called out. If more extensive work is involved than can be attended to by one man with a pair of pliers, it is necessary to program the work and utilize more personnel. It would be under these circumstances that the heavier tools, ladders, grounding sets, etc. would be used.

There are two components to line maintenance as practiced in the subdivisions, line patrol/rectification, and transformer load measurement and balancing. Line patrol is carried out generally during the winter months, as summer seems to be taken up with continuity of service problems resulting from the generally higher loads and temperatures occurring at that time.

The line patrol reports were examined and found to list mainly problems with high- and low-voltage jumpers, loose or excessively sagging conductors, and requirements for tree trimming. Correction of these issues do not require any significant amount of material and are carried out during the winter months also, as soon as the patrol reports are transcribed and work is planned.

The engineering team observed two maintenance crews at work in different subdivisions, coincidentally both carrying out tree trimming activities. The trees being trimmed were generally large and had clearly been in place for a long time. It is uncertain why they were chosen for trimming at this time. In both cases, the entire circuit was taken out of service at the substation feeder breaker, and a grounding set of the type mentioned was installed several spans from the work site. The size of the crews involved was large, in one case twelve men, although only one was actually in the tree, working with a clearly dull axe to cut branches. The others were clearing fallen limbs and placing them in a large truck.

In another case, the tree trimming crew had felled a large branch directly onto the line (see picture below). This picture shows a number of safety issues, only beginning with the fact that a large and heavy branch is resting on the line where it can potentially damage pins, insulators and conductors. In actual fact, the branch was cleared by pulling on the cut off end until it fell off the tree and fell clear of the line, potentially damaging not only the wire, but the insulators and pins on the adjacent structures. In addition, the lineman is standing in a position such that if the cutoff branch slipped off the stump, it could hit him in the chest, causing fatal injuries. The preferred method for removing such a large branch would be to take it down in pieces, using ropes and tackle, to hold the cutoff pieces and prevent their falling on the line.



A second maintenance objective of the subdivision is to maintain a log of measurements of the loading of transformers, and to periodically rebalance the loads so as to make the full capacity of the transformer available. Transformer load measurements are to be taken twice yearly and recorded in a ledger. Examination of the ledger in one subdivision office indicated that the recording of loads had been done on only about 20 out of several hundred transformers represented in the ledger. Load information was also more than two years old in most cases. In the second subdivision, the manager admitted that they did

not keep up the ledger and checked the loading of transformers only when they suspect that one may be overloaded. This is clearly inadequate and contributes to the poor transformer reliability.

The issue of lineman safety was discussed with division and subdivision staff visited. LESCO suffered a total of 12 fatal lineman accidents during FY2010. LESCO has about 4,000 active linemen (classes LM-I and LM-II), not including assistant linemen who are not allowed to climb poles and line supervisors. A fatality rate of 12 per year corresponds to one fatality for every 330 climbing linemen. The approximate distribution of causes was reported to be 30% due to electrocutions and 70% due to falls; the management blamed most accidents on the failure of linemen to use the available protective equipment. In some cases, electrocutions were reportedly caused by consumer generators incorrectly attached to the low-voltage network, which caused backfeeds, combined with failure to install earthing sets.

Given the high level of lineman fatalities, LESCO is having difficulty convincing assistant linemen to transition to full climbing linemen, and it is true that most of the linemen observed by the engineering team to be climbing poles were senior.

The engineering team observed that the issues affecting lineman safety in electric utilities are not unique to LESCO and usually fall into one of the following categories:

- Personal protective equipment that is either inadequate for the purpose or difficult or unpleasant to use. The climbing belts and grounding sets used by LESCO fall into this category. The belts are too narrow and uncomfortable to lean into for any length of time, and the grounding sets are of a design that is completely inadequate for preventing electrocution.
- The shortage of personal protective equipment is such that jobs are attempted even in the absence of equipment. This may be an issue in accidents involving trouble call linemen, as they cannot carry all the necessary equipment with them due to a lack of transport.
- Construction standards do not consider maintenance requirements and do not provide adequate clearances for linemen to work or climb near energized conductors. While LESCO linemen do not work on energized lines, system congestion calls for them to work in close proximity to other circuits that are energized, without protective cover-up equipment.
- Inadequate tools for cutting, lifting, and pulling, requiring linemen to exert force, either pulling or pushing that can result in injury if the load shifts unexpectedly.
- Poor tagging and clearance practices. It was reported that some line work is done during load shedding outages, without proper work permits preventing lines from being reenergized.
- Inadequate training in safety practices at lineman training schools. This needs further evaluation.
- Pressure from supervisors to sidestep safety procedures in order to complete work. This was reported by LESCO staff but needs further examination.
- Poor work planning procedures that do not consider safety as a goal of the project. The tree trimming activity indicated in the picture above falls into this category.
- Failure to maintain an environment in which safety is emphasized on a daily basis as part of the work schedule.
- Lack of sanctions for staff who knowingly violate safety procedures and by their example encourage others to do so.

Most of these issues are within the control of management, and the engineering team finds it disingenuous at best to blame deceased linemen for their own fatalities.

Meter Security

The security of metering installations was discussed. Advances in electronic meter technologies have improved the performance of meters as compared with the old electromechanical meters, but vulnerabilities remain. A number of tampering efforts have been discovered that involve installation of a

remote turn-off device inside an electronic meter. Since the measuring unit of the meter is an electronic circuit board, a low-current switch is sufficient to turn off the power to the measuring board and make the meter intermittent, under the control of the consumer. Such interventions are extremely hard to detect and those that have been uncovered have usually resulted from informants.

Of course all the old vulnerabilities remain as well for these bottom connected or A-base meters. Terminal covers over the connections have always been a weak area for A-base meters. For the new plastic bodied meters, a plastic one-way cover is provided with the meter such that once the connections are made, and the cover is pushed in, it cannot be removed without breaking it. Unfortunately, examination of a number of installations on the system indicated that the plastic cover is rarely pushed in, apparently because the connections tend to loosen with thermal cycles and must be periodically retightened. Of course, leaving the connections uncovered makes the meter vulnerable to the most basic forms of tampering.

Similarly, the use by utilities of service drop conductors that are neither concentric (protected by a concentric neutral shield against tampering) nor enclosed in a metal mast makes the entire service drop vulnerable to tampering with the cable. The picture below shows a meter that cannot be considered secure.

Unfortunately, observation indicates that this sort of exposure is very common, and must be a factor in the high level of nontechnical loss suffered by LESCO.

Procurement

Procurement is carried out by the Procurement Department, which prepares a procurement budget based upon the averages of material issues during the previous three years, taking into account requests from the Operations Department, and controlled by the available funds. In addition, the budget for new material is developed on the basis of available stock in stores. LESCO has a sophisticated stores inventory system, part of the enterprise resource planning (ERP) program and the amounts of material in stores at any time is known with considerable precision. The procurement budget for 2010/11 is Rs. 4,000 million, or approximately $US 47 million. This is not a large amount for a utility with over 3 million consumers and must cover all internally funded expansion or upgrade work as well as maintenance needs. This entire amount is funded from internally generated funds, with approximately half coming from LESCO's DM, and thus generated through tariffs, and the remaining half an allowance for deposit work. In some cases, deposit work funds are contributions in aid obtained from consumers for line extensions and in others they are paid by local authorities for line relocations resulting from such projects as road widening, etc.

Materials are divided among 29 categories according to a legacy WAPDA classification list, although in reality, only approximately 19 categories are commonly used. However, each category has sub-

classifications that may be separately procured, and solicitations for any given subclass are held twice a year. The result is a large number of solicitations – a total of 106 in FY2010 – with values as small as $US 12,000 and as large as $US 10 million. The largest tenders are for distribution transformers while the smallest are for hardware items. The LESCO transformer failure rate of 4% annually on an MVA basis alone accounts for almost 2,000 transformers per year, requiring $US 15 million for this purpose alone. Given that almost one third of the budget is taken up with two semiannual transformer procurements, clearly the vast majority of the remaining solicitations are small, averaging no more than $US 300,000 each.

Most suppliers for items produced in Pakistan are Pakistani sourced. Although there is no prohibition against foreign suppliers, all suppliers must be prequalified, and the process of prequalification, the small size of the procurements, and in some cases the existence of special requirements tends to limit the interest of foreign vendors. For instance, transformers must be warranted against all hazards whether related to workmanship and materials or not, and damaged units must be replaced rather than credited. This is not a standard international commercial practice and has been accepted only by Pakistani vendors. Procurements for projects funded with donor funds (World Bank, Asian Development Bank, etc.) follow different procedures and are handled by the respective project management units.

The Procurement Department is responsible for management of the central warehouse as well as for procurement, but materials pass from the direct control of the department to the Operations Department when they are transferred from central stores to warehouses associated with the operations circles. Once materials are transferred to a circle storehouse, they are generally not available for use in other circles even though a subdivision in a different circle may have needs that cannot be met by the relevant circle storehouse.

2.3.5 Distribution Feeder Mapping and Loss Segregation Analysis

As discussed in the Methodology section, the segregation of technical and nontechnical losses for the LESCO distribution system will be based on power flow models of a sample of LESCO feeders. The process calls for selection of feeders on the basis of a consistent sampling method, mapping the feeders using a simplified GIS tool, collection of feeder peak load and power factor data from substation feeder metering, and modeling of the feeders using power flow software.

The intention of the exercise is that the technical losses as determined by this process will then be a valid proxy for the technical losses of the entire system. The difference between the total distribution losses and the technical losses so determined can then be presumed to represent nontechnical (administrative and commercial) losses. Further, the power flow model will allow the division of technical loss among 11 kV lines, distribution transformers, LT networks, and service drops.

Selection of Feeders

According to data provided during its annual business plan presentation in October 2010, LESCO has 1,249 11 kV feeders, totaling 24,910 km of line. Average feeder length is approximately 19km. There are, however, many feeders that are both considerably longer and shorter than this value, with different combinations of consumer load types. Clearly, in order to select a sample of feeders that is representative of the utility feeder population as a whole it will be necessary to employ a sampling technique with specific criteria. The sampling criteria chosen were as follows:

- The average feeder length of the sample population should be close to the average feeder length of the overall feeder population.
- Distribution of sales in kWh/year between domestic, commercial, industrial, agricultural, and other consumers for the population of sample feeders should be close to that of the overall LESCO feeder population.
- The proportion of rural and urban consumers in the sample feeders should be similar to that in the system as a whole.
- The sample feeders should have complete data, including total sales, feeder input data, and total length. Feeders with data anomalies would be excluded.

Data was obtained from LESCO on the entire feeder database. Because LESCO's customer information system (CIS) links customers to the feeder that serves them, it is possible to obtain data on sales by feeder and this was also requested. LESCO feeders are also classified as to whether they are urban (U), rural (R), industrial (I), or dedicated (D) to a single consumer. Issues with the data provided are summarized below:

- LESCO provided data on a total of 1,314 feeders; however, 25 of these had sales of zero for FY2010. This means that there are a total 1,289 active feeders.
- A total of 258 feeders showed losses of 0% or less, and 155 showed losses in excess of 40%.
- A total of 409 feeders lacked data on length.

The anomalies in the data appear to be due to a slow process for updating feeder information. Feeders that show either negative losses or excessive losses have probably been adjusted in coverage and the changes not reflected in the customer information system.

After excluding feeders with anomalous or missing data, a selection was made using a random number system and tested against the criteria. A total of 14 feeders emanating from 12 grid substations were chosen for mapping as shown below.

TABLE 2.1 LIST OF FEEDERS

Grid Substation	Feeder Name	Urban/Rural	Length km	Amps Demand
132KV-BHATI GATE	Ali Hajvari	U	8.296	360
132KV-BHATI GATE	Faseil Road	U	8.4	390
132KV-BHATI GATE	Ibrahimi Rd.	U	5.309	400
132KV-FORT	Karim Park	U	5.226	340
132KV-A.I. TOWN	Ayubia	U	6.447	250
132KV-MODEL TOWN	Attaturk Block	U	11.01	370
132KV-TOWN SHIP	Industrial No 4	U	8.53	360
132KV-BOGGIWAL	Yasrab Colony	U	9.745	380
132KV-FATEH GARH	Bund Road	U	8.142	360
220KV-BUND ROAD	Sabaza Zar Colony	U	10.75	340
132KV-DEFENCE CLY	Defence No. 3	U	9.9	370
132KV-RUSTUM	Jia Musa	U	6.442	390
132KV-BHAI PHERU	Kot Maji	R	92.3	340
132KV-BOGGIWAL	Bhagat Pura	R	8.35	380

A comparison of the characteristics and sales proportions of the selected feeders, disaggregated between urban and rural feeders is shown below:

TABLE 2.2 COMPARISON OF THE CHARACTERISTICS

Feeder Type	Avg Length km	Total Sales	Sales Proportion				
			Domestic	Commercial	Industrial	Agricultural	Other
LESCO							
Urban	8.8	75.2%	44.0%	8.1%	38.0%	9.1%	0.8%
Rural	66.4	24.8%	42.0%	9.1%	41.1%	7.1%	0.6%
Sample							
Urban	8.2	83.5%	49.3%	11.7%	33.6%	5.4%	0.0%
Rural	50.3	16.5%	56.6%	6.9%	29.9%	4.6%	2.1%
Combined							
Sample	14.2		50.5%	10.9%	33.0%	5.2%	0.3%
LESCO	**19.9**		**41.7%**	**8.6%**	**34.9%**	**6.5%**	**1.8%**

The first section of the table shows the breakdown between urban and rural feeders within the overall LESCO system. It is apparent that 75% of LESCO's sales are urban and 25% rural. The average length of an urban feeder is 8.8 km while for a rural feeder, the average length is 66.4 km. Sales proportions between rural and urban, i.e., the percentage of feeder sales going domestic, commercial, industrial, and agricultural consumers is surprisingly similar between urban and rural feeders.

The second section of the table shows the same breakdown for the sample of feeders chosen for mapping. Urban sales for the sample account for 83.5% of the total sales of sample feeders, with 16.5% for rural feeders. The breakdown between consumer types for the sample urban feeders is very close to that of the system as a whole, while the sampled rural feeders tend to show more domestic sales and a lower proportion of industrial sales than the rural feeders of LESCO as a whole. The average length of the sampled urban feeders is close to the urban average, but the rural feeder sample has an average length that is somewhat shorter than the system rural average.

The third section of the table compares the characteristics of the sample taken as a whole with the entire LESCO system. The average feeder length of the sample as a whole is somewhat less than that of the system, and the sample has slightly higher domestic and commercial sales, as a proportion of total sales than the system as a whole. Overall, however, the characteristics of the sample are very close to those of the LESCO system as a whole. The discrepancy in average feeder length is due to the fact that feeders in LESCO appear to fall into two length classes, either quite short, or very long. Due to this "granularity" of the available sample space, it was not possible to map an additional long rural feeder in the time available, although this would have given a better mix. It is not expected that this discrepancy will affect the results, as it will be possible to correct for feeder length in the loss calculation.

Mapping and Modeling of Feeders and LT Networks

The feeders were all mapped using a rapid GIS technique that identifies only corner and intersection poles and poles with equipment installed on them. Observable data such as conductor size, transformer capacity, and transformer status, whether general service or dedicated, was noted manually and transferred to an attribute database. Once the circuit was mapped, the information was transferred to a Milsoft Windmil model. Milsoft Windmil is a standard distribution analysis software used widely in the US and Latin America. Windmil can model single or three phase loads, 60 Hz or 50 Hz systems and accepts user information on all conductors and transformer characteristics not in the default database.

The majority of the conductors used at 11 kV by LESCO are Osprey and Dog, with some Panther and Rabbit, all of which are ACSR conductors. LT conductors are mainly Wasp and Ant, which are all aluminum conductors. Characteristics for these conductors were obtained from tables and incorporated into the database. Similarly, LESCO specifies transformers with maximum allowable levels of losses, a legacy of WAPDA procurement practices. The maximum allowable levels of loss have recently been

changed, but none of the new units have been supplied yet. Transformer characteristics used in the model therefore correspond to legacy LESCO transformer values of no-load and load losses, as shown below:

TABLE 2.3 NO-LOAD AND LOAD LOSSES

KVA Rating	10	15	25	50	100	200	400	630
Impedance	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
Core Loss (W)	65	85	123	175	310	495	925	1350
Load Loss (W)	320	435	640	1170	2020	3410	5600	8150

It should be noted that these are the values specified in the WAPDA transformer specification DDS-84 for prototype transformers. The standard allows a +15% tolerance in the individual no-load and load loss values of individual production units and a +10% tolerance in total losses. No attempt was made to incorporate these tolerances into the model, but so it is likely that transformer losses are in reality slightly higher than those indicated.

While Milsoft can accept data on location linked consumer loading, the time available for this project did not permit data on actual loading to be used in the model. Instead, the feeder peak load was obtained from substation records and this known load was allocated among the various transformers on the basis of transformer capacity, i.e., a transformer of 200 kVA was allocated twice as much of the actual feeder demand as a 100 kVA transformer.

Another matter to be decided was the level of power factor to be used in the model. Substation meters record kWh and kVARh, from which the power factor could be calculated. However, only circuit amperes and kWh readings are actually recorded by substation operators. The engineering team obtained station log sheets from the period around the feeder peak. The estimated average hourly power factor was computed by calculating kVA using logged amperes and an assumed bus voltage of 11.5 kV and the differences between the hourly kWh meter readings to estimate kW. The result of this calculation is presented below for five of the feeders, the only ones for which substation log sheets could be obtained.

TABLE 2.4 NO-LOAD AND LOAD LOSSES

Feeder Name	Power Factor At Max Load %	Power Factor at Min Load %
Ali Hajvari	80%	96%
Faseil Road	69%	100%
Ibrahimi Rd.	66%	83%
Industrial No 4	89%	100%
Sabaza Zar Colony	87%	74%

It is apparent that the shown power factor for two of the feeders was less than 70% even on peak and varied during the day. The preparation of the data indicated that the method used to determine the power factor was not entirely satisfactory, probably due to variations resulting from the manual reading of substation meters. Rather than generalize what may be an exceptional value for the power factor, and due to the small sample, it was decided to use 80% as the power factor for all feeders in the analysis.

Once the model, loading, and power factor are established, the feeder power flow analysis can be carried out. The results, disaggregated by line (conductor) loss and transformer no-load and load loss, are shown below.

TABLE 2.5 DISAGGREGATED LOSSES

Feeder Name	Urban or Rural	Length km	Peak Demand kW	Line Loss kW	Transformer Loss	
					No-Load kW	Load Loss kW
Ali Hajvari	U	8.3	5,487	56.4	22.3	95.9
Faseil Road	U	8.4	5,944	32.1	30.9	69.3
Ibrahimi Rd.	U	5.3	6,097	101.6	20.8	125.1
Karim Park	U	5.2	5,182	92.0	23.8	87.3
Ayubia	U	6.4	3,810	31.1	29.1	37.1
Attaturk Block	U	11.0	5,639	51.9	17.3	136.2
Industrial No 4	U	8.5	5,487	60.3	27.4	80.8
Yasrab Colony	U	9.7	5,792	32.8	27.2	106.7
Bund Road	U	8.1	5,487	123.7	30.6	79.3
Sabaza Zar Colony	U	10.8	5,182	102.7	29.9	78.2
Defence No. 3	U	9.9	5,639	56.6	66.7	37.5
Jia Musa	U	6.4	5,944	114.1	31.4	75.2
Kot Maji	R	92.3	5,182	431.3	48.5	55.4
Bhagat Pura	R	8.4	5,792	29.9	40.7	73.3

While these results assess the line and transformer losses of the feeders, it is necessary to evaluate the losses of LT networks and service drops to obtain a complete picture. Because the number of LT networks on any of the feeders is substantial, it was necessary to carry out a sample survey. A total of eight LT networks were mapped and modeled. The process of mapping differed from that used for the 11 kV feeders in that, for the LT networks, the mapping included a consumer census of all the consumers fed by the network. In addition, a meter reader accompanied the survey team, carrying with him the meter read route book from June 2010, the month of assumed peak demand. It was therefore possible to obtain and record in the GIS database for the LT network the metered consumption for each consumer.

Since the majority of the consumers located on the LT networks are billed by kWh consumption only, it was necessary to covert the kWh data to demand (kW) for modeling. As no measurements of actual demand were available, it was necessary to estimate demand using only the average energy consumption of the consumers. In order to determine the peak demand in kW likely from consumers on each LT network during the month of June, the data on consumption was applied to the demand equation below. This equation was derived many years ago by the Rural Electrification Administration in the US, and has been verified by NRECA as acceptably accurate for use in developing countries as well. The equation is as follows:

$$D = N*(1-.4N+(N^2+40)^{0.5}) \; 0.005925*C^{0.885}$$

Where:

D = monthly peak demand in kW for a particular group of consumers
N = number of consumers in the group
C = average monthly consumption per consumer in kWh/mo

The demand value calculated by the equation was applied as the source demand for the particular LT network, at a power factor of 80%, and the demand allocated to the segments of the LT network in proportion to the kWh of the consumers connected to that segment. The results are shown below:

Feeder Name	U/R	LT Length (km)	Transformer Size	LT Source Load	Source p.f.	Total Losses	
			kVA	kW	%	kW	W/kVA
Faseil_Road	U	0.048	200	78	80%	0.186	0.93
		0.370	200	199	80%	17.029	85.15
Karim_Park	U	0.26	200	174	80%	2.937	14.69
		0.26	200	141	80%	0.925	4.63
		0.132	200	73	80%	0.925	4.63
						Average Urban	**22.00**
Kot_Maji	R	0.645	200	166	80%	11.154	55.77
		1.174	200	62	80%	1.15	5.75
		0.903	200	89	80%	10.21	51.05
						Average Rural	**37.52**

The results of the LT analysis show that LT losses are extremely variable from one transformer to the next, depending mainly on loading and the length of the LT network fed by the transformer. Urban LT networks were on the order of 300 m per transformer, while rural networks averages almost 900 m of line per transformer. Loading for this group of transformers varied from loads of no more than 45% of capacity to 124% of capacity. Of the transformers chosen, four, or 50%, exceeded 80% of their capacity in June 2010. No attempt was made to assess balance, but it is clear that a significant number of LESCO transformers are at or near their allowable peak loading.

For purposes of this analysis, it is necessary to generalize these results so that they can be applied to all general use transformers on all the modeled feeders, so as to obtain a value for LT losses. A value of average loss in watts per kVA of transformer capacity was developed for this purpose and is shown in the last column of the table. As can be seen, there is considerable variation in the value of this parameter from one transformer sector to another for the urban transformers, and more uniformity for the rural transformers.

Service Drop Loss

Service drop losses were calculated on the basis of the assumption that all domestic sales used single-phase meters, while all commercial and direct reading industrial sales used three-phase meters. At some time in the past, an effort was made to move meters to the base of the pole as opposed to being mounted on the exterior of the residence. This had the effect of shortening the effective length of the service drop from the utility's standpoint, to something less than 10 m. Examination of the system indicates that this process has not been completed in many urban areas, and the meters are still located on the exterior of the buildings. For this reason, the average service drop length has been assumed to be 12 m. The assumptions for the three types of consumer are shown below.

TABLE 2.6 CHARACTERISTICS OF SERVICE CONDUCTOR

Consumer Type	Service Wire	Cores	Service Type	Length M
Domestic	7 x 0.052	Two	1 Ph	12
Commercial	7 x 0.052	Four	3 Ph	12
Industrial	19 x 0.052	Four	3 Ph	12
Agricultural	19 x 0.083	Four	3 Ph	12

Average service loading was determined using the Rural Electrification Administration equation described above to calculate the total demand of the consumers of each class on each of the modeled feeders. Knowing the number of consumers of each type on the feeder allowed for an average demand per consumer to be calculated. Three-phase loads were assumed to be balanced.

Loss Summary and Segregation Analysis

Once the components of demand loss have been calculated, it is necessary to convert the values derived from demand loss on peak to average energy loss. Because losses are a function of the square of load, it is necessary to account for the variation in load during the course of a year. The standard way in which this is handled is to determine a loss load factor based on the annual load factor of the system. The standard equation used in the US private utility industry is:

$$LLF = 0.7(ALF)^2 + 0.3(ALF)$$

Where:

LLF = loss load factor, or the load factor of the on-peak losses
ALF = average annual load factor for the element under consideration.

The ALF was computed for each feeder on the basis of the data supplied by LESCO and the LLF calculated according to the given equation. The same feeder LLF was applied to all components of loss. The results, disaggregated between urban and rural feeders are shown below:

TABLE 2.7 LESCO SUMMARIZED LOSS ANALYSIS

Feeder Type	Conductor Loss %	Transformer Loss %	LT Network Loss %	Service Drop Loss %	Annual Energy Loss %
Urban	0.8%	2.2%	1.6%	0.2%	4.8%
Rural	3.6%	2.4%	2.0%	0.2%	8.2%
Total Sample	**1.1%**	**2.3%**	**1.6%**	**0.2%**	**5.2%**

During the process of calculating the conductor loss for 11 kV feeders, an increase of 32% was applied to rural conductor losses due to the difference between the average length of the rural feeders in the sample and for LESCO as a whole.

Because the sample was chosen to be representative of LESCO as a whole, the interpretation of this result is that the technical losses of the LESCO distribution system are in the range of 5.2%. LESCO had total system losses of 13.8% in FY2010. As noted above, the transmission loss recorded was only 0.1% – an unrealistically low number. If transmission losses were a more reasonable 2.3%, the distribution component of loss would be 11.5%. The difference between the distribution technical loss of 5.2% and a probable total distribution loss 11.5% is a nontechnical loss of 6.3%.

Validation

LESCO, in its October 2010 report to the MWP, indicated technical losses of 10.1% and nontechnical losses of 3.7%. This is significantly at variance with the results presented here, so it was decided to carry out an independent evaluation using a benchmarking technique developed for electric systems in the rural US. Studies conducted by the Rural Utilities Service, the financing and monitoring arm of the US rural electric program, have determined that, for systems using conductors and voltages typical of good engineering practice, system loss is a complex function mainly of sales density, that is, MWH sales per km of line. The equation developed based upon that parameter is as follows:

L= (-1.8458*(LN(H7*1.609))+17)

Where:

L = total losses (technical and nontechnical) in percent
H7 = Sales density in MWH of sales of all types per km of distribution line
LN = natural logarithm function

For purposes of this analysis, distribution line is considered to include both HT and LT line. The tendency of this equation is to assess higher losses for utilities with lower sales densities, that is, for utilities with dispersed consumers and low sales in MWh/km of distribution line, losses are higher than for utilities with more dense service areas. Thus increasing the amount of distribution line considered tends to increase the allowable level of losses.

Applying this equation to LESCO, results are in the following table:

TABLE 2.8 LESCO BENCHMARKED LOSSES

HT & LT Km	Sales Density MWh/Km	Benchmark Technical Loss %	Actual Reported Distribution Loss %
41,623	333.5	5.4%	13.7%

It is apparent that, according to this benchmark, LESCO should have a distribution loss of approximately 5.4%, a value that is in close agreement with the assessment of technical losses presented in this report.

Possible Technical Opportunities for Reduction of Nontechnical Loss

The fact that the majority of LESCO's losses are nontechnical does not mean that there are no technical solutions for them. Potential opportunities are as follows:

- Mapping of lines and consumers using a GIS provides important information for use not only in planning, but also in monitoring of transformer loading. Accurate location of consumers with respect to the feeder and transformer that serves them allows for better tracking of feeder losses and can aid in identifying areas where theft is high, as well as provide a means for evaluating the impact of other improvements.

- Open conductor LT line is notoriously vulnerable to unauthorized hooking or "kunda" connections. Replacement of at least some of the open LT system with covered multiplex conductor would assist in limiting loss from this source.

- The engineering team was advised that approximately 80% of LESCO meters are still the old electromechanical type, and these are notorious for slowing with age and for vulnerability to tampering. While wholesale replacement of these meters with electronic units may be more expensive than LESCO wishes to undertake at the present time, a campaign for calibration of the existing meters would have immediate results at much reduced cost.

- Meter-reading improvements that minimize the number of error prone manual transcriptions of data would help minimize errors and assist in identifying problematic meters for replacement

In addition, rural feeders have approximately double the technical loss of urban feeders, mainly due to the conductor and LT network loss. Rural feeders only account for 25% of LESCO sales, so improvements in technical loss on rural feeders will only marginally improve LESCO's overall loss picture, but they do offer an opportunity for reduction in non-technical loss that may be even more important than in urban feeders. In addition, the addition of capacitors to improve power factor will have significantly more impact on rural feeders than on urban ones, and this should be considered.

Another technical measure that, while having a minimal effect on losses, will improve customer service and reduce resistance to payment could be as simple as the installation of connectors on all high-current joints. The type of connectors used should be compression connectors, which can in most cases be installed using hand tools. Compression connectors are much cheaper and more reliable than bolted connections.

2.3.5 Distribution Standards and Equipment Capabilities

While it is not the purpose of this operational audit to evaluate national level organizations, the activities of LESCO are greatly affected by the actions of standard-setting bodies. For this reason, the engineering team visited the offices of the NTDC, which has jurisdiction over distribution standards. This is a legacy of WAPDA, when all standards were administered internally.

The standardization of distribution equipment and construction falls under the preview of the CE of design and standards (D&S) who reports to the general manager of the NTDC. The office of the CE of D&S has the following functions:

Design and Standards

The D&S Section is headed by a manager who is responsible for the development of product specifications for 11 kV and 400 volts distribution networks. This includes the development of distribution design specifications (DDS), distribution design product descriptions, and general product descriptions for the equipment. D&S adopts IEC, IEEE, ANSI, and EN international standards as reference standards for energy meters, distribution transformers, line hardware, cables and conductors, switchgear, line tools and protective equipment, but also adds local requirements specific to the Pakistani environment. The department also ensures compliance with specifications by conducting prototype type testing and formally approves the product for mass production and field installation.

Distribution and Engineering

The manager of distribution and engineering is responsible for distribution line design, review and development of standard construction instructions, and internal electrification design of WAPDA facilities. He also provides technical support to DISCOs in equipment installation and prequalifies construction companies for carrying out electrification jobs.

Distribution Planning

The manager of distribution planning prepares quarterly load data reports of power transformers, allots feeder codes, and prepares monthly progress reports for feeder rehabilitations.

The PDIP engineering team reviewed the performance of the office of the CE D&S. There was special focus on distribution transformers and conductor specifications: 100 kVA and 200 kVA transformers are most commonly used for power distribution whereas other ratings such as 25 kVA, 50 kVA, 400 kVA, and 630 kVA are installed for the dedicated use of commercial and industrial consumers. The specifications, especially for transformer losses, have not changed since DDS-84 was developed. In 2007, new 10 kVA and 15 kVA transformer ratings were introduced. Recently, Amendment 5 was issued on 3 June 2010 under which the transformer no-load and full load losses were reduced by 27% and an incentive was given to manufacturers to offer low loss transformers. A comparison of old and new transformer losses as per this amendment is as follows:

TABLE 2.9 TRANSFORMER NO-LOAD AND FULL LOAD LOSSES

Transformer Rating (kVA)	No-Load Losses (Watts)		Load Losses (Watts)	
	Old	New	Old	New
10	65	52	320	256
15	85	68	435	348
25	123	98	640	512
50	175	140	1170	936
100	310	248	2020	1616
200	495	396	3410	2728
400	925	740	5600	4480
630	1350	1080	8150	6520

As noted above, the losses allowed by standard DDS-84 are for prototype transformers, and there are tolerances that somewhat dilute the intent of the standards, that is, that losses up to 10% higher than those specified are allowed for production units. Amendment 5 does not address this issue, but does allow for a credit on the purchase price to be applied in the event that a particular manufacturer offers transformers with lower losses than specified. The value of the credit is incremental, that is, it is computed based only on the difference in losses between the specified and offered values, so the actual credit allowed is minimal.

The office of the CE D&S introduced a new specification for LT networks and aerial bundled conductors (ABCs) by following the French NFC 33-02 standard. A pilot project is underway for the walled city of Lahore under LESCO.

The original 1964 WAPDA standard construction instructions have been updated in recent years to consider the use of concrete poles. Initially, these were of the reinforced variety, but new standards calling for centrifuged poles have been issued. Although there is considerable evidence that new standards are required for service in congested areas, such as the old city of Lahore, no activity is underway to evaluate any changes in standards for this purpose. It was reported that since no request has been received for assistance in the development of such standards, no activity is underway. In the event that a request is received, the department stands ready to prepare new standards.

Findings

The total losses for 100 kVA transformers are reduced from 2,340 watts to 1,864 watts, and from 3,905 watts to 3,124 watts for 200 kVA transformers, which are in most frequent use by DISCOs. Still, these losses can be further reduced by improving design standards and specifications.

A review of the specifications for switchgear revealed that, in spite of the outgoing breaker capacity of 630 amps, the maximum load that a feeder can serve remains limited to 400 amps as the current transformers installed inside the cubical are capable of handling a maximum of 400 amps, thus limiting the optimum use of breaker capacity.

Comment on ABC: This concept is being utilized for the first time in Pakistan, not only to reduce LT losses but also to restore aesthetics. To continue with this approach, similar alternatives for 11 kV service in congested areas should be considered. Options include spacer cable to allow for compact HT lines, or high-density aluminum conductors to allow for high-current circuits.

2.3.6 Factory Visit

The PDIP team visited Pak Elektron Ltd. (PEL), a leading manufacturer of power and distribution transformers, switchgear, and energy meters. PEL has recently reworked its transformer factory and has changed details of its design. For instance, fin type cooling to minimize welding on tanks reduces the potential for leaks. PEL uses cold rolled grain oriented core steel, one step below laser-etched steel for assembly of cores. As a result of improvements in manufacturing capability, PEL has lobbied the change in NTDC/DISCO specifications to reduce permitted losses. So far, a small order has been placed by LESCO for the supply of these low-loss transformers from PEL.

While PEL has made significant advances in the manufacture of its transformers, it still uses stacked core designs with their inherent high losses. Since DISCOs are the only buyers of distribution transformers, every manufacturer is compelled to follow the NTDC specifications and is therefore reluctant to introduce new technologies such as wound core or amorphous core rather than traditional stacked core designs. The introduction of these low-loss technologies will await the improvement of NTDC specifications and will require considerable investment in transformer manufacturing capability.

Perhaps a more alarming tendency is LESCO's request for the development of 400 kVA transformers that fit into the same footprint as a 200 kVA unit. The objective of this request is to allow "drop in" increases in capacity without additional HT construction to alleviate distribution transformer overloads. PEL has utilized high temperature design to meet this requirement, with silicon working fluids to allow winding temperature rise to approach 100 C. The results of this design approach are, of course, a tremendous increase in losses, equivalent essentially to operating a 200 kVA transformer at double its

rated capacity. This, coupled with the fact that simply increasing transformer capacity without addressing LT network design will further increase system loss, is not a positive development

Electromechanical energy meters have completely been banned for any further procurement by DISCOs and static meters are being procured and installed instead. The engineering team examined the production area for both single- and three-phase meters at PEL. These static energy meters are enclosed in ultraviolet stabilized polycarbonate covers, ultrasonically welded and hermetically sealed. Once the meter is sealed into its enclosure, even the removal of the lead seals does not allow access to the interior. This is a good technique to secure energy meters from possible tampering by the public. However, more extensive security features are necessary as the PDIP team witnessed a number of tampered-with meters. In one case, the supposedly ultrasonically welded polycarbonate covers were opened and special remote control devices were installed to turn the meter on or off. PEL is considering the installation of tamper switches under the circuit board of the meter to determine whether the internal components have been disturbed.

Similarly, the engineering team examined the CT/PT meters used for large industrial connections. It was noted that one could easily access the meter software through the optical port and reprogram the multiplying factor while comfortably placing responsibility on the DISCO concerned. Clearly, this aspect requires consideration as well.

2.4 FINANCIAL

2.4.1 Overview

The financial management operational audit was designed to evaluate the effectiveness and efficiency of financial management for LESCO. The audit process has been designed to evaluate operational control against standards set by management. Factors included in the audit process include long-range plans, budgets, and operating policies and procedures.

2.4.2 Summary of Key Findings

The following are key findings of the PDIP review of LESCO's financial management.

Cash Receipts and Disbursements

- LESCO's collection rate for government clients is much lower than for private clients: the collection rate for government clients is 73.5%, while that for private clients is 94.7%. GOP accounting regulations prohibit making provision for past due receivables from government clients and therefore LESCO must consider all government receivables as collectible.

- LESCO is forced to remit payments for general sales tax (GST) on all billings, regardless of whether the bills are actually collected. Thus, even though taxes are considered a pass-through, the difference between billed and collected taxes is paid out of the company's DM. These taxes represent a significant financial burden.

Financing and Investment

- In 2008, four DISCOs, including LESCO, were asked by the GOP to obtain loans to pay for government shortfalls in power costs that were incurred by all DISCOs. LESCO was required to absorb a portion of the interest expense incurred on these loans.

- Although it has revenues of Rs. 130 billion ($US 1.5 billion) per year, LESCO could only afford to undertake about US$ 60 million of system investment in FY2010. Approximately 70% of this investment was taken up by the transmission network, leaving only about US$ 15 million for investment in the distribution network, of which almost half was paid for either by consumers or other government agencies as deposit work. This level of investment is insufficient to maintain the distribution infrastructure in the long term.

Internal Controls

- LESCO's annual financial audit makes no reference to shortages in distribution and transmission stores. This is significant since there were specific references to store shortages in the annual audited financial statements of five other Pakistani DISCOs.

- Internal Audit only functions as a financial control in the review and certification of consumer electricity billings. Moreover, the external auditor is unable to rely on the work of Internal Audit due to the function's lack of independence and professional competence. The existing audit manual does not address the specific audit procedures that will be required to perform internal auditing procedures in LESCO's planned ERP environment.

Cost Containment

- LESCO's vehicle fleet consists of a total of 1,096 vehicles, 349 of which are 20 years old or more. The company's fleet management policy requires vehicle replacement when a vehicle reaches ten years of age. However, vehicles are rarely replaced on schedule due to conflicting approval policies. Even if LESCO were to demonstrate that the purchase of a new vehicle would result in lower operating and maintenance costs, there is no policy that might allow for the replacement of a vehicle. Not surprisingly, the maintenance costs of older vehicles are significant. These costs are exacerbated by a PEPCO policy that requires LESCO to send all fleet vehicles to a WAPDA vehicle repair workshop, where prices are approximately twice the market rate.

- LESCO has significant financial exposure due to a lack of insurance on its facilities. Grid stations and certain new vehicles are presently the only facilities covered by insurance.

Financial Reporting

- LESCO's ERP project has the potential to make a major impact. As many as 1,000 employees may be affected by its implementation. However, training in ERP is an issue as various modules are rolled out through the organization. In addition, there is concern regarding the organizational unit structure needed to support the ERP program. Presently, third-party consultants are playing a major role in the implementation and training of the ERP project.

Financial Performance

- Maintenance expenses as a percentage of operating revenue indicate that LESCO is spending significantly less than US rural electric cooperatives to maintain its electric system: 1.28% for LESCO compared to 7.98% for US rural electric cooperatives. This is partly explained by the fact that LESCO has invested a significantly smaller amount in total utility plant per km of line than US rural cooperatives.

- The plant revenue ratio (total utility plant/operating revenue less cost of power) indicates that LESCO has significantly more operating revenue remaining after power costs to support its existing plant through operations and maintenance expense as compared to US rural electric cooperatives: 2.8 for LESCO and 6.3 for US rural electric cooperatives. A smaller plant revenue ratio indicates higher revenue per unit of investments in plant. US rural electric cooperatives have invested significantly more in total plant per km of line than LESCO: Rs. 2,622,327 for US rural electric cooperatives and Rs. 1,063,381 for LESCO.

- The amount of trade debt receivables over 60 days as a percentage of operating revenue is significantly higher for LESCO than for US electric cooperatives: LESCO's trade debt to operating revenue ratio is 1.8%, while the US electric cooperative average is 0.23%. This comparison is based on FY2010 LESCO trade debt.

- US electric cooperatives' consumer density averages 8 consumers per km, while LESCO has 81 consumers per km of line. Larger US cooperatives have consumer-to-employee ratios of 467/1, while LESCO's consumer-to-employee ratio is 161 to 1. Even though LESCO is above average in consumers per employee when compared to other DISCOs (see Table 10 below), it could improve its financial position significantly by improving its consumer-to-employee ratio. Were

LESCO able to achieve a consumer-to-employee ratio close to 467:1, the savings would approach Rs. 2.7 billion per year.

2.4.3 Analysis and Discussion

Financial management responsibilities rest with the entire LESCO management structure. However, direct responsibility for overseeing financial management lies with the director of finance who is responsible for providing leadership with regard to the management and direction of cash receipts and disbursements, financing and investment management, internal control, cost containment and financial reporting. This report highlights some important aspects of each of these functional areas.

Cash Receipts and Disbursements

LESCO receives cash from various pay points including banks, post offices, and the National Database and Registration Authority (NADRA) with methods of payment including cash, online banking, and credit cards. All payment collection centers are required to transfer funds collected (net of collection fees) to the respective LESCO central bank account. LESCO receives 70% of its deposits the same day in its bank account; 25% of deposits, primarily from offline banking, are received within two to three days after payments have been made. The remaining 5% of deposits, received from post offices, take up to a week to be transferred to the LESCO primary bank account. LESCO then make periodic payments from central bank accounts to PEPCO/ Central Power Purchasing Agency (CPPA) after deducting a DM and applicable taxes. Taxes are paid directly to local, provincial, and central government authorities, while DISCOs are authorized to employ the DMs to finance non-power operating costs. While improvements can be made to improve cash transfers, a significant portion of payment receipts are transferred to the LESCO account on a timely basis.

It was noted by the finance director that, on occasion, PEPCO withdraws cash from LESCO's bank account to cover power costs attributable to GENCOs and/or independent power producers (IPPs), which is outside CPPA billing. Currently, excess capacity fuel cost charges can only be passed through on a quarterly basis while excess energy fuel cost charges are passed through on a monthly basis. The loss of time it takes to recover excess capacity charges is a cost in the loss of cash flows.

LESCO annual reports show significant trade debt receivables. LESCO makes provision for doubtful trade debt accounts using the values shown in Table 2.10.

TABLE 2.10 TRADE DEBT PROVISIONS FOR DELINQUENT CONSUMERS

No.	Category	Value %)
1.	Disconnected consumers	100
2.	Overdue more than one year	100
3.	Government agency balance	10
4.	Active consumers 3 to 6 months overdue	25
5.	Active consumers 6 to 12 months overdue	59
6.	Cases under litigation	100

In FY2009 and FY2010, a provision was recorded as an expense of the amount Rs. 1,541,772,617 and Rs. 0, respectively. The Rs. 0 amount for FY2010 is the result of a Rs. 150,086,029 reversal from previously provided collections. In FY2009 and FY2010, the trade debts that were written off amounted to Rs. 4,157,817 and Rs. 833,652, respectively. Provincial and federal trade debts are required to have no provision related to electricity sales but may make provision for non-electricity sales-related receivables. Provision expense is included as an operations expense for purposes of DM and the size of the provision expense may have a limited impact on the amount of DM received. In an analysis of FY2010 trade debt receivables over 60 days as a percentage of operating revenue, LESCO was somewhat higher at 1.8% as compared to US electric cooperatives at 0.23%.

Following the assumptions shown in Table 10, LESCO accumulates provisions for past due accounts receivables under the observation that these accounts are uncollectible. The cumulative total provisions at LESCO amount to Rs. 3,007,403,207. Given that LESCO considers these accounts to be uncollectible, it

makes no further attempt to collect them. Alternatively, it could consider engaging a collection agency to make further attempts to collect against these accounts, paying a percentage of the collected total toward achieving the collection targets paid on a contingency basis. This practice is being used by tax authorities and other organizations, such as gas utilities. Additionally, LESCO receivables from government accounts equal to Rs. 2,371,354,609. The LESCO collection rate for government clients is much lower than it is for private clients; the collection rate for government clients is 73.5%, while that for private clients is 94.7%. LESCO does not make provision for uncollected government accounts. GOP accounting regulations prohibit making provision for past due receivables from government clients and the DISCO is required to consider all government receivables as collectible. A legal remedy will be required to force the government to pay past due debts – or perhaps to allow a tax offset against aging, unpaid electric bills.

LESCO and other DISCOs are required to retain and later pay taxes and license fees to local and federal agencies as a function of commercializing electric power. Some of the taxes that are due to the government are assessed on the basis of electricity sales rather than receipts against billings. The following describes amounts collected monthly in addition to the consumer electric bill:

- GST assessed at 17% for domestic consumers and export industries.
- Income withholding tax of 5% and 10% retained for industrial and commercial consumers, respectively.
- Excise duty of 1.5% on all consumers (varies by local jurisdiction).
- A flat fee of Rs. 35 on domestic consumers to support the national television network.
- Surcharges may be assessed as needed to cover the costs of certain power plant projects.

Given that GST is levied on the basis of billings, the DISCO is forced to remit payments for GST on all billings, regardless of whether the bills are actually collected. Thus, even though taxes are considered a pass-through, the difference between billed and collected taxes is paid from the DISCO's DM. These taxes represent a significant burden for those utilities with low collection rates. The net general sales tax payable was Rs. 1,081,506,852 in FY2010.

Financing and Investments

Electric utilities are capital-intensive operations, requiring a regular and dependable stream of long-term financing at reasonable rates in order to be able to undertake system improvements when prudent and necessary. LESCO's financing needs are met from two sources: internal cash generated by the distribution margin, and long-term financing arranged through the GOP. Of the two, the only dependable source is internally generated cash. Long-term financing may be typified as World Bank, or Asian Development Bank lending but, in reality, these funds are actually lent by the donor to the GOP who on-lends them to the DISCO. Subject as they are to the geopolitics of government and multilateral bank relations, the availability of such financing is not related to the financial strength or the particular needs of the utility, are always project-specific, and cannot be relied on to be available when needed by the DISCO.

Local banks are not likely to be enthusiastic about extending long-term credit to the DISCOs, since, as government entities they are subject to political requirements that are not always aligned with their individual financial sustainability. For instance, in 2008, four DISCOs, including LESCO, were asked to obtain loans to pay for government shortfalls in power costs that were incurred by all DISCOs. LESCO was required to absorb a portion of the interest expense incurred on these loans.

Generally, cash flow generated by operations is satisfactory only for meeting short-term needs, making the LESCO essentially an operations-oriented entity. One of the reasons that system planning is so constrained is the shortage and uncertain availability of significant investment funds. LESCO, while it has revenues of Rs. 130 billion ($US 1.5 billion) per year, could only reliably undertake about US$60 million of system investment in FY2010. Approximately 70% of this investment was taken up by the transmission network, leaving only about US$ 15 million for investment in the distribution network, of which almost half was paid for either by consumers or other government agencies as deposit work.

All DISCO investment projects are required to be filed with the Planning Commission, Central Development Working Party, and executive committee of the National Economic Council for approval regardless of funding status. Each project is evaluated on a benefit/cost basis and only projects that have an acceptable benefit/cost ratio proceed. The documentation required for these filings is burdensome regardless of the funding source. The finance director would like to see the process streamlined to minimize effort in meeting documentation and reporting requirements, especially for projects that do not have government funding.

The weighted average cost of capital is used in the computation of the rate of return on a rate base. It is a blended rate of the cost of debt and the cost of equity. LESCO's rate of return on rate base can range between 13% and 17%.

Internal Controls

The team visited regional and field warehouse site locations and reviewed policies, procedures, and operations. The LESCO warehouse procurement policies are provided for under the Public Procurement Regulatory Authority manual. There are two distinctly different warehouse operations: one for 11 kV distribution system materials the other for 132 kV transmission materials. The 11 kV warehouse operations consist of one regional warehouse and 12 field warehouses. The LESCO annual financial audit included no observations with regard to shortages in distribution and transmission stores. This is significant since there were specific references to store shortages in the annual audited financial statements of five other DISCOs. During our discussions and observations, the following strengths were noted in warehouse operations:

1. Facilities guarded by competent private security firm.
2. ERP reporting and control procedures.
3. Employee training.
4. Competent personnel.
5. Appropriate segregation between purchasing and stores functions.

It was noted that the value of obsolete items accounted for was approximately 12% and 2% of the main warehouse and field warehouse, respectively. While the Board of Directors has the authority to approve write-off amounts, action will not be taken without PEPCO's approval.

As mentioned earlier, the BFP is a governing document and was approved by the Board of Directors (Board) in October 2002. The BFP establishes various approval authorities and monetary limits for financial transactions and certain other actions taken by LESCO management and the Board in the operation of day-to-day activities. The BFP was reviewed and discussed with the secretary of the Board, who is also LESCO's in-house attorney. LESCO has prepared a draft of proposed changes to the BFP to address more efficient approval authorities and adjust monetary limits to reflect the current financial environment. These proposed changes were made with regard to maintaining high corporate governance and internal control standards. This proposal was made in 2008 but has been delayed pending approval by PEPCO.

In a review of the Internal Audit (IA) function, it was determined that the IA operations employ approximately 168 people out of a total of 201 sanctioned positions. IA continues to employ the WAPDA audit manual dated August 1985. In addition to the WAPDA audit manual, IA uses a revenue audit manual issued by WAPDA in June 1998 to replace Chapter 1 and Chapter 6 (the relevant chapters) of the audit manual. The revenue audit manual was designed to assist in the review and certification of consumer electricity billings and to report to management about the status of compliance with policies and procedures regarding commercial operations. The functions of IA, as defined in the audit manual under Section 2.1 states that the "Internal Audit Division has to ensure that rules and orders framed/adopted by the Authority from time to time in connection with execution of works, pay and allowances, stores, etc. and for maintenance of various accounts, books, etc. are followed by all WAPDA formations/offices and the defects and irregularities noticed in such accounts/books are rectified as far as possible." However, IA only functions as a financial control in the review and certification of consumer

electricity billings. The external auditor is unable to rely on the work of IA due to its lack of independence and lack of competence. The existing audit manual does not address the specific audit procedures that will be required to perform internal auditing procedures in an ERP environment.

The finance director was very concerned about the level of organizational employee competence and the lack of job descriptions against which to evaluate employee performance. This includes situations where titled position descriptions differ from the actual job performed – for example, the director of marketing and tariff has nothing to do with tariffs. He highlighted this as a major challenge faced by LESCO. The lack of job descriptions against which to evaluate employees' competence puts the company at risk in the performance of its duties.

Cost Containment

Cost containment refers to the process of identifying expense items and categories that offer opportunities for significant savings by identifying alternative sources for goods and services. DISCOs have historically been required to employ WAPDA services for software and other services that are not cost competitive with other private sector sources. The application of WAPDA rules for employing services is not uniform across all DISCOs, so opportunities for savings may vary from DISCO to DISCO.

In the case of LESCO, vehicle fleet maintenance costs were discussed with the director of HR. The LESCO vehicle fleet consists of a total of 1,096 vehicles; 349 of these are 20 years old or more. The LESCO fleet management policy requires vehicle replacement when a vehicle reaches ten years of age, while the private sector practice usually requires replacement after five years of age; this occurs due to a ban on new vehicle purchase enforced by PEPCO.

With a high number of very old vehicles, vehicle maintenance costs are significant. These costs are exacerbated by a PEPCO policy that requires LESCO to send all fleet vehicles to a WAPDA vehicle repair workshop, where prices are approximately twice the market rate. While LESCO is authorized to use local market repair facilities to make minor repairs, it must obtain a no objection certification from the WAPDA if it wishes to use a private workshop for major vehicular repairs. Even if LESCO were to demonstrate that the purchase of a new vehicle would result in lower operating and maintenance costs, there is no policy that might allow for a replacement of a vehicle.

LESCO may have significant financial exposure due to a lack of insurance on its facilities. Grid stations and certain new vehicles are the only facilities covered by insurance.

Financial Reporting

LESCO is in the final stages of migrating from a manual system to a computerized system for its financial and materials management, HR, customer information, and billing systems. It is an Oracle-based system but the ERP software includes a software integration solution for other non-Oracle based applications to be applied. This system includes applications for:

- **Financials**
    1. General ledger
    2. Receivables
    3. Payables
    4. Asset management
    5. Cash management
    6. Project costing
    7. Business intelligence
- **Material management**
    1. Purchasing

2. Inventory management
3. Order management

- HR management
  1. Core HR database functions
  2. Payroll
  3. Self service
  4. Recruitment
  5. Expense management

The conversion to the ERP system is being made using the DISCO's current business processes. There is also a future business process that will include improvements and may be implemented at an appropriate time. During interviews with the finance director, the regional warehouse manager, and others, a number of benefits of the ERP system were noted, including:

1. Better control at all levels
2. Ability to facilitate day-to-day management reporting
3. Immediate access to enterprise information
4. Integration of various business functions
5. More accurate information
6. Improved financial management and corporate governance

The ERP project has evolved into a huge success for LESCO. It is estimated that approximately 1,000 employees may be involved with the ERP program. However, training in ERP is still an issue as various modules are rolled out through the organization. In addition, there is concern regarding the organizational unit structure needed to support the ERP program. Presently, third-party consultants play a major role in the implementation and training of the ERP project.

A customer relationship management system, similar to MS SharePoint, is being included in future ERP development to allow customer service representatives and others to share access to certain customer records and provide for an improved customer service experience.

In the management's letter to the Board of Directors for FY2010, it was noted that construction work in progress included Rs. 522 million of completed and available utility plant that had not been properly capitalized and depreciated due to a failure to properly complete the necessary documentation. Failure to properly capitalize and depreciate assets has the effect of understating expense on the income statement.

All DISCOs were required to convert to the NEPRA Uniform System of Accounts by 31 December, 2010. The new chart of accounts is more detailed than LESCO's current chart of accounts. LESCO was on target to meet the 31 December 2010 deadline and should provide additional management reporting details.

LESCO continues to use a legacy WAPDA accounting manual that has become increasingly outdated due to changes in accounting practices in Pakistan. LESCO's finance director is in the process of updating the manual.

Financial Performance Indicators

Financial performance indicators provide a means of measuring distribution utility performance as a function of other, similar high-functioning electric distribution utilities. The use of performance benchmarks requires establishing a reasonable baseline for comparison – that is, finding a group of electric utilities that are of similar size and characteristics (geographic scope, gross sales, sales density,

etc.). While the DISCO community in Pakistan provides a reasonable peer group for comparison between one another, it would take more time than is available to identify an ideal group of high-performing electric utilities that are quite similar across many characteristics.

For purposes of comparison, the PDIP proposes to use the financial and technical performance characteristics of the large group of rural electric utilities in the US. These utilities are small in comparison to the Pakistan DISCOs and have far fewer consumers per km of distribution line, but they are characterized by low line losses, extremely high collection rates and have been financially self-sustaining without capital or operating subsidies. For purposes of this comparison, the largest of the US rural electric distribution cooperatives were selected for this benchmarking process. These cooperatives range in size from slightly more than 80,000 consumers to over 200,000 consumers; DISCO sizes range from 400,000 to over 3 million consumers.

Maintenance expenses as a percentage of operating revenue indicate that LESCO is spending significantly less than US rural electric cooperatives to maintain its electric system: 1.28% for LESCO compared to 7.98% for US rural electric cooperatives. However, this is partly explained by the fact that LESCO has invested a significantly smaller amount in total utility plant per km of line than US rural cooperatives. The plant revenue ratio (total utility plant/operating revenue less cost of power) indicates LESCO has significantly more operating revenue remaining after power costs to support its existing plant through operations and maintenance expense when compared to US rural electric cooperatives: 2.8 for LESCO and 6.3 for US rural electric cooperatives. A smaller plant revenue ratio indicates higher revenue per unit of investments in plant. The US rural electric cooperatives have invested significantly more in total plant per km of line than LESCO: Rs. 2,622,327 for US rural electric cooperatives and Rs. 1,063,381 for LESCO.

Given the very low consumer density per km of line, the level of line losses for US rural cooperatives (5%) should present a reasonable target for overall technical losses for DISCOs. Line loss in excess of 5% could therefore be viewed as commercial losses and an opportunity for operational improvement.

The amount of trade debt receivables over 60 days as a percentage of operating revenue is significantly higher for LESCO than for US electric cooperatives: LESCO's trade debt to operating revenue ratio is 1.8%, while the US electric cooperatives' average is 0.23%. This comparison is based on FY2010 LESCO trade debt.

US electric cooperative consumer density averages 8 consumers per km, while LESCO has 81 consumers per km of line. Larger US cooperatives have consumer-to-employee ratios of 467 to 1, while LESCO's consumer-to-employee ratio is 161 to 1. Even though LESCO is above average in consumers per employee when compared to other DISCOs (see Table 11 below), it could improve its financial position significantly by steadily working to improve the consumer-to-employee ratio close to the US electric cooperatives' average. Were LESCO able to achieve a consumer-to-employee ratio close to that of the US average, the savings would approach Rs. 2.7 billion per year.

TABLE 2.11 LESCO/US ELECTRIC COOPERATIVE PERFORMANCE RATIO COMPARISON

Category/Performance Indicator	LESCO	US Cooperative Average
Liquidity		
Current ratio	1.5	1.6
Amt. over 60 days/op. rev. (%)	1.8	0.23
Profitability		
Return on assets	7.02	5.07
Op. rev/km line (Rs.)	3,270,781	1,528,519
Consumers/km line	81	8
Consumers/employee	161	467
Main exp./op. rev. (%)	1.28	7.98
Op. exp./op. rev. (%)	6.38	7.03
Cost of power/op. rev. (%)	88.29	70.55
Plant utilization		
One-year plant rev. ratio	2.8	6.3

Total plant/km line. (Rs.)	1,063,381	2,622,327
Solvency		
Equity/assets (%)	4.8	42.4
Long-term debt/total capitalization (%)	57.7	52.0
Line loss (%)	13.8	5.0
Elec. sales collected/elec. sales billed (%)	88.4	N/A
Government	94.7	N/A
Nongovernment	73.5	N/A

2.5 COMMERCIAL

2.5.1 Overview

This chapter describes LESCO's commercial management practices, followed by an analysis of the impact of selected changes to commercial practices. The policies, practices, and procedures employed by LESCO are not unique to LESCO; they are generally common to all Pakistani DISCOs, varying in scale and in some particulars.

2.5.2 Summary of Key Findings

The following are key findings of the PDIP's review of LESCO's commercial management.

- **New service connections**. Several factors designed to minimize mistakes in the data entry into the CIS unfortunately contribute to significant delays in consumer billing – sometimes for several billing cycles. As a result, some newly connected consumers have received service for more than a year before receiving their first bill.

- **Meter reading**. Numerous problems were found in the area of meter reading. Commercial management and employees indicate that there is insufficient time to perform the randomized evaluations of meter reading accuracy that are supposed to occur. Moreover, review of meter reader logs revealed that meter readers do not consistently identify and record problems with meters. Further, LESCO does not employ a practice to remove, clean, and calibrate meters. The company has a program to eventually replace the electromechanical meters with electronic meters, but about 80% of LESCO meters remain electromechanical.

- **Bill preparation**. The billing process involves manual data transfers and data entry, which often cause delays. Data entry for 6,000 meter reads requires a full day for the revenue office team, so if one reader is behind schedule, the entire batch is delayed.

- **Bill delivery**. Inadequate time is allowed for bill delivery with the result that there are instances where bills have been delivered on or even after the payment due date. The billing timeframe is very tight, meaning that delays in any part of the process will result in delays of delivery of bills to the revenue office where the bills are sorted and delivered to each subdivision. Delivery of bills is often by hand, so lack of transportation also routinely delays bill receipt and payment.

- **Bill adjustments**. Adjustments to consumer bills can be made at any center, but the bill must be returned to consumer's revenue office for data entry. Since there may be a substantial time lag in processing the adjustment, the consumer may have to return to the billing center for another billing adjustment. In simple terms, the company's back-office procedures do not follow through with actually adjusting consumer records.

- **Payments**. The payment handling arrangement is also fraught with inefficiencies and requires frequent manual intervention. For pay points without online facilities, scrolls and payment stubs are physically transferred to the revenue office. The revenue office reconciles stubs and scrolls; this usually takes three to four business days. The bank will not accept payment amounts less than the amount indicated on the printed bill.

- **Disconnection/reconnection**. While LESCO's process for disconnecting/reconnecting delinquent customers is reasonable, it involves a number of separate departments and is not automated, introducing potential risks and delays.

- **Customer service**. At the local level, there are no dedicated customer service representatives. Personnel are assigned to man the windows for a few hours and then return to their other duties; hence, there is little or continuity in resolving customer issues. The current customer care system is dependent on telephone lines which are either busy or faulty much of the time, creating customer frustration. An efficient and effective customer care system is needed by LESCO and its counterpart DISCOs.

- **Meter maintenance**. Meter inspection, testing, repair and replacement are inconsistent at best. Established procedures are not followed, documentation is not completed, and handling of meters appears haphazard. Management of meter assets would be much better served by enforcing existing guidelines.

- **Advanced meter reading**. LESCO has conducted two advanced meter reading pilot programs that confirm suspicions about nontechnical losses, e.g., due to meter tampering, meter reading fraud, electricity diversion, etc. In the first, automation of meter reading reduced losses on the test feeder from 12% to approximately 2%. A second LESCO project provided meter readers with meter-reading devices (handheld computers) to be used on a single feeder with approximately 3,000 consumers. Although meters were bar coded with their account numbers, the reader still had to manually enter the reading into the device. Line losses remained at pre-project levels – approximately 12%. This strongly suggests that meter reader discretion in reading and manipulating the meter readings is the underlying explanation for unaccounted for losses.

- **Theft control**. Theft of electricity and related fraudulent activity that reduces revenue to LESCO is rampant and varied. Many instances appear to involve company employees. Reconciliation of customer meter readings to known area meter readings, which would highlight areas for investigation, has not been implemented.

- **Meter integrity and meter reading practices**. When a meter is declared to be defective, the consumer is billed on the average consumption of the last 11 months. Because it is the meter reader that declares a meter defective, it is possible for collusion between the reader and the consumer, especially during the peak season of summer. Since it takes three to four months for the meter to be replaced, the air conditioning season is over before the consumer is billed on actual consumption again. Also, with many meters located 7-10 feet above the ground, it is difficult to detect meter tampering.

- **Information technology (IT)**. Presently, LESCO business processes are characterized by manual and cumbersome practices, inadequate controls, insufficient commercial focus, limited transparency, and lack of reliable information. The use of IT to improve efficiency and effectiveness has not yet proven successful. Several standalone applications are not integrated either with other applications or with potential applications to be deployed in the future. Although the level of deployment of IT varies significantly from one DISCO to another, the key applications have been in multilevel aggregation of data or large-scale data processing. In other words, IT is being used as a tool to address a specific issue or two at a time and not as a long-term, holistic strategy to achieve fundamental business goals. LESCO's move to an ERP environment is an opportunity to rationalize and update core business processes as a prerequisite to further automation.

2.5.3 Analysis and Discussion

The commercial revenue cycle in DISCOs, including LESCO, is governed by three documents, including:

1. Commercial Procedures, 6th edition, November 2000.
2. Consumer Eligibility Criteria, 2003.

3. Consumer Service Manual, 2010.

The Commercial Procedures manual is a true procedures manual developed by USAID in the 1980s and is still the "bible" for carrying out commercial activities. The purpose of the revisions that have been made was primarily to raise authorization limits and reassign signing authority as needed.

In response to the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997 (the Act), NEPRA developed the Consumer Eligibility Criteria manual in 2003 to ensure a nondiscriminatory provision of distribution service and sale of electric power to all consumers within the service territory of a DISCO. This document is included as an appendix to the Consumer Service Manual.

The Act also led NEPRA to prepare the Consumer Service Manual, which provides instructions and a code of conduct and procedures for dealing with the consumer. It describes the obligations and rights of the consumer, as well as the rights and obligations of the DISCO. The timeframes for processing consumer applications, for completing service connections, meter reading, bill processing and delivery, and for resolving complaints are addressed in the manual. The manual also includes safety and conservation tips for the consumer. The frequent clause, "(DISCO to insert its name)" means that all DISCOs are to follow the policies stated and are not encouraged to develop their own consumer service manual, but to use the standard NEPRA document.

Overview of Revenue Cycle

The LESCO (and other DISCO) revenue cycle is composed of a number of interrelated steps. The first step – a pre-revenue prerequisite, is the application for service connection. There are nonrecurring fees assessed in the application and connection process, so this is in fact a part of the revenue cycle process. Once a consumer has received a service connection and begins consuming electricity, the DISCO revenue system must collect consumption data, process the data, print and deliver the bill, and collect revenues from the consumer. Each step requires a structured set of actions that must be orchestrated to allow the DISCO to manage an extremely high volume of transactions on a monthly basis. The following sections of this report describe each step of the revenue cycle for LESCO; much of this information applies to all DISCOs, since all use very similar commercial practices.

New Connections

The first step in revenue cycle management is to register and connect the consumer. The location associated with the meter is identified as the consumer; that is, the premises are registered. Should the occupant of the premises change, the consumer identification number is not changed, just the name associated with the number. Numbers are assigned in the walk order of the meter route. As new structures are added, the route must be renumbered to adjust to the additional structures.

LESCO's new connection policy is similar for general and industrial consumers. The difference is in the documentation required and who has the authority to approve the application. General consumers (domestic and commercial) can apply for service at the local subdivision office. Large consumers must apply at the marketing and tariff office located at the headquarter complex. Once the application and the terms of agreement are completed, and signed and appropriate documentation is attached, the application is assigned a registration number. Application efficiency is measured by the length of time from the registration of the application until the consumer is connected. Table 2.12 provides a sample of the timeframes involved.

TABLE 2.12 SAMPLE TIMEFRAMES FOR NEW CONNECTION

Application	Demand Note	Paid	CSO	Connected
30 June	8 July	14 July	15 July	22 Nov
29 Oct	15 Nov	24 Nov	25 Nov	--
31 Aug	9 Sept	7 Oct	--	--

LESCO is very efficient at the start of the process. Within a week of receiving a consumer application, the subdivision has conducted the site survey to determine if there is available power and prepared the cost

estimate for the connection. General consumers who are within 40 m of the connection point are charged a flat fee. A demand note for the connection fee and another demand note for the security deposit are prepared and sent to the consumer. The consumer has 30 days to pay the demand note at the pay point specified. Once payment has been made and the subdivision office is notified, the consumer is added to the queue for new connections.

A connection service order (CSO) is prepared after the fees are paid. The meter, cable, and necessary materials are drawn from stores, and the connection is installed. Frequently, the consumer signs the CSO to signify that the connection is complete. Either way, a copy of the CSO is sent to the divisional revenue office. Unfortunately, the materials needed are often not available for several weeks, in many cases months, after payment of the demand note.

Several factors designed to minimize mistakes in the data entry into the CIS unfortunately contribute to significant delays in consumer billing – sometimes for several billing cycles. For example, the preparation of documentation needed to include the new consumer in the billing system is low priority for technical personnel. In some cases, newly connected consumers have received service for more than a year before receiving the first bill. Even if the CSO is transferred immediately, it generally takes LESCO two months to process the first bill.

The process is as follows. First, the revenue office prepares an input sheet of customer data. This information is sent in electronic format to the billing center. The billing center then prints a "pre-bill" listing so the revenue office can verify that the data is correct. If the data is not correct, the errors are corrected, sent back to the billing center, and a pre-bill is printed again. If this occurs, the first billing cycle will have passed.

Meter Reading

Effective, efficient, and reliable metering and recording of electric power consumption is the heart of electric power distribution utility commercial systems. Many utilities experience significant difficulties in the meter reading process, including inaccurate or faulty meters; human error in recording and/or transcribing meter reading data; delays in recording and transferring metering data; and meter reading fraud involving consumers, meter-reading employees, and third parties.

There are a variety of strategies that can be employed to address problems with meter reading, including auditing meter-reading employees; rotation of meter-reading employees; outsourcing meter-reading services; use of advanced metering technology including automated meter reading (AMR), and/or use of prepaid meters. Each option and technology comes with an associated cost and vulnerabilities; no single approach is fool-proof, although some are, without question, less problematic than others.

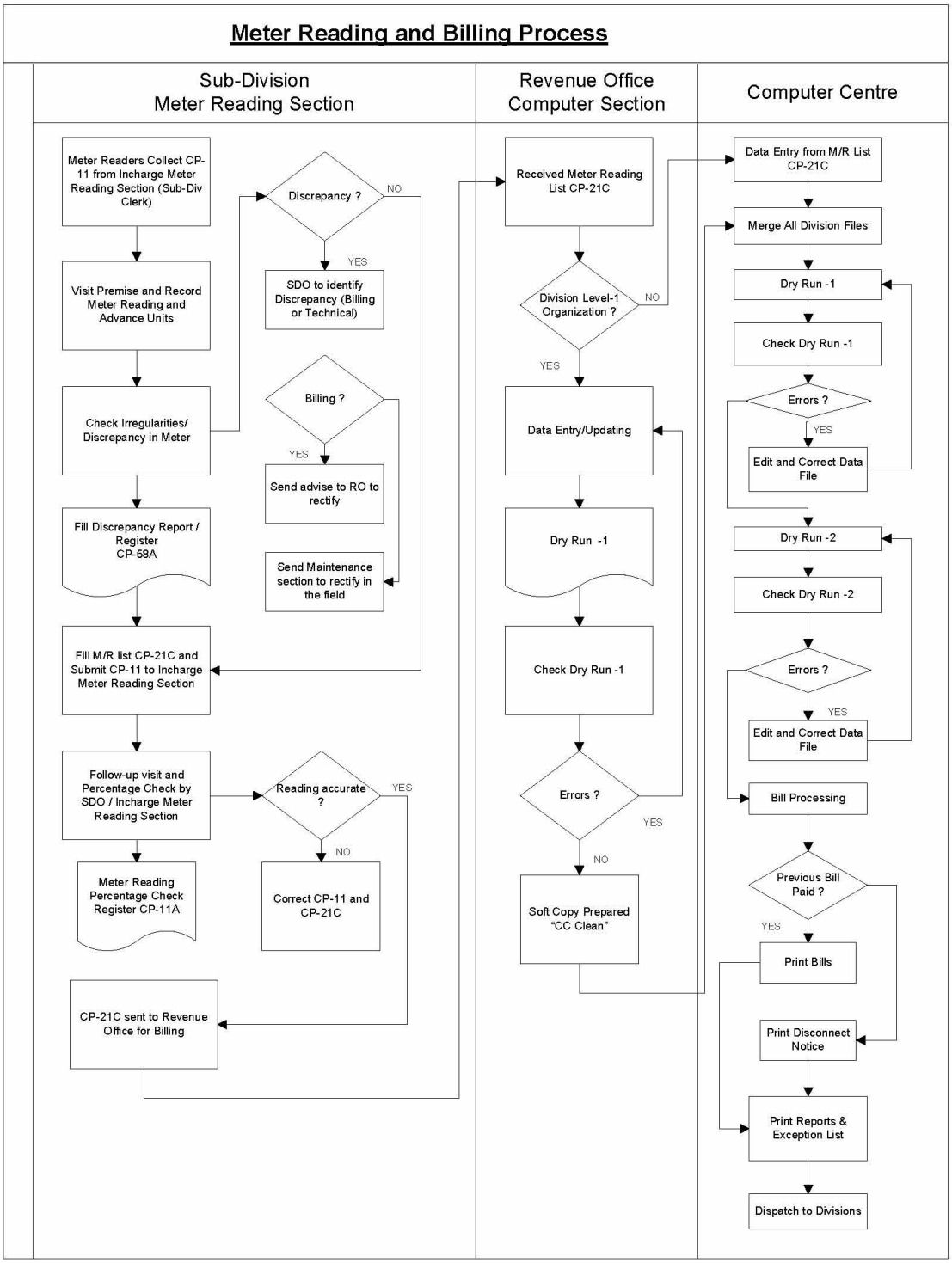
LESCO and its DISCO counterparts have all designed checks and balances in the meter reading policies and procedures in an effort to ensure robust and trust-worthy metered data from LESCO consumers. Interestingly – and quite problematically – this is the area of commercial operations for which there is the highest degree of distrust and anecdotal information regarding employee manipulation. It is important to note that the purpose of this report is neither to present evidence of fraudulent practices nor to make unsubstantiated claims, but to identify problems that affect DISCO performance and to identify solutions to the problems that are noted.

Figure 6 below illustrates the meter reading, data processing, and billing processes as described by LESCO commercial staff and verified by the PDIP team. As the diagram shows, meter readers are responsible for meter inspection to note if there are problems with the meter enclosure, signs of meter tampering, meter stoppage, or other problems. The diagram also shows that the subdivision officer is also responsible for performing random checks of meter reading values – to verify if there are issues with particular meter readers. Thus, there are formal checks in place to detect meter inaccuracy, as well as to detect meter reading fraud.

While these measures have been designed into the LESCO/DISCO system, interviews with LESCO commercial staff and record sampling indicate that in fact, there is little or no evidence that these procedures are actually followed. That is, LESCO commercial management and employees indicate that there is insufficient time to perform randomized evaluations of meter reading accuracy; and review of

meter reader event logs revealed that meter readers do not consistently identify problems with meters. Furthermore, LESCO does not employ a practice to remove, clean, and calibrate meters. LESCO has a program to eventually replace the electromechanical meters with electronic meters, but about 80% of LESCO meters remain electromechanical.

Figure 6. Meter reading and billing cycle process diagram



With regard to the meter reading cycle, LESCO divides meter reading into a series of batches. Given that there are 20-23 working days per month, LESCO divides consumers into 20-25 batches for purposes of meter reading, bill printing and delivery. This allows for continuous bill processing. The benchmark is for the bill to be given to the customer 15 days after the meter reading.

LESCO uses 20 batches to manage the meter reading and billing cycle for general consumers. These batches are read by the regular meter readers. An additional two to three batches for industrial and tube-wells equipped with demand meters are read by the subdivision officer or the division XEN. Other batches are dedicated to general consumers with loads greater than 5 kW and have time-of-use meters. These meters are also read by subdivision senior personnel.

The reading list for each batch is supposed to include consumers on the same feeder. However, this is not the always the case. LESCO commercial officers stated that exceptions are made where feeders intersect; it is more convenient for the reader to read the meters on adjacent feeders when the meter readers are already in proximity to them. When possible, the size of the batch is based on the number of readers and the "yardstick" of 2,000 meter reads per month. However, because LESCO has been adding a significant number of new consumers, it is accurate to say that the batch size is the total number of general consumers divided by 20 working days. The batch is then divided by the number of readers to create the daily route size so many meters may not be read every month.

The billing center aims to print meter reading lists five days prior to the scheduled meter reading date. The lists are delivered to the division office and then distributed to the subdivision offices. The lists may reach the meter readers three to five days after the reading date. However, readers do not use the reading list while reading the meters. Readings are recorded in a "Kalamzu book" (meter reading book) and then transferred to the reading list at the end of the day.

The reading lists contain the consumer number, their tariff code, the previous read, and the consumption for the same month in the previous year. When transferring the current reading from the Kalamzu book to the meter-reading list, the reader also calculates the consumption. If the consumption is out of line with the previous year's consumption, the current reading maybe adjusted. It was not uncommon to find cross-outs and overwrites on the reading list.

As the readings are transferred to the reading list, the reader calculates the consumption. Because the reading lists contain the consumption of a prior period, the reader and/or management can adjust the reading so that the consumptions are comparable. The purpose of calculating the consumption is to prepare a check for the data entry of the readings. The process of meter reading and preparing the meter list may take two to three days.

The date of the meter reading used for billing purposes is the date scheduled for the meter reading. Readings may actually occur two to three days before to two to three days after this scheduled date.

Bill Preparation

The meter reading lists from each subdivision are passed to the division's revenue office. The transfer process usually requires another day or so. The revenue office enters the readings for all subdivisions under its control. Each revenue office is managed by two data entry clerks and a supervisor who enter all consumer data for transfer to the computer center in addition to the readings. The clerks work in shifts in order to get all data entered in a timely manner. Data entry for 6,000 meter reads requires a full day for the revenue office team, so if one reader is behind schedule, the entire batch is delayed. Once the data entry has been completed, the total consumption for the batch is compared to the sum of the subdivisions batches as determined by the reading lists. The data is then transferred to the billing computer center either by e-mail or delivered to the center by flash drive.

The data for B3 and B4 industrial consumers (the largest consumers on the system) is entered at the computer center. There are instances where the division offices are requested to supply personnel for data entry.

If the closing for the previous month has not been completed, bill processing will be delayed. If all batches with the same number have not been received from all circles served by the center, bill processing may also be delayed. Not every division sends electronic data files and the data must be entered or

digitized by the computer center. Therefore, it may take nine to ten days to process meter reading data for a batch assuming there are no delays in receiving the raw data and data entry.

It is interesting to note that the issue date on the bill is not always the date when the bill was printed. For the month of November, the issue date was frequently two to three days prior to the actual date of bill preparation. However, the due date on the bill is calculated from the issue date – normally ten days from the issue date. The schedule allows two to three days from the print date for delivery to the revenue office.

The billing program that is being used by LESCO was written in COBOL in the late 1960s. Since the code was originally written, revisions have been introduced to improve functionality for maintaining customer balances. Printing of bills and reports is done in SEQUEL. The database is designed exclusively for electricity billing activity. However the COBOL program will not allow LESCO to include other revenues and security deposits in the bill.

The billing program was first developed by WAPDA, which originally programmed controls to ensure the integrity of the program and the data it contained. The program is now controlled by the DISCOs and many of the controls are no longer in use. There has been no transactional audit since the transfer.

There are 25 billing centers around the country. A DISCO may have one to five centers; LESCO has three. Customer service centers are connected to the system so that duplicate bills can be produced. However, bill adjustments must go through the revenue offices.

Bill Delivery

The due date should be calculated from the bill print date with an allowance for delivery days. The consumer should have at least seven days from receipt of the bill to complete payment to LESCO. However, the due date is usually the target date prescribed by standard LESCO revenue practices, without taking into account the frequent delays that occur. As a result, inadequate time is allowed for bill delivery; there are cases where bills have been delivered on or even after the due date.

The billing timeframe is very tight. Delays in any part of the billing cycle will result in delays of delivery of bills to the revenue office where the bills are sorted and delivered to each subdivision. The schedule assumes one day for delivery after receipt in the revenue office.

Usually, DISCO personnel are responsible for bill delivery but the process is outsourced in some cases. Bills are hand delivered to urban consumers. Because transportation is not provided, bills for rural areas are left at a single location, and consumers are responsible for collecting bills from predefined central locations. This introduces another source of risk to the bill delivery process.

Bill Adjustments

Bills can be adjusted if required at the customer service centers. If the adjustment is for less than 500 kWh, the customer service representative has the authority to make adjustments immediately. Adjustments in excess of 500 kWh require verification by field personnel.

When bills are not delivered in a timely manner, consumers may ask for an extension of one to three days. If a consumer makes a request for partial payment of a bill, the customer service representative may authorize installments of two to three payments, provided the amount is less than Rs. 25,000. Due to the fact that meter readings are, on occasion, estimated rather than read, actual readings in subsequent months can have the result of pushing some consumers into a higher tariff block. The consumer's bill may be divided (another form of installments) into several periods to lower the total bill.

Adjustments to consumer bills can be made at any center, but the bill must be returned to consumer's revenue office for data entry. The problem that may arise is the time required to deliver the adjustment to the consumer's revenue office and the time at which the adjustment is actually entered into the computer. If there is a substantial time lag, the consumer may have to return to the billing center for another billing adjustment. In other words, the back-office procedures do not follow through with actually adjusting consumer records.

Payments

Payments to LESCO can be made at any of the 41 banks that have teller arrangements with LESCO, at local post offices, at NADRA kiosks, or can be made electronically. The LESCO computer centers receive 41% of the payments through NADRA kiosks, ATMs, credit cards, etc. Forty-five percent of the payments are received through banks that do not have facilities to transfer payment information electronically.

As payments are received, the pay points prepare a scroll documenting the customer account and the amount paid. If the banks have online facilities the customer information may be transferred electronically. For those pay points without online facilities, scrolls and payment stubs are physically transferred to the revenue office. The revenue office reconciles stubs and scrolls; this period usually takes three to four business days.

The bank will not accept payment amounts less than the amount indicated on the printed bill. If the bill has been adjusted by the utility, the billed amount is adjusted, with the adjustment written on the bill. However, since bills are bar coded, adjustments require manual intervention when scanning the bill for data entry.

The payment stubs and scrolls are transferred to LESCO on a daily basis in most cases. The money is transferred to LESCO's collection account. The timing of fund transfer is dependent on the agreement between LESCO and the pay points.

Daily postings to the consumer accounts are balanced with the bank scrolls (receipt logs). Banks provide a weekly statement of amounts collected. The revenue office of the division will reconcile the statement with the office copies of the bank scrolls.

Disconnection/Reconnection

The billing/collection program automatically prepares a list of delinquent consumers who are subject to disconnection through an equipment removal order for all consumers who have not paid their outstanding balances within the grace period. The list is reviewed and edited by the billing supervisor and the revenue officer. The revenue officer has the authority to selectively delete consumers from the list, and the equipment orders for disconnection are thereafter cancelled.

The list and the equipment orders to be executed and the cancelled orders are sent to the revenue officer. The orders are sent to the technical department to be executed. The revenue officer is required to periodically review the status of equipment orders to ensure that services have been disconnected. When equipment orders are executed, LESCO technicians remove meters and services from the customer's premise, all of which are deposited and stored in the subdivision warehouse.

If the consumer pays all amounts due within one year, service and meter are reinstalled. After one year, the equipment is returned to division stores. Should the consumer pay his bill after one year but before three years have passed, the consumer may be reconnected but will be required to pay for a new service connection. The consumer is credited with the depreciated value of the equipment removed, but must pay for a new service and meter. After three years, the consumer is required to pay a new current security deposit and the full equipment costs.

Customer Service

LESCO has established a call center to process consumer complaints. Most consumer complaints have to do with service issues, but the call center also registers a significant number of complaints associated with billing issues. Call center attendants forward customer calls to the appropriate subdivision office, and follow up with the consumer to ensure that the complaint has been attended to.

Consumers may also lodge complaints at the customer service centers and at the subdivision offices. The complaints are registered in log books according to the type of complaint. Customer service personnel have the authority to adjust consumer bills up to 500 units (kWh) and to provide installments of two or three for bills less than Rs. 25,000.

At the local level, there are no dedicated customer service representatives. Personnel are assigned to man the windows for a few hours and then return to their other duties. If the complaint requires an

adjustment to the customer's bill, the change is entered onto the bill and the customer is free to go pay his bill.

All DISCOs need an efficient and effective customer care system. The current customer care system is dependent on telephone lines, which are either busy or faulty most of the time. This adds to customer frustration. Other utilities in Pakistan, particularly telecoms, have installed complaint ticketing systems, where the customer sends an SMS text under a short code to the complaint center. The complaint system on receiving the text will reply with a ticket number for the complaint with a possible time of resolution and escalate the matter to a higher level, if not closed. This allows the utility to maintain a database of complaints. Telecom operators have developed very efficient call centers for customer care. Partnership projects with different operators could be considered.

The schedule of power outage in case of load shedding or maintenance purposes is either not publicized or is done through the print media, which is an obsolete source. This lack of information causes frustration and loss of time and money for the commercial sector. Telecom operators could be queried about offering an SMS broadcast solution, whereby each consumer who has provided their mobile number to a DISCO will receive an SMS text for such outage. Airlines have adopted similar systems with some success.

Commercial Department Organization

The commercial function is partly managed by the operations director, the customers services director, and manager MIS at the headquarter level, a deputy commercial manager, and deputy manager MIS, at the circle level, and a revenue officer, at the revenue office attached to the division. The customer services directorate is managed by the manager commercial/director customer services, who reports directly to the CEO; the manager MIS reports functionally to the manager of customer services, and administratively to the CEO.

The deputy commercial manager is posted at circle level and reports functionally to the CEO but administratively reports to the SE of the circle. The deputy manager MIS is posted at the circle computer center, and reports functionally to the deputy commercial manager but administratively to the SE of the circle.

The revenue officer posted to the revenue office at division level reports functionally to the circle deputy commercial manager but administratively to the XEN of the division.

The revenue office is headed by a revenue officer and is organized in four main sections as follows:

- Accounts section: headed by a divisional accountant responsible for managing the cash book, reconciliation of weekly bank statement with the cash book, and reconciliation of the debtors' control accounts. The divisional accountant also has responsibility for accounting matters under procedures laid down in the divisional accountant manual.

- General section: headed by a commercial superintendent responsible for receiving duplicate copies of certain specified application forms and other connection documents from the subdivision offices, and maintaining connection application registers and files for each consumer.

- Billing control section: responsible for controlling meter reading and data delivery to computer center; ensuring that billing is correct; making adjustments to inaccurate or incorrect bills; issuing disconnection notices; preparing certain management reports and statistics; and dispatching bills.

- Debtor's control section: responsible for controlling the computer-prepared debtors' ledger, balancing ledgers, carrying out debt recovery action, and debtors' control reports and statistics.

The following section summarizes a review of the impact of changes to LESCO commercial practices

Analysis of Changes in Revenue Cycle Practices

During October 2010, Rs. 11.5 billion was collected. If the collection period were reduced by just ten days, Rs. 31.5 million could be generated, assuming an interest rate of 10% for the month. Potential savings accrued from improved meter readings are yet more substantial, and if there were a better

mechanism matching new connections, there would be an increase in revenues with an increase in customers billed. Consumers are not billed when the billing center fails to receive notice that a consumer has been connected or reconnected. In many cases, the consumer is billed after a period of delays, and the utility makes concessions by allowing installments or even writing off a portion of the bill.

The revenue system would work more effectively if practices and procedures were implemented with greater discipline. However, it is undocumented transactions (administrative losses) that are worrisome. The calculation of technical losses and energy accounting would allow a better reconciliation of deliveries and amounts billed. Detailed analysis of this aspect of losses is given in the Engineering section of this report. Comparing losses of the current period to prior periods is not a true accounting of energy. It merely perpetuates the previous error.

Because there is much reliance on the meter reader in the revenue cycle, more rigorous controls and oversight are required of the meter reading cycle. It is impossible to assert effective transaction control if there is collusion between the meter reader and other parties in the revenue cycle. Although there are procedures in place that could provide some of the needed oversight, they are not adequately observed or performed in a timely manner. A comparison of meter readings with the readings recorded in the Kalamzu book could provide some oversight. However, manipulation can occur while preparing the reading lists used for billing purposes. The preparation of meter reading lists can be eliminated altogether through a change in technology – or by a combination of changes such as AMR with handheld devices.

Distribution losses can be hidden by adjusting consumption of selected meter reading upward. The addition of consumption to various consumers can be used to manipulate revenue and allow managers to meet performance targets. Some of this manipulation may be uncovered during data entry. But with the addition of AMR, data is uploaded to the billing program, eliminating the need to enter it manually.

Meter routes should be organized around metered transformers and all those meters should be read on the same day. The transformer number should be made part of the customer record to calculate allocated load and total energy consumption at the transformer level. Meter reading of the transformer meter, if installed, can provide a sound base for energy accounting and transformer load management.

A reconciliation of energy needs to be made for each transformer to determine the reasonableness of the energy billed. If it is not reasonable, it could imply theft, meters that have been missed or recorded incorrectly, or there might be a problem with the system.

To prevent newly connected/reconnected consumers from going unbilled for several periods, logs of prepared service orders and status should be kept and reported. Service orders should be in duplicate and copies sent to the revenue officer, who should be responsible for following up when the order has not been cleared within a reasonable time. When a meter is reported as defective, it should be replaced immediately. If the utility has its own meter repair and calibration lab, it might be possible to fix it, recalibrate it, and place it back in stores to be reused. If it is not economical to repair the meter, it should be dismantled for spare parts that can be used in future repairs.

When the service connection order has been prepared, the consumer should be established and entered into the meter reading list and the reader's Kalamzu book. The reader should track the progress of the installation while reading meters and would be in a position to note the meter number and the current reading during the first cycle that the consumer is connected. The consumer's billing data can be prelisted and the consumer will be ready to be billed once the connection is completed.

If the customer is given a reasonable level of service, he may not find it necessary to procure electricity through nefarious means. LESCO will have better control over its system, dangerous situations can be eliminated, and satisfied consumers are more likely to pay their bill regardless of "outlandish" tariff rates.

Meter Maintenance

Random meter testing is not practiced at LESCO. Meters are only tested when there are consumer complaints, or when the meter reader notes a problem with the meter. At one subdivision, if a meter for a general consumer is removed, it is destroyed rather than being refurbished/recalibrated.

Only industrial meters are tested every six months. The testing procedure is performed in the presence of the industrial consumer. As reported, industrial meters are also checked on a random basis. Other meters are tested if a consumer requests a test or the concerned utility employee reports an abnormality in consumption or there appears to be physical damage. If the meter slows gradually with age, it will very likely go undetected. Moreover, many meters are located on poles or high on the outside walls of the premises, above eye level. It is doubtful that those meters are actually read and any damage or abnormality is likely to go unnoticed.

Taking into consideration field observations of meter reader management, location of meters, and the state of many meters, it is questionable that all meters are read and inspected each month. In theory, meter readers should inspect meters during the reading process and report any abnormalities and damage to the meter each month. However, there was scant evidence of meter status reports at LESCO's revenue offices.

Meter replacement is done if the meter is reported as defective. A defective meter log is updated by the meter reader. The logs that were reviewed revealed few entries; defective meter logs might not be kept in some subdivisions. It may take several months to replace defective meters, and there are no reports of how long meters have been declared defective. Someone other than the meter reader should also inspect the meters on a regular basis.

Meter serials numbers not routinely recorded when new meters are received from the manufacturer. Meters are "managed" at the subdivision level. When meters are installed, the serial number is recorded in the Kalamzu book and in the consumer's computer file.

Advanced Metering

LESCO has designed and deployed two pilot projects intended to introduce advanced meter reading practice and technology to improve metering practices. One program installed 350 AMR points on a single feeder. The feeder included a mix of domestic and commercial customers. Losses on this feeder dropped from 12% to approximately 2%.

A second LESCO improved meter reading project provided meter readers with the handheld meter reading devices (computers) to be used on a single feeder with approximately 3,000 consumers. This was a high-end feeder servicing a mix of commercial and residential consumers. Although the meters were bar coded with account numbers, the reader still had to manually enter the reading. Line losses remained at pre-project levels – approximately 12%. This indicates that the meter reader's discretion in reading and manipulating the meter readings is the real reason for the failure of handheld devices. No details are available about the nature of the trials mentioned, but it is clear that additional steps are necessary to limit manual access to meter readings if such high-technology solutions are to be effective. Utilities should treat the meter as their "cash box" that should not be accessible to anybody who is not authorized to manipulate it. If the integrity of this "cash box" can be maintained, commercial losses can be eliminated.

LESCO has also installed AMR meters on selected transformers that transmit the energy consumption by radio frequency. It cost about Rs. 100/month for the "bandwidth." Unfortunately, the radio frequency does not work in rural areas. This technology is quite attractive, however, for large commercial and industrial consumers. To improve the billing process, AMR meters should be installed not only on the premises but also at delivery points. AMR meters will eliminate transcription errors and reading errors and the manipulation of readings on behalf of consumers or management. The data can be loaded directly into the computer system. AMR meters result in real time consumption data provided directly to the utility commercial system. Consumer usage can be monitored from a remote point of access (such as the commercial office). Modern meters allow reading of a host of electrical data that can be used for technical analysis and understanding load behavior.

Prepayment meters can be used to allow consumers to purchase energy before using it. The basic principle of the prepayment system is that customers estimate how much energy they require before they consume it, and buy payment tokens (electronic or hard copy) beforehand from a vendor. The prepayment meter is then credited with the value of purchased credit. After the prepaid credit has been consumed, the meter automatically disconnects until additional credit is purchased and programmed into the meter. While there are advantages to the consumer (no more overbilling, control of the amount and

timing of payment, ability to monitor consumption, etc.), these advantages will have to be communicated to consumers to sell the program to them. There are obvious financial advantages for the utility, of course.

Meter Reading and Bill Delivery Practices

Although meter readers are assigned less than 200 meter reads per day, many are not able to read the full complement of meters. They are required to provide their own transportation without reimbursement. The result is that many "readings" may be estimated or simply falsified. This is a serious problem for the DISCO and for the consumer.

Meter readers are not systematically rotated as required in the DISCO revenue policies and procedures prescribed. Meter lists and routes are not defined for individual feeders, which complicates energy accounting. Trade unions monopolize areas, allowing employees to retain designated routes within specific subdivisions. This leads to a lack of objective meter reader control that, in other countries, has resulted in developing and sustaining personal income streams through fraudulent meter reading practices. In cases where meter readers are not rotated or constricted by trade union representatives, this has led to a lack of transparency, accountability, and the required level of checks and balances that is needed for program integrity.

Bill distribution is performed in urban areas on a house-by-house basis, while in rural areas, bills are left at a central location. Since bill delivery requires that the employee provide his own transportation, this leads to less-than-adequate delivery practices in many cases. This problem leads to delayed delivery where consumers receive bills with a shortened period to complete the payment process. Because the bill preparation process is often delayed, the delivery of bills is delayed as well.

Theft Control

With a less-than-ideal meter reader rotation, opportunities for collusion with consumers are numerous. Practices that can result from collusion include falsifying meter readings (recording low or high consumption as needed) and/or declaring the meter defective so that estimated bills will be lower than actual consumption. Because the time required to replace the defective meters is lengthy, invalid meter readings can continue for some months. Collusion can also result in the reporting of lower consumption levels to ensure that the consumer is billed at lower slab rates.

There are numerous checks prescribed in the NEPRA guidelines, and adopted by DISCOs to audit meter readings, but field reports indicate that these procedures are not followed. XENs and SDOs claim they are too busy to make time for meter reading audit procedures. The team was told that, in some cases, inspectors falsify inspection reports.

Meter readings submitted for billing purposes are reportedly influenced by the management of the divisions and subdivisions in order to meet revenue targets. Some consumers are overcharged because of excess readings to compensate for the under-billed consumers. Readings are said to be adjusted to manipulate the slab tariffs to create revenues. Over a period of a few months, the actual meter readings will be correct, but the consumer will have charged at higher rates which are not fully compensated when the consumption is lowered. Although this tactic could not be objectively verified, the system does allow this sort of manipulation.

One of the major tools for theft control is the reconciliation of electricity consumption data from all points of termination, i.e., grid, transformer, and consumer. One method for bringing the metering verification closer to the consumer is to install master meters on the distribution transformers and to compare the readings from these meters with those of the customers served by the transformers. Previous attempts to carry out this measurement have had difficulties due to differences in meter read times between the master and consumer meters. The DISCO could streamline this process by installing AMR meters at the transformer with continuous readings so that the transformer meter readings can be coordinated with the time at which the consumer meters are read.

Meter Integrity and Meter Reading Practices

When a meter is declared to be defective, the consumer is billed on the average consumption of the last 11 months. Because it is the meter reader who declares a meter defective, it is possible for collusion

between the reader and consumer, especially during the peak season of summer. The reader can declare the meter defective and the consumer will be billed at a lower estimated consumption level. Since it takes three to four months for the meter to be replaced, the air conditioning season is over before the consumer is billed on actual consumption.

With meters located 7-10 feet above the ground, it makes it difficult to detect meter tampering. The quality of service installations is problematic; many of the meters are poorly installed. Employees sometimes have to use the tools and small parts (screws, etc.) furnished by the customer. The meters may be loose, crooked, etc. making it difficult to state that someone has tampered with the meter.

Customer Information System

Presently, LESCO distribution system practices are characterized by manual and cumbersome processes, inadequate controls, insufficient commercial focus, limited transparency, and lack of reliable information. As a result, commercial operations are highly inefficient with the potential for substantial revenue leakages and poor customer orientation. The use of IT to improve efficiency and effectiveness is inadequate. Several standalone applications limit the ability to effectively interface and integrate either with other applications or with potential applications to be deployed in the future. Although the level of deployment of IT varies significantly from one DISCO to another, key applications have been in multilevel aggregation of data or large-scale data processing. In other words, IT is being used as a tool to address a specific issue or two at a time and not as a long-term holistic strategy.

The following are some examples of inefficiencies:

- A number of new connections are pending even the capital cost and security amount has been paid because there is no material available in store. The availability of service materials is not confirmed prior to issuing the demand notice. An integrated materials management and work order module would allow LESCO to order materials when needed, and connect consumers on a timelier basis.
- LESCO does not have digital records of paid demand notices.
- Applications for new connections are managed manually (a number of hands and desks are involved), without any level of automation.
- Late submission of consumer consumption data to the computer center for billing new connections results in delayed billings and revenue recovery.
- The commercial processes are reasonably well designed, but the lack of electronic technology creates significant delays, and moreover, opens tremendous vulnerabilities that can be easily exploited.
- Customer services activities are not automated. One significant problem is that customer account records cannot be updated in real time, i.e., the customer bill is revised manually but in many cases the same amount appears as arrears in next month's bill.
- Delayed billing due to a non-distributed billing/data processing system increases bill processing and bill collection cycles, i.e., the computer center waits for data from all subdivisions of all divisions of all circles before processing.
- Only one-month billing information is available on the computer master file; historical data is recorded off-line, i.e., on tape cartridges. Thus, no trend analysis/drilling to find the grey area of business can be performed.
- Delayed cash processing/posting (more than ten days in some cases) delays the cash reconciliation process. Also, management receives information very late.
- Delay by banks in remitting money to the company's account due to cash collection policy.
- No historical computerized record of service complaints.

- No computerized system for transmission loss calculation.
- Field staff are engaged in a number of duplicate activities, i.e., maintaining documents/registers at many levels, and copying information from one form/register to another form/register, etc.
- Unwillingness/lack of cooperation by system users to accept new technologies is a key hindrance toward improvement in the customer/utility relationship.

2.6 HUMAN RESOURCES

2.6.1 Overview

LESCO operates in a large service territory with more than 3.2 million consumers – a major utility by any standards. Modern electric distribution utilities must master the engineering challenge of commercializing huge energy transfers over complex power infrastructure systems; manage significant capital resources to finance system expansion, maintenance, and fleet costs, etc; and manage complex arrangements for the purchase of large amounts of power from GENCOs, receipts of payments from consumers, and payments to a multitude of vendors. In short, electric power utility employees are tasked with managing a highly complex business that requires a wide variety of skills and experience. Unquestionably, HR represents the utility's most valuable asset class.

2.6.2 Summary of Key Findings

The following are key findings of the PDIP's review of HR management.

- The challenges facing the HR infrastructure are serious and entrenched because DISCOs have been subject to both internal and external manipulation – by political sponsors, government agencies, trade unions, and by employees themselves.
- LESCO has yet to develop a strong and progressive corporate culture in which management and staff have well-defined and clear responsibilities and where management is endowed with adequate authority and all employees have accepted and understood their accountability.
- Results of the interview process indicate that management is unclear as to whether it reports to the Board of Directors, PEPCO, or the MWP. Partly because of this, outside governmental as well as political pressures are commonly and effectively exerted on LESCO's senior management – which is itself selected by PEPCO, not by the Board of Directors.
- There is a lack of transparency in hiring and career advancement within the company. Clear and transparent HR-related rules and regulations are lacking, without the necessary checks and balances in the system to foster an atmosphere of fairness and impartiality with respect to the annual performance review process.
- LESCO's corporate culture has not evolved in ways that reflect a modern, independent electric distribution utility. Employees appear to be locked in an historic public sector mindset, where once employed, an employee continues to be employed and even promoted based on seniority rather than performance.
- The compensation system makes no distinction between "performers" and "nonperformers" nor does the system reward high-risk jobs, such as that of linemen.
- DISCO salaries, including LESCO's, are artificially low as an result of continued adherence to WAPDA salary scales. While this may result in savings to the DISCO's operating cost, it is an artificial saving; one cannot expect employees who are perennially underpaid to function at high levels of performance. In other countries, low compensation levels have been linked not only to poor performance, but also to the tendency to engage in corrupt work practices.
- The PDIP review revealed that LESCO has not yet drafted updated job descriptions for senior management and key staff positions. Rather, the position descriptions for senior management

remain the AEB position descriptions. These documents lack clear and specific descriptions of roles and responsibilities; descriptions of required educational background and professional experience; descriptions of core competencies; and a description of scope of authority and responsibility.

- While LESCO provides capacity and safety training at a central training center, linemen trainees are trained with tools that are not commonly provided to line workers. Line workers are, in general, not provided the basic line tools and equipment required to perform corrective maintenance and line operations in a safe and effective fashion.

- Health coverage for employees and their dependents is poorly structured and imposes considerable hardship on employees.

- LESCO's senior management has a vision, but this has not been effectively communicated to mid-level management and staff. It is therefore not well understood by employees.

- Recruitment of talented staff is hampered by the lack of effective position descriptions, comparatively low wage scales, and willful interference in hiring decisions.

- LESCO does not employ a corporate performance management system. Instead, it uses the standard GOP annual performance review program, which is not based on goal setting and objective evaluation of performance.

- LESCO has not yet developed an employee handbook.

- The company does not have a comprehensive training and development action plan and generally lacks training or capacity building programs. The training that is offered is mostly aimed at allowing employees to advance within the DISCO system as opposed to skill development. Training facilities are ill-equipped, with instructors who have themselves not been retrained in many years, and with training manuals that have not been updated in two decades or more. The training program also lacks post-training impact evaluation to judge effectiveness.

2.6.3 Analysis and Discussion

The WAPDA infrastructure development program, when originally conceived, was designed to establish and expand a nascent electric power generation, transmission, and distribution system. It went through stages of expansion and re-engineering to achieve institutional development goals, and has had a rich history of achievement. However, for the past 30 years, while the external packaging has changed, the internal infrastructure, including the policies and procedures used to govern and manage the various power utilities (GENCOs, TRANSCOs, and DISCOs) has remained stagnant. The DISCOs that jointly manage perhaps the single biggest commercial enterprise in Pakistan use the same organizational infrastructure that has been employed for three decades while the world around them has changed enormously. It is no surprise that the time has come – if not past due – for significant changes in DISCO business, engineering, financial, and HR management.

The challenges facing the human resource infrastructure are particularly great, because this part of the DISCOs has apparently been subject to both internal and external manipulation – by political sponsors, by government agencies, by trade unions, and by employees themselves.

The changes that are needed are similar to changes that have been addressed in other former government utilities that have undergone reform programs. The goal of making changes is to create an environment and conditions such that DISCO executives, managers, engineers, tradesmen, and unskilled employees understand their roles in the organization; are given the level of authority needed to manage the tasks assigned to them; are given the means to succeed in their positions; are provided the training to better accomplish the tasks and activities assigned to them; are adequately compensated to thrive in their chosen profession; and feel an alignment and sense of engagement with their position and with the DISCO as their institutional home. This section addresses a variety of themes that were covered in the LESCO operational audit, presenting results and comments on the results of the audit process.

Overview of LESCO Corporate Culture and HR Environment

Observations from the management and staff interviews have led to the conclusion that, while LESCO appears to have made significant progress in retailing electric power to its customers, it still faces significant challenges to modernize its HR policies, procedures, and overall HR functionality. It has yet to develop a strong and progressive corporate culture in which management and staff have well-defined and clear responsibilities, and where management is endowed with adequate authority and have accepted and understand its accountability. For all intents and purposes, LESCO today employs a very close facsimile of the WAPDA legacy HR policies and procedures; it does not reflect the values and attributes of a modern, independent, well-managed electric distribution utility. Results of the interview process indicate that management is unclear as to whether it reports to the Board of Directors, PEPCO, or the MWP. Partly because of this, outside governmental as well as political pressures are commonly and effectively exerted on LESCO's senior management – which is itself selected by PEPCO, not by the Board of Directors.

During the interview process, a theme that surfaced repeatedly from senior management down to the functional personnel in LESCO, was the lack of transparency in hiring and career advancement within the company. Clear and transparent HR-related and other rules and regulations are also lacking, without the necessary checks and balances in the system to foster an atmosphere of fairness and impartiality with respect to the annual performance review process.

LESCO corporate culture has not evolved to reflect a modern, independent electric distribution utility. Employees appear to be locked in an historic WAPDA or public sector mindset, where once employed, an employee continues to be employed and even promoted based on seniority, with scant regard to performance.

Modern HR Practices

LESCO staff repeatedly stressed the need for modern, fair, and transparent HR practices. A modern HR management system that is based on accurate and up-to-date job descriptions, key performance indicators, fair and rigorous appraisal system, etc., establishes the foundation of a well-managed electric distribution enterprise but remains a dream. The PDIP team's assessment indicates the lack of this system as the root cause of so many problems in LESCO, and unless corrective actions in this area are taken now, all other solutions – commercial, engineering and financial – for problems in those particular areas, will not have the desired results.

A modern HR system complete with newly defined policies and procedures should include the following attributes:

1. Position descriptions complete with descriptions of duties, expectations of performance, and education and experience requirements for all positions in the company.
2. An objective hiring process that allows the HR Department to recruit professionals as required with independence and in the absence of any external interference.
3. A career ladder structure defining the prerequisites for promotion from one level to the next within each ladder.
4. A performance assessment process based on clearly enunciated goals and objectives, administered annually and designed to recognize and reward superior performers while identifying and providing opportunities for counseling underperforming employees.
5. A clear, transparent, and objective merit-based promotion policy applicable to all positions throughout the company.
6. A progressive and competitive compensation package independent of government compensation levels, adjusted to reflect market rates for all professional and skilled positions.
7. A newly defined health policy that provides increased flexibility to employees, allowing them to seek and receive health care beyond the WAPDA-centric health facilities.

Analysis of Compensation

DISCO regular employees are compensated through legacy WAPDA "basic pay scales" (BPS), a standard compensation package of the GOP. Salary-related benefits, such as allowances, bonuses and increments, are also treated under the same system. Under this system, seniority is the only measure by which pay increases are determined. There is no distinction between "performers" and "nonperformers" nor does the system reward high risk jobs, such as that of linemen. As a consequence, mediocre performance is the norm and assistant linemen who do not incur the risks of climbing poles either refuse promotion, move to other positions, or ask for early retirement.

An exception may occur when an employee is hired as a "contract employee" (e.g., the directors of HR, Legal, and Finance). The pay package for contract employees may be higher than the BPS, but subject to PEPCO rules. In all cases, LESCO's pay scales for employees and contract employees alike are much lower than private sector pay on a position-by-position basis. For this audit, a rough comparison for some job positions, and also views expressed by the HR Department, indicate that, for higher-level skilled positions in LESCO and indeed all other DISCOs, the BPS is not an attractive proposition, other than getting "life-long" employment. To arrive at a more definitive answer to the question of desired compensation packages in a private sector entity, a market-based survey with a much broader scope and presumably carried out by a professional HR firm is needed. However, such a compensation and benefits package will be possible only when the company is freed from the GOP's pay scale requirements.

In order to illustrate the degree to which LESCO and other DISCO salaries are below local market value, a comparison is made below (Table 2.13) between comparable LESCO positions and engineering and management positions at NESPAK, a leading engineering consulting company fully owned by the GOP.

TABLE 2.13 COMPARISON OF LESCO AND NESPAK COMPENSATION PACKAGES

LESCO				NESPAK				
Positions	**Basic Pay**	**Other Allowances**	**Gross Salary**	**Positions**	**Basic Pay**	**Other Salary Benefits**	**Social Benefits**	**Total Package**
Lineman I	5,845	17,928	23,773	Mid-Level Surveyor	15,500	22,586	16,960	55,046
SDO	16,820	40,907	57,727	Junior Engineer	20,075	33,320	22,631	76,026
XEN	21,610	47,482	69,092	Principal Engineer	29,555	53,402	30,820	113,777
					44,360	84,587	43,357	172,304
SE	27,740	59,094	86,834	General Manager	56,585	107,647	53,335	217,567
CE	33,915	74,765	108,680	Vice President	63,185	140,140	66,179	269,504

Table 2.13 illustrates that Nespak pays senior engineers and managers almost three times the salary and benefit package that LESCO offers engineers and senior management. For example, LESCO's CE is paid Rs. 108,680, while NESPAK pays a principal engineer with approximately five years' experience a total compensation package approximately equal to that of LESCO's CE. The NESPAK example does not in any way set a similar target for all LESCO engineers. LESCO staff in engineering, planning, and design positions naturally feel that their counterparts in NESPAK receive far better remuneration. Engineers working for private sector firms earn several times more than NESPAK engineering professionals.

It may also be useful to compare LESCO salaries with the Pakistan Telecommunications Corporation (PTCL), a recently privatized telecommunications company now organized under a public-private partnership under management control of Etisalat UAE. The PTCL compensation package for selected positions is illustrated in Table 2.14 below.

TABLE 2.14 PTCL COMPENSATION LEVELS FOR MANAGEMENT POSITIONS

Positions/Grade	Average Salary	Other Benefits	Total Package
Senior Vice President	575,000	120,000	695,000
Executive Vice President	325,000	100,000	425,000
General Manager	212,500	75,000	287,500
Senior Manager	125,000	45,000	170,000
Manager	70,000	20,000	90,000
Assistant Manager	40,000	10,000	50,000

The data in Table 2.14 further illustrates the wide difference in LESCO/DISCO compensation with other, similar institutions in Pakistan. The fact that DISCO salaries are artificially low is an historic result of adherence to WAPDA salary scales, but while this may result in savings to DISCO operating cost, it is an artificial saving. One cannot expect employees who are perennially underpaid to function at high levels of performance. In other countries, low compensation levels have been linked not only to poor performance, but also to corrupt work practices.

Comparisons with IPPs and utilities in the gas sector also indicate that the LESCO salaries are extremely low. The top position in good IPPs carries a salary package of over Rs. 23 million per year. The average salaries of the next level of executives are in the order of about Rs. 10 to 12 million per year. The banking sector in Pakistan also transformed itself from state-owned entities to fully functional private sector banks. This was brought about by adopting an attractive compensation package ranging from Rs. 3 million (junior executives) to about Rs. 30 million per year for senior management. LESCO senior management in key positions will have to be offered salaries comparable to other companies that went through a transition to private sector operation. KAPCO was a fully government owned power plant in the public power sector. When KAPCO was transformed into a private sector entity, the private sector pay scales ranging from Rs. 10 million to about Rs. 23 million were implemented.

It is important to note, however, that the increased compensation afforded to employees of quasi-private organizations such as NESPAK and PTCL is accompanied both by greater expectations for performance, and a greater potential for discharge in the event of business cycle downturns or in the event of demonstrated employee malfeasance. Such increases in compensation must also be accompanied by greater discipline in the hiring of staff. It is not possible for LESCO to offer significant increases in salary while each LESCO employee continues to serve only 160 consumers. Not only will the overall ratio of consumers to employees have to increase, there will have to be notable improvements in efficiency in such areas as commercial operations, attention to consumers, and continuity of service.

Review of Management and Key Staff Positions

The PDIP team reviewed management and key staff positions, including that of the CEO and functional heads. The review revealed that LESCO has not yet drafted revised, updated job descriptions for senior management and key staff positions. Rather, the position descriptions for senior management remain the AEB position descriptions. These documents lack clear and specific descriptions of roles and responsibilities; descriptions of required educational background and professional experience; descriptions of core competencies; and a description of the scope of authority and responsibility.

In order to evaluate the degree to which current and future management and key staff are qualified to perform the requirements of their position, position descriptions need to be defined. Modification of LESCO position descriptions needs to take into account the current needs and requirements of LESCO, but must also be forward looking – evaluating the leadership qualities that will be needed to transform LESCO into a more dynamic and advanced electric DISCO. Combining electric distribution utility experience with modern business experience, as well as experience with IT and communication system options, for example, will be extremely important toward managing a more efficient and effective distribution system.

A comprehensive review of the entire HR management system, covering clear identification of duties and responsibilities will be required to address LESCO's future management and leadership needs.

Health and Safety

While LESCO provides capacity and safety training at a central training center, linemen trainees are trained with tools that are not commonly provided to line workers. Line workers are, in general, not provided the basic line tools and equipment required to perform corrective maintenance and line operations in a safe and effective fashion. The number of fatal and nonfatal accidents of line staff last year was 12 and 26, respectively. Advanced safety training is needed to ensure that linemen are provided rigorous training and are required to follow the practices and procedures defined by the safety guidelines – with the threat of loss of work hours and other penalties if they fail to observe safety regulations. Perhaps the most problematic issue is that LESCO has not developed a safety program with safety policies and procedures that govern lineman working conditions; provides ongoing training; provides an incident reporting system to record and evaluate all workplace injuries; and governs the enforcement of practices and procedures for safety in line construction, maintenance, and system operations. Investigation of safety events is inadequate, leading to poor reporting and inadequate analysis of lapses in safety policies and procedures. The safety department comes into action when a fatal accident happens and their investigation begins, which is not a proactive approach.

A safety program will require a significant investment in training, protective clothing, tools, and program monitoring. It will require a cultural shift in the workplace, all aimed to dramatically reducing accidents and deaths. In addition, LESCO employees would benefit from a diversification of health care options moving away from the WAPDA health facilities as the primary provider of services, to increased options for primary care for employees and family members.

Health coverage for employees and their dependents is poorly structured and involves considerable difficulties for employees. Employees and their dependents cannot obtain medical care (outpatient and in-hospital) of their choice. They are forced to use the WAPDA central hospital in Lahore or a peripheral health care center, which can require considerable travel or which does not possess the required facility or services. Alternatives such as better health care through insurance or paying a fixed proportion of salary for outdoor treatment have not been evaluated or brought up for serious consideration.

Vision and Internal Communication

LESCO's senior management has a vision, but the vision has not been effectively communicated to mid-level management and staff. It is therefore not well understood by employees who play the role of principal representatives of the company. Articulating the company's vision to employees not only will facilitate more effective manifestation of the vision, it will also have the very positive effect of strengthening a sense of engagement with the company and loyalty to the company's goals and objectives.

Recruitment

Effective recruitment begins with well-defined position descriptions specifying core competencies, experience, level of responsibility and authority, and compensation levels. Once these attributes are defined, the HR Department can advertise for candidates to fill vacancies both within and outside of the company.

As mentioned above, position descriptions for even the most important jobs at LESCO are not well defined: they do not specify core competencies, required educational background, or level of responsibility. The position descriptions are too general to be used effectively to guide the recruitment process.

The compensation package is certainly well-known within Pakistan, but it is not competitive with similar private sector jobs. It is certainly not an inducement to attract well-qualified candidates to assume key roles within LESCO.

Lastly, the recruitment process itself is often short-circuited by direct appointments made by PEPCO and/or the MWP. This practice violates the concept of an independent electric distribution utility, and forces LESCO and other DISCOs to absorb professionals into positions for which they are likely not well suited. A more objective, independent, and transparent process is required to support operational improvement and DISCO independence in the future.

Corporate Communication

LESCO lacks a clear and well articulated corporate communication strategy. Communications within the company, and between LESCO and its consumers are therefore inefficient and at times ineffective. LESCO would benefit from a proactive and aggressive public relations (PR) program, There is no intranet or common communication medium, such as company e-mail. Staff use Yahoo, Gmail, etc., even for official communication. Business cards are reserved for senior management.

Performance Management System

LESCO does not employ a corporate performance management system. It uses the standard GOP annual performance review program, which is not based on goal setting and objective evaluation of performance. A robust performance program needs to start with well-defined position descriptions that establish performance expectations from employees, core competencies, reporting requirements, and the professional demeanor that is expected of each employee. The process should include goal setting, discussion between the employee and supervisor at the outset of the year, and an objective review and evaluation process at the year's end. The LESCO/GOP program is not described by these attributes. For all intents and purposes, advancement is based almost entirely on seniority – not on achievement – so there is little incentive for employees to improve skills or generally invest themselves in their jobs.

HR Policies and Procedures

LESCO has not developed a consolidated and easily accessible set of HR policies and procedures manuals available to its management and staff. From recruitment to termination, clear-cut rules and procedures are required. In the place of policies and procedures that serve LESCO's needs as a large and growing corporate entity, it has continued to employ legacy WAPDA HR policies that reward longevity and seniority, rather than high performance and dedication to the LESCO mission. Many of the legacy HR policies and procedures date back to the early 1980s and beyond, and in some cases have fairly little relevance to high functioning electric distribution utilities. The longest serving HR Department staff are usually those who know almost all the rules and even how and where to find them. Staff, particularly from outside the HR Department are, therefore, greatly disadvantaged, because they are dependent on the department even for small things, such as leave regulations, etc. In such a scenario, fair HR operations in a transparent and equitable manner usually suffer. Where policies or procedures do exist, there is inadequate implementation, leaving the door open to influences, both internal and external.

Employee Handbook

LESCO has not yet developed a LESCO employee handbook, a concise document providing essential guidance on LESCO employee policies and procedures –do's and don'ts to help guide employees. Ideally, such a handbook should be available on the Internet, in booklet form, and in both English and in Urdu.

Training and Capacity Building

The company does not have a comprehensive training and development action plan and generally lacks training or capacity building programs. The training that is offered is mostly targeted to allow employees to advance within the DISCO system, not really oriented toward substantive skill development. LESCO has neither designed nor implemented an effective needs assessment to design future training programs. The training facilities are ill equipped, with instructors who have themselves not been retrained in many years, and with training manuals that have not been updated in two decades or more. The training program also lacks a component to perform post-training impact evaluation.

While a complete training needs assessment will be needed for LESCO to provide a detailed identification of specific training needs, the PDIP team has identified essential training needs that should be addressed at the earliest possible date. These include, but may not be limited to the following:

Commercial training

1. *Meter reader training*. This training should focus on familiarizing meter readers with new metering technologies; training meter readers to use handheld electronic meter reading devices and to identify and record meter faults, meter tampering, and meter maintenance requirements; and ensuring that meter readers are properly oriented in carefully recording and transcribing data.

2. *Improving basic computer skills for commercial staff.* This would dovetail with ERP implementation, to ensure that commercial staff understand how to specifically manage new levels of responsibility using ERP screens, troubleshoot functions, modify customer information, print modified bills, and other basic tasks associated with an advanced commercial customer information and billing program.

3. *Customer service training.* This would orient commercial staff to think of and treat customers as valued clients.

Engineering and operations training

1. *Safety management program.* Establish a safety management program, and provide basic and advanced safety training to DISCO linemen and line superintendents.

2. *Work planning management.* Train line crews how to work more effectively to complete tasks in a timely manner. Concurrently, train line crew supervisors how to manage crews more effectively.

3. *Area planning and mapping.* While the long-term goal for engineering staff will be to develop and deploy GIS systems, in the interim, LESCO staff could and should develop improved manual mapping and planning tools.

4. *Line design.* LESCO and other DISCOs do not really design distribution lines. Rather, they use rules of thumb as a proxy for engineering design practices and procedures. This results in high-cost, and often inappropriate, line design.

5. *Metering theory and practice.* This should focus on training engineering staff in a variety of metering options, meter types, and metering applications.

Finance and accounting

1. *ERP training.* Train staff in financial functions, HR functions, and material management functions of the new ERP system. While the vendor will provide very basic training in the new ERP system, there will be a need for more detailed training across a number of essential application modules.

2. *IA training.* LESCO internal auditors focus on only one of several IA obligations as outlined in the IA manual – identifying low/inaccurate meter reading. IA obligations are far broader than only meter reading.

3. *Updating accounting manual.* Train accounting staff in accounting best practices as specified in the revised accounting manual. Provide training in compliance with chart of accounts.

HR management

1. *Basic computer competency training.* MS Office applications, management of the HR data base. HR staff need to improve basic computer skills to manage modern HR software.

2. *HR planning and forecasting training.* This is a more specialized training aimed at improving the overall capacity of the HR Department to undertake HR planning and assess training needs.

3. *Annual performance evaluation program design and training.* To familiarize employees and staff in performance evaluation program.

4. *Capacity building for trainers.* This is an important training-of-trainers program.

2.7 COMMUNICATION AND OUTREACH ASSESSMENT

2.7.1 Overview

LESCO is one of the leading electricity distribution companies with a large base of internal and external stakeholders. As a corporate entity, LESCO stands at a crucial transition point. While it is making sufficient efforts to assume the role of a service-delivery organization, it continues to face a wide range of

problems, including the ever-widening gap in the demand and supply of electricity. It is headed by a CEO and governed by a Board of Directors. PEPCO has a peculiar role in electricity governance and exercises its influence over LESCO in terms of overall communication and outreach. NEPRA has a regulatory role in electricity governance.

LESCO serves its 3.2 million customers with a vast network of subdivisions, divisions, and circle offices. It has established a network of customer services centre to address the complaints and problems of customers closer to their location. The company has an active PR Department dealing with the media for relevant information sharing and press releases with its given resources. Frequent power shortages and increases in tariff hike are a sad reality and an important challenge for LESCO. This has become all the more visible in the last few years. Despite ceaselessly serving its consumers, LESCO has not been able to earn consumer confidence and satisfaction. As a result, it has faced the brunt of customers' dissatisfaction both on account of power shortages and tariff hikes. It is a difficult task to satisfy customers and maintain a strong corporate image/branding due to factors such as low electricity production and increasing tariffs, which are not in the domain of LESCO.

2.7.2 Summary of Key Findings

Analysis and Discussion

In a large organization like LESCO, which employs over 17,000 people in over 150 different job categories in over 170 subdivisions, internal communication is an uphill task. It requires a coherent and integrated strategy to ensure fast, regular, and comprehensive communication among its employees. The task assumes more significance due to the fact that existing communication and outreach practices are a continuation of a typical public sector organization that relies on rigid protocols of restricted availability and access to information and resists digitizing procedures, rules, and regulations.

The culture of communication at LESCO relies primarily on letters/inter-office memos, which are forwarded through inter-office files, personal delivery, fax, and post. Electronic mail culture is least prevalent.

The penetration of computer-based information and communication technology (ICT) is found to be dismally low. The project of a web portal with interactive capability (though currently on a limited scale meant for the HR Department) and the ongoing implementation of an ERP system could clear the way for a proactive internal communication culture with its own employees and departments.

It was observed that the organizational culture of LESCO appreciates the importance of contemporary communications and outreach but faces the critical challenge of a traditional corporate culture that inevitably pushes the role of communications to the periphery. However, a well-thought-out and well-designed communication strategy could help LESCO improve its internal performance, ensuring better access to useful information, and minimizing (and ultimately abolishing) the orthodox culture of restricting the availability of relevant information to internal and external stakeholders. The embedded and integrated role of communication and outreach strategies could help foster a progressive corporate culture at LESCO.

The senior and middle management was found to be well aware of the challenges of internal and external communication and determined to deliver as much as they could with the available resources and flexibility. However, their potential capability is overshadowed by the overriding policy influence of PEPCO and the MWP as well as the constraints of resources and management space besides their continued preoccupation with ongoing issues of governance and technical nature. The capability of senior management appeared competitive and exuberant, which could bring gradual changes in corporate efficiency and communication style if the business operating environment is supportive. The audit noted that the prevailing management pool has the potential to embrace a paradigm shift in the internal and external communication culture and practices through the implementation of a gradual and integrated change management plan. With due recognition of existing corporate strengths, efficiency, and practices, the following key findings emerged during the internal and external communication assessment of LESCO, which could highlight gaps for improvement:

Status of Corporate Entity: Independent or Illusion of Independence?

The present status of DISCOs in Pakistan is marked by contradictions. On one hand, significant steps have been taken to eliminate a monopolistic regime and create self-governing independent electricity distribution entities with individual boards of directors. Yet, the given autonomous status of DISCOs has remained largely a de facto monopoly of PEPCO, raising uncertainties at many levels. Experience suggests that such external pressure stifles innovation and service improvements, constraining organizational effectiveness. In order to break out of their current state of inertia, DISCOs need to be empowered with strong institutional structures capable takeoff withstanding external pressure.

Presumably, LESCO also operates as independent electricity DISCO with its own Board of Directors and a well-defined senior management team with a vision and will for change. However, interaction with senior and middle management and review of corporate practices revealed that LESCO continues to follow the image, practices, and policies of its parent organization, WAPDA, in many areas. Further, PEPCO appears to play a decisive role in the management practices of LESCO. With its current status, LESCO draws authority for many strategic management and communication issues from PEPCO, the MWP, and WAPDA. Some observations are as follows:

1. File covers being used within the company for departmental and inter-departmental communication still carry the logo and color scheme of WAPDA. However, official letterheads and business cards carry the logo of LESCO. This reflects the embedded influence of WAPDA over the company and infers that, in order to meet the complex challenges that LESCO has inherited, it needs substantial capacity building in corporate communications.

2. The new electricity connection contract between LESCO and the consumer uses a standard contract application form that reflects the name and logo of WAPDA instead of LESCO. It is ironic that, on the other hand, bills are issued and collected by LESCO and not WAPDA.

3. The overriding impression among management was that Board of Directors followed the policy guidelines of PEPCO and the MWP.

4. The practice of communicating a unified and independent corporate brand was not found to be in place, even in nontechnical areas such as having standardized visiting cards and file folders. In external communication, the name and logo of PEPCO appeared as an integral design compulsion in all press advertisement along with LESCO's logo. It was observed that the logo of LESCO did not clearly register its corporate name when printed in small press advertisements (10 x 2 column cm), revealing lack of attention to standardized corporate branding.

5. Mass media campaigning is considered the exclusive domain of PEPCO, which decides what subjects need advertising, which media mix should be used, and what should be the frequency of advertisement. These are strong limitations that ultimately constrain LESCO's effectiveness in consumer outreach. By way of example, LESCO was obliged to pay for mass media campaigns carried out by PEPCO. The budget at the disposal of the PR Department was a mere Rs. 22 million while it paid Rs. 164 million in FY2010 and Rs. 167million during FY2011 to PEPCO as its share of the cost of the mass media campaign.

6. When it comes to the appointment of an advertising agency, LESCO is obliged to work with a PEPCO preapproved panel of advertising agencies. Mainstream media campaigns are also managed by PEPCO and it recruits suitable advertising agencies for each job.

Challenges of Corporate and External and Internal Communication

The prevailing corporate culture and practices pointed out serious challenges to LESCO's external communication as well as internal communication, which are summed up as follows:

Corporate and External Communication

- Currently, there is a lack of corporate branding and image building in external communication.
- The role of external communication is limited to PR.

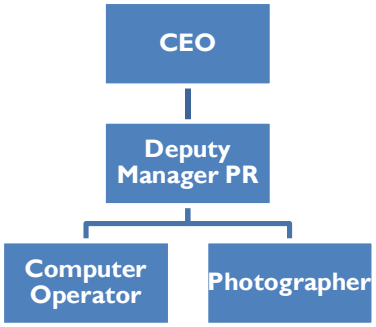
- External communication could not earn due priority within LESCO as reflected in budget allocation and the limited role of the Public Relations Department.
- There is unreasonably skewed budget allocation (as mentioned in Section 3.5.1) at the disposal of the PR Department and PEPCO for external communication.
- The potential of public outreach activities has not been properly explored. However, need-based piecemeal efforts have been carried out, such as energy conservation poster campaign for school children.
- At a corporate level, the practice of developing a comprehensive proactive annual communication plan and calendar of activities does not exist.
- No annual report has been published for the last two years. However, annual financial accounts have been compiled, which are meant for relevant internal and external stakeholders.

Internal Communication

- LESCO rigidly follows the legacy of WAPDA in terms of style and mode of internal communication. This style is based on preparing notes by subordinate staff, which is approved by one or more senior staff, and then returned through the same path as a follow-up to which a formal letter or inter-office memo is issued. Copies marked for related staff are prepared as well. Such letters are then numbered in a dispatch register and delivered in person to the head office and nearby offices. As evident, this process takes time and is highly formal. The personal delivery of official mail and documents from various field offices is still very common in an era of efficient courier companies, post, and electronic communication.
- Internal communication among a large workforce used to a traditional style of communication is a daunting task in which speed and efficiency are natural challenges.
- The continuation of orthodox and obsolete communication practices and inhibited use of contemporary ICT at a corporate level is another challenge.
- The continuation of tedious protocols for official communication (the traditional file culture) is an important challenge that leads to restricted availability and access to information.
- There is very low penetration of computers, networking, and electronic communication. Electronic mail culture is hardly in practice e-mail addresses and computers having been assigned to most managerial staff.
- A phased plan for providing training in basic IT to staff is in process at a relatively slow pace.
- The implementation of the ERP system has already started with reasonable success, which could pave the way for improving the culture and efficiency of internal communication practices.
- Not much effort has been made to develop an information database (knowledge management) of rules and regulation, operations, and other information that should be in the public domain

External Communication Process, Practices, and Outreach Strategies

The PR Department at LESCO is the focal department for external communication and outreach activities. The department is headed by a deputy manager and assisted by two staff members as computer operator and photographer.



The deputy manager has worked in this department for many years and appears to know his core functions fairly well.

PR Department: The PR Department is not represented in the current organization chart. In practice, this department is a support department and directly reports to the CEO. Its main job is to liaise with the media on behalf of the company. It is also mandated to focus on external communications. The department has minimal interaction with other departments except for news and information collection and dissemination.

The main functions of the PR Department include:

1. Scanning national and regional newspapers on a daily basis to prepare a summary for the CEO of any material published about LESCO in particular and the power sector in general.
2. Preparing and issuing press releases about LESCO activities, public notices, procurement notices, shut down announcements, etc.
3. Liaising with the local press and electronic media for corporate coverage.
4. Responding to any adverse media query that appears on national TV channels or the press (in a target of 40 minutes in the case of TV channels).
5. Liaising with PEPCO for corporate and external communication activities, media queries, preparation of new media campaigns and press issues relating to the Press Information Department.
6. Liaising with the designated advertising agency – Midas (Pvt) Limited – in the preparation of press and electronic media campaigns and media responses.
7. Managing the compilation and publication of a monthly newsletter that aims to project corporate activities.
8. Liaising with local printing presses/production houses to manage printing jobs.
9. Liaising with other departments to collect information material and manage the printing of the Annual Report.
10. Arranging outreach activities including seminars, events, radio talk shows, and press briefings on corporate and electricity-related issues.
11. Managing any other activity that involves the media, printing material development, and printing.

PR Process and Practices: LESCO undertakes external communication at the local media level while mass media campaigns are managed by PEPCO to which LESCO contributes its share of the cost (mentioned in Section 3.5.1). The main communication activities of LESCO are issuing press releases, a monthly newsletter, shut down announcements, and procurement (tender) notices. The main outreach activities include occasional seminars on energy conservation, press talk shows, radio shows, and event management.

The PR Department liaises with local media for corporate coverage and handles bad press. It also creates a daily media report for the CEO and responds to media stories and issues as necessary. The media review is shared with other departments concerned as well for their information and input.

The department prepares and issues press releases as per the brief (usually verbal) of the CEO or any other departmental head if required. It has an annual budget of up to Rs. 25 million.

The department uses a mix of media, which includes newspapers, TV channels, and radio. The local press is the most commonly used followed by radio. Since TV advertisement campaigns are managed by PEPCO, the department does not have any worthwhile activities that might require independent coverage.

Communication and Outreach Campaigns

The PR Department creates and manages media coverage to highlight information such as power shut downs and promote energy conservation. However, the level and frequency of this type of communication and media outreach is not significant to make a noteworthy impact in the media. The issuance of press releases as media responses or information on/promotion of LESCO-related issues is done on a need basis. No calendar of media campaigns and activities is prepared as a corporate communication and outreach strategy.

Past press releases have referred to LESCO's activities, power shut down situation clarification, development plans, safety plans and practices, and employee welfare issues. Radio talk shows are related to LESCO's activities, customer services, and energy conservation. Only three or four posters and leaflets have been printed during the last few years and related to safety and energy conservation.

Very few outreach activities have been observed. These activities mainly include energy conservation seminars at educational institutions and radio talk shows.

Internal Communication Process, Practices, and Outreach Strategies

Internal communication is based on the norms of a public sector organization. Office letters and inter-office memos with traditional protocols are the most common internal communication tool. Circular notices, departmental and inter-departmental meetings are also common tools of internal communication.

Overall, correspondence and communication has the entrenched flavor of government correspondence, which usually emphasizes tedious and unnecessary paper pushing apparently to complete one's own file. Audit requirements and litigations make a strong case to maintain a traditional "file"-driven communication culture. Clarity, creativity, and decisive communication are the ultimate causalities of such practices.

The penetration of computers is very low. The sanctioned strength of staff was determined some 30 years ago when computers were not in wide use. Earlier, stenographers and typists would assist in preparing internal correspondence and record keeping. Historically, managers depended on typists or stenographers to prepare their communication and maintain records. Despite the changes in technology and typewriters having become obsolete, a similar pattern is still followed. Now that computers are used in most cases to replace typewriters, stenographers appear redundant as prime correspondence operators and now work as personal assistants to their respective managers. It was reported that most of them have not been retrained in computer skills mainly due to their own inclination to keep to the comfortable job of assistant to senior and middle managers.

It was reported that the management in general is not computer-friendly or even computer literate in a few cases. A knowledge management system comprising a reliable database of employees, rules and regulations, and operations is not available for ready reference through computers for field staff and head office-based employees. This forces employees to rely on traditional "file culture" which hinders prompt and clear communication in most cases. The use of modern communication technology and across-the-board training in such tools has been identified as inevitable for a corporate shift to more efficient, prompt, and clear communication.

There are few outreach activities; those that are reported are mainly related to staff gatherings on special occasions, usually farewells for retiring employees or staff welfare-related events. No other activities such

as events, commemorations, seminars, family gatherings, staff functions/gatherings, open houses, etc. have been reported.

Customer Centers/Complaint Centers and Communication with Consumers

LESCO has a main customer service centre at its head office, and customer complaint centers at the circle, division, and subdivision level. It was observed that staff members who deal with customer complaints either in person or through the helpline number have not been exclusively trained in customer handling and etiquette of customer-centric communication. It was also reported that dedicated staff are not allocated at circle, division and subdivision level; rather, staff at field customer services offices belong mainly to field operations and are duty-bound to attend the customer services center for a designated period.

A record of complaints is maintained manually with good follow-up to coordinate with other departments so that complaints are resolved promptly. Monthly reports of complaints are prepared and sent to the Customer Services Department for reference and record. The manual data held at customer services centers should be digitized to maintain a convenient database and to allow for subsequent data analysis for better customer service. The use of IT was not seen to be in practice at most centers. It was observed that customer-centric training and online connectivity could help create a more efficient and customer-friendly environment at these centers.

A pilot of mobile customer service through a delivery van is being implemented and has been found to be effective in reaching out to remote areas. A plan is underway to replicate this model.

A dedicated chief executive complaint desk is present at the customer services center located at LESCO's headquarter. Senior managerial staff look after it on a rotational basis and have authority to resolve customers' complaints on a daily basis with quick on-the-spot responses and redressal procedures.

Customer services centers do not have sufficient information material such as posters, brochures, and flyers explaining the process of complaint handling, the chain of supervising officers, and salient points of NEPRA's customer service guidelines for incoming customers.

Current State of IT Used for External and Internal Communication

During the past few years, LESCO has taken several initiatives that serve as important steps toward creating a positive environment for ICT development and access to information. Among the most important is the deployment of ERP, which is crucial for achieving the desired internal efficiency and competitiveness. It is also encouraging to see that LESCO is already taking bold steps to develop the relevant infrastructure by outsourcing hardware and network connectivity assistance to Wateen. However, the major challenge in effective ERP implementation is to make the staff ERP-ready. A training module in basic computer skills is being implemented at present. Reaching a threshold level of staff capacity for ERP is still an uphill task as shared by MIS staff. Hence, IT automation is currently limited to billing.

The penetration of ICT was found to be very low. It was reported that around 1,300 computer terminals are in use. It was also observed that most of these computers are mainly used for data processing and typing. The MIS Department reported having arranged e-mail connectivity for most managers but only a few dozen e-mail addresses are in use with apparently minimal usage for official communication.

LESCO's current web page is an example of a potentially powerful communications tool that is relatively well maintained. The potential of the web portal for internal and external communication could be enhanced by training managerial staff and increasing the use of electronic communication. The MIS Department updates the website as and when needed.

Customer Services and Complaint Handling from a Gender Perspective

The customer service centers are not gender-sensitive. No separate counters have been designated for women, there are no separate seating arrangements or dedicated female staff for women complainants (although qualified female professional staff are deployed as key managers to look after the customer services center located at the headquarter), and no separate toilets are available. However, it was reported that women complainants are dealt with on a priority basis as per corporate practice and cultural norms.

Outreach Practices

Few outreach activities are carried out by LESCO. No annual calendar of activities is prepared. Most activities carried out are need-based rather than planned corporate activities. Outreach activities include seminars on energy conservation with the collaboration of some leading educational institutions and media. Some talk shows have been organized on radio and a few posters and leaflets were reportedly printed advocating safety and energy conservation. Budget constraints were reported as one reason for the lack of outreach activities. However, no annual outreach plan has been developed either.

3. RECOMMENDATIONS

While the preceding chapter presented the results of the LESCO operational audit, this chapter will present an interpretation of the results and make recommendations for future action. The Performance Improvement Action Plan for LESCO, a companion report, will present a more detailed description of the proposed changes in processes, procedures, and investments, all aimed at transforming LESCO into a modern electric power distribution utility.

LESCO's successful future will be built on a foundation of three fundamental areas of improvement:

1. ***Introduction of appropriate technology***. This will include automated metering systems; high efficiency distribution transformers; expansion of IT systems, including integrated enterprise information systems, GIS, and eventually, advanced business systems. A key prerequisite to the more effective use of technology systems is the rationalization of current business processes. Other utilities' experiences have shown that simply automating outmoded and archaic business processes leads to new systems that fail to realize the greatest possible benefits.

2. ***Adoption of industry-leading HR policies, practices, and procedures***. A transformation of LESCO's management and staff will require complete revision of the employee compensation plan, overhaul of position descriptions, redesign of the performance management system, application of clear and transparent hiring and promotion practices, and a program to adjust staffing levels to achieve enterprise efficiencies in line with high-performing electric utilities in similar developing markets.

3. ***Redesign of commercial revenue cycle.*** To address vulnerabilities, the introduction of advanced technology is needed to ensure revenue recovery, while the reorganization of staff and redefinition of reporting requirements is needed to normalize control and eliminate potential conflicts of interest.

3.1 GOVERNANCE

The Board of Directors does not yet function effectively as a corporate board. The CEO, who is appointed by PEPCO and not hired by the Board, is a Board member. The CEO is also a member of the Audit Committee, a conflict of interest. In addition, there is no financial expert either on the Audit Committee or Board.

- The Board should consider replacing the CEO on the Audit Committee with a Board member who has financial expertise. The newly reconstituted Board of Directors will require training to prepare them for the challenges of governing LESCO in the changing utility environment in Pakistan. Board members need to be made aware of their roles and responsibilities vis-à-vis the MWP, NEPRA, and other stakeholders in the power sector.

- The Board should be formally established as an independent governing body with ultimate decision-making authority and, in general, empowered to (1) set the company's policy, objectives, and overall direction, (2) adopt bylaws, (3) name members of the advisory, executive, finance, and other committees, (4) hire, monitor, evaluate, and fire the CEO and senior executives, (5) determine and pay the dividend, and (6) issue additional shares.

3.2 ORGANIZATION

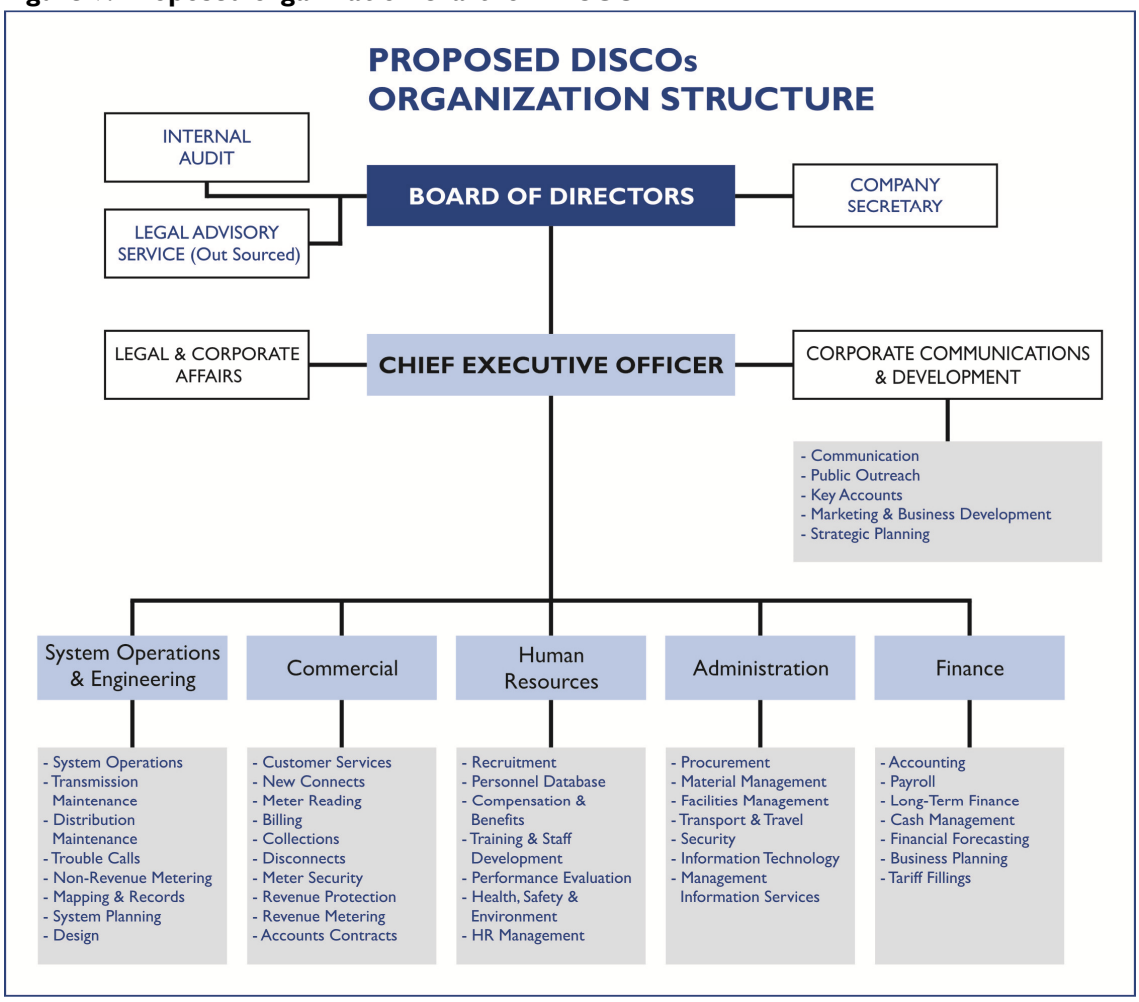
The LESCO organizational chart, as noted in the previous chapter, is not organized in a fashion that supports effective commercial management and the checks and balances that are required to improve meter reading, billing, energy auditing, and collections.

The PDIP recommends an organizational structure that is designed along functional lines, with departments that include:

1. *General and administration*. Encompasses accounting, HR management, warehouse management, facilities management, procurement, and fleet management.
2. *Commercial management*. Includes meter security and theft control; division commercial offices, under which will be located customer service; meter reading and control; billing; and connections/disconnections.
3. *Finance*. Supervises long-range finance and cash management.
4. *Operation and maintenance*. Oversees LESCO transmission operations (transmission lines and substations) and distribution operation and maintenance.
5. *Engineering and planning*. Supervises line construction, system planning, mapping, and records.

The proposed structure will allow the CEO to focus on strategic issues, leaving day-to-day operational management to experienced and trusted senior management. Moreover, all commercial operational management should be consolidated within the commercial department, while all engineering planning, design, and construction activities are managed by the engineering department manager. All administrative functions, including HR, accounting, procurement, and facilities management should be organized under a single administrative department. An example of an organizational structure that is designed along functional lines is shown in Figure 7 below. A more detailed review of LESCO's specific needs will be required before an organizational structure can be recommended, but it is worth considering that the majority of efficient and effective electric power distribution utilities are organized in very similar fashion to the organizational chart shown here. The exact structure should also be a subject of detailed study to match existing positions, eliminate certain functions through consolidation, and introduce new positions including new units to achieve the objectives of a fully functional organization.

Figure 7. Proposed organization chart for LESCO



3.3 ENGINEERING

The Findings and Conclusions section of this report present the process whereby the PDIP engineering team prepared an evaluation of LESCO's distribution management system, and the results of a mapping and loss assessment effort. This section presents the conclusions of the PDIP engineering team resulting from their observations and calculations, as well as recommendations for opportunities for improvement.

Transmission Network

The PDIP team did not carry out any specific analyses of the transmission network, as it was clear that the major problems were in distribution. The only issue noted with transmission has to do with the computation of transmission losses, which for FY2010 were stated to be 0.1%. Transmission losses for LESCO are low, given the density of the network, but a value of 0.1% is not realistic. An approximate computation indicated that a more reasonable value would be in the range of 2-2.5%.

A better method of determining transmission losses should be adopted. Such a method should rely mainly on improved metering, but could also employ modeling to evaluate whether the metering results are reasonable.

Planning Processes

Without accurate maps, planning is not possible because it is impossible to assess issues on an area-wide basis and resolve multiple problems with a single integrated plan. Maps do not have to be computer

generated, as utilities have for decades relied on paper maps using municipal street maps or survey maps as a base.

- LESCO should consider undertaking a paper mapping effort at least in the most congested part of Lahore as an interim measure pending the implementation of electronic mapping capability. As a minimum, all single-line maps, available with subdivisions, could be converted into digital maps. These would form the basis for further mapping and updating.

- In the long term, a fully automated GIS-based mapping and updating system must be implemented. This could be achieved through the progressive infusion of technology in the company as well as by utilizing local engineering services firms who could take responsibility for mapping, updating, database management, preparation of work orders, inspection and verification of work orders, preparation of as-built reports, and updating the asset accounting system. Similar services are currently being used by the DISCOs for the verification and release of reimbursements under donor-funded programs. A detailed study of existing and future work order systems is needed.

Standards and Specifications

- A concerted effort should be made to develop a more secure metering installation to reduce known vulnerabilities such as external tampering and access to service drop connections and conductors.

- Transformer standards require review in the current environment of high-cost power. The section has issued a revised standard calling for a 27% reduction in maximum allowable losses for transformers, but more should be done to lower transformer losses.

- In dense systems such as Lahore City, transformer losses account for half of total technical loss, and even the revised standards allow almost twice the losses as can be achieved with more modern technologies. Wound core and amorphous core technologies need to be explored.

- Introduction of multiplex or ABC LT systems should be considered as a means of combating power theft.

- Areas that are important to address in congested areas are:
    - Underground cable and installation standards for use in congested urban areas.
    - Standards for transformers that can be installed in vaults rather than being installed on platforms in the street.
    - Spacer cable or aerial bundled cable standards allowing for overhead HT construction in congested areas.
    - Standards for compact transformers for use in congested areas.

Procurement Effectiveness

- While there is no absolute method for determining the ideal size of a solicitation, it is likely that LESCO's needs for materials could be satisfied by eight to ten procurements a year, two each for poles, hardware and accessories, cable and conductors, and transformers. Special purpose solicitations may be necessary for turnkey items such as substations, but even these should be few and large. It may even be possible for DISCOs to share procurements, allowing them to increase the size of procurements to levels that would attract international vendors.

- The company should build on the comprehensive system it has already created for the control of material inventories, linked to the ERP system, which does an excellent job of tracking exactly what it has on hand and where it is located. This is an impressive feat and is certainly one of the major successes of the company's ERP implementation.

- In a corporate – as opposed to a governmental – environment, users are considered customers and it is therefore incumbent on the Procurement Division to seek opportunities to improve the efficiency of delivery of materials. This could be achieved to some extent by maintaining control of all warehouses until the materials are actually issued to the final users, allowing for shifting stocks between warehouses, a feature facilitated by the ERP system but not yet taken advantage of.

- The use of larger, fewer solicitations to procure the majority of required material at low cost can be combined with flexibility for the purchase of small quantities on the local market when needed to provide a more efficient procurement system.

Construction Quality

- Inspections of completed jobs should be performed independently of the Construction Department to ensure quality control and durable construction.

- Connectors should be specified for all jumpers and other joints and the practice of wrapped or "served" aluminum strands should be phased out beginning with high-current LT joints.

- The standard connector specified by WAPDA construction standards is a two-bolt aluminum parallel groove connector, which is admittedly expensive. However, parallel groove compression connectors are cheap and simple to install with hand operated tooling, and provide far superior connections with much lower resistance than wrapped joints.

Problems of construction quality control are particularly evident in the center of town where unorthodox construction approaches have been used, such as 11 kV insulated cable installed on standard pin insulators as a means of construction in areas with limited clearances. One could make the argument that such construction is necessitated by circumstances, but the sloppiness of almost any cable riser pole is harder to justify.

In the face of these issues, it may be preferable to consider outsourcing construction, which would no doubt require the development of a contracting industry, but would allow the Construction Department to reconstitute itself as a quality control organization that would supervise contractors.

Operations

- LESCO must ensure that tools, both hand tools and heavier equipment, are in good working condition and available in sufficient quantities for job requirements. Tools such as blocks and tackle for lifting, hand-lines for transferring items up the pole, and wire handling tools such as grips and come-alongs for tensioning conductors must be provided. Tree trimming equipment more than axes, trimming shears, and pruning hooks is also needed. Transport needs to be provided to avoid situations where lineman must travel on their own motorbikes to jobs.

- Even a single work fatality must be considered unacceptable. Continuous emphasis should be placed on safety as one of LESCO's core values. This must be reinforced by recurrent training, safety meetings, and a program that enforces safety rules with penalties for worker noncompliance. Protective equipment such as safety belts and grounding sets must be well designed for their intended purpose.

Meter Security

- LESCO should take steps to improve the security of exposed connections and service conductors and for the conversion of vulnerable LT to covered conductors.

- The existing fleet of electromechanical meters, numbering in the millions, can be brought to a reasonable level of accuracy through inspection and testing, thereby improving the commercial loss situation.

Technical Losses and Loss Segregation

Technical losses in the distribution system for LESCO were found by the PDIP to be 5.2%, broken down as follows:

- Conductor loss 1.1%
- Transformer loss 2.3%
- LT network loss 1.6%
- Service drop loss 0.2%

This level of technical loss can be compared to the total, reported distribution network loss of approximately 11.5% (allowing 2.3% for transmission loss), indicating that nontechnical (commercial) losses, e.g., electricity theft, metering fraud, etc., may be as high as 6.3%.

LESCO should, as a high priority, undertake a comprehensive program to identify areas of high, nontechnical (commercial) losses and realize the very significant commercial savings associated with eliminating these losses. Reconciliation of customer meter readings with known feeder loads should be considered an effective starting point for such a program.

Planning and Mapping Improvements

- A ten-year load and revenue forecast should be developed in support of budgeting, financial planning, and system planning. A relatively straightforward combination of econometric and end-use modeling techniques will enable LESCO to produce forecasts that are more reliable and useful for a wide variety of important applications. Most of the demographic, household, and economic data needed to augment sales and pricing data already in LESCO's hands should be readily available from government and private sources.

- Improvements in mapping and planning tools will allow for anticipatory planning so that problems with service quality can be identified and resolved before they become issues.

HT Improvements

HT improvements mainly concern rural feeders, where, due to their longer length, there is greater conductor loss. Opportunities include:

- *Better metering between the transmission and distribution network.* Although not strictly speaking a loss reduction action, better metering between the transmission and distribution network would allow for better segregation of transmission and distribution losses. This is necessary to be able to determine with greater certainty just how large the commercial loss problem is.

- *Application of capacitors.* The installation of capacitors that could improve the power factor on the Kot-Maji feeder (92 km of line) from 80% to 95% would reduce losses on this circuit by 27% or over 144 kW. This measure would be less effective on urban feeders due to their shorter length and larger conductors, but since 25% of LESCO's sales are in rural areas, it is a valid loss reduction measure.

- *Coordination of the capacity of feeder breakers with that of the Osprey conductor in use on most of LESCO's feeders.* The conductor has a capacity of 700 amps whereas most feeder breakers are limited to 400 amps due to the current transformers on the breakers. Increasing this limit would allow increased loading of downtown feeders, which would increase feeder conductor loss, but allow more funds to be expended on reducing losses in other areas.

- *Development of spacer cable systems for use in congested areas.* This would allow HT lines to be brought closer to consumers in congested areas and the LT line extent to be minimized. In conjunction with this would be the use of T-T connected compact transformers with wound cores and low losses so that three-phase transformers can be applied in limited space.

- *Development of improved transformer specifications*. This will dramatically reduce transformer losses, which reflect half of LESCO's technical loss, and technologies exist to cut even the current new specification losses substantially.

- *Evaluation of underground cable for urban feeders*. Cables can be installed in duct banks and initially used to supplement overhead feeders in areas with congested rights of way.

- *Review of long feeders (over 60 km in total length) on the basis of voltage drop rather than thermal capacity*. The current method of identifying problems only when conductor loading exceeds 300 amps is inappropriate for long rural lines. These circuits have already incurred voltage problems and high losses long before reaching the 300 amp threshold.

- *Application of compression connectors for most taps and other joints to eliminate jumper burnouts*. Points at which sectionalizing is done could be retrofitted with bolt-on connectors to facilitate disconnection. Replacement of wrapped joints would reduce callouts for jumper failures and improve service quality, though the impact on losses would be small.

LT Improvements

The following are recommended improvements that should be considered in the area of LT:

- *Prepare a census of consumer locations so that consumers can be linked to the transformers that serve them in the CIS*. This would allow for improved transformer load management as well as providing an opportunity to evaluate losses on a transformer-by-transformer basis, using portable measuring instruments to correlate transformer loading and sales.

- *Selectively replace open wire LT line with multiplex or ABC to reduce vulnerability of the system to casual hooking*. A side benefit of this action would be a reduction in the incidence of transformer damage due to short circuits occurring on the open wire LT.

- *Relocate transformers so that they feed the center of an LT sector rather than the end*. This would reduce losses on the affected LT sector by 50%. The incidence of end-feeding is uncertain, but five of the eight transformer sectors modeled in this projects were end-fed, so it is likely that the practice is widespread.

- *Retrofit compression connectors on jumpers and other high current joints, and improve connections to the low voltage bushings of transformers*. The present system of wrapped joints produces a significant level of callouts for overheated joints, which, although not a loss issue, does affect consumer service quality.

Metering Improvements

The following are recommended metering improvements:

- Introduce an electromechanical meter-testing program that is oriented toward ensuring the accuracy of electromechanical meters until they can be replaced with electronic units. This could be combined with an accelerated program for changing electromechanical to electronic meters.

- Evaluate options for improving the security of meter installations. One option is to use connection boxes and neutral concentric cable as opposed to unguarded open installations. The customer cannot be given access to meter bottom connections or the installation has no security at all. Neutral concentric cable encloses the cable in a grounded sheath so that any attempt to penetrate the cable with a sharp item such as a nail or an awl will cause a short circuit and defeat the attempt at penetration.

- Investigate the use of socket-type meters. These provide greater security for meter connections and have larger high-current connections, allowing them to be applied for direct reading up to 320 amps. This would reduce the number of current transformer (CT)-type meters that have to be installed, removing the CT accuracy as an issue.

- Replace most of the current stock of CTs in use in industrial metering boxes with either direct reading meters or higher quality CTs. There have been a number of instances of CT failure, which of course compromises meter reading.

- Work with meter manufacturers to improve the security of indirect meters (CT and CT/PT installations). The current crop of electronic indirect meters can be reprogrammed from an optical port to alter the meter multiplier. This creates a vulnerability to any person with the correct software and the optical programming wand, all of which can be obtained at low cost in various markets.

3.4 FINANCIAL

- Policy changes should be sought that would allow LESCO to treat government clients on an equal commercial level as other clients, particularly in the case of nonpayment for electric services provided.

- LESCO should ensure that the 30% of its payment collection points that are nonbanking partners meet the same standards of timeliness in remittance as its banking partners currently meet through electronic funds transfer. Transfer of funds within one business day of receipt of customer payments should be the standard.

- LESCO is in the final stages of implementing an ERP framework, demonstrating leadership among Pakistani DISCOs. The ERP system will provide the means to automate currently manual processes and integrate business, HR, engineering, asset management, work plan management, and operations into an electronic environment that can be used in real time in all phases of LESCO operations.

- The company should manage its transition to this new ERP environment carefully to ensure that all affected employees understand why the changes are being made, receive adequate training and support to use the new capabilities effectively, and participate in decisions on how the system will be configured where possible.

- LESCO should expand the role of IA beyond electricity billings and update the audit procedures that were established in 1985 and have not been revised since. The legacy WAPDA audit manual is too narrow in scope to effectively audit LESCO financial and functional activities, and will not be sufficient to perform auditing procedures in an ERP environment.

A number of instances of government involvement were noted that hampered the operations of LESCO. The following constraints should be evaluated and proposals made to overcome them or minimize their impact on future business operations:

- PEPCO has currently placed a ban on the purchase of new vehicles when one third of the vehicle fleet is 20 years of age or older.

- PEPCO is the *de facto* authority for approving ERP implementation and certain hires and new positions.

- Major vehicle repairs have to be performed by the WAPDA base workshop, which generally incurs twice the cost of having the repair performed in the private market unless a no objection certificate exception is issued.

- In 2008, four DISCOs, including LESCO, were asked to obtain loans to pay for government shortfall in power costs that had been incurred by all DISCOs.

- All DISCO investment projects have to be filed with the Planning Commission, Central Development Working Party, and executive committee of the National Economic Council for approval regardless of funding status. This is a very burdensome process.

Finance and Accounting Recommendations

To summarize recommendations in finance and accounting, LESCO should:

- Hire a consultant to revise and update accounting and internal audit manuals in line with the movement to modernize LESCO, to increase the internal auditing scope to more effectively serve the needs of the Board of Directors, and to adjust to the new ERP environment.
- Evaluate means for improving transfers from pay points to LESCO bank accounts.
- Complete implementation of the ERP platform, and expand applications to serve all finance and accounting needs in line with control, management, and financial reporting to the LESCO Board of Directors, NEPRA, and the MWP as needed.
- Establish in-house expertise to support ERP functionality, train LESCO management and staff, and develop new applications.
- Obtain insurance coverage for buildings, equipment, inventories, and other such assets as deemed necessary to eliminate exposure to significant financial loss.
- Consider alternative sources for working and investment capital and propose changes in policy to reduce overdependence on government financing in the long term.

3.5 COMMERCIAL

The following are key recommendations for commercial management:

- There is an urgent need to introduce automation technology into the commercial management of LESCO. The use of AMR, prepayment metering technology, handheld meter reading technology, and other current communication and metering technologies would eliminate reading and transcription errors and reduce vulnerability to employee and consumer manipulation of metering data. Use of AMR meters on industrial clients and transformers would make energy accounting more readily available, and would support work planning and analysis of the distribution infrastructure. An essential part of any such technology implementation is proactively involving employees who will be directly impacted by the changes to design new and better business processes.
- Management should enforce provisions of the Commercial Procedures that require checks of a prescribed number of meter readings and bills delivered ensuring that "losses are brought down to a bare minimum and bills are delivered to the consumers." This will discourage customer meter fraud and deter collusion between customers and employees.
- Similarly, transaction audits should be performed to confirm that billing system adjustments are legitimate and conform to company standards.

Billing Cycle and Energy Accounting

- Improving billing cycle efficiency will result in accelerated revenue collections, allowing LESCO to generate short-term interest for dividends or to allow CPPA to reduce interest and penalty charges that might accrue from delays in payment to GENCOs.
- LESCO billing, collection, and financial transfer procedures are common business practices for a manual system that could made more be effective for recorded transactions if followed. Adding new technology and revising the procedures for the additions would streamline the billing cycle and reduce errors. Employees with jobs in billing and collection should be directly engaged in the design of new systems to ensure that meaningful changes are made to business processes, that new systems are readily accepted, and that appropriate training and ongoing support requirements are fully understood.
- Establishing a method to more accurately account for energy sales by feeder or distribution transformer would yield additional value, and could result in reduced commercial losses. Energy

accounting could be accomplished by a number of methods. The use of AMR meters as revenue meters or at delivery points would allow LESCO to accurately monitor consumption via electronic, real-time means. Energy accounting could also be accomplished by using conventional electronic meters on distribution transformers, although this would be subject to the integrity of the meter reading process. However, if subdivision management were to focus on areas where losses are highest, making a concerted effort to audit meter readings at delivery points, this would support an effective loss reduction program. An effective energy accounting initiative would not only result in lower administrative losses, it would also result in higher billings leading to more income to the DISCO.

Improved Consumer Service

- LESCO has established a call center that tracks consumer complaints, forwarding calls to the appropriate party. This program has not been rolled out to all circles, and communication with consumers has been limited. Moreover, complaint resolutions have been subject to lags, given that DISCO consumer service personnel are not always available or perhaps do not make sufficient efforts to clear consumer complaints. A more aggressive program should be implemented.

- LESCO should consider assigning personnel to complaint resolution on a dedicated basis and give them reasonable authority to resolve issues to eliminate the need for the consumer to make repeated visits to a consumer service center.

Summary of Recommendations

In order to improve commercial performance, a number of interventions will be required that are related to one another. Improvements in metering technology from electromechanical meters to electronic meters will have little effect, for example, unless organizational and procedural changes are made in the meter reading auditing process to detect fraud or manipulation of data. Implementation of a CIS will require new accounting, data collection and transfer, and billing procedures. Best practices require that a consumer census be taken to populate the CIS database with accurate information.

The following recommendations, if implemented in a systematic and coordinated fashion, will result in increased revenue recovery, improved commercial efficiency, and more effective consumer service:

- Consumer census to verify/add consumers.

- Installation of a new CIS.

- Reorganization of corporate structure so that all commercial activities report to the director of consumer services.

- Update metering, using advanced metering technology where appropriate, and evaluate use of meters on selected distribution transformers.

- Reorganize meter routes.

- Implement energy accounting.

- Design more comprehensive customer service and consumer awareness programs.

- Enforce meter reading audits and meter inspection program.

- Establish systematic meter repair, testing, and calibration.

3.6 HUMAN RESOURCES

Of all activities at LESCO, HR management needs the most attention. Because it is dependent on policies and procedures, and because policies and procedures company-wide have largely gone without substantial review and revision for nearly three decades, the HR management program does not support LESCO's needs to attract and retain highly skilled, dedicated, and engaged employees. This conclusion is reflected

not only by repeated responses from staff and management, it was also repeated by the results of the HR survey that was administered at LESCO.

While there is much work to be done to design and define new HR policies and procedures that are responsive to LESCO's needs, changing policies and procedures will require a modest investment of time and funds in comparison to other, more capital- and effort-intensive measures. These changes, if accepted and implemented, will require substantial buy-in from LESCO's management and staff. Some of the changes will be back-office in scope, such as redefining position descriptions, carrying out a comprehensive compensation study, and designing hiring and advancement policies. Others will require a high degree of retraining, communication with management and staff, and some fundamental changes in corporate culture.

The heart of the necessary changes has to do with the compensation package, the hiring and promotion program, and the performance management program. As mentioned in the previous chapter, fundamental changes need to occur in redefining position descriptions, position requirements, lines of authority, and other related factors. Concurrently, with an upward adjustment in salary structure, there will likely be a need to sustain staff reductions through outsourcing and attrition. Significant reductions will be required to bring LESCO in line with best practices, but this issue will require and receive significant additional analysis before final decisions are made.

Recommendations

The PDIP team recommends that the following changes and initiatives be undertaken at the earliest possible date:

- Draft new, more complete position descriptions for LESCO management and staff.
- Perform a compensation analysis and design a revised compensation plan for LESCO employees and management.
- Develop performance management program to establish an annual review process, setting goals and objectives for professional positions, evaluating employee performance and rewarding employees based on performance.
- Modify recruiting policy to ensure an objective, transparent, and unbiased recruitment process that eliminates external influences.
- Review and revise LESCO's benefit plan, including the employee health plan, to increase flexibility and choice of health care providers and facilities.
- Establish a robust lineman safety program that provides structure, incentives, and discipline for all linemen employees. Ensure that linemen are provided with and required to use proper clothing and safety gear when performing construction and maintenance tasks.
- Evaluate staffing levels vis-à-vis international best practices. Develop a staffing plan to reduce staffing levels in conjunction with an outsourcing and reduction-through-attrition program.

3.7 COMMUNICATIONS AND OUTREACH

An integrated plan is required to change the existing traditional style, mindset, and tools of communication. However, it is proposed that a gradual change in policy should be adopted with the first phase of change focusing on managerial staff.

The following recommendations are outlined:

- An integrated LESCO-specific communications strategy should be designed, outlining key objectives and target audiences along with a comprehensive action plan and budget to develop effective external communications and outreach for the company.
- A more central, well-positioned, and well-recognized role for communications and outreach within LESCO is sorely needed to coordinate and provide leadership for communication-related tasks. This would provide consistency as well as oversight for corporate branding and quality control for various initiatives, such as those related to fostering a coherent and credible public

image of LESCO. In light of this, the PR Department should not work as an isolated entity and needs to be restructured and strengthened to take on an enhanced decision-making role and regular budget which should enable it to plan and execute corporate image building and mass media campaigns at a local level. The name of the department should be changed as appropriate to reflect its larger role in external communication.

- An annual calendar of promotions and outreach activities should be developed. Issues of corporate social responsibility and brand equity should be regularly promoted through the local mass media with a series of planned public outreach activities. The department's reliance on PEPCO must be reduced to make it an empowered department.

- The development of knowledge management, i.e., a database for multiple types of information, should be encouraged and made accessible electronically to all managerial staff. This data could include engineering, operations, customer service, rules and regulations, and employee-related data. Successful and early implementation of an ERP system would immensely help the development of such a database. Once databases are developed and a mechanism for regular updating is in place, levels of access to information for different managerial levels can be decided as per job requirements. Managerial staff should be encouraged to use the database and avoid the current practice of extracting routine data through the tedious process of inter-departmental communication.

- A coherent corporate brand should be promoted and standard templates developed for stationery, file folders, visiting cards, publications, etc.

- Gradual penetration of ICT at LESCO should be planned to ensure that all managerial staff is provided desktop or laptop computers, trained in basic IT skills, networked within and among departments, and mandated to use e-mail as a primary communication tool.

- A phased plan of training modules for staff should be put in place to gradually transform LESCO's web portal to a convergence platform for internal communication. An interactive web portal should be developed and managerial staff encouraged to use it as a vehicle to promote ease of information availability and communication. All managerial staff should be provided e-mail addresses and assured networking.

- LESCO's web page needs to be upgraded for more comprehensive content display. The website should be made interactive and updated regularly. A fortnightly or monthly e-newsletter could be developed to keep customers aware of LESCO activities.

- Outreach activities should include the active engagement of various groups of consumers, such as industrial, agricultural, commercial, and domestic consumers to promote dialogue on corporate social responsibility-related issues of tariff, safety, electricity theft, energy conservation, system upgrades, and constraints, etc. Seminars, public dialogue, press talks, radio shows, and collaborative events are a few examples that could be carried out on a regular planned basis.

- Dedicated and trained staff should be deputed at customer services centers to eliminate the current practice of depending on field duty staff. Gender sensitivity at such centers could be ensured by providing separate window for women, wherever possible, along with separate seating arrangements and public utility services for incoming women to lodge their complaints. Female staff should be recruited as part of the dedicated work force at circle-level customer services centers.

- Team-building retreats and related activities such as annual luncheons, etc., should be institutionalized to improve effectiveness and efficiency, internal communications, and staff morale.

- Staff should be trained in soft communication skills with due emphasis on gender sensitivity (wherever required), including business communication, interpersonal communication, reporting techniques, and corporate relations.

- A periodic post-communication monitoring and evaluation practice should be initiated to improve a continuous communications and outreach program.

APPENDIX: AUDIT METHODOLOGY

A.1 Overview of Data Collection and Process Assessment

The operational PDIP audit process has been designed to facilitate data collection and to evaluate engineering, financial, commercial, HR information and data in collaboration with DISCO management. The objective of this activity is to evaluate performance efficiency by means of performance and process analyses, and by collecting information through one-on-one interviews with DISCO management and employees. The PDIP team will not only collect data, but will also review and evaluate management practices and processes. For example, a key performance process for all electric distribution utilities involves the commercial cycle – the means by which meters are read, bills processed and delivered, revenues collected, and delinquency notices delivered. For a program whose goal is to measure commercial, financial, administrative, and technical performance, review of key processes like the revenue collection cycle is extremely important.

The operational audit for LESCO will follow an identical process to audits undertaken in the other seven DISCOs. The process will collect and evaluate data in six areas of electric distribution operations, including:

1. DISCO governance
2. Organizational review
3. Engineering
4. Financial management
5. Commercial management
6. HR management

Comparison of performance indices for a particular utility with those of highly functioning electric distribution utilities highlights the functional areas that require improvement, while a comparison of best practices will allow the PDIP team to identify high-impact performance interventions.

A.2 Governance

In addition to reviewing DISCO operational activities, the PDIP team will review the DISCO governing board policies, procedures, and practices. With increased emphasis being placed on providing a governance structure with a higher degree of operational independence to the DISCOs, it is essential to evaluate the changes that are needed to better support board composition, qualifications, training, and other characteristics.

To this end, the PDIP team will review the following documents and board actions:

1. DISCO bylaws that establish board selection processes, scope of authority, and overall board responsibilities.
2. Review of board policy and procedures manual, if available.
3. Review and analysis of board composition focusing on the issue of ensuring independent governance and adequate local representation on the board.
4. Review of board member appointment process, board member terms, and process of removal (if warranted).
5. Board member qualification requirements.
6. Training orientation provisions for new board members.

7. Periodicity of board meetings, and provisions for extraordinary board meetings.
8. Board member fee structure – are board members reasonably compensated for their participation?

The purpose of this review will be to present an analysis of the changes required to improve board composition, functionality, and preparedness to undertake DISCO governance.

A.3 Organizational Assessment

The PDIP team will review the management and organizational structure of each DISCO with the goal of assessing the efficacy of the institutional capacity to effectively manage its HR, physical assets, and business systems based on the organizational structure. The review will include an evaluation of the following organizational issues:

1. Analysis of organizational design and structure.
2. Review of DISCO departments and divisions.
3. Review of key managerial positions and position descriptions.
4. Assessment of managerial and functional competencies.
5. Review of organizational chart and recommended revisions.

A.4 Engineering Operational Audit

The engineering assessment will review four components:

- Transmission issues.
- Distribution system management.
- Segregation of technical and commercial losses.
- Distribution standards.

A.4.1 Transmission Review

The transmission review will evaluate the contribution of transmission losses to overall system losses. In the event that transmission losses do not constitute a significant component of overall system loss, the evaluation will be truncated. In most cases, the transmission networks of the DISCOS are quite robust and are not a source of problems and it is expected that this segment of the evaluation will be very limited.

A.4.2 Distribution System Management

Evaluation of distribution system management will consist of a series of interviews with staff from the Planning and Design, Construction, Operations, and Procurement departments. During these interviews, the DISCO staff will respond to the team's questions and provide insight into the technical operations of the utility. These interviews will inevitably be colored by the attitudes of the interviewees, as well as the misunderstandings of the interviewers, and should be taken as indicative rather than absolute truth.

Typical questions explored by the engineering team will include:

- Status and currency of system maps.
- Processes used for distribution system planning.
- Methods for procurement, adequacy and availability of materials.

- Adherence to standards in construction and a visual review of the quality of construction.
- Meter security and vulnerability to tampering.
- Operations practices and adherence to established policies and procedures.
- Adequacy of lineman safety programs and equipment.

A.4.3 Segregation of System Losses

The third component will involve a mapping exercise and power-flow assessment in which the team will attempt to use a sampling technique to segregate distribution losses between technical and commercial, and between the various components of technical loss. The team will select 11 kV feeders that are, in the aggregate, representative of all the DISCO's feeders and therefore indicative of the level of technical loss of the entire company. An even smaller subset of low voltage (LT) networks will be surveyed in detail with the objective of identifying the contribution of LT systems to the DISCO's corporate technical losses.

In preparation for this portion of the task, the team will review transmission and distribution-system performance data to the extent that it is available. Data in the review will include:

1. Power delivered to each feeder by month for FY2010 (July-June).
2. Commercial sales data by feeder, as available for each month of FY2010.
3. Length of 11 kV feeders and laterals – by substation, as available.
4. Engineering standards, including standard conductor size for all voltage levels, maximum circuit lengths for medium voltage (11 kV) and low voltage (400 volt) distribution circuits.
5. Standard for service entrance, meter installation for each customer category.

The engineering team will then select a group of feeders from the record that as a whole represents the principle characteristics of the DISCO; that is, sales distribution between domestic, commercial, and industrial consumers, as well as average feeder length.

Each DISCO has up to, and in some cases more than 1,000 11 kV feeders, so it is necessary to establish sampling criteria as follows:

- Feeders will be selected by a random number process so that each feeder has as much chance of being selected as any other. This will enhance the potential of the set of feeders being truly representative of the system as a whole.
- The average feeder length of the sample population should be close to the average feeder length of the overall feeder population.
- Distribution of sales in kWh/year between domestic, commercial, industrial, agricultural, and other consumers for the population of sample feeders should be close to that of the overall DISCO feeder population.
- The sample feeders should have complete data, including total sales, and feeder input data, including total length. Feeders with data anomalies will be excluded.
- Total feeder length will be limited to 200 km, which is the length of line that the PDIP GIS team can survey in the period allocated.

Once the 11 kV feeders have been chosen, a total of no more than six LT networks will be chosen for detailed analysis. Because data is limited for LT networks, it will be necessary to specify that the LT networks chosen be fed by the selected feeders. To the extent possible, they should be chosen randomly from the set of general service distribution transformers on the selected feeders.

11 kV Feeder Mapping and Analysis

Once selected, the 11 kV feeders will be mapped using a rapid GIS technique that identifies only corner and intersection poles and poles with equipment installed on them. Observable data such as conductor size, transformer capacity, and transformer status, whether general service or dedicated, will be noted manually and transferred to an attribute database.

Once the circuit is mapped, the information will be transferred to a Milsoft Windmil model. Milsoft Windmil is a standard distribution analysis software used widely in the US and Latin America. Windmil can model single- or three-phase loads and 60 Hz or 50 Hz systems, and accepts user information on all conductors and transformer characteristics not in the default database. The majority of the conductors used at 11 kV by the DISCO are Osprey and Dog, with some Panther and Rabbit, all of which are ACSR conductors. LT conductors are mainly Wasp and Ant, which are all aluminum conductors. The characteristics of these conductors will be obtained from tables and incorporated into the database. Similarly, the DISCOs use a common specification that specifies transformers with maximum allowable levels of losses, a legacy of WAPDA procurement practices. The maximum allowable levels of loss have recently been changed, but none of the new units have been supplied yet. Transformer characteristics used in the model therefore correspond to legacy DISCO transformer values of no-load and load losses, as shown in the table below:

KVA Rating	10	15	25	50	100	200	400	630
Impedance	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
Core Loss (W)	65	85	123	175	310	495	925	1350
Load Loss (W)	320	435	640	1170	2020	3410	5600	8150

It should be noted that these are the values specified in the WAPDA transformer specification DDS-84 for prototype transformers. The standard allows a +15% tolerance in the individual no-load and load loss values of individual production units and a +10% tolerance in total losses. No attempt will be made to incorporate these tolerances into the model, so it is likely that transformer losses are in reality slightly higher than those indicated.

While Milsoft can accept data on location-linked consumer loading, the time available for this project will not permit data on actual loading to be used in the model. Instead, the feeder peak load will be obtained from substation records and this known load allocated among the various transformers on the basis of transformer capacity, i.e., a transformer of 200 kVA will be allocated twice the actual feeder demand of a 100 kVA transformer.

Another matter that is important is the level of power factor to be used in the model. Substation meters record kWh and kVARh, from which the power factor can be calculated. However, only circuit amperes and kWh readings are actually recorded by the substation operators. The engineering team will obtain station log sheets from the period around the feeder peak. The estimated average hourly power factor will then be computed by calculating kVA using logged amperes and an assumed bus voltage of 11.5 kV and the differences between the hourly kWh meter readings to estimate kW.

Once the model, loading, and power factor are established, the feeder power flow analysis can be carried out. Losses can then be developed for each feeder for conductor and transformers. Because of the assumption that the sample feeders represent the system as a whole, the percentage losses attributable to conductor and transformers are assumed to apply not only to the sample feeders but to the entire system.

LT Network Mapping and Analysis

Because not all the LT networks on a particular feeder can be mapped, the process of mapping for the LT networks will differ from that used for the 11 kV feeders. For the LT networks, the mapping will include a census of all the consumers fed by the LT network. In addition, a meter reader will accompany the survey team, carrying with him the meter read route book from June 2010, the month of assumed peak demand. It will therefore be possible to obtain and record in the GIS database for the LT network the metered consumption for each consumer.

Since the majority of the consumers located on the LT networks are billed by kWh consumption only, it will be necessary to covert the kWh data to demand (kW) for modeling. As no measurements of actual demand are available, it will be necessary to estimate demand using only the average energy consumption of consumers. In order to determine the peak demand in kW likely from consumers on each LT network during the month of June, the data on consumption will be applied to the demand equation below. This equation was derived many years ago by the Rural Electrification Administration in the US, and has been verified by NRECA as acceptably accurate for use in developing countries as well. The equation is as follows:

$$D = N*(1-.4N+(N^2+40)^{0.5})\ 0.005925*C^{0.885}$$

Where:

D = monthly peak demand in kW for a particular group of consumers
N = number of consumers in the group
C = average monthly consumption per consumer in kWh/mo.

The demand value calculated by the equation is applied as the source demand for the particular LT network, at a power factor of 80%, and the demand allocated to segments of the LT network in proportion to the kWh of the consumers connected to that segment. Losses computed from the model will therefore correspond to the losses in the LT network conductors.

It will be necessary to generalize these results so that they can be applied to all general use transformers on all the modeled feeders so as to obtain a system value for LT losses. A value of average loss in watts per kVA of transformer capacity will be developed for this purpose.

Service Drop Losses

Service drop losses can be calculated on the assumption that all domestic sales use single-phase meters, while all commercial and direct reading industrial sales use three-phase meters. In most DISCOS, an effort was made at some point in the past to move meters to the base of the pole as opposed to being mounted on the exterior of the residence. This had the effect of shortening the effective length of the service drop from the utility's standpoint, to something less than 10 m. Examination of the system indicates that this process has not been completed in many urban areas, and that meters are still located on the exterior of buildings. For this reason, an average service drop length of 12 m will be assumed. The table below indicates the assumptions for the three types of consumer.

CHARACTERISTICS OF SERVICE CONDUCTOR

Consumer Type	Service Wire	Cores	Service Type	Length M
Domestic	7 x 0.052	Two	1 Ph	12
Commercial	7 x 0.052	Four	3 Ph	12
Industrial	19 x 0.052	Four	3 Ph	12
Agricultural	19 x 0.083	Four	3 Ph	12

Average service loading is determined using the Rural Electrification Administration equation described above to calculate the total demand of the consumers of each class on each of the modeled feeders. Knowing the number of consumers of each type on the feeder allows for the average demand per consumer to be calculated. Three-phase loads are assumed to be balanced.

Calculation of Energy Losses

Once the components of demand loss are calculated, it is necessary to convert the values derived from demand loss on peak to average energy loss. Because losses are a function of the square of load, it is necessary to account for the variation in load during the course of a year. The standard way in which this is handled is to determine a loss load factor based on the annual load factor of the system. The standard equation used in the US private utility industry is:

$$LLF = K(ALF)^2 + (1-K)(ALF)$$

Where:

LLF = loss load factor, or the load factor of the on-peak losses.
ALF = average annual load factor for the element under consideration.
K = a constant determined by analysis of the load curve of the feeder and recognizing that losses vary inversely as the square of load.

The ALF is computed for each feeder on the basis of the data supplied by the DISCO and the LLF calculated according to the given equation. The factor K is determined by reviewing the substation log sheets for the two-week period around the system peak for the feeder, and determining the K factor by analysis The same feeder LLF is applied to all components of loss.

Once the components of energy loss for the sample have been determined, consisting of conductor loss, transformer loss, LT network conductor loss, and service drop loss, it is possible to sum all the components to determine the technical losses for the sample and thus for the system as a whole. Any difference between the stated distribution losses of the DISCO and the technical losses calculated by this method will constitute an estimate of nontechnical loss.

Validation of Results

In its October 2010 report to the MWP, each DISCO reported technical losses and nontechnical losses. Because these values may be at variance with the results computed by the sample technique presented above, it was decided to carry out an independent evaluation using a benchmarking technique developed for electric systems in the rural US. Studies conducted by the Rural Utilities Service, the financing and monitoring arm of the US rural electric program, have determined that, for systems using conductors and voltages typical of good engineering practice, distribution system loss is a complex function mainly of sales density, that is, MWH sales per km of line. The equation developed based on that parameter is as follows:

$$L = (-1.8458*(LN(H7*1.609))+17)$$

Where:

L = total losses (technical and nontechnical) in percent
H7 = sales density in MWH of sales of all types per km of distribution line
LN = natural logarithm function

For purposes of this analysis, distribution line is considered to include both HT and LT lines. The tendency of this equation is to assess higher losses for utilities with lower sales densities, that is, for utilities with dispersed consumers and low sales in MWH/km of distribution line, losses are higher than for utilities with more dense service areas. Thus, increasing the amount of distribution line considered tends to increase the allowable level of losses.

Applying this equation to LESCO, results in the characteristics shown below:

RESULTS OF LOAD VERSUS LOSS ANALYSIS			
HT & LT Km	Sales Density MWh/Km	Benchmark Technical Loss %	Actual Reported Distribution Loss %
41,623	333.5	5.4%	13.7%

The results from the benchmark loss column of the table should be comparable with the technical losses computed by the sample technique.

A4.4 Distribution Standards

The fourth and final component, which will be applicable to all DISCOs but reported only for LESCO, consists of a series of interviews with staff at the Distribution Standards group of the NTDC. The Distribution Standards group maintains the construction and design standards that are utilized by all DISCOs, as well as the technical specifications that govern all procurements. In addition, the team will visit a single manufacturer of distribution transformers and meters in an effort to evaluate local resources for these important components.

A.5 Financial Management Audit

In the preparatory period prior to beginning the operational audits, key financial parameters will be identified and included in the data collection and analysis process. The financial performance parameters that will be evaluated include: financial reporting, internal control, cash receipts and disbursements, operational financing and investments, and cost containment.

The financial management audit will consist of a combination of interviews, data collection, and analysis of key financial data. Interviews with senior DISCO management will be conducted to gain an understanding of DISCO policies, procedures, and operating practices. From these discussions, the PDIP audit team will identify operational objectives, expected financial controls, and key areas of risk.

DISCO practices and procedures will be evaluated for financial performance parameters. Variance between industry practice and DISCO performance will be noted and reported. Procedures will be used to test each financial control as a means of verifying the control mechanisms with the results documented in the DISCO assessment report.

The first operational audit undertaken at LESCO will serve as a vetting process for the above described plan. The financial audit team will work as a single unit at LESCO to ensure that all team members gain experience and understanding of the assessment process, and to adjust the audit process for later DISCO audit processes.

Once the LESCO audit begins, the finance team will meet with LESCO's chief financial officer to discuss the audit plan and determine with which DISCO officers the PDIP team members should coordinate to perform the required tasks. Financial management team members will meet at the end

of each working day to discuss problems, make any necessary adjustments to the process, and schedule a plan for the next day.

Tools
The financial management team will review LESCO's organizational policies and procedures, annual report, system of accounts, and interview DISCO management and employees. Templates have been developed as a data-gathering tool to populate various financial models that will be used for analysis. The financial management team may need to coordinate with the commercial management team to ensure that information and data that might be needed by both teams is shared and incorporated into the analysis and reporting process.

Analyses
Analyses will include an evaluation of financial management processes, management of banking functions, management of cash and receivables, internal control processes, and overall management of DISCO financial performance. The results of these analyses will be presented in the form of data tables, performance ratios, and discussions of specific issues that do not lend themselves to objective numeric presentation.

Presentation of Results

- Analysis of cash receipts and disbursements
- Operational financing
- Internal control
- Cost containment
- Financial reporting with financial performance indicators

A.6 Commercial Management Audit

The focus of the commercial management audit will be the revenue cycle, which includes the registration of new consumers, meter reading practices, bill production and delivery, and the receipt of consumer payment information. Other activities such as the disconnection and reconnection process, bill adjustment procedures, and customer services will also be reviewed. These examinations will be made so as to identify opportunities to increase the efficiency and transparency of commercial activities and improve the financial performance of the DISCOs. Opportunities to improve financial performance may include revisions to current procedures with technological enhancements or replacement of the billing system with a CIS to better manage customer information with records of all customer interactions in addition to preparing bills. The commercial assessment team will consist of international and Pakistani consultants who have practical work experience with one or more electric DISCOs, and have some understanding of utility commercial practices and procedures.

Data Collection
Procedural data will be collected through interviews and observations. The overall commercial process will be ascertained from the commercial director. He will be given the opportunity to discuss specific problem areas and activities that are deemed crucial to the revenue process. Procedural details for each activity and the time required will be obtained from the in-charge department heads. These procedures will be verified by observing the actual practices at selected revenue and district offices and pay points.

The commercial team will also collect billing/collection/consumer data from the billing system. Not only will this data serve as a baseline reference to gauge future results but it can also be used to provide an indication of the time needed to complete the revenue cycle. Other hard data to be

collected during the interviews includes the number of meter reading routes, the actual number of meters in a route, frequency of meter tests and calibration, customer billing complaints, and number of employees involved in the revenue cycle.

Strategic Analysis
Once the data collection process is complete, the commercial management team members will evaluate the data and DISCO commercial practices to determine what changes are needed to improve transparency, cost recovery, and effectiveness of the commercial procedures and practices. Each step and stage of the revenue process will be mapped indicating the flow of documentation, when approvals are obtained, decision points for corrective action, and the interaction between departments. These maps will be reviewed for redundancies and possible internal control weakness such as a lack of segregation of duties or reconciliations. The maps will be studied to determine if there is a more efficient flow of data or where interventions might be helpful in reducing costs, increasing revenues, and/or accelerating cash flows.

The interventions will likely include a combination of investments in secondary distribution systems, transformers, services, and revenue meters; as well as changes in commercial system practices and procedures to improve DISCO metering and revenue recovery practices. Procedural changes may require the addition of devices that will eliminate transcription errors, speed up data entry, or increase internal controls. The commercial specialist will also evaluate and make recommendations regarding the effectiveness and adequacy of commercial software (the CIS), with the aim of determining if a software solution that more effectively integrates commercial, accounting, HR, work order, and other DISCO functions is merited.

A.7 HR Management Audit

An integral part of the operational audits will include an evaluation of HR management and systems for each DISCO. The HR review will evaluate DISCO organizational structure, analyze performance management systems, evaluate compensation systems, review selected management and staff positions, and perform a preliminary analysis of training needs, specifically focusing on commercial needs and linemen training to improve productivity and safety. The HR audit will be led by the organizational specialist, who will be responsible for organizing and leading a team of Pakistani HR and institutional management specialists.

The goal of the HR management audit is to identify improvements needed in DISCO organizational structure and HR management to result in an HR model that supports the long-term institutional needs of the DISCO. The HR model should support appropriate levels of compensation and benefits, and establish a work environment that provides the incentives needed to support a well-motivated work force. This model should support emerging process-centric culture and a cost delivery model that appropriately balances customer service with effective service delivery. The DISCO organizational structure should support high-quality electric service and high customer satisfaction, both of which are predicated on highly motivated and satisfied DISCO employees The assessment should therefore focus on assessing not only organizational structure and key processes, but also on HR management and management systems, HR functions, the organizational structure in which the HR functions operate, and the current roles of line managers and their staff managers.

The organizational team will review and evaluate the state of HR management system, functions, responsibilities, performance management systems, and compensation package. The evaluation will compare the DISCO's HR management and management systems with best practices from within and beyond Pakistan, from which recommendations will be made regarding how policies, practices, and procedures can be improved to enhance the productivity of each DISCO. The organizational assessment team will use diagnostic tools to identify gaps in optimal DISCO personnel performance.

Data will be collected through interviews and surveys to establish a baseline of current policies and practices; this will be contrasted with best practices to define the actions that are necessary through the DISCO Performance Improvement Action Plans to result in significantly improved HR policies, practices, and management systems.

Data gathering will include:

1. Internal interviews with and surveys of department managers and senior engineers.
2. Interviews with chief executives and senior management to evaluate the company's vision, mission, and strategic objectives.
3. Identification of major functional skills and competencies.
4. Surveys of staff from engineering, commercial management, system operations, and DISCO administration at the division and subdivision levels to include roles and responsibilities, adherence to existing DISCO procedures, including health and safety, and any other standard operating procedures that exist within the DISCOs.

Review of HR strategic and functional analysis will include:

1. Assessment of the company's vision, mission, goals and objectives, and their linkage with departmental goals and objectives.
2. Assessment of the recruitment process.
3. Evaluation of compensation and benefits.
4. Evaluation of performance management system.
5. Evaluating the integration of corporate communications and HR communications.

Evaluation of training and capacity building needs will:

1. Develop a training needs assessment survey form.
2. Conduct a survey of training needs by distributing needs assessment forms to functional heads to determine gap in critical skills and competencies. This will be translated into the launch of an urgent training program as a pilot project.
3. Identify essential and immediate training needs for engineering, financial management, commercial management, and HR functions at LESCO.

A.8 Communications and Outreach Audit

Communication and outreach is a direct expression of corporate culture and the values of an organization. The key areas of communication as well as processes and tools employed to communicate largely determine the corporate priorities of internal and external stakeholders. One of the major differentiating features of progressive organizations vis-à-vis status quo-driven organizations is the practice of contemporary modes of communication, openness, and scientific knowledge management for efficient and speedy decision-making for the larger good of the organization.

A communication and outreach assessment will be conducted for a diagnostic analysis of the state of internal and external communication and outreach. The analysis is intended to provide sufficient information to serve as a foundation for developing a communication and outreach strategy leading to an action plan, promoting better understanding and improved public opinion of the DISCO.

The communications assessment includes:

1. Review and analysis of existing internal and external communication and outreach strategy, organizational chart of relevant departments, and job descriptions of relevant staff.
2. Review existing and previous communication and outreach campaigns, materials, media mix, budgets, communication briefs, etc.
3. Visiting customer centers/complaint centers to obtain first-hand information about on-ground communication with customers in terms of customer services and complaint handling style, clarity, processing time, and delivery practices. Customer services and complaint handling will also reviewed from a gender perspective.
4. Review of internal communication process, feedback, and follow-up status to assess the efficiency of internal communication.
5. Review the current state of IT being used for external and internal communication.
6. Identifying training needs for relevant staff.
7. Assessing the current practice of using various communication tools/vehicles such as websites, newsletters, e-mails, event management, and other multilayered activities.

Drawing on the assessment results, the report describes various issues and identifies areas where action would be worthwhile. It offers a series of recommendations for high-priority communication-related activities that could enhance the DISCO's effectiveness in communications and outreach, improve the capacity of communication-related staff, and strengthen the effectiveness of its communications department.

Ultimately, the recommendations will contribute to positioning the DISCO as a service delivery and customer-centric corporate entity.

Internal Communication

Internal communication is related to communication within the DISCO, i.e., between individuals, between different departments, or between individual and department. The assessment will help map internal communication processes, feedback, and follow-up status to assess the suitability and efficiency of the existing system and procedures.

External Communication and Outreach

The analysis of external communication determines the extent of activities carried out for corporate image building to serve as entry points in liaising between the organization and its relevant stakeholders, including extended audiences. Promotion of a strong corporate culture and coherent brand identity through an appropriate choice of communications tools, processes, media mix, supporting budget, and follow-ups are areas that deserve careful attention.

Outreach activities for target groups of stakeholders are an extension of corporate communication to ensure sustained visibility and perception of a positive corporate image.

The following methodology will be employed to review and analyze the communication and outreach process and existing strategies of the DISCO:

Interviews with Key Staff

In-depth interviews with the key informants in the DISCO will be conducted using a semi-structured questionnaire. The questions asked will be geared toward developing an understanding of existing practices, modes and means, efficiency and speed of communication, and availability and access to information. Issues relating to the existing penetration of ICT and current practices of knowledge management will also be discussed. Deliberations will focus on strategic efforts to develop a corporate brand image with external stakeholders to spell out a coherent communication strategy for the company. The existing activities of outreach and potential of such activities will also be discussed.

Besides interviews with key informants, relevant senior officers of the DISCO will be asked to complete questionnaires on corporate, external, and internal communication and the outreach activities of the company.

Focus Group Discussion

A focus group discussion will be held with the managerial staff of relevant departments to discuss the cross-cutting issues of internal and external communication on similar lines to that mentioned above to ascertain feedback and comments from middle management. Topics of discussions will include internal and external communication practices and the readiness of staff to embrace a contemporary communication culture.

Documentary Review

Review and appraisal of relevant record and material available with the PR, MIS, and Customer Services departments will be undertaken, including records of daily press cuttings, press releases, printing, and publications of the PR Department. Similarly, practices and processes of data collection, bill printing, and various output reports will be reviewed at the MIS Department. The registers maintained to record details of complaints at the Customer Services Department will be reviewed to understand the practices and efficiency of the current system.

Visit to the Customer Center

The Customer Services Centre located at the DISCO head office will be visited to understand the complaint handling process as well as gauge the level and quality of customer service.

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