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# **NINETEENTH QUARTERLY PROGRESS REPORT**

**APRIL - JUNE 2015**

PRODUCED BY:

USAID POWER DISTRIBUTION PROGRAM



# **NINETEENTH QUARTERLY PROGRESS REPORT**

## **APRIL - JUNE 2015**

IRG, USAID Contractor for the Power Distribution Program

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Islamabad, Pakistan

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# ACRONYMS

ABC	Aerial Bundled Cable
AMR	Automatic Meter Reading
CEO	Chief Executive Officer
CFL	Compact Fluorescent Lamp
CIS	Customer Information System
CoS	Cost of Service
CoSS	Cost of Service Study
CPPA-G	Central Power Purchasing Authority Guarantee Limited
CSP	Completely Self-Protected
CT	Current Transformer
DIIP	Distribution Company's Integrated Investment Plan
DISCO	Government-Owned Power Distribution Company
DSM	Demand Side Management
ELR	Energy Load Reduction
ERP	Enterprise Resource Planning
FESCO	Faisalabad Electric Supply Company
GEPCO	Gujranwala Electric Power Company
GET	Gender Equity Training
GIS	Geographic Information System
GPRS	General Packet Radio Service
GSM	Global System for Mobile Communications
HESCO	Hyderabad Electric Supply Company
HHU	Handheld Unit
HR	Human Resources
HT	High Tension
IESCO	Islamabad Electric Supply Company
IGTDP	Integrated Generation-Transmission-Distribution Plan

IMR	Improved Meter Reading
IRG	International Resources Group
IT	Information Technology
KM	Kilometer
KV	Kilo Volt
KVA	Kilo Volt Amperes
KW	Kilowatt
LDI	Load Data Improvement
LESCO	Lahore Electric Supply Company
LT	Low Tension
MEPCO	Multan Electric Power Company
MVAR	Million Volt Ampere Reactive
MW	Megawatt
MWP	Ministry of Water and Power
MYT	Multi-Year Tariff
NEPRA	National Electric Power Regulatory Authority
NOC	Network Operating Center
OJT	On-the-Job Training
ORD	Outage Reduction Devices
P&E	Planning & Engineering
PBES	Performance-Based Evaluation System
PC	Privatization Commission
PDC	Power Distribution Center
PDP	USAID Power Distribution Program
PEC	Pakistan Engineering Council
PESCO	Peshawar Electric Supply Company
PETSAC	Pakistan Electric and Telecommunications Safety Codes
PT	Potential Transformer
PPI	Power Planners International
QESCO	Quetta Electric Supply Company

RTC	Regional Training Centers
SAP	Systems, Applications and Products in Data Processing
SEPCO	Sukkur Electric Power Company
TESCO	Tribal Areas Electric Supply Company
UAT	User Acceptance Testing
USAID	United States Agency for International Development
VAR	Volt-Ampere Reactive
VFD	Variable Frequency Drive
VVO	Volt/Var Optimization
WAPDA	Water and Power Distribution Authority

# SECTION 1: PROGRAM OVERVIEW

This Quarterly Report of the United States Agency for International Development (USAID) Power Distribution Program (PDP) covers the continuing efforts of USAID and International Resources Group (IRG) to implement improvements affecting the overall commercial performance of participating government-owned power distribution companies (DISCOs), the Ministry of Water and Power (MWP), and the National Electric Power Regulatory Authority (NEPRA) in the April-June 2015 period. Under Component 1, PDP conducted operational audits of MWP, nine DISCOs, and NEPRA, and developed Action Plans for future interventions and demonstration projects. Components 2 and 3 have focused on the execution of jointly-selected interventions identified in Action Plans as codified in the approved PDP Work Plan, with the goal of improving sustainability in the power sector.

## FINANCIAL SUMMARY

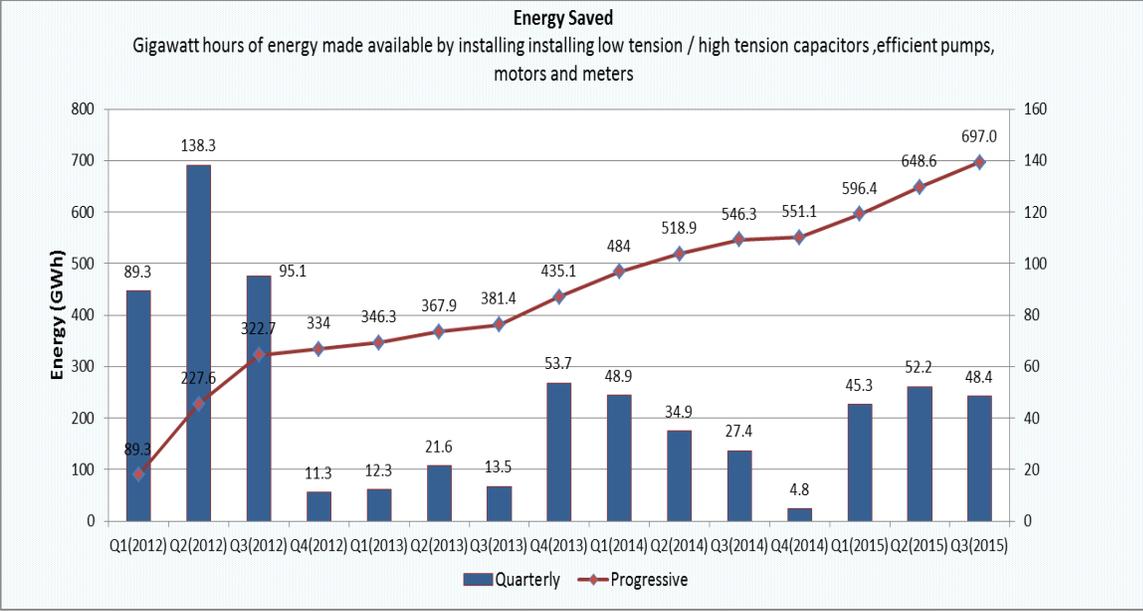
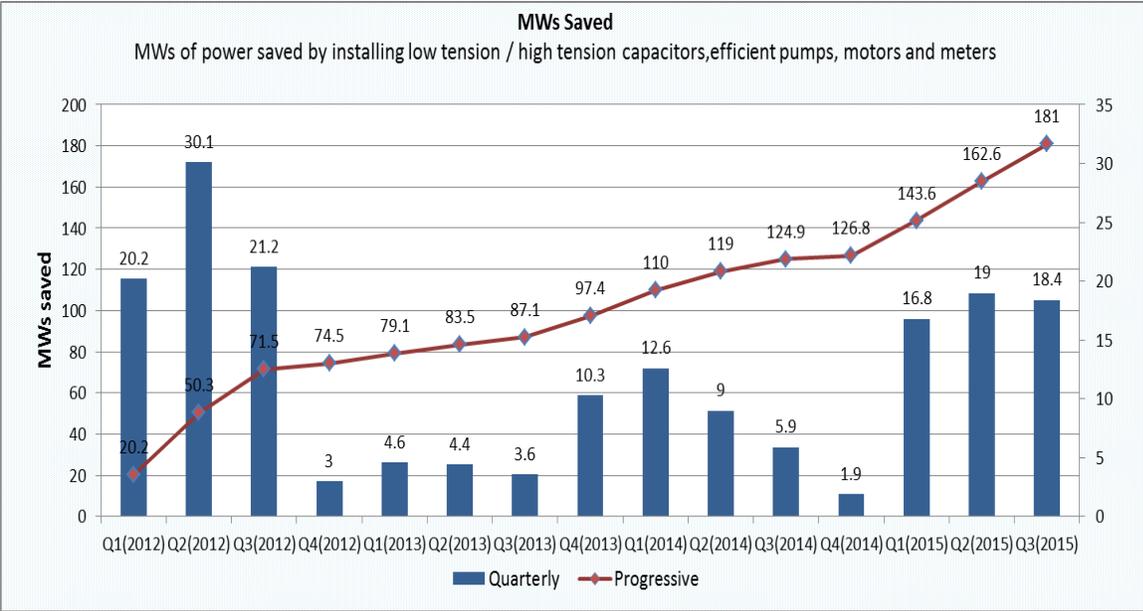
Contract No:	EPP-1-00-03-00006-00, Task Order 13
Date of Issuance of Task Order:	September 17, 2010
Amount Obligated Under Task Order:	US \$218,000,000
Total Project Funds Expended to Date:	US \$189,890,537
Project Funds Expended During the Quarter:	US \$21,668,121

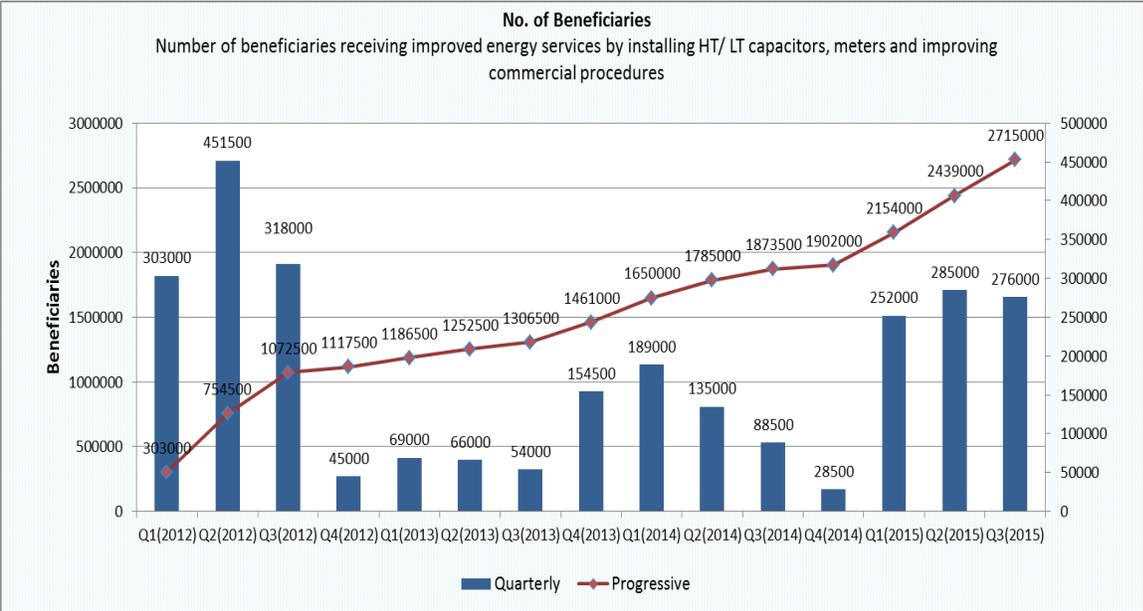
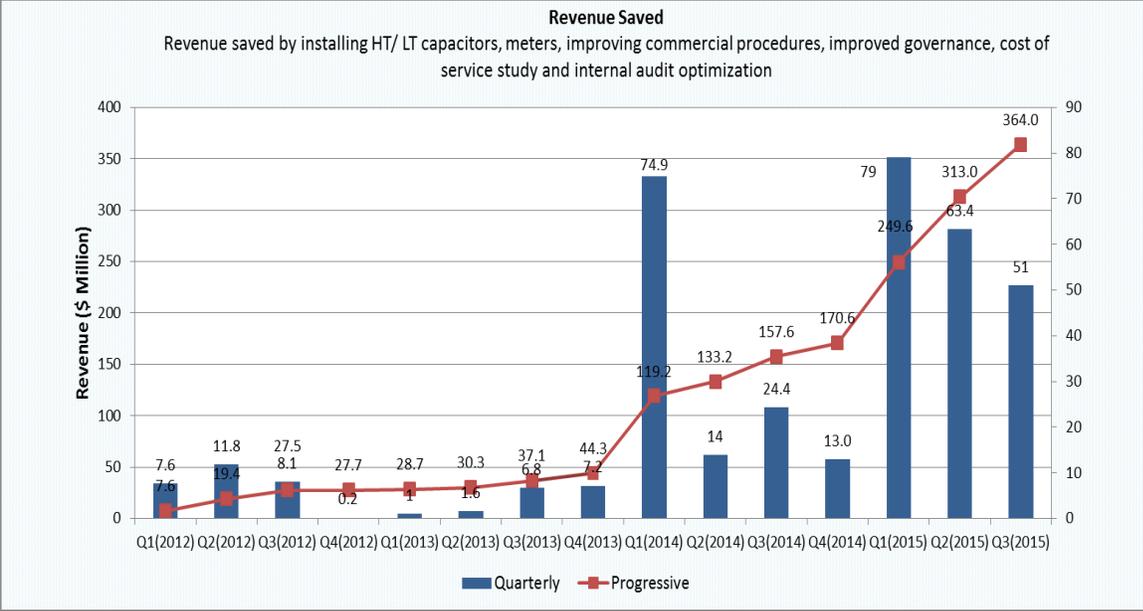
## Costs by DISCO

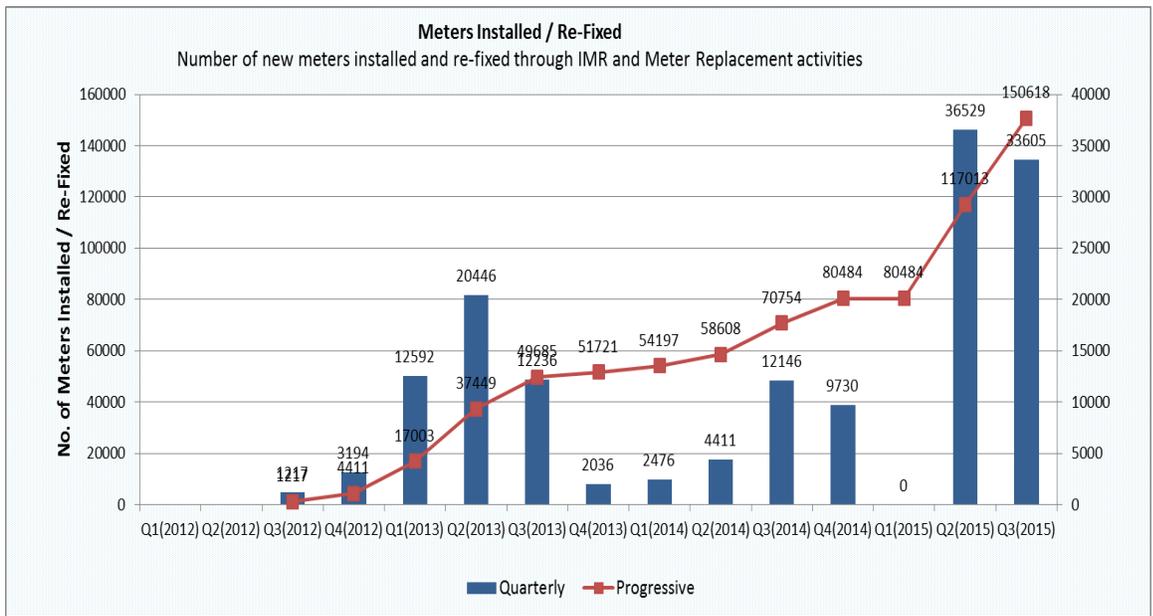
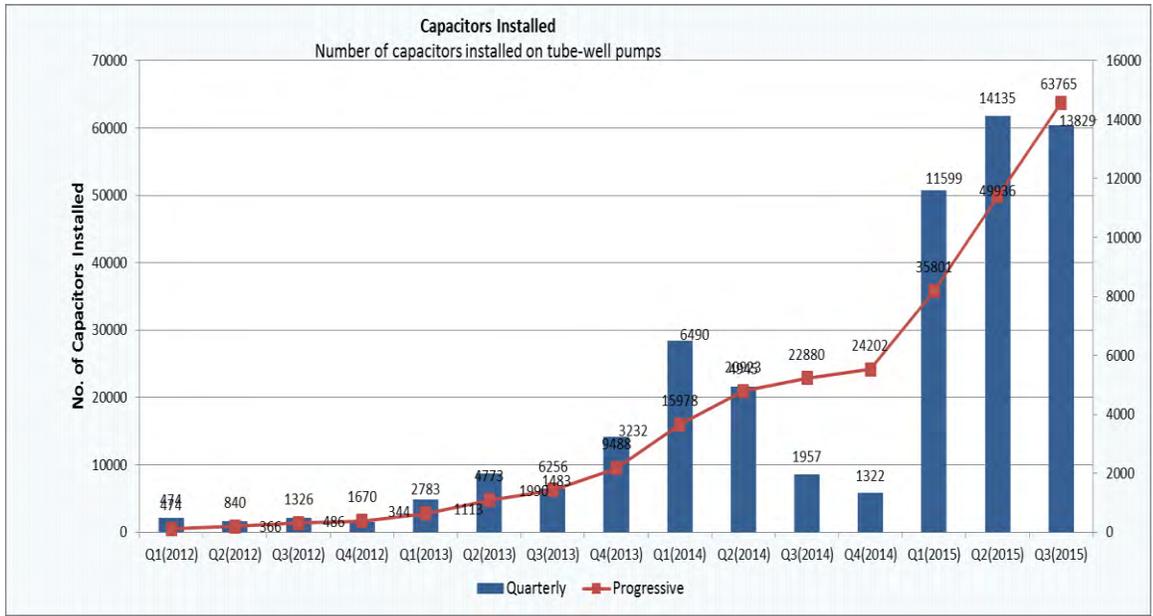
Project Inception to June 30, 2015	
DISCO	Amount (USD)
PESCO	40,518,500
LESCO	21,236,050
MEPCO	57,435,239
IESCO	12,521,138
HESCO	11,401,533
FESCO	10,358,075
GEPCO	9,587,098
QESCO	12,264,669
SEPCO	6,348,346
NEPRA/MWP	4,819,889
Stores *	3,400,000
<b>TOTAL</b>	<b>189,890,537</b>

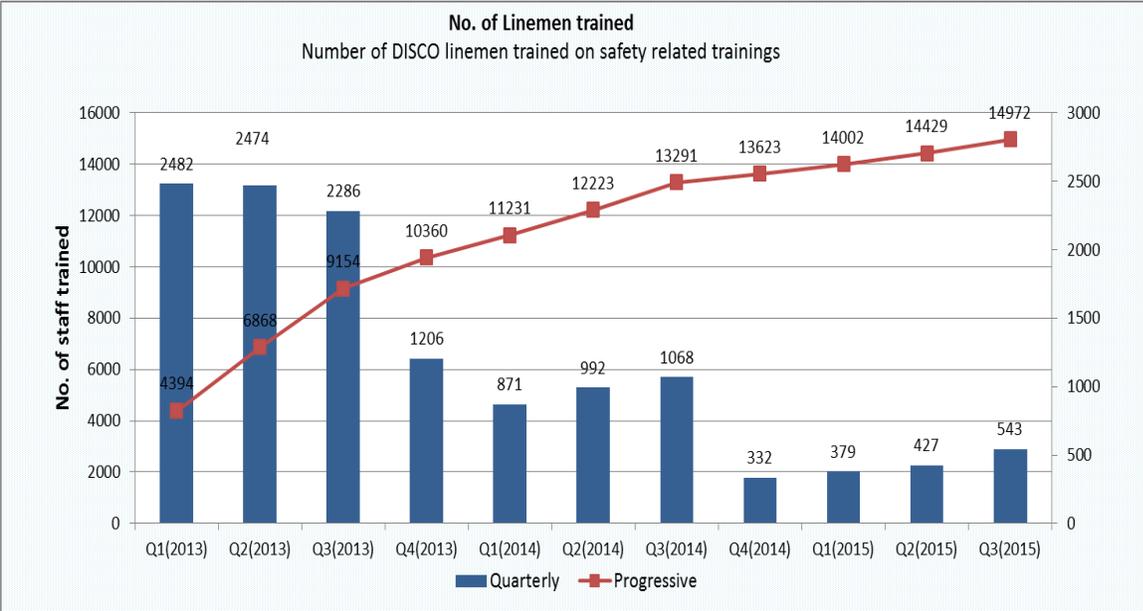
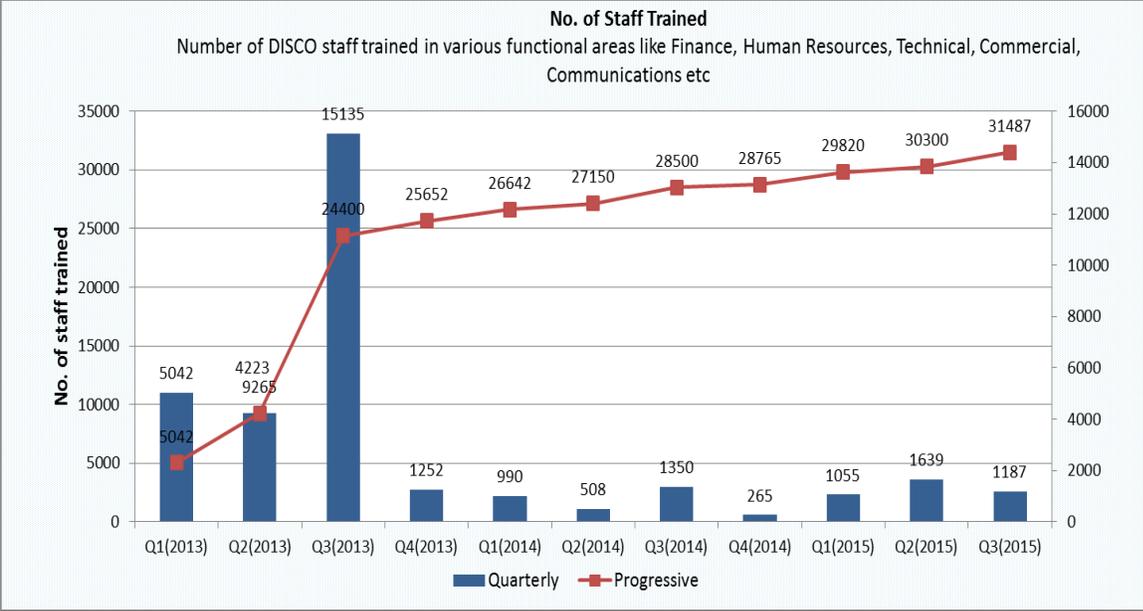
\*Commodities which have not been issued to DISCO and are located in PDP warehouse.

# SECTION 2: PERFORMANCE









# SECTION 3: COMPONENT 3 TASKS

## TASK 1: COMMERCIALIZATION OF DISCOs

Task 1 provides a two-pronged approach to commercializing DISCOs, focusing on improving performance of two Turnaround DISCOs – Peshawar Electric Supply Company (PESCO) and Multan Electric Power Company (MEPCO). PDP will modernize policies, processes, and procedures and provide a modern infrastructure that will allow these companies to improve their commercial, technical, and financial performance.

### HIGHLIGHTS

- **Improving Customer Services in Peshawar Electric Supply Company** – PDP has been working toward improving customer services in power distribution companies. As part of this activity, PESCO’s existing centers are being renovated into ones equipped with modern technology, besides creating a better environment for both staff and customers. This quarter, PDP inaugurated two circle level customer support centers at Khyber Circle and Peshawar Circle, following the inauguration of the center at PESCO headquarters. For sustainability purposes, PDP trained 25 staff members on customer service skills to improve the interaction and communication between employees and customers. Additionally, PDP completed renovations on five customer service centers which will be inaugurated in July 2015 to begin operations.

- **Automated Meter Reading on High-End Users**

– This activity was designed to assist MEPCO and PESCO in achieving significant improvements in commercial performance through integration of advanced metering processes. Both turnaround distribution companies have an outdated metering system based on electromechanical metering which is subject to inaccurate reading and field tampering, resulting in a loss of revenue. MEPCO and PESCO lack the funds to upgrade these meters to state-of-the-art technology. Under this intervention, PDP is assisting both companies in carrying out large-scale meter replacements across their territories, with Global System for



**Installation of Automatic Meter Reading meters**

Mobile Communications (GSM) / General Packet Radio Service (GPRS) enabled Automatic

Meter Reading (AMR) meters for all high-end residential, agricultural, commercial, and industrial customers with sanctioned loads over 20 kilowatts (KW). This includes three-phase whole current AMR meters with remote disconnect and connect capabilities and AMR Current Transformer (CT) / Potential Transformer (PT) meters. These AMR meters have two-way communication capabilities and can support a minimum of two different thresholds against peak and off-peak time slots. By the end of this quarter, in what is an ongoing activity, PDP installed 41,000 AMR meters at MEPCO and PESCO.

- **Geographic Information System Mapping Continues in Peshawar** – As an ongoing activity, PDP continued Geographic Information System (GIS) high tension (HT) and low tension (LT) network mapping in PESCO and all other distribution companies. GIS mapping aims to build a smart mapping facility and database of important assets to perform technical analysis of the system, in addition to providing single-line diagrams for operational ease. PDP is assisting PESCO in completing mapping of all HT feeders and substantial LT feeders in Peshawar Circle, in addition to mapping feeders in Multan Circle. PDP completed mapping a total of 153 HT and 61 LT feeders of Peshawar Circle and 117 HT feeders of Mardan Circle independently. The total number of feeders mapped so far has hit 335 for HT and 68 for LT in all six circles of PESCO – i.e. the Peshawar, Mardan, Khyber, Swat, Bannu and Hazara Circles. To build sustainability, PDP is also utilizing PESCO-trained staff for GIS mapping and successfully completed GIS mapping of 162 HT feeders and 10 LT feeders with PDP support staff. PDP also continued to assist the company's Planning and Engineering (P&E) staff on the planning, analysis, and generation of proposals including Outage Reduction Devices (ORD), completely self-protected (CSP) transformers, and GIS mapping. GIS mapping and the use of SynerGEE planning software will lead to proper and effective planning and efficient system operations, resulting in substantial savings.
- **Enterprise Geographic Information System Mapping in Multan** – All PDP-created P&E computer centers at DISCOs' headquarters have been made operational and the mapping function extended to operational staff, in order to ensure consistent updating and maintenance. GIS field data will be available to the field engineers responsible for system construction, maintenance, and operation. PDP, in consultation with MEPCO, identified how the existing GIS Information Technology (IT) infrastructure could be enhanced to facilitate remote data access. The Deputy Director Technical, who remains in close contact with MEPCO's Stores, Construction, and Operations Divisions, was trained to update and analyze the network as needed. PDP extended HT GIS mapping to all nine MEPCO circles, namely Bahawalpur, Vehari, Sahiwal, Bhawalnagar, DG Khan, Rahim Yar Khan, Muzaffargarh, Khanewal, and Multan. PDP provided on-the-job training (OJT) and basic load flow analysis training to MEPCO's planning engineers, operational staff, and field surveyors to ensure the project's sustainability. MEPCO's P&E Department is now able to use GIS maps for network optimization, calculating HT and transformation losses, and

using the SynerGEE power analysis tool. Of a total of 1,050 feeders of MEPCO, 528 were surveyed using GIS mapping and analysis of SynerGEE was conducted. The IT infrastructure for the Enterprise GIS software is deployed at the Water and Power Distribution Authority's (WAPDA) Network Operating Center (NOC). A custom application for the dissemination of information, based on ArcGIS Server technology is currently deployed in four circles of MEPCO. This application will allow the operational units to update the geographical network.

- **Congested Area Improvement in Multan Electric Power Company Territories** – Under this initiative, PDP is providing MEPCO with 500 kilometers (KM) of Aerial Bundled Cable (ABC), which will be introduced in 462 locations of Multan Circle. The total numbers of distribution transformers associated to these locations are 742. In addition to this, 100 completely self-protected low loss 50 Kilo Volt Amperes (KVA) single-phase transformers will be introduced in congested areas where it is hard to lay down / install overhead conductor and conventional transformers. Moreover, 50 75 KVA three-phase CSP transformers will be introduced in open areas. This project will not only help in reducing the system's technical losses, but will also enhance its reliability, in addition to reducing theft and enhancing safety both for the public as well as for MEPCO employees. During this quarter, a total of 266 proposals were prepared; 10 three-phase 75 KVA CSP transformers and 64 single-phase transformers were proposed, bringing the total proposals prepared to date to 742.
- **Installation of Insulated Cables in Peshawar Electric Supply Company** – Generally, in Pakistan, illegal hooks – called “kundas” – to steal electricity are common in congested areas where electricity lines pass close to roofs and balconies. Furthermore, the open wires are a constant life-threatening hazard to residents. In an ongoing activity, PDP is installing insulated quad cables which will effectively eliminate electricity theft, in addition to reducing non-technical losses and improving revenue. With the Wapdaga feeder selected as the model for this intervention, PDP completed replacing the bare LT cables of 44 (of 65) transformers with quad cables and shifted all meters to the new system. Field surveys for the remaining transformers were completed, all work orders were issued, and 85KM of a planned 500KM of ABC have now been installed.

- **Technology Upgrades Improve Customer Service and Operational Efficiency in Multan Electric Power Company** – In a high-level event this month, the U.S. Ambassador to Pakistan, Richard Olson, inaugurated MEPCO's first fully functional IT lab, provided by PDP. This lab provides the power utility with state-of-the-art



**U.S. Ambassador Olson inspecting handheld units at Multan Electric Power Company**

technologically advanced tools that will prove instrumental in automating various manual procedures, including the new customer billing system.. The Power Distribution Program has also overhauled the utility's power flow management system, replaced 252 industrial motors to reduce energy losses incurred by MEPCO's largest consumers, and automated all office functions and introduced a geographic information system. These technological improvements introduced by PDP have resulted in an increased income to MEPCO up to \$56 million.

- **Enterprise Resource Planning Rollout at Multan Electric Power Company** – Existing back-office operations at power distribution companies are incapable of providing timely information required for making effective managerial decisions or for properly monitoring and controlling utility operations. Furthermore, their cost / revenue centers are dispersed geographically, adding to the delay in reporting. Additionally, current collection, validation, compilation, and data processing orders are inefficient. The automation of back-office operations through an Enterprise Resource Planning (ERP) system will streamline processes, improve workflow efficiency, and enable reliable and precise financial and management information. Last quarter, PDP successfully developed baseline and final configurations for all software in accordance with the Blueprint Design Documents formally approved by MEPCO, loaded and tested master data (non-transactional data such as basic employee information), conducted integrated testing for Human Resources (HR) and Payroll, Financials, and Material Management, carried out Training of Trainer training sessions to orient MEPCO staff to working on the new system, and started User Acceptance Testing (UAT), which involves testing the system using various scenarios to assess the system's performance in various possible business settings. This quarter all the configuration for the ERP system was completed. Data from the old system (which was primarily manual) was transferred and cleaned (a significant amount of work required of a large manual system), uploaded, and the SAP (Systems, Applications and Products in Data Processing) system was run live using the first month of data. The first month of data was closed at approximately the same time as MEPCO closed their books via their traditional method. The data center became operational in the quarter, and at the very end of the quarter, the ERP server hosting the SAP testing data was being transferred from the cloud to the new ERP server in the Data Center. All remote sites under this project have been connected and made operational.
- **Enterprise Resource Planning at Peshawar Electric Supply Company** – The Peshawar Electric Supply Company has been struggling with an obsolete and outdated accounting system and practices that were simply incapable of meeting accounting and financial reporting requirements of a modern power utility. The new PDP-implemented ERP system will automate these procedures by allowing all departments to share the same data which eliminates inter-departmental dependency, making business processes more efficient and PESCO a more robust distribution company. ERP implementation brings huge savings by

optimizing business processes. The Oracle Hyperion software will help the company to keep operating expenses within a set target range by enforcing strict financial discipline and budgetary controls; and real time information on collection and remittance helps PESCO to improve cash management and drastically reduces Cash-in-Transit. This quarter, PDP conducted conference room pilots for the Finance, Material Management, HR and Payroll, and Project Management units, in order to provide end-users with a practical demonstration of the system and iron out any deficiencies prior to ERP rollout at PESCO. Additionally, User Acceptance Testing was also completed to assess whether the system meets reporting, operational, and regulatory requirements of the utility. UAT was conducted to efficiently accommodate Finance, Material Management, Projects, Human Resources and Payroll activities.

- **Capacity Building Continues for Power Distribution Companies** – This quarter, PDP organized five workshops designed to facilitate the employees of both turnaround distribution companies in developing the right knowledge, tools, and skills to assist in the completion of routine tasks. The primary purpose was to build employee engagement and motivation. Also this quarter, PDP arranged performance improvement workshops for the senior management and Boards of Directors at seven power distribution companies – PESCO, Lahore Electric Supply Company (LESCO), Gujranwala Electric Power Company (GEPCO), Islamabad Electric Supply Company (IESCO), Hyderabad Electric Supply Company (HESCO), Sukkur Electric Power Company (SEPCO) and Quetta Electric Supply Company (QESCO), to facilitate participants’ understanding of the performance losses being incurred in monetary terms. The workshops also provided distribution companies with the knowledge, tools, and awareness to apply benchmarking techniques, set performance targets, and develop the necessary skills in implementing a performance benchmarking system.
- **Capacity Building at the Multan Electric Power Company** – Under its Management Development Program, PDP this quarter facilitated a one-day workshop on the role of distribution companies in an effective power distribution regulation system. The workshop facilitated a stronger understanding of the relationship between electricity regulation and competition, in addition to demonstrating an understanding of the regulatory process. Participants gave positive feedback and many expressed the need for related workshops. PDP also organized a two-day workshop on performance management and objective-setting in Multan for senior and middle management. This was aimed at facilitating the implementation of PDP’s Performance-Based Evaluation System (PBES). The PBES aims to increase productivity, employee engagement, and motivation through rewards and recognition, provide career opportunities to high performers, and make development plans to improve those who perform below expectations.

- **Building Sustainable Working Environments for Women** – Continuing its initiatives for the development of gender-friendly strategies in power distribution companies, PDP this quarter conducted Gender Equity Training (GET) sessions for LESCO’s senior management. GET was designed to sensitize participants to gender inequalities within their own organizations, and assist them in identifying solutions through active discussions with their subordinates (or peers), creating a congenial work environment. Furthermore, in order to strengthen the concept of gender equity in power distribution companies, PDP worked with the HR Department at all distribution companies and requested them to make GET a part of their curriculum at their respective Regional Training Centers (RTCs), in addition to induction trainings. Thus far, MEPCO, LESCO, HESCO, GEPCO, QESCO, and Faisalabad Electric Supply Company (FESCO) have expressed their interest and nominated their instructors and HR staff to undergo a three-day training of trainers program, which will over time allow the program to be embedded within their syllabi. As part of these training sessions, PDP also handed over detailed training manuals in both English and Urdu, for the use of RTC instructors.
- **Establishing Standing Inquiry Committees for Investigation into Sexual Harassment** – In 2010, the Government of Pakistan passed the “Protection Against Harassment at the Workplace Act 2010,” though PDP found that most distribution companies were severely lacking in its compliance and implementation. The Act ensures the equal treatment of both male and female employees and the provision of equal opportunities for both without the fear of discrimination. PDP served as the catalyst in the adoption of the Act by assisting in the formation of Standing Inquiry Committees and the display of the Code of Conduct at prominent locations. The Act has since been adopted in eight distribution companies, i.e. PESCO, MEPCO, LESCO, GEPCO, HESCO, QESCO, FESCO, and IESCO. The implementation of the Act at distribution companies and the training of the inquiry committees has developed the capacity of distribution companies to fairly handle complaints regarding sexual harassment without involving external parties.
- **Mass Media Campaign Facilitating Public Participation** – As part of an ongoing public outreach and awareness initiative, PDP this quarter designed, developed, and executed a mass media campaign to facilitate public participation and support, in order to ensure the smooth and uninterrupted supply of power to consumers. The messages included “time of use” as an energy conservation tip, reporting electricity theft, the safeguarding of electrical installations, and reporting any unusual activity with regards to such installations, and a request for timely bill payments. The campaign was publicized through all Peshawar’s leading national newspapers in addition to cable television, radio, billboards, and streamer-displays on street lights.

- **Promoting Energy Conservation on Earth Day** – PDP has been supporting PESCO by conducting grassroots-level energy conservation sessions in all major cities of the Khyber Pakhtunkhwa province through the dissemination of information on how to save electricity. This quarter, PDP arranged an Earth Day Energy Conservation Walk on the internationally celebrated Earth Day, which was attended by a large number of students, PESCO senior management, and staff. Addressing the large gathering, PESCO Chief Executive Officer (CEO) Syed Hassan Fazil stated that the energy conservation drive was one of the most economical ways of saving electricity across the country. PDP has launched multiple awareness campaigns on energy conservation in order to build awareness among the public, especially the youth, about the prevailing energy crisis and motivate them toward implementing conservation habits so that they can serve as the change agents of the future.
- **Enhancing Revenue in Peshawar through Revenue Protection Cell** – PESCO has historically suffered high losses due to power theft and poor revenue collection practices. PDP created the Revenue Protection Cell – a unit tasked with theft surveys, theft surveillance, recovery of arrears, tracking cases of power theft, and legal prosecution. This quarter, the Cell continued to operate and significantly improve its results, with 390 theft cases registered in Peshawar and Charsadda. To date, 1,833 theft cases have been reported, 1,268 direct hooks have been removed, and 923 theft cases have been registered. Furthermore, court decisions have been taken on 56% of registered theft cases. The Hand Held Unit (HHU) meter reading system has been implemented at 31 subdivisions with an additional nine undergoing parallel runs. An Electricity Theft Control document has been prepared which details the laws and issues with regards to electricity theft and makes recommendations for improvement.
- **Commercial Activities at Multan Electric Power Company** – The Power Distribution Program initiated the implementation of mutually agreed performance initiatives that included the expansion of the Improved Meter Reading (IMR) intervention, HHU projects in Multan Circle, and surveillance activities for revenue enhancement. This quarter, all remaining subdivisions of the Multan and Vehari Circles not equipped with IMR have been completed, and billing in 35 subdivisions of Multan Circle and six subdivisions of Vehari Circle was completely converted to HHU-based billing. Additionally, civil work was completed for one-window customer services centers in 15 subdivisions and MEPCO’s Regional Center, in addition to the completion of paint jobs in 25 subdivisions of Multan Circle; furniture is being provided to eight subdivisions to completely refurbish these centers.
- **Customer Information System in Multan Electric Power Company** – The Customer Information System (CIS) is a fully automated system that aims to increase the efficiency of the billing and collections processes, including setting up new customers and managing existing ones. Augmented by the introduction of HHUs and AMR, the CIS generates accurate bills for consumers and provides a one-window customer services center that will help

improve customer services. The shift to the CIS not only improves the company's cash flows, but also enhances the accuracy of billing, provides historical usage data of consumers, and generates user-friendly reports. Last quarter, PDP made this CIS operational in four divisions – Musa Pak, Multan Cantt, Mumtazabad, and Multan City – of MEPCO's Multan Circle, covering 635,000 consumers. This quarter, the new CIS system has been stabilized and successfully ran billing for three consistent months; additionally, the system was connected to the legacy system to produce month-end consolidated reports for Multan Circle and all of MEPCO.

## **TASK 2: ENERGY CONSERVATION & DEMAND SIDE MANAGEMENT**

Pakistan's power supply falls significantly short of the estimated demand from consumers year-round. The capacity shortfall has resulted in eight to 10 hours of load shedding in metropolitan cities such as Lahore, and as much as 16 hours of load shedding in rural areas. In the face of such challenges, energy efficiency and Demand Side Management (DSM) can contribute significant benefits and often within the shortest possible timeframe.



**18.5 KW tubewell motors awaiting replacement at Ittehad Chemicals Limited, one of Pakistan's largest chemical producing companies**

DSM initiatives are considered to be the most cost-effective options for transforming peak demand growth to a longer time horizon and reducing wasted electricity consumption due to inefficiency.

### **HIGHLIGHTS**

**Volt / Volt-Ampere Reactive (VAR) Optimization Program at Multan Electric Power Company** – This initiative aims to deliver power with appropriate voltage limits and optimal power factor, and to minimize system losses, all of which will ensure that equipment on the consumers' end operates properly. Under this project, PDP is supplying MEPCO 125 megavolt switched capacitors and 80 voltage regulators whereas fixed capacitors will be provided by MEPCO. This equipment will provide immediate relief to high loss 11 Kilo Volt (KV) feeders by reducing customer peak demand and energy consumption. During this quarter, the engineering team has carried out technical analysis of 28 11 KV feeders on SynerGEE. With this addition, the total number of proposals prepared to date is 52, in which eight fixed capacitors, 112 switched capacitors, and 48 voltage regulators have been proposed. These proposals were

submitted to the Chief Engineer (P&E) for approval and the issuance of a work order.

### **TASK 3: COST OF SERVICE & NEPRA REFORM**

This task covers two activities: Cost of Service Study (CoSS) and Tariff Design for all DISCOs and NEPRA Reform. The Cost of Service Model is the tool with which the CoSS is performed; it includes a repository of financial, technical, and billing information in a spreadsheet-based model. The model performs a functional classification of the total costs a utility incurs, and then allocates these costs to different customer categories. Once a customized model is developed, it becomes possible for utility staff to perform CoSS by simply updating the information repository.

#### **HIGHLIGHTS**

- **Cost of Service Models Delivered to Four Distribution Companies** – PDP this quarter delivered the last batch of Cost of Service (CoS) models to the four remaining distribution companies, namely PESCO, HESCO, QESCO, and SEPCO. Discussions were held with DISCO staff to explain and clarify results of their Cost of Service Studies. These CoS models utilize the actual financial and operational data of distribution companies, in order to determine the cost of electricity supply to different customer categories. The total cost is functionalized into generation, transmission and distribution components before being assigned to respective categories. The CoS models also look at the adequacy of the current tariff structure and determines which categories are being subsidized or are cross-subsidizing others and to what extent. As a result of these CoSSs, distribution companies will be able to create and assign cost-reflective tariffs.
- **Assisting Distribution Companies in the Tariff Petition Process** – Filing tariff petitions in line with Cost of Service Study results is a regulatory requirement, which PDP has been assisting all DISCOs with as an ongoing activity. In addition to breaking down DISCOs' total revenue requirement for the tariff request period into costs by category, assistance is also being provided in other areas like calculating the Weighted Average Cost of Capital etc. PDP will continue to support power distribution companies during the tariff proceedings at NEPRA, by providing any clarifications required on the Cost of Service process and methodology.
- **Assistance to NEPRA in Developing the Process for Approving Integrated Generation Transmission Distribution Plans** – The overarching theme of the Integrated Transmission Distribution Plan (IGTDP) is that all power sector planning will be conducted in a manner consistent with the NEPRA Act. PDP's initiatives include supporting NEPRA in carrying out a

gap analysis to discover the underlying disparities between current NEPRA in-house practices and the requirements for processing IGTDPs consistent with the NEPRA Act and the NEPRA Tariff Guidelines which provide a strategy for setting consumer-end tariffs on both an annual and multi-year basis. The findings of the gap analysis show that significant gaps exist between what is expected of NEPRA, per national policies, and what it delivers. The IGTDP process, a methodology prepared by PDP, is designed to fill those very gaps, a conclusion which was presented in the widely circulated draft “Investment Standards Rules for Transmission and Distribution Licensees.” Also this quarter, PDP arranged a joint technical workshop with NEPRA on the Tariff Guidelines and the relevance and applicability of the new standards. The workshop was attended by over 70 participants and was very well-received.

- **Reevaluating Organizational Assessment and Restructuring at NEPRA** – This quarter, PDP designed, developed, and delivered various training and capacity building interventions that focused on developing and improving the functional and technical skills of NEPRA employees. PDP arranged a comprehensive two-day workshop on Power Distribution Network Optimization & Operations, which included participants from different DISCOs. The workshops used real-time case studies from selected DISCOs on different interventions carried out by PDP and their impact. Another significant highlight was the participants’ visit to the WAPDA NOC and to the manufacturing facility to observe the process for the manufacturing of smart metering solutions. The program was well-received by participants and provided NEPRA with the opportunity to learn about different power distribution network issues, their solutions, and seeking the opinions of distribution companies on different technical matters. Subsequent to the Regulation of Electricity Networks training delivered in January 2015, PDP in its effort to facilitate NEPRA to regulate power sector effectively, conducted a workshop on Role of Distribution Companies in Effective Power Sector Regulation. This two-day workshop was delivered by an international training firm, Clarion Training UK. Two sessions were held at Lahore and Karachi, attended by participants from all DISCOs and NEPRA. This enabled DISCOs to understand their role in effective power sector regulation in line of best practices. This also provided NEPRA an opportunity to explain different regulatory requirements of DISCOs, their purposes, and the overall functioning of the power market. In addition to these two training programs, PDP has conducted customized training programs, tailored specifically to the needs of NEPRA participants on Analytical and Research Skills and Report Writing Skills. NEPRA professionals in their day-to-day operations spend most of their business time on performing research, analyzing submission by different stakeholders and documenting their findings / results in the form of reports. Both trainings were outsourced to the training consultancy firms, Carnelian and Management Development Institute respectively.

## TASK 4: CAPACITORS AT TUBEWELLS FOR POWER FACTOR IMPROVEMENT & LOSS REDUCTION

One of the largest loads on Pakistani DISCOs is that of tubewell pumps. Nationwide, electric consumption via tubewell pumps accounts for about 12% of the total annual energy consumption, with significant variation from one DISCO to another. Tubewell pumps used in Pakistan have low-rated power factors, on the order of 80-85% even when new. Due to poor power quality, frequent rebuilding of pumps results in further reductions in power factor. Low power factor increases reactive power demand on transmission and distribution lines and transformers, and results in higher technical losses. The high number of inefficient tubewell pumps with low power factor has a significant effect on the system's technical loss, and creates unnecessary demand on the system.

### HIGHLIGHTS

- **Capacitor Installation at Five Power Distribution Companies** – Under its Capacitor Installation Program, PDP is installing capacitors on tubewells throughout the country, and capacitors have been installed in PESCO and QESCO. Of 45,000 capacitors planned for MEPCO, nearly 40,000 were installed by the end of this quarter. The capacitor installation program will result in substantial reduction in demand and technical losses.



Capacitors for tubewell installations at PESCO

## TASK 5: FEEDER OPTIMIZATION FOR LOSS REDUCTION

DISCOs have not assessed current requirements for HT power factor correction. Feeder loads have changed with the addition of air conditioner motors and other appliances, causing poor power factor on many feeders, leading to lost revenue, low voltage, and customer dissatisfaction.

PDP's P&E program will focus on MEPCO to perform feeder power flow analysis using new software technology and install 11 KV HT capacitors. This task will include installation of HT capacitors on feeders and in grid stations.

## **TASK 6: EXPANSION OF HIGH IMPACT OPPORTUNITIES & IMPROVED GOVERNANCE**

This task includes the following activities:

- Activity 1: Load Data Improvement Project
- Activity 2: Improved Meter Reading Project
- Activity 3: Line Staff Skill Development
- Activity 4: Governance
- Activity 5: Lineman Training for all DISCOs

### **HIGHLIGHTS**

- **Load Data Improvement Program** – PDP ended this quarter by successfully achieving the objective of the program, i.e. to reduce unscheduled load shedding through the installation of AMR meters at the grid substations of all ten power distribution companies. Following the establishment of the Tribal Area Electric Supply Company (TESCO), the MWP requested the Power Distribution Program to integrate its power utilization intervention with the Load Data Improvement (LDI) project. By quarter's end, a total of 9,335 meters were installed across all power distribution companies, including TESCO. In a related activity, PDP established and made operational a Power Distribution Center (PDC) at TESCO. The PDCs now established at all 10 companies are integral in making quick adjustments to load management issues as they arise, an initiative that has almost eliminated unscheduled (i.e. forced) load shedding. PDP also installed specially designed executive screens in the CEO and General Manager / Chief Engineer Operations' offices at all distribution companies. For the first time in the history of the energy sector, real-time megawatts (MWs) received from the national grid are displayed on these live data screens which are instrumental in controlling and reducing unscheduled load shedding.
- **Outage Reduction Devices Project** – The reliability of electric distribution systems is critically important for distribution companies and the consumers they serve. Currently, distribution companies lack the sectionalizing devices integral in isolating power faults to the affected area, as opposed to causing consumers outside the vicinity to suffer as well. In

FESCO, LESCO, MEPCO, GEPCO, IESCO, and HESCO, until this quarter PDP installed 441 fault indicators. These devices will reduce the time it takes to determine the source of faults in the distribution system, PDP also installed 18 ground-operated gang switches of 900 Amps on critical and sensitive feeders, 147 disconnect switches of 600 Amps on main feeders, 951 load break switches of 200 Amps on branch lines; in addition, 3,153 fused dropout cutouts of 100 Amps were installed on distribution transformers, making a total of 4,710 ORD switches installed in the six companies. In PESCO, planning and design work for 2,877 ORDs was completed and work orders issued for their installation on 115 11KV feeders. So far, a total of 2,400 switches have been installed in the field. These devices will reduce the customer outage time while the switches will help in isolating only the affected section as opposed to the entire feeder, thereby reducing the outage time for the remaining consumers on that feeder.

- **Assistance to the Privatization Commission** – PDP is working with the Privatization Commission (PC) in the transition of selected power distribution companies from publicly held utilities to privately held ones. PDP’s in-house Privatization Advisor, stationed at the PC, is working with the Privatization Commission in order to provide the PC with a structured checklist for managing many of the risks associated with implementing and managing the privatization transaction by preparing and documenting each required step for each identified mode as per the relevant rules and regulation guiding privatization. This quarter, three checklists were developed, which include all tasks that are required by the rules and regulations, and recommendations for improvement that can enhance the PC’s ability to manage transaction risk effectively. For example, the checklists include recommendations to increase transparency through the use of press releases, and increasing from 30 days to 60 or 90 days the amount of time financial advisors have to submit proposals to the PC, among many other suggestions for improvement. These checklists will be delivered as drafts to the PC early next quarter as part of the scheduled Task 1 report, with further checklists appended to the Task 2 report later in the next quarter, for all other modes of privatization. Also this quarter, PDP delivered to the PC its draft Task 3 report, which included strategic advice on power sector privatization transactions such as transaction work plans, transaction status reports, privatization program status reports, transaction team organization structure, transaction team digital file systems that included a very detailed survey of a number of cloud service providers that the PC could utilize immediately as it improves its own IT systems, detailed strategy and cost estimates to market state-owned enterprises to strategic investors, and suggestions for public outreach documents.
- **Creating Fully Operational Central Power Purchasing Authority-Guarantee** – The Central Power Purchasing Authority Guarantee Limited (CPPA-G) was created through the bifurcation of the National Transmission Distribution Company License, which gives NTDC transmission rights. CPPA-G was created to serve as an independent market operator to

conduct market operations and bring greater transparency and efficiency to the power sector. Efforts to create CPPA-G had been underway since 2009, but the company failed to become operational due to persistent delays. To resolve the situation, the Ministry of Water and Power asked PDP to facilitate in its operationalization. This quarter, as part of this request, PDP assisted MWP and NEPRA in the successful execution of the Business Transfer Agreement, the Power Procurement Agency Agreement, the Market Operator Registration Rules, and the Commercial Code. These deliverables have resulted in the full and effective operationalization of CPPA-G as an independent market operator which has been highly appreciated by the MWP. The success of this intervention is reflected in various CPPA-G operations, such as the routing of cash flow from all DISCOs through the bank accounts of the CPPA-G, and the financial settlement to generation companies is now dealt through the CPPA-G.

- **Formulation of National Electric Safety Codes** – The Power Distribution Program has been involved in the development of the national electric safety codes, now collectively known as the Pakistan Electric and Telecommunications Safety Codes (PETSAC). The new codes will help in implementing safe work practices in the power and telecommunications sector, work to minimize accidents that occur as a result of poor work practices and failed safety equipment, thus saving the loss of 200 lives per year. This quarter, the Pakistan Electric Council (PEC) called a final meeting of its taskforce during which the final PETSAC draft was approved and vetted and a draft for the Statutory Regulatory Order finalized and sent to the PEC's law division for vetting. Upon approval, the codes will be mandated for adoption across all utilities, transforming the safety practices in the sector.
- **Assistance to the Ministry for the Preparation of Multi-Year Tariff Petitions** – In addition to assisting NEPRA in the creation of tariff petitions, the Power Distribution Program is developing a five-year investment plan, necessary in preparing multi-year tariff petitions for the two turnaround companies. This investment plan requires prior approval by NEPRA and this quarter, engaged the services of Power Planners International (PPI), which is currently supporting MEPCO and is finalizing the improved version of the five-year IGTDP in light of NEPRA's formats and guidelines. Once approved, this will form the basis of MEPCO's multi-year tariff (MYT) petition. Additionally, MEPCO is now in the final stages of preparing the company's financial forecast for the MYT application. Similarly, PPI has also started work for the improvement of IGTDP with PESCO. Simultaneously, PESCO has initiated working on the Distribution Company's Integrated Investment Plan (DIIP) formats, including the finalization of financial projections for the next five years. Lastly, the NEPRA-PDP joint technical workshop held in June elaborated upon the Tariff Guidelines and DIIP formats in a comprehensive manner which will benefit MEPCO and PESCO in preparation and filing of their MYT petitions.

# SECTION 4: COMPONENT 2 TASKS CONTINUING IN COMPONENT 3

## TASK 1: CONGESTED AREA IMPROVEMENT

Under Component 2, congested area work is underway at PESCO, HESCO, and LESCO. Under Component 3, PDP will assist the DISCOs in planning congested areas, focusing on the two Turnaround DISCOs, and installing ABC cable to extend HT lines by shortening LT lengths, plus installing new high efficiency transformers, switches, and outage reduction equipment. To achieve this improvement, PDP will purchase and install the bulk of the material with participation from distribution companies. This activity will lead to reduced losses and increased revenue in congested and high theft areas, resulting ultimately in improved customer safety and satisfaction.

### HIGHLIGHTS

- **Installation of Completely Self-Protected Transformers**

– The Power Distribution Program’s intervention to install 45 KVA and 74 KVA CSP transformers while reducing the Low Voltage Secondary length, in order to reduce losses on the lengthy LTs, in addition to improving the end consumer’s voltage profile. PDP provided and allocated 31 45 KVA and 47 75 KVA transformers for installation on PESCO’s distribution system. Field surveys, designs, and work orders with maps and materials were released for 30 of the former and 47 of the latter transformers. Two each of these transformer types will be retained as spares for PESCO’s stores for emergency and maintenance purposes. PESCO’s Peshawar Construction Division assigned five PDP-trained linemen to exclusively work on installing 45 KVA transformers, and eight linemen for the 75 KVA transformers. Installations were completed for 27 of the 45 KVA transformers and 28 of the 75



**A 45 KVA CSP transformer being installed in Peshawar Circle**

KVA transformers. The remaining transformers are planned for installation by the end of next quarter.

## **TASK 2: HIGH TENSION POWER FACTOR IMPROVEMENT**

Under Component 2, the DISCOs have committed to repair or replace installed HT capacitors. PDP will continue under Component 3 to assist the DISCOs to complete this ongoing effort. Improved distribution system power factor will reduce technical losses and reactive power (MVAR) demand with improved voltage resulting in customer satisfaction. DISCOs have not assessed current requirements for HT power factor correction. Yet the feeder loads have changed with continuous loads of air conditioners, motors, compact fluorescent lamps (CFLs), and other appliances, resulting in poor power factor on many feeders and lost revenue, low voltage, high technical loss, and customer dissatisfaction. PDP will focus on PESCO and MEPCO to conduct feeder power flow analysis, using new software to determine the requirement for installation of HT capacitors on feeders and congested area strategies on high-loss feeders. At MEPCO, this activity is coupled with voltage regulators for the introduction of the Volt/Var Optimization (VVO) Program as part of the Energy Loss Reduction (ELR) program.

### **HIGHLIGHTS**

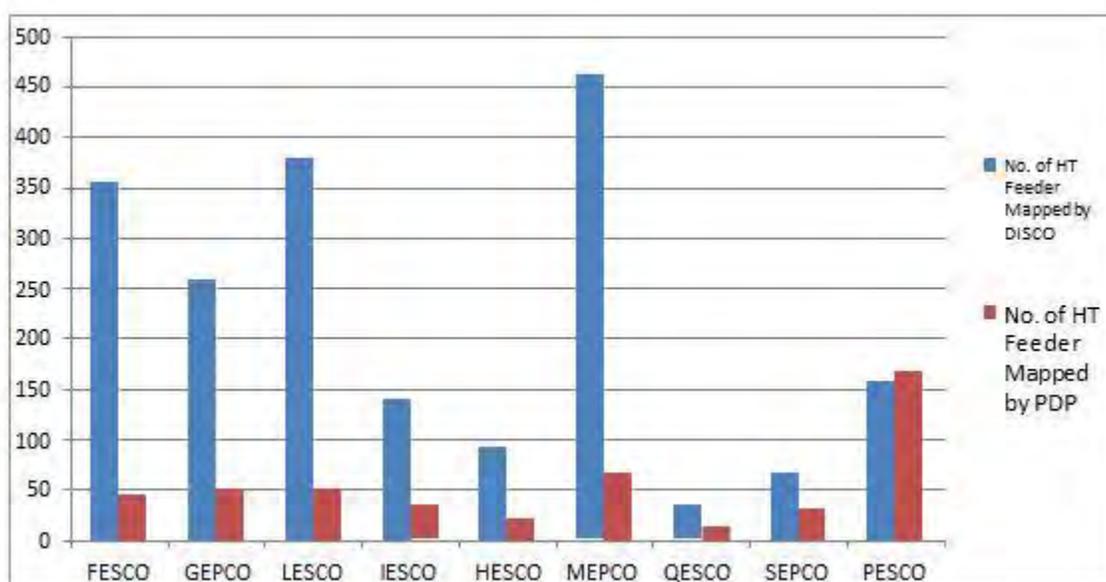
- **Energy Loss Reduction Program Begins at Multan Electric Power Company** – Under the ELR program, a mix of switched HT capacitors and HT voltage regulators will be applied to improve MEPCO's voltage and power factor problems on critical feeders. This quarter, 37 units out of 125 units of 450 KVA Reactive-switched HT capacitor orders were installed in MEPCO. Eighty units of 32-step voltage regulator unit orders were received at MEPCO's regional stores in Multan.

## **TASK 3: GEOGRAPHIC INFORMATION SYSTEM SURVEY & ENGINEERING ANALYSIS**

In Component 2, PDP carried out feeder mapping and analysis of one subdivision per DISCO. PDP initiated a program to enable all nine DISCOs to develop a geodatabase with accurate mapping with locations of all field installations. To date, nine DISCO P&E computer centers have been made operational. Under Component 3, this effort will continue and PDP will build the capacity in DISCOs to map entire divisions and circles. Planning engineers will be encouraged to concentrate their engineering software analysis on these areas to produce more accurate feeder / area rehabilitation plans, based on field GIS data.

## HIGHLIGHTS

**Data Collection and Database Development Continues at Distribution Companies –** The creation of a GIS database of the power distribution facilities at all DISCOs is essential for improved governance and resource management. This quarter, work continued at all DISCOs, where individual data per feeder is being collected and processed into a GIS database suitable for mapping and engineering analysis. Seven DISCOs are, with PDP’s assistance, now using their own personnel to conduct GIS work, with PDP providing OJT only. PDP’s GIS trainings focused on facilitating staff in processing spatial data captured through field surveys and subsequent processing for use in SynerGEE, the power flow analysis tool. Thus far, over 2,400 feeders have been mapped across the country, with the DISCOs mapping an increasing number of feeders themselves. The chart below provides a comparison between feeders mapped by DISCOs and those mapped with PDP’s assistance.



## TASK 4: DEMAND SIDE MANAGEMENT PROGRAM

Industrial motors contribute an estimated 60-80% of industrial electricity consumption in most Pakistani industrial sectors. Under the rollover program and through funding from the Energy Efficiency Program, PDP, in Phase 1 of its “Motors in Industry” program, installed 811 energy efficient motors and 641 Variable Frequency Drives (VFDs) in industries throughout Pakistan (except Baluchistan) until December 2013. In Phase 2, PDP installed 729 motors and 318 VFDs; this phase concluded on May 31, 2014. Another program activity was the replacement of inefficient pump-sets in the publicly owned water and sewerage utilities. Under Component 2,

PDP replaced 135 inefficient municipal pump-sets of Islamabad's Capital Development Authority Islamabad, and 75 big tubewell motors and pumps in the Karachi Water & Sewerage Board. This activity concluded in December 2013.

## **TASK 5: LOW TENSION CAPACITOR INSTALLATION PROGRAM**

Under Component 2's Capacitor Pilot Program, PDP has installed nearly 24,000 LT capacitors on agricultural tubewells for the purpose of improving pump-set power factor in MEPCO, FESCO, LESCO, IESCO, and QESCO. Based on the successful results of this project, PDP has started the capacitor installation project under Component 3 with the installation of LT capacitors totaling up to 68,200 on tubewell motors, addressing the challenges faced during the pilot project, to maximize the nationwide program's success and peak demand savings and technical loss reduction.

## **TASK 6: COST OF SERVICE STUDY**

After completing the Cost of Service Study of IESCO under Component 2, PDP has been working on CoSSs at nine DISCOs – LESCO, FESCO, GEPCO, MEPCO, HESCO, PESCO, SEPCO, QESCO, and TESCO – in Component 3 of the program.

The methodology and Cost of Service Model developed for IESCO and approved by NEPRA is being applied and customized to meet the needs of each DISCO. Studies for LESCO, FESCO, MEPCO, and GEPCO have been completed, and work is in progress at the remaining distribution companies.

## **TASK 7: ORGANIZATIONAL ASSESSMENT & RESTRUCTURING**

Understanding that all DISCOs share similar structures, the assessment work conducted at MEPCO will be validated for PESCO with minimal assessment performed in areas where there might be discrepancies or inconsistencies. The project will focus on the implementation of approved proposals / studies.

### **HIGHLIGHTS**

- **Organizational Assessment and Restructuring at Peshawar Electric Supply Company –** PDP's interventions in PESCO were designed to counter the prevailing non-competitive organizational structure, addressing the vague policies and procedures which resulted in delayed

decision making. The objective of this activity was to address the deficiencies within the current policies and departmental structure of PESCO. By the end of this quarter, PDP provided the new organizational structure, departmental profiles, and validation reports, of which the departmental structures of Finance, IT, and Internal Audit have already been approved while the following documents have been endorsed by PESCO: HR Policy and Procedure Compendium, Employee Handbook, Safety Guide and Policy, Training and Development Manual, Recruitment Manual, Health Policy, and Compensation and Benefits Study.

- **Organizational Assessment and Restructuring at Multan Electric Power Company –** A comprehensive study was conducted to gather data for all currently existing positions in MEPCO, in order to develop updated and relevant job profiles, i.e. Job Descriptions and Key Performance Indicators. All deliverables regarding this project have been completed and submitted to MEPCO for review and feedback – the deliverables include job profiles, the PBES, Training Needs Assessment for all cadres of employees, Training Function Development to improve the performance of the training centers, HR Help Desk Policy and Procedure, Employee Handbook (in both English and Urdu), Rewards and Recognition Policy, the revised Recruitment and Selection Policy, and Anomalies in MEPCO's HR System. Training workshops on the PBES, Job Descriptions, and Training Function Development were also conducted this quarter to ensure the sustainability of these measures.

# APPENDIX A: TABULAR PERFORMANCE RESULTS

Indicator	Unit	Start of Project to End of Previous Quarter	Current Quarter (Apr-Jun 2015)	Start of Project to End of Current Quarter
<b>Power and Energy Saving</b>				
MWs of power saved by installing LT capacitors, HT capacitors, meters, efficient pumps and motors	MW	162.6	18.4	181.0
Giga-watt hours of energy made available by installing high tension / low tension capacitors, meters and improving commercial procedures	GW-h	648.6	48.4	697.0
Revenue saved or revenue generated by installing high tension / low tension capacitors, meters and improving commercial procedures, internal audit process optimization, MDI billing, LDI project and advising PESCO on a corporate level	\$ million	313.0	51.0	364.0
<b>Beneficiaries</b>				
Number of beneficiaries receiving improved energy services by installing high tension/low tension capacitors, meters, and improving commercial procedures	No.	2,439,000	276,000	2,715,000
<b>Capacitors</b>				
Number of capacitors installed in tube well pumps	No.	49,936	13,829	63,765
<b>Pumps &amp; Motors</b>				

Number of pumps installed in municipalities	No.	210	-	210
Number of motors installed	No.	1,539	-	1,539
Number of variable speed drives (VSDs) on motors	No.	749	-	749
<b>Load Data Improvement Project</b>				
Number of AMR meters installed for LDI Project	No.	9,234	101	9,335
<b>Meter Installation Improved Meter Reading &amp; Meter Replacement Activity</b>				
Number of new meters installed through improved meter reading & meter replacement activity	No.	97,638	22,475	120,113
Number of meters re-fixed with new service drops and proper fixing brackets through meter replacement activity	No.	19,375	11,130	30,505
Total new meters installed and re-fixed through improved meter reading and meter replacement activity	No.	117,013	33,605	150,618
<b>ABC Cable</b>				
Kilometers of ABC Cable	Km.	48	306	354
<b>Miscellaneous Installations</b>				
Number of outage reduction devices	No.	4,981	2,129	7,110
Number of automatic meter reading meters	No.	33,672	21,996	55,668
Number of transformers	No.	42	12	54
<b>Revenue Protection Cell</b>				
Total number of theft cases reported	No.	1,443	390	1,833

Total number of illegal hooks detected	No.	878	390	1,268
Total number of FIRs lodged	No.	547	376	923
<b>Improved Meter Reading</b>				
Number of theft cases detected	No.	11,011	13,132	24,143
Number of consumer premises checked	No.	223,444	59,954	283,398
Number of meters replaced	No.	42,035	10,837	52,872
<b>Census</b>				
Number of consumers enumerated	No.	256,266	42,688	298,954
Number of theft cases observed through census	No.	34,999	6,195	41,194
Wrong tariff cases identified through census	No.	468	147	615
<b>Linemen Training</b>				
Number of linemen trained on proper safety techniques	No.	14,429	543	14,972
<b>Functional Training</b>				
Number of DISCO staff trained in various functional areas like Finance, Human Resources, Technical, Commercial, Communication, Safety etc.	No.	30,300	1,187	31,487
<b>Governance</b>				
Number of policies and international best practices analyzed, developed and issued	No.	41	1	42

**USAID Power Distribution Program**

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