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# USAID POWER

# DISTRIBUTION PROGRAM

COMPONENT 3 WORK PLAN

March 2013



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March 2013

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Islamabad, Pakistan

### **DISCLAIMER**

The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

## ACRONYMS

ABC – Aerial Bundled Cables  
 AMR – Automatic Meter Reading  
 BOD – Board of Directors  
 CIS – Customer Information System  
 COS – Cost of Service  
 CPPA – Central Power Purchasing Agency  
 DISCO – Government-owned Power Distribution Company  
 DSM – Demand Side Management  
 DQA – Data Quality Assessment  
 EE – Energy Efficiency  
 EMMP – Environmental Monitoring and Mitigation Plan  
 EOI – Expression of Interest  
 ERP – Enterprise Resource Planning  
 GIS – Geographic Information System  
 GOP – Government of Pakistan  
 GPRS – General Packet Radio Service  
 GSM – Global System for Mobile Communication  
 HHU – Hand Held Unit  
 HR – Human Resources  
 HRIS – Human Resource Information System  
 HRM – Human Resource Management  
 HT – High Tension  
 ICO – Integrated Commercial Operations  
 IEE – Initial Environmental Examination  
 IMR – Improved Meter Reading  
 JD – Job Description  
 KPI – Key Performance Indicator  
 kV – Kilo Volt  
 LDI – Load Data Improvement  
 LT – Low Tension  
 M&E – Monitoring and Evaluation  
 MVAR – Million Volt Ampere Reactive  
 MW – Megawatt  
 MWP – Ministry of Water and Power  
 NEPRA – National Electric Power Regulatory Authority  
 NPCC – National Power Control Center

NTDC – National Transmission and Distribution Company  
OMS – Outage Management System  
P&E – Planning and Engineering  
PDC – Power Dispatch Center  
PDD – Project Design Document  
PDP – Power Distribution Program  
PESCO – Peshawar Electric Supply Company  
PICG – Pakistan Institute of Corporate Governance  
PITC – Power Information Technology Company  
PMO – PDP’s Program Management Office  
PMP – Performance Management Plan  
PMS – Performance Management System  
PMU – Project Management Unit  
PPA – Power Purchase Agreement  
RF – Radio Frequency  
RFP – Request for Proposal  
RFQ – Request for Quotation  
RTC – Regional Training Center  
SCADA – Supervisory Control and Data Acquisition  
SECP – Security and Exchange Commission of Pakistan  
TOU – Time of Use  
USAID – United States Agency for International Development  
VSD – Variable Speed Drive

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## Section 1: Executive Summary

Pakistan's power sector is beset by significant challenges including limited reliable and affordable fuel supply; alarming and unsustainable subsidies; and aging and inadequate generation, transmission, and distribution infrastructure. The power sector suffers from inefficient governance and inadequate expansion planning; its utility operational policies and practices lag significantly behind those of modern utilities elsewhere in the world. The result of these inefficiencies has created a crisis situation, with violent protests across cities leading to significant property damage, breakdown of law and order, and, in some cases, fatalities. The power crisis and the subsequent rioting have had a significant ripple effect across the economy, with decreasing industrial output and business investments, stalled infrastructure and electricity access programs, and shutdown of public, private and educational institutions.

The United States Agency for International Development's (USAID's) response to Pakistan's energy crisis was to launch the Power Distribution Program (the Program, or PDP). PDP, a five-year USAID-financed project, is designed to facilitate improvements in government-owned electric power distribution utilities across Pakistan through addressing governance issues, reducing technical and administrative losses, and increasing revenues. Component 3 covers the next phase of this improvement strategy, which is schedule to conclude in October 2015.

As infrastructure investment requirements in the distribution system<sup>1</sup> have been estimated to exceed \$2.2 billion, the Program's approach includes transferring 'know-how' in all key areas of utility operation (commercial operations, finance and accounting, engineering, communications, etc.) while working at the federal level to improve the policy environment in which distribution companies (DISCOs) operate. PDP is leveraging its limited funding with DISCO resources to finance and deliver high-impact and essential activities that DISCOs can then replicate using solely their own funding.

The PDP Component 3 Work Plan<sup>2</sup> provides a detailed description of the activities that will be completed during this phase of the Program. Activities range from preparing DISCOs for commercialization (including development and implementation of standard utility information technology systems) to specific tasks aimed at improving the workforce skills and capacity. While the Turnaround and Model DISCO activities will be the major interventions of the Component 3 Work Plan, additional interventions will be implemented that focus on needed areas of reform such as improving the methodology used to apply for tariffs, improving management capabilities of the national distribution network through improved metering and data analysis, and increasing the capacity of energy sector governance.

Component 3 activities will also include a number of cross-cutting activities including gender strategy, internship programs and DISCO communications that are designed to increase the sustainability of the interventions being implemented. Also included in this Work Plan is a detailed description of supporting project management activities including the project's Engagement Strategy, Sustainability Strategy, Program Management Office (PMO), Project Schedule, Task Summary Matrix and Risk Matrix. These project

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<sup>1</sup> For government-owned DISCOs alone and does not include the privately owned Karachi Electric Supply Company (KESC)

<sup>2</sup> The Component 3 Work Plan covers only Component 3 activities. For information on Component 2 activities please see the C2 Work Plan and supporting Project Design Documents.

management activities will support the execution of the improvement initiatives; thus, increasing the likelihood for success of the overall project

All stakeholders – particularly the Government of Pakistan (GOP), the DISCOs, their staff, and consumers – are poised for major reform. Through delivering Component 1 and 2 activities, PDP has established itself as a catalyst for change and developed a strong relationship with its partners. Building on its base of successes to date, Component 3 is positioned to deliver tangible results that will significantly reform the country’s power sector.

## Section 2: Tasks Narratives

Component 3 comprises of the following six tasks:

- **Task 1:** Preparing DISCOs for Commercialization
- **Task 2:** Energy Conservation and Demand Side Management
- **Task 3:** Cost Reflective Tariff and NEPRA Reform
- **Task 4:** Capacitors at tubewells for Power Factor Improvement and Loss Reduction
- **Task 5:** Feeder Optimization for Loss Reduction
- **Task 6:** Expansion of High Impact Opportunities and Improved Governance

Task 1: Preparing DISCOs for Commercialization is divided into two sub-tasks. Task 1a focuses on improving performance of the Model DISCO and improving the policy environment in which the DISCO operates. The goal will be to attract private entities willing to invest in the DISCO and introduce best management practices through different mechanisms such as management contracts. Task-1b focuses on improving a Turnaround DISCO with initiatives resulting in significant loss reduction and performance improvement to demonstrate the means by which low-performing DISCOs can be improved.

Other tasks include Energy Conservation and Demand Side Management (Task 2), Cost Reflective Tariffs and NEPRA Reform (Task 3), Capacitors at Tubewells for Power Factor Improvement and Loss Reduction Project (Task 4), Feeder Optimization for Loss Reduction (Task 5) and High Impact Projects (Task 6). Under Task 6, high impact projects initiated under Component 2 such as governance, communications/outreach and lineman training programs will continue under Component 3 and will be expanded to benefit all DISCOs. Component 3 tasks were chosen to support the Energy Policy Matrix jointly created by a working group of PDP the USAID Office of Energy, and other USAID contractors.

### Task 1: Preparing DISCOs for Commercialization

Task 1 comprises of the following two sub-tasks:

- **Task 1a:** Preparing a Model DISCO
- **Task 1b:** Turnaround DISCO

The following narrative describes the initiatives planned as an integral part of the Model DISCO and Turnaround DISCO activities.

#### Task 1a: Preparing a Model DISCO

The activities under this sub-task are designed to assist a Model DISCO achieve significant improvement in commercial performance through integration of advanced metering, billing and collection processes; improved planning and engineering (P&E) design practices and procedures; and effective internal and external communications.

This sub-task comprises of the following four activities:

- **Activity 1:** Modernization of Business Systems
- **Activity 2:** Change Management and Human Resources Development
- **Activity 3:** Introducing Modified Supervisory Control and Data Acquisition (SCADA) Systems to Improve Power Flow Monitoring
- **Activity 4:** Improving Operations & Maintenance Processes and Procedures

### Activity 1: Modernization of Business Systems

An essential prerequisite to improving business operations is the design and development of essential processes, procedures and practices. To achieve this result in the Model DISCO, the PDP team will work with Model DISCO senior management to deliver business process enhancements focused on transforming the current business practices and integrating all operational aspects of the electricity distribution business. This activity will focus on the following sub-activities:

- **Sub-Activity 1.1:** Enterprise Resource Planning System.
- **Sub-Activity 1.2:** Effective and Accurate Metering System
- **Sub-Activity 1.3:** Upgrading P&E with Geographic Information System Mapping

Process improvements will lead to better financial management and control over the Model DISCO's revenue cycle. Estimated impacts related to improvement in revenues and collections range from 1% for better performing DISCOs and 3% for poorly performing DISCOs, respectively ranging from up to \$5 million to \$16.8 million annually depending on DISCO chosen. Circular debt will be correspondingly reduced by a similar amount. Additionally, in areas where Task 5 Feeder Optimization will be carried out, a targeted reduction of up to 5% in losses will be achieved in the feeders/sub-divisions.

### Sub-Activity 1.1: Enterprise Resource Planning System

#### ERP - Financial and HRIS

**Scope:** Existing DISCO legacy back office operations are incapable of providing timely information required for management to make effective decisions or to properly monitor and control utility operations. DISCO cost/revenue centers are dispersed geographically, adding to the delay in reporting. Furthermore, processes related to collection, validation, compilation and processing of data are inefficient. Automation of back office operations through delivery of an Enterprise Resource Planning (ERP) System will result in streamlined processes, improves workflow efficiency, and produces reliable and precise financial and management information.

Based on knowledge and experience gained from the development of the ERP Documentation Manual under Component 2, PDP will implement the ERP initiative at both Model and Turnaround DISCOs in accordance with the guidelines outlined in the manual.

The ERP Documentation Manual covers various modules which may be included in the ERP system under Component 3, depending on the requirement:

- **Financials:** General ledger, accounts payable, accounts receivables, fixed assets, cash management, budget, and payroll
- **Material Management:** Inventory & procurement management
- **Project Management:** Management and project costing

The Request for Proposals (RFP) will address the scope for both Model and Turnaround DISCOs, with the flexibility to mobilize the vendor to Model DISCO at a later date. ERP implementation is planned in the following two phases:

- **Phase 1:** General ledger, accounts payable, accounts receivables, fixed assets and cash management, and human resource
- **Phase 2:** Material management, project management, project costing and payroll

**Schedule:**

<b>For Turnaround DISCO:</b>	<b>Start Date:</b> August 2012	<b>End Date:</b> July 2015
<b>For Model DISCO:</b>	<b>Start Date:</b> April 2013 <sup>3</sup>	<b>End Date:</b> August 2015

**Turnaround DISCO:** Development of functional specifications and other preparatory activities started in August 2012 will continue up to March 2013. The procurement process will begin by March 2013 through issuance of an RFP, followed selection and award of contract in June 2013. The Contractor will mobilize in July 2013 and the ERP initiative is scheduled to be completed in June 2015.

**Model DISCO:** Utilizing the procurement mentioned above, it is envisioned that the contractor will be mobilized in September 2013 and the ERP activity will be completed by August 2015.

**Deliverables:** Successful implementation of the ERP at the Model and Turnaround DISCOs will result in the following deliverables:

- **Phase 1:** General ledger, accounts payable, accounts receivables, fixed assets and cash management and human resource
- **Phase 2:** Material management, project management, project costing and payroll
- **IT Support:** IT infrastructure supporting ERP that include data centers with servers, end user computers and network infrastructure
- **Reporting:** Baseline report for collecting and validating existing data

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<sup>3</sup> All Model DISCO start and end dates are based on the assumption that the Model DISCO will be selected by March 15, 2013 and are subject to revision, should the selection process be delayed. As the work plan is a living document, the dates relating to the Model DISCO will be updated as soon as the selection is notified.

**Results:** Reduced cash flow cycle time, improved asset management operations and reporting, improved banking operations and reduction in labor costs associated with these operations.

## Customers Information System

**Scope:** DISCOs experience high non-technical losses and poor revenue generation mainly due to reasons: ineffective billing and collections combined with high levels of power theft. Meter reading manipulations contribute significantly to improper billings and lead to customer distrust and a lack of willingness to pay. The use of outdated manual procedures allows these errors to continue. Integrating and automating core commercial functions like meter reading and billing/collections will minimize the human element in commercial processes and lay the foundation for sustainable revenue cycle reforms.

Leveraging the lessons learned from Component 2 activities, PDP will pursue an Integrated Commercial Operations (ICO) project at both Model and Turnaround DISCOs. Interventions under this project are broad in scope and span the range of the utilities' policies, procedures, and operating practices.

A Customer Information System (CIS) sits at the core of ICO. Augmented with handheld meter reading system, the ICO generates reliable data and a one-window customer services facility for an improved customer experience. Part of the ICO project is a consumer census activity for the consumers of the selected project area. This will help to improve the customer database so as to reflect accurate field information.

Implementation will begin with improvement of the consumer database through conducting a consumer census (for the selected circle(s)). This will be followed by development of an IT infrastructure and networking; integrating metering and billing processes for commercial and bulk consumers; deployment of handheld meter reading system; and concluding with CIS deployment.

**Schedule:** The schedule for ICO/CIS will follow the same pattern as discussed above under ERP – Financial & Human Resources Information System (HRIS) section.

**Deliverables:** Following are the deliverables from the implementation of ICO/CIS at Model and Turnaround DISCOs:

- Accurate customer database and mapping to distribution network
- Replacement of legacy billing system with CIS at selected circle(s)
- Handheld meter reading system
- One-window customer service centers
- Consumer census report of the selected circle(s)

**Results:** This will result in improved operational efficiency, improved revenue flow, reduced receivables, increased accuracy of bills, reduced process cycle time, more efficient customer services and a reduction in customer complaints.

## Sub-Activity 1.2: Effective and Accurate Metering System

**Scope:** The Model DISCO currently has a large number of electro-mechanical meters whose poor performance has contributed to the current revenue losses. These meters are in need of changing; however, wide-scale meter change out has not been pursued due to DISCOs' lack of funds. The installation of new meters and metering systems under this sub-activity will improve the DISCO's ability to accurately bill, manage revenue and address collection issues, improve accounting of energy usage, and lower meter reading costs. Accurate billing has an impact on the consumer's propensity to pay their bill. Often customers will not pay a bill they believe to be inaccurate. If the billing situation is not corrected quickly, many months will go by without the consumer paying often resulting in a huge debt that the customer will eventually default on. Also, DISCOs lack basic consumption information that would allow the DISCO to analyze consumption levels and begin managing the network assets better. Some of the more advanced Automatic Meter Reading (AMR) meters will provide for real time data, thus allowing the DISCO to manage loads factors on transformer, circuits and distribution points.

In this task, PDP will work with the Model DISCO on an effort to achieve installation and commissioning of improved consumer metering, including electronic and Radio Frequency (RF)-enabled meters and AMR/GPRS meters on high-use consumers. For RF-enabled meters, the meters will be read by the meter reader using the RF-enabled Hand Held Units (HHUs), eliminating the human bias. The AMRs automatically transmit the reads to the remote servers. Moreover, to ensure the accuracy and enhance the control over meter reads of electronic meters to be provided by the DISCO, HHUs with picture taking capability will also be implemented at Model DISCO. PDP will work jointly with the DISCO to identify locations where meters will be installed, lead the procurement of electronic meters with HHU capability as well as AMR/GPRS and RF meters, and oversee the DISCO installation of these meters with PDP's monitoring. A consumer metering unit will be accountable for all metering programs under Component 3. This unit will consist of representatives from technical, planning, procurement, metering, and testing operations that will be accountable for implementation of the field metering projects aimed at curtailing commercial losses. Also, a communication and public outreach program will be designed and implemented, to increase consumer buy-in and acceptance of the metering program.

**Schedule:** April 2013 – June 2015

The RFP for Model DISCO will be executed in April – May 2013. Meters installation will begin in October 2013 and will be completed by June 2015.

**Deliverables:** Installation and commissioning of:

- Design documents
- Installation of AMR/GPRS meters
- Installation of RF-enabled meters
- Installation of electronic meters
- Provision of HHUs
- Remote Data Acquisition Center/upgraded control center
- Establishment of a consumer metering unit

- Implementation of communication and public outreach program

**Results:** Improved commercial viability of the Model DISCO by improving the volume and accuracy of energy meter data resulting in improved revenue and reduction in commercial losses.

### Sub-Activity 1.3 – Upgrading Planning & Engineering with Geographic Information System Mapping

**Scope:** This task includes surveying the Model DISCO high tension (HT) network and selected portions of the LT network in targeted divisions and circles at the Model DISCO, resulting in an accurate geo-database supporting load flow analysis, segregating the technical and non-technical losses, and preparing an asset management database.

**Schedule:** April 2013 – June 2015

Under Component 2, P&E Centers were established in all DISCOs. PDP will expand the Model DISCO's P&E activities. In June 2013 a DISCO-wide roadmap will be developed and implementation will begin with Geographic Information System (GIS) data collection support and engineering analysis augmented with resident personnel. With DISCO's engineering planning strengthened, from December 2014 onwards PDP will provide monitoring support to the Model DISCO.

**Deliverables:** This includes the following deliverables:

- Complete GIS survey and geo-database for the selected area
- Network analysis, including load flow analysis for targeted divisions and sub-divisions
- Roadmap for full scale implementation across the Model DISCO
- GIS mapping department created

**Results:** Accurate database of actual physical distribution facilities leading to improved planning capability at the Model DISCO to carry out feeder rehabilitation, feeder reconductoring, feeder bifurcations, and other engineering analysis that results in cost-effective infrastructure investments, reduced technical losses and improved quality of customer service.

### Activity 2: Change Management & Human Resource Development

While equipment supplies to the Model DISCO will result in quick fixes and short term, high impact gains, the sustainability of these actions will require people and processes to be augmented to a level comparable to a well-run utility.

This activity will focus on the following sub-activities:

- **Sub-Activity 2.1:** Organization Restructuring/Process Re-Engineering
- **Sub-Activity 2.2:** HR Development/Training & Capacity Building
- **Sub-Activity 2.3:** Additional Change Management Initiatives

## Sub-Activity 2.1: Organization Restructuring/Process Re-Engineering

**Scope:** DISCOs have yet to develop a progressive corporate culture in which management and staff have well-defined job functions, management is empowered with appropriate authority, and employees accept and understand their responsibilities. DISCOs current organizational structures are not well aligned with current and future business requirements. PDP will work to develop a new organization structure that meets current the business requirements, clarifies reporting relationships, and help corporatize and commercialize the DISCO's operations.

While an organizational assessment and resulting restructuring is necessary, it is not sufficient in and of itself. Other related and supporting actions as well as a number of sub-interventions are needed, including developing and refining job descriptions (JDs) with Key Performance Indicators (KPIs), establishing an effective performance management system, developing and putting in place a well-designed Human Resource Management (HRM) system, and automation of the Human Resource (HR) functions through Human Resource Information System (covered under the ERP activity).

PDP will work with the Board of Directors (BODs) of the Model DISCO to make them champion this intervention through an aggressive engagement plan. BOD members will understand how delivery of the Organization Restructuring/Process Re-Engineering activity is aligned with their own requirements to have an efficient and effective organization. PDP will work alongside BODs to develop long term vision, set goals, plan resources, increase the autonomy of the DISCOs to achieve the strategic objectives of the companies, and design quick impact activities to improve operational performance. PDP will facilitate in developing the short term, medium term and long term strategic objectives and target setting through development of business plans, make the BODs champion and sponsors of all PDPs interventions by conducting periodical meetings on the implementation of business plans including the PDP's program including identifying program support requirements, place technical advisors in each functional area within the DISCOs to support delivery of the project and to enhance the capacity of DISCO management and employ college graduate interns to assist DISCOs management and PDP advisors with program delivery.

**Schedule:** July 2013 – July 2015

An RFP for organizational assessment and restructuring will be issued by April 2013. Vendor selection will be done by May 2013 with a contract finalized and vendor mobilized in August 2013. The project will be complete by July 2015.

**Deliverables:** This includes the following deliverables:

- Improved organizational structure
- Improved business processes
- Enhanced corporate communications (internal and external)
- Performance based evaluation system
- JDs
- Human Resource manual
- Improved accountability systems and social audit mechanism

- Internal communication and public awareness committee
- Market-based compensation system and remuneration packages proposed

**Results:** A better aligned organizational structure supporting business needs and operations.

### Sub-Activity 2.2 – HR Development/Training & Capacity Building

**Scope:** DISCOs in Pakistan have not given much importance nor contributed the required resources for the development of their human capital in terms of training and capacity building. This has ultimately resulted in low productivity, increased accidents, and poor customer services.

PDP will revitalize the training infrastructure including required training equipment, well-trained instructional staff and skills-oriented training design. PDP will also provide the institutional model for technical and behavioral skills among DISCOs’ employees, which leads to increased productivity and motivation which, in turn, contributes to increased quality and overall organizational productivity.

In addition, through the use of shadow managers<sup>4</sup>, PDP will provide top leadership consulting, coaching and development addressing the unique needs of top management.

**Schedule:** April 2013 – July 2015

The training infrastructure upgrade will be completed by September 2013. Training workshops/seminars will be conducted throughout the life of the project.

**Deliverables:** This will include the following deliverables:

- The HR Development/Training & Capacity Building initiatives with a strong change management component
- Facilitation and development of Board of Directors
- Management development programs for senior and mid-level management
- Functional areas training program
- Lineman training program including provision of IT equipment and linemen tools & equipment and upgrading of the regional training center (RTC)
- Curriculum plans and training
- Train the Trainers programs
- RTC principals trained
- Specifications on tools and equipment.

**Results:** Better trained and focused workforce to meet the requirements of a modern electric utility.

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<sup>4</sup> Shadow managers will work side by side with the existing functional managers heading different functions like finance, IT, engineering etc. The objective is to fill-in the gap in the existing skill sets that the DISCOs lack at the Senior Staff level, so as to facilitate the joint implementation of PDP work. For PESCO, the BOD and the Senior Management has endorsed the deployment of shadow managers, who have already been mobilized to PESCO to work with PESCO.

### Sub Activity 2.3: Additional Change Management Initiatives

**Scope:** DISCOs currently lack the capacity and drive to implement any new initiatives or changes programs supporting overall performance improvement.

The Project Management Unit (PMU) will be established at the Model DISCO headquarters for overall coordination, monitoring and implementation of the PDP's projects. This unit will also be empowered to coordinate change management initiatives related to human resources (HR), training and capacity building, finance, P&E, operations and maintenance, commercial management, and communications and outreach. All training and development activities will be centralized.

**Schedule:** April 2013 – July 2015

The change management initiatives will be carried on throughout the life of the project.

**Deliverables:** This activity includes the following deliverables:

- Upgrading the role and capacity of the Information Technology department of the DISCO to ensure successful undertaking, adoption, and sustainability of the automation plans. Under the Organizational Restructuring (sub-activity 2.1 mentioned above), the IT department will be restructured so as to support implementation of back-office automation systems such as CIS, ERP, modified SCADA and AMRs at the Model DISCO. PDP's IT shadow manager will continually upgrade the IT capacity and knowledge of the staff throughout the life of the project.
- All proposed applications (CIS, Billing System, ERP–Finance, HR, Inventory, Procurement, AMR, modified SCADA, corporate intranets, and business intelligence systems) will be launched under one umbrella for strong integration and to maximize benefits and support for the corporate analytical and decision-making processes
- Stakeholder engagement plan
- Communication strategy
- Champions of change identified within the organization

**Results:** This approach will bring economies of scale; standardization of policies, procedures, and resources; business case-driven investments and cost savings in term of capital and operational expenditures.

### Activity 3: Introducing Modified SCADA to Improve Power Flow Monitoring

**Scope:** At present, DISCOs do not have capabilities to monitor and control flow of power within the network, resulting in limited ability to manage and control the electrical distribution system. Current practices include using manual readings and control, creating an inefficient system operation with little feedback as to if proper actions are being taken. There is no real-time data available and no automatic control to enable timely control responses to upset conditions. These functions are provided in modern utilities by SCADA systems.

As a first step to improved power flow monitoring, PDP is delivering the Load Data Improvement (LDI) project covered under Task 6, which will provide accurate data on the system operation, but does not include

any provision for automatic responses to be taken to open, close or regulate system components. As of March 2013, more than 1,600 AMRs under the LDI project have been installed across DISCOs.

In this task PDP will work with the Model DISCO to install and commission a modified SCADA allowing for effective data and control of the DISCO substations. The LDI project will be extended in the Model DISCO by including AMRs on common delivery points, and also extending the capability to control the open/close functionality of some of the 11 Kilo Volt (kV) feeders.

**Schedule:** April 2013 – May 2015

An Expression of Interest (EOI) for vendors for modified SCADA was issued in October 2012 and evaluated. In April 2013, the draft RFP for modified SCADA will be prepared and, after selection of Model DISCO anticipated in April 2013, PDP will finalize the RFP scope and issue to qualified vendors. By September 2013 a SCADA vendor will be selected and equipment will be installed by June 2014. Modified SCADA will be fully operational in January 2015 with technical advisory services continuing until May 2015.

**Deliverables:** This activity includes the following deliverables:

- Installation and commissioning of remote as well as local monitoring and control capability in the grid stations of the Model DISCO
- AMRs with contacts on all incoming and outgoing feeders, at common delivery points and interfaces with other DISCOs

**Results:** Better load management, thereby diverting 3% of consumption from residential consumers to higher paying industrial consumers. Potential for improvement in annual revenues is up to \$1.5 million and \$3 million (depending on DISCO chosen for Model DISCO). Additional benefits from add-on applications leading to improved distribution network, effective energy accounting, improved power factor, and other benefits.

#### **Activity 4: Improving Operations & Maintenance Processes and Procedures**

This activity has the following four sub-activities mentioned below with targeted improvement of 1% in the annual revenues of the chosen DISCO, already covered under Activity 1 of Task 1.a.

- **Sub-Activity 4.1:** O&M Infrastructure
- **Sub-Activity 4.2:** Work Planning
- **Sub-Activity 4.3:** Data Gathering

##### **Sub-Activity 4.1 – O&M Infrastructure**

**Scope:** This will include investments in low-cost vehicles to increase line staff mobility; procurement of lineman tools and line hardware such as connectors, compression tools, improvements in the sub-division storage areas; and design efforts to standardize meter installations.

**Schedule:** April 2013 – May 2015

**Deliverables:** Training and capacity building of the line staff to use the new tools coupled with field supervision to install the new line hardware and follow the new designs for meter installations, connectors, and compression joints. The following are the deliverables for this intervention.

- Procurement of low-cost line vehicles for maintenance procedures and line operations
- Procurement of lineman tools and protective equipment
- Procurement/provision of improved maintenance materials such as connectors, compression tools, splices and others
- Improvements in sub-division offices and storage areas
- Replacement of bare neutral conductors with insulated conductors (90% of transformer damage is due to phase/neutral contacts)
- Provide proper sectionalization equipment/solutions for providing switching options on high tension (HT) and low tension (LT) lines
- Standardization of designs for installation of meters so that they can be easily read and are mechanically well supported

**Results:** Increased revenues due to improved service quality, reduction in outages, improved productivity of work force. Please refer Annex 4 for details.

#### Sub Activity 4.2: Work Planning

**Scope:** This activity will include procurement and implementation of work scheduling software, and implementation of material and tool management processes to streamline the material movement process and allow for smooth work in the field.

**Schedule:** April 2013 – May 2015

**Deliverables:** This activity includes the following deliverables:

- Procurement and implementation of work scheduling software at subdivision offices in targeted divisions
- Development and implementation of a material and tool management process
- Development and implementation of a lockout-tagout process

**Results:** Improved work planning and higher productivity of the line staff.

#### Sub Activity 4.3: Data Gathering

**Scope:** This activity will include a data gathering and analysis of the data which will include interruptions, deployment of an Outage Management System (OMS), building a database of transformer load and circuit voltages, and presenting data in a consolidated manner to the planning department.

**Schedule:** May 2013 – May 2015

**Deliverables:** This activity includes the following deliverables:

- Logging interruptions in a specially designed database
- Procurement and deployment of an OMS, which will log interruption events including cause, duration, and location, and will be coordinated with GIS and SCADA development
- Database of transformer load and circuit voltage
- Development of an operations management information system reporting strategy to present data in a consolidated manner that allows for decision-making on improvements
- Moving substation log sheet data collection from manual data sheets to tablet computers

**Results:** Reduction in unplanned outages, improved outage management, improved service quality with shorter and less frequent outages, improvement in power factor and reduction in transformer failures and other improvements.

**Final Note:** For Task 1.a, PDP will establish PMU at the Model DISCO headquarters. The PMU will be staffed with a Task Team Lead for Model DISCO and the Shadow Managers for most of the functional areas. The activities of the interns to be selected will also be coordinated through this PMU for enabling smooth delivery of PDP's projects. Apart from day to day coordination between different projects at Model DISCO, PMU will be the principal responsible entity to monitor and manage projects implementation. This centralized coordination arrangement will ensure optimal resource sharing for meeting the project objectives.

## Task 1.b: Turnaround DISCO

The Peshawar Electric Supply Company (PESCO) has been selected as the Turnaround DISCO. Starting in August 2012, PDP has enhanced its focus on PESCO and initiated planning and design of the activities for PESCO. Moving forward, PDP will modernize policies, processes, and procedures and provide modern infrastructure that will allow PESCO to improve commercial, technical, and financial performance.

This sub-task covers the following activities:

- **Activity 1:** Wide-Scale Electronic Metering & Reconductoring Program
- **Activity 2:** AMRs on High-End Bulk, Industrial & Commercial Consumers
- **Activity 3:** Public Awareness – Energy Theft
- **Activity 4:** Implement Enterprise Resource Planning
- **Activity 5:** Organizational Assessment & Restructuring, Training & Capacity Building

Task 1.b will focus on two categories of activities for the Turnaround DISCO. First are those that focus on PESCO-wide interventions such as deployment of AMRs on high-end industrial, bulk, and commercial consumers (Activity 2). ERP implementation for finance and inventory (Activity 3); public awareness against theft (Activity 4) and the Organizational Assessment and Restructuring, Training Component (Activity 5). Second are activities that focus on specific circles characterized by high losses and where the security situation is more conducive to allowing PDP staff to work effectively in the field. These include the Wide-Scale Electronic Metering and Reconductoring Program (Activity 1); and implementation of the billing and collection component of the ERP implementation (Activity 3).

## Activity 1: Wide-Scale Electronic Metering & Reconductoring Program

**Scope:** PESCO has an outdated metering system based on electro-mechanical metering, which is subject to inaccurate manual readings, theft and field tampering. PESCO lacks funding to upgrade these meters and service wiring to improve these systems.

PDP will assist PESCO to carry out a large-scale meter replacement program which will include electronic meters in rural areas, RF-enabled meters in urban areas, AMRs (GSM/GPRS) for high-end commercial and industrial customers, and replacement of bare secondary conductor with insulated Aerial Bundled Conductor (ABC) in target circles. It is currently foreseen that this activity will be focused on Peshawar Circle, targeting high loss sub-divisions where the security situation is comparatively stable, thereby allowing PDP and its teams to work without issue.

Installation works will be done utilizing DISCOs crews with supervision and monitoring support from PDP. This will also include enumerating all of the consumers of the targeted circle, classifying them in correct tariff codes and updating the customer information so that the accurate information can be fed into the CIS. This information is necessary for effective management of the meters installation program.

**Schedule:** September 2012 – July 2015

PDP has been closely working with PESCO since September 2012 to identify the project locations, analyze the data, and design the metering and reconductoring program. As such, Request for Quotations (RFQs) for Turnaround DISCO meters will be issued in February 2013. Orders will be placed by April 2013 and meters installation will begin in July-August. This intervention will be completed by June 2014. Prior to delivery of USAID-funded meters, PDP will mobilize DISCO linemen to install static meters procured by the DISCO and currently in stock.

**Deliverables:** The deliverables of this activity are:

- Installation AMR/GPRS enabled meters (covered under activity 2 below)
- Installation of RF-enabled meters
- Installation of Electronic meters
- Securing of Service Drops
- ABC installation on the secondary network
- A monitoring program and consumer census (for selected circle)

**Results:** Metering interventions targeted at high loss divisions will result in a reduction in non-technical losses by up to 25 million KWh and will lead to improvement in revenues of up to \$2.75 million annually. In addition, a targeted reduction of 5% in losses will be achieved in the feeders/sub-divisions where Task 5 Feeder Optimization will be carried out.

## Activity 2: AMR on High-End Bulk, Industrial and Commercial Consumers

**Scope:** PESCO has 270,000 commercial customers and 28,000 high-use consumers which are currently manually read. There is significant loss of revenue from these customers which can be reduced by application of AMR to improve accuracy and reduce opportunities for theft. PDP will assist PESCO to improve their revenue in this area by focusing on installing AMR/RF-enabled meters on B1, B2, B3, B4 and high-use commercial consumers across PESCO.

A second application of the AMR system will be to pilot a prepayment meter activity. Under this scheme, AMR meters equipped with disconnect switches will be installed on the high-end residences and/or commercial establishments of participating consumers in an urban feeder. High end consumers, whether residential or commercial, will be chosen for this pilot as they generate the most revenue in their class, and any improvement in their revenue will generate the highest returns on the investment. PDP will use the existing payments systems that are available in the market and will curtail electricity through remote disconnect of the electricity meter once the prepayment amount of the customers has been exhausted. AMR meters are read at least daily. When the credit balance reaches zero, the AMR system would command the meter to disconnect service until additional credit is deposited. AMR-based prepayment metering is not an experimental technology and is well proven in the US and Europe. The use of the AMR system in this way obviates the need for installing traditional prepayment meters with customer keypads or other payment token processing systems, avoids the need to implement a vending system with multiple retail outlets, and in general avoids introduction of another new technology.

**Schedule:** September 2012 – July 2015

While PDP is closely working with PESCO since September 2012 to identify the project locations, analyze the data and design AMR on high-end customers, RFQs for Turnaround DISCO meters will be issued in February 2013. The orders will be placed by April 2013 and meters installation will begin in September-October 2013. This intervention will be completed by June 2014.

**Deliverables:** The deliverables of this activity are:

- Installation of AMRs high-end consumers in PESCO
- Commissioned Remote Data Acquisition Center
- Implementation of GSM/GPRS network
- Installation of head-end system
- Pilot a prepayment meter system
- Staff trained

**Results:** Securing PESCO's revenue from Industrial Consumers. Total revenue increase targeted up to \$5 million annually.

### Activity 3: Public Awareness - Energy Theft

**Scope:** DISCOs have been facing challenges in overcoming technical losses due to non-availability of resources; however, attention towards reduction in non-technical losses can also result in reduction in overall losses and increase in DISCO revenues. PESCO is among the DISCOs with highest non-technical losses due to a large amount of theft largely due to security issues, negative image of PESCO due to overbilling and lack of aggressive outreach campaigns to address customer grievances.

At present, most if not all DISCO senior management and staff are invested in some way in the *status quo*. For real change to take place, staff at every level must be aware of, understand and support change efforts if the program is to be a success. PDP-supported public awareness campaign for PESCO will focus on major stakeholders including employees, DISCOs consumers, and the general public. Specific campaigns will be designed with tailored messages developed for each stakeholder group, with the aim to bring awareness of the issue of energy theft to the public. Included in the campaigns will be public service announcements, information brochures, bill board ads, and information posters at each of the DISCOs complaint offices. Communication Strategy for Component 3 is covered under Section 3.3 of this document. The public awareness on energy theft is part of overall communication strategy for stakeholders under Component 3 for Turnaround DISCO that also includes initiatives like establishing a corruption reporting hotline possibly through a Call Centre and regular communication channel with the targeted customers facilitating smooth delivery of the projects.

**Schedule:** November 2012 to March 2015

PDP initiated the discussions with PESCO on this activity in November 2012. Through its communications office established at PESCO, PDP has finalized the campaign concept. PDP will hire a media agency to design a campaign by ensuring close involvement of PESCO senior management by May 2013. Campaigns will be designed by August 2013 and will be executed after the summer peak load shedding season ends i.e. October – November 2013.

**Deliverables:** The following are the deliverables of this intervention:

- Public awareness campaign for PESCO
- Pre attitude survey to establish baseline & Post campaign survey to measure the impacts
- Campaign products (videos, print messages and documentaries)

**Results:** PESCO's image promotion as a dynamic and customer friendly DISCO by encouraging energy conservation and discouraging theft among their consumers and Increase in public awareness on electricity theft issues will help PESCO in reduction in losses and improvements in revenues.

### Activity 4: Implement Enterprise Resource Planning

Covered in Task 1a, Activity 1.

## Activity 5: Organizational Assessment & Restructuring, Training & Capacity Building

**Scope:** DISCOs have yet to develop a strong and progressive corporate culture, in which management and staff has well-defined job functions, where management is empowered with appropriate authority and employees accept and understand their responsibilities. The PDP team observed that functions that require particular skill sets are, in many cases, headed by staff without the relevant background or experience. As an example, at the division and sub-division levels, training and capacity building as well as HR, commercial and customer-based functions are performed by Executive Engineers or Sub-Divisional Officers who may not be qualified for these functions.

An organizational assessment and restructuring effort will be combined with a number of sub-interventions, including developing and refining JDs with relevant KPIs, establishing an effective performance management system, developing and putting in place a well-designed HRM system, and automation of the HR functions.

**Schedule:** September 2012 – July 2015

From September 2012 to the present, PDP has worked with the PESCO BOD to obtain necessary support and buy-in for this activity. Based on the discussion with PESCO, the RFP entailing detailed Terms of Reference has been prepared. An RFP will be issued by March 2013. Vendor selection will be done by April 2013, and a contract will be finalized and vendor will be mobilized by July 2013. Project is complete by July 2015.

**Deliverables:** The following are the deliverables of this intervention:

- Revised improved organizational structure
- Improved business processes, supported by automation and enhanced corporate communications (internal and external)
- JDs
- Performance Management System (PMS)
- Human Resource manual
- Implementation of Human Resources Management System
- Pay scale plan in comparison to market-based compensation packages
- External Change agents deputed
- Long term plan to turn-around PESCO

**Results:** A better aligned organizational structure focusing on business needs.

This activity also entails preparation of a five-year Turnaround Plan for PESCO and a Reform Plan for the Model DISCO. The plans will provide a roadmap including a series of transformation projects that, when implemented, will result in specific and measurable improvements. The plans will align the DISCOs' own planned initiatives with PDP-supported activities so as to achieve the greatest impact in the shortest period of time. Establishing a Strategic Business Unit structure in the two DISCOs (one of the outcomes of the organizational restructuring initiative) will help ensure sustainability of the business planning function.

**For Task 1.b**, PDP has already established a PMU at PESCO headquarters. The PMU is staffed with a Task Team Lead for PESCO and the Shadow Managers for most of the functional areas. The activities of the interns being selected will also be coordinated by the PMU for enabling smooth delivery of PDP's projects. Apart from day to day coordination between different projects at PESCO, PMU will be the principal responsible entity to monitor and manage projects implementation. This unit will also be empowered to coordinate change management initiatives related to HR, training and capacity building, finance, P&E, operations and maintenance, commercial management, and communications and outreach. This centralized coordination arrangement will ensure optimal resource sharing for meeting the project objectives.

## Task 2: Energy Conservation and Demand Side Management<sup>5</sup>

This task comprises of the following two activities:

- **Activity 1:** Development of Capacity of Utility Energy Audits
- **Activity 2:** Design and Execution of Demand Side Management (DSM) Programs

### Activity 1: Development of Capacity of Utility Energy Audits<sup>6</sup>

The PDP team will develop a DSM training program with emphasis on training participants to conduct industrial and residential energy audits in both the Model and Turnaround DISCOs. PDP trainers will conduct training and capacity building programs for DSM program managers and field engineers who will be responsible for oversight and execution of the energy audits and subsequent implementation programs. PDP will aim to set up an Energy Auditing Cell at both the Model and Turnaround DISCOs, and will engage with the DISCOs to mentor energy auditors in carrying out energy efficiency (EE) assessments, preparing reports and selling DSM opportunities to DISCO consumers.

### Activity 2: Design and Execution of DSM Programs

Pakistan is currently facing its worst power crisis in its history. Power generation of 11,000 megawatt (MW) falls significantly short of the estimated demand of 19,000 MW. The capacity shortfall has resulted in 12 hours per day of summertime load shedding in metropolitan cities and as much as 20 hours in rural areas.

Financing the expansion of power supply beyond the available 11,000 MW capacity is a significant burden on the economy, and it has proven difficult for the government to entice foreign investment. Moreover, the subsidies on electricity tariffs have caused a mounting circular debt crisis.

In the face of such challenges, EE and DSM can contribute significantly and, in many cases, in the shortest possible timeframe. 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.

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<sup>5</sup> In FY 2013 activities will largely be funded using the Khushali Bank's funds. Supplemental work will be carried forward in FY 2014, assuming funding needs are met.

<sup>6</sup> Per USAID instruction, this activity is not being pursued at this time. It will be reevaluated in FY 2014.

The PDP team will implement the following DSM sub-activities under this activity:

- **Sub-Activity 2.1:** Urban DSM Program
- **Sub-Activity 2.2:** Industrial DSM Program
- **Sub-Activity 2.3:** Municipal DSM Program
- **Sub-Activity 2.4:** Load Management

For the first three DSM initiative stated under Activity 2, PDP will select feeders (in coordination with DISCOs) that show significant industrial, municipal, and urban load by customers. PDP technical staff will work with DISCOs to collect the available history of interval-load data on all customers and customers' monthly bills, and produce the consumer and feeder load profiles; these will be analyzed to select target feeders. Preference shall be given to feeders that have predominately high consumption.

PDP engineers will be involved in the correct sizing of the replacement motors and pump-sets. In some cases of industrial motors replacement, where load is variable through the day or the year, PDP will undertake installation of both EE motors and variable speed drives (VSDs) to optimize the motor load and energy consumption.

### Sub-Activity 2.1: Urban DSM Program<sup>7</sup>

**Scope:** The Urban DSM Program will install evaporative cooling units, as a proof of concept on selected feeders with high urban load and with a history of high seasonal load variation. The project will demonstrate the impact of reducing air conditioning load on specific feeders, highlighting the impact of the MW load reduction on these feeders, and the hours of resultant load shedding decrease. For selected urban feeders, PDP will undertake the installation of evaporative cooling units at high-profile and well-visited locations, with USAID providing a 50% cost share.

#### Schedule:

DISCOs:            **Start Date:** TBD            **End Date:** TBD

**Deliverables:** Monthly reports showing installation status of industrial motors/municipal and sewerage pump-sets along with average energy savings (in MW).

**Results:** Total peak demand savings due to the replacement is forecasted to be approximately up to 9.5 MW, if this activity is implemented.

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<sup>7</sup> This activity is currently under review and will be reevaluated in FY 2014. Evaporation units require considerable ducting throughout the building premises. This is best installed during new builds, or total renovations, and is best suited to industrial / factory type buildings. In FY 2013 activities will be funded largely using the Khushali Bank's funds.

## Sub-Activity 2.2: Industrial DSM Program

The Industrial DSM Program focuses on replacement of inefficient motors and VSDs. Industrial motors are estimated to contribute between 60%-80% of industrial electricity consumption in most Pakistani industrial sectors.

Under Component 3, PDP will **replace motors and VSDs**, initially focusing on the Turnaround DISCO and then onwards in the Model DISCO, followed by the other DISCOs. PDP will undertake the replacement of inefficient motors based on orders generated by the private motor suppliers with a 30% USAID cost share.

### Schedule: <sup>8</sup>

<b>For Turnaround DISCO (PESCO):</b>	<b>Start Date:</b> October 2013	<b>End Date:</b> July 2015
<b>For Model DISCO:</b>	<b>Start Date:</b> October 2013	<b>End Date:</b> July 2015
<b>For all other DISCOs:</b>	<b>Start Date:</b> October 2013	<b>End Date:</b> July 2015

**Deliverables:** Monthly reports showing installation status of industrial motors/municipal and sewerage pump-sets along with average (MW) energy savings. Project closeout report will be prepared at the end of this activity for USAID.

**Results:** Total peak demand savings due to the replacement is forecasted to be up to of 16 MW.<sup>9</sup>

## Sub-Activity 2.3: Municipal DSM Program

**Scope:** The Municipal DSM Program aims to replace inefficient pump-sets in the publicly-owned water and sewerage utilities. These municipal water and sewerage pump-sets are a large load on each Pakistani DISCO from a MW standpoint as well as a financial revenue recovery standpoint. Under Component 3, PDP will replace **inefficient municipal and sewerage pump-sets**, initially focusing on the Turnaround DISCO (PESCO) and then onwards in the Model DISCO, followed by the other DISCOs. This will include replacement of inefficient municipal and sewerage pump-sets from the targeted municipalities with a 100% USAID cost share - with EE motors and municipal /sewerage pump-sets.

### Schedule:

<b>For Turnaround DISCO:</b>	<b>Start Date:</b> October 2013	<b>End Date:</b> July 2015
<b>For Model DISCO:</b>	<b>Start Date:</b> October 2013	<b>End Date:</b> July 2015
<b>For all other DISCOs:</b>	<b>Start Date:</b> October 2013	<b>End Date:</b> July 2015

<sup>8</sup> These dates reflect the work to be carried out by USAID's funding that is expected to commence starting next fiscal year i.e. October 2013.

<sup>9</sup> Up to 16MWs are expected to be saved from the USAID-funded Industrial DSM program under Component 3, which might can change based on USAID approval to implement this activity.

**Deliverables:** Monthly reports showing installation status of industrial motors/municipal and sewerage pump-sets along with average (MW) energy savings. Project closeout report will be prepared at the end of this activity for USAID.

**Results:** Total peak demand savings due to the replacement is forecasted to be up to 8 MW.

### Sub-Activity 2.4: Load Management<sup>10</sup>

Time of Use (TOU) metering has been introduced and implemented in most of the Punjab DISCOs for domestic and commercial customers with loads of 5kW and greater, and on all industrial loads. There is opportunity for greater penetration of TOU metering. DISCO consumers go to great lengths to ensure that they are not classified with loads exceeding 5kW, indicating that a different measure should be employed to classify DISCO consumers into the TOU category. PDP will evaluate the feasibility of extending TOU billing to the smaller, under 5kW sanctioned load consumers, as a means of improving revenue collection from users of air conditioners and other high consuming loads. If determined to be feasible for either the Model DISCO or PESCO, PDP will work with the DISCO to obtain National Electric Power Regulatory Authority (NEPRA) approval for the required tariff modifications.

#### Interruptible Load Management:

PDP will undertake a detailed study of the options available for selective load interruption, and provide a recommendation for one or more pilot projects in the Model and Turnaround DISCOs to develop real options and recommendations for their implementations.

### Task 3: Cost Reflective Tariff and NEPRA Reform

This task has the following two activities:

- **Activity 1:** Cost of Service Study & Tariff Design for all DISCOs
- **Activity 2:** Assistance to NEPRA

#### Activity 1: Cost of Service Study & Tariff Design for all DISCOs

**Scope:** A crucial factor in any DISCO's sustained profitability is the tariff or the rate that it can charge its consumers. However, currently in DISCOs the consumer end tariff for several categories is either being subsidized by the government or cross-subsidized by other consumer categories. Furthermore, DISCOs file tariff petitions with the regulator without any Cost of Service (COS) analysis to back up the requested rates. As a result, the regulator disallows several portions of the requested cost causing significant loss of revenue for DISCO.

A COS study will be performed by the PDP in eight (8) DISCOs (LESCO, FESCO, GEPCO, MEPCO, HESCO, PESCO, SEPCO and QESCO). A methodology developed under Component 2 will be applied and

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<sup>10</sup> This activity is currently under review and will be reevaluated in FY 2014.

amended to meet the needs of each DISCO. Financial, commercial and load data will be used to populate the model. AMR meters will be procured and installed at all transformers of selected feeders in each DISCO for establishing demand coincidence and contribution to the DISCO's demand. An appropriate methodology for calculation of weighted average cost of capital will be used to determine market based rate of return.

Revenue requirement will be estimated based on the analysis of financial statements, budgets, capital expansion plans, sales, and demand and load data projections. The total COS provision will be functionally unbundled and then fixed and variable costs required to serve each customer category will be determined. Based on these, demand, energy and customer related costs will be estimated. The Central Power Purchasing Agency (CPPA) allocation of power purchase cost among various DISCOs will be reviewed and improvements will be suggested to align the process with COS principles. Costs allocated to each customer category as a result of cost of service study will be compared with NEPRA determined tariffs to determine the adequacy of current tariffs and degree of cross-subsidization within customer classes and across DISCOs.

PDP will assist each DISCO in preparation of its tariff petition based on the results of COS study. The task will be completed in two groups considering similarity of DISCO profiles, the logistics convenience and the level of effort to complete the requisite task as follows:

**Group 1:** LESCO, FESCO, GEPCO and MEPCO

**Group 2:**<sup>11</sup> PESCO, HESCO, SEPCO and QESCO

**Schedule:** February 2013 – July 2015

**For Group 1 DISCOs:**                      **Start Date:** February 2013                      **End Date:** July 2015

**For Group 2 DISCOs:**                      **Start Date:** February 2014                      **End Date:** June 2015

Data collection and analysis will start in the middle of February 2013 and conclude by the end of December 2014 for Group 1 DISCOs. In parallel, COS Model used for IESCO will be customized for each DISCO by the end of December 2013 as well as AMR meters will be installed at transformer level on a selected number of 2-3 feeders in each DISCO by the end of March 2014.

The cost allocation and tariff design will be completed for LESCO, FESCO, GEPCO and MEPCO by March 2014. Technical assistance will be provided to these DISCOs in preparation of their tariff petitions based on the results of the cost of service studies to be filed with NEPRA by the end of June 2014.

The cost allocation and tariff design will be completed for HESCO, PESCO, SEPCO and QESCO by March 2015. Technical assistance will be provided to these DISCOs in preparation of their tariff petitions based on the results of the cost of service studies to be filed with NEPRA by the end of June 2015.

Capacity building and updating the COS study results will continue throughout the duration of this task and will conclude by the end of July 2015 for all DISCOs.

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<sup>11</sup> PESCO and other Group 2 DISCOs have poorer data available upon which the COS heavily depends. FY 2013 will be needed to collect and clean data needed for an accurate and dependable COS study.

**Deliverables:** Successful completion of this task will offer following deliverables:

- Customized COS Model for each DISCO
- DISCO Specific COS Model User Manual
- Capacity building of DISCOs in preparation and filing of tariff petitions based on COS
- New tariff design proposals
- AMR meters installed at all feeders across one Model DISCO

**Results:** Total cost recovery gap for FY 2010-11 was \$609 million. International studies have shown that COS leads to approximately 7-12% improvement in revenue shortfall. PDP is targeting an improvement of 10% which leads to reduction in cost recovery gap of about \$61 million annually.

## Activity 2 – Assistance to NEPRA

NEPRA is mandated to regulate the electric power market of the country, with an eventual goal to deregulate the market so that it itself regulates the business with the regulator ensuring that the market is operating as per the parameters set through the NEPRA Act, its rules, regulations and procedures. However, in the last fifteen years of its inception, NEPRA has not been able to deliver the mandate under which it was created. There is a significant capacity, exposure, training, resource, technology deficit within the organization and this has resulted in significantly affecting the performance of the power market itself.

Through interventions as detailed below, the capacity of NEPRA will be improved to the level that it starts delivering and playing its role as an effective regulator.

### Sub Activity 2.1: Organizational Restructuring of NEPRA

**Scope:** NEPRA lacks an organizational structure that encourages induction of professionals. There is a significant gap between the compensation and benefits of NEPRA as compared to organizations of similar type. Changes in the organizational structure of NEPRA are required to improve its capacity to deliver. This will involve carrying out an organizational and functional analysis of NEPRA, and performing resource planning and staffing analysis to make sure NEPRA can play the role of effective regulator of the power sector in Pakistan.

**Schedule:** June 2013 – June 2014

This will involve carrying out an organizational and functional analysis of NEPRA by September 2013, performing resource planning and staffing analysis by March 2014, and recommending an organizational structure by June 2014.

**Deliverables:** This activity includes the following deliverables:

- NEPRA in a much better position to meet the requirements as mandated under the Act. Staff strength rationalized as per requirement
- Organization motivated and strengthened to actually regulate the power market for all of its tiers

**Result:** NEPRA organization strengthened and performing its role in effectively regulating the entire Pakistan power sector.

### Sub Activity 2.2: Review of Electricity Sector Market Framework

**Scope:** There has been a lack of progress in moving the power sector towards de-regulation and competition, partly because of massive power shortages in the country and non-implementation of market framework. PDP will review electricity market frameworks in other countries and develop a vision of the competitive market structure that may ultimately be established. A course of action for eventual transition to deregulated and competitive environment will be devised. Consultant will be engaged for the purpose.

**Schedule:** March 2013 – June 2015

**Deliverables:** This activity includes the following deliverables:

- A Road Map Document with recommended way forward for the power market transition from a protected monopoly to an open competitive environment

**Result:** A road map with recommended way forward provided for establishing a competitive power market.

### Sub Activity 2.3: Modification in Tariff Rules and Regulations

**Scope:** Current rules, regulations and methodology for tariff determination need improvement. PDP will thoroughly review how the rate cases are being conducted and recommend more efficient approaches.

**Schedule:** January 2014 – December 2014

**Deliverable:** This activity includes the following deliverables:

- A report will be prepared based on the review of current rate case processing and tariff determination methodology. It will identify strengths and weaknesses of the current system and suggest improvements

**Result:** Improved and more transparent tariff process.

### Sub Activity 2.4: Equipment and Software Upgrade

**Scope:** The existing IT infrastructure at NEPRA is outdated and cannot meet the requirements of a modern robust and dynamic system. There is a strong desire at NEPRA to have a real-time communication links established between NEPRA and the DISCOs. This will include assessment of existing Information Technology infrastructure (hardware/software) in use at NEPRA as well as a staff competency assessment related IT use. Based on the assessment, required IT hardware and software at NEPRA will be upgraded.

**Schedule:** March 2013 – June 2015

This will involve assessment and review of NEPRA's existing IT equipment by March 2013, and issuing the RFP for supplemental equipment and software by June 2013. The project is expected to be completed by June 2015.

**Deliverables:** This activity includes the following deliverable:

- NEPRA will be strengthened in its IT infrastructure (hardware and software)

**Result:** Customized consumer complaint handling system. Interlink with DISCOs operational data. Improved communication will facilitate improved decision making and operations of NEPRA.

### Sub Activity 2.5: Regulatory Partnerships

**Scope:** NEPRA has largely isolated itself from other stakeholders in the energy sector, with limited awareness of what is happening in the world outside. Many regulators in the region and around the world have contributed significantly in turning around loss-making entities. Such experiences will be significant for NEPRA in dealing with the crisis at hand.

PDP will work to establish relationships between NEPRA and international regulatory bodies (preferably countries in the region or with similar environments) and facilitate trainings, workshops and information exchange through fielding international experts in Pakistan. PDP will identify separate regulatory training programs for commissioners/members and for professional staff and facilitate such trainings/workshops. PDOP plans to send NEPRA experts to other regulators via exchange programs so that the experts can have hands-on experience of working with other regulators, and gather experience on how regulators function in open electricity markets.

**Schedule:** November 2012 – June 2015

The Training Needs Assessment will be completed by April 2013. The process will be initiated and the first set of candidates will be sent for training by June 2013. There onwards it will be a continuous process of training and workshops until June 2015.

**Deliverables:** This activity includes the following deliverables:

- Improved capacity of the regulator to understand and introduce international best practices
- Increased awareness of addressing issues related to the power market
- Improved access and alignment of regulatory professionals within NEPRA

**Result:** Sustainable regulatory partnership(s) programs for long term information exchange, training, and continued development of activities.

## Sub Activity 2.6: Regulatory Changes

**Scope:** The market practices have changed significantly locally, regionally and internationally, which need to be understood and adopted by the regulator as being prudent and beneficial for the competition process itself. Propose changes in regulatory laws or find solutions through which international best practices can be introduced. This will involve assessment and review of existing market practices that have been adopted by various regulatory authorities and have proved beneficial for the overall environment. The concept will be to find solutions that will move the market to the next stage without bringing any significant change to the regulatory laws. Consultant will be engaged for the purpose.

**Schedule:** March 2013 – June 2015

**Result:** A recommended strategy developed for the market which will have international best practices included and with improved dynamics.

**Deliverable:** This activity includes the following deliverables:

- Modern concepts like Service Providers, resale business and franchisee will be discussed and presented to NEPRA with recommendations for adoption

## Task 4: Capacitors at Tubewells for Power Factor Improvement and Loss Reduction

### Capacitor Installation Program on Tubewells

**Scope:** One of the largest consumers of power in the system is that of tubewell pump-sets. Nationwide, electric consumption by tubewell pump-sets accounts for 15% of the total annual energy consumption, with significant variation from one DISCO to another. Tubewell pumps used in Pakistan have relatively low-rated power factors<sup>12</sup>. 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, resulting in higher technical losses. The high number of inefficient tubewell pumps with low power factors has a significant effect on the system's technical loss, and creates unnecessary demand on the system.

PDP will reduce the peak MW demand through installation of capacitors for the purpose of power factor correction. The losses in the line feeding a pump with a lower power factor (around 80%) are substantially higher compared to a pump with a power factor of 95%. The PDP team will achieve this reduction in power demand through installation of capacitors on tubewell pump-sets.

Under Component 3 in this Fiscal Year<sup>13</sup> the strategy is to allocate 11,500 capacitors to Turnaround DISCO (which covers 100% of its requirement). Because there are two potential Model DISCOs, with LESCO seemingly in the lead, LESCO is allocated 33,000(100%) and FESCO 14,300 (50%). The smallest DISCO in

<sup>12</sup> On the order of 80-85% even when new

<sup>13</sup> This activity will be reevaluated in FY 2014 based on the availability of further funding and the proven ability of DISCOs to use their own manpower to assist with capacitors installations.

terms of LT capacitors total requirement (IESCO) is allocated 3,000 (100%). Some other DISCOs will also be covered to some extent in this Fiscal Year. Subsequent installations in FY 2014 will be focused on the remaining DISCOs.

### Capacitor Installation Program for Industrial Motors

**Scope:** The industrial sector consumes 27% of Pakistan’s total electricity. Eighty percent of industrial electricity consumption is from electric motors, which are in most cases highly inefficient. Similar to the potential for energy savings from capacitor installation at tubewell motor locations, there is significant peak demand saving potential from capacitor installation on industrial motors.

PDP will offer industrial and commercial entities to participate in a ‘Motors in Industry’ program. The participants will be assessed to identify maximum efficiency improvement in replacing motors.

For the industrial motors capacitor replacement program, PDP will select feeders in coordination with DISCOs that show significantly high technical losses. PDP will work with DISCOs to collect the available history of interval-load data of all customers as well as their monthly bills, and produce the consumer and feeder load profiles. These will be analyzed to select target feeders. Preference shall be given to feeders that have consumers with low power factors.

PDP will undertake the training of DISCO linemen for the installation of capacitors, along with private installation contractors.

#### Schedule:

<b>For Turnaround DISCO (PESCO):</b>	<b>Start Date:</b> December 2012	<b>End Date:</b> July 2015
<b>For Model DISCO:</b>	<b>Start Date:</b> April 2013	<b>End Date:</b> July 2015
<b>For all other DISCOs<sup>14</sup>:</b>	<b>Start Date:</b> February 2013	<b>End Date:</b> July 2015

The procurement process for Component 3 was initiated in September 2012 by issuance of RFP and subsequent due diligence. Signing of the contract with one or multiple suppliers is expected by March 2013, with deliveries expected to start by June 2013. The installation activity will be completed in June 2015.

**Deliverables:** This activity includes the following deliverables:

- LT Capacitors installed on tubewells
- Monthly reports showing installation status of LT capacitors along with average (MW) energy savings.
- All equipment used for energy auditing and sizing of capacitors, and the installation of capacitors will be handed over to the DISCO for future use by linemen in the installation and maintenance of LT capacitors

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<sup>14</sup> February 2013 is the start date for the Punjab based DISCOs.

**Results:**<sup>15</sup> The installation of capacitors on tubewells will improve their power factor, and would lead to releasing much needed peak generation capacity.

## Task 5: Feeder Optimization for Loss Reduction

This task is covered under Task 1. HT capacitor work details are given below.

### DISCO HT Power Factor Improvement

**Scope:** The DISCOs have not assessed current requirements for HT power factor correction in approximately five years, during which feeder loads have changed with air conditioner motor and other appliances being added, causing poor power factor on many feeders with lost revenue, low voltage and customer dissatisfaction.

The PDP Engineering and Planning program will focus on the Model and Turnaround DISCOs to conduct feeder power flow analysis using new software technology and to install proper 11 kV HT capacitors<sup>16</sup>. This task will include installation of HT Capacitors on feeders and in grid stations and congested area strategies on high-loss feeders.

**Schedule:** September 2012 - July 2015

**Deliverables:** The following are the deliverables of this activity:

- Installation of 11 kV HT capacitors on feeders
- Installation of improved distribution equipment

**Results:** Improved power factor on distribution feeders and at the grid stations, thereby reducing the technical loss in the system with reduced demand in the increased revenue, improved voltage and increased customer satisfaction.

## 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

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<sup>15</sup> The level of achievement of the results will be based on further availability of funding and the proven ability of DISCOs to use their own manpower to assist with capacitors installations.

<sup>16</sup> Either switched or un-switched depending upon the results of our analysis

## Activity 1: Load Data Improvement Project

**Scope:** Unscheduled load shedding is a serious problem in Pakistan. It causes serious civil disturbances with property damage and loss of life and is a focal point for civil disobedience. Unscheduled load shedding occurs when the National Power Control Center (NPCC) must take action to reduce load quickly to prevent the national grid from failing. The operators making these decisions do not have near real-time data available on actual system loading upon which to make decisions. If a DISCO does not follow the plan to shed load, the NPCC does not realize the problem until system frequency starts to drop, and they must then make decisions to take unscheduled load shedding actions. Currently none of the nine DISCOs nor NPCC are able to know in near real-time the actual load the individual DISCOs are taking from the National Transmission and Distribution Company (NTDC) grid or the total aggregate load being drawn by all the DISCOs.

PDP is assisting the DISCOs and NPCC to obtain load flows information on a near real-time basis by installing over 7,800 AMR - data acquisition meters on all incomers and outgoing feeders of all 741 DISCO grid stations. This information will be supplied to NPCC and DISCO upgraded Power Dispatch Centers (PDCs).

**Schedule:** August 2012 – July 2013

PDP is fast-tracking delivery of this intervention. Meter prototype tests were completed successfully in November 2012, and a subcontractor was awarded the contract in December 2012 with meter manufacturing started immediately. Meter installation will take place from February 2013 with the priority given to PESCO followed by the Model DISCO (pending selection). By March 2013 all meters will be installed, after which interfacing will be done to establish communication with the meters. Data management system will be made operational by April 2013 and real-time data will be available in NPCC and DISCO PDCs by May 2013. From June 2013 onwards real-time data system would be in routine operation.

**Deliverables:** This activity includes the following deliverables:

- Installation and commissioning of data gathering devices in all outgoing feeders at all nine DISCOs
- AMRs on all incoming and outgoing feeders in nine DISCOs
- Near real-time data provided to NPCC and all DISCO power dispatch /control centers
- Modified procedures developed

**Results:** Reduction in unscheduled load shedding across Pakistan, improved DISCO load management, improved timeliness and quality of data required for timely operations decisions on feeder rehabilitation, bifurcations, load shifting, capacitor installations, power quality control, and availability of feeder data for power flow analysis and long term planning.

## Activity 2: Improved Meter Reading Project

**Scope:** Meter reading within the DISCOs is of poor quality, resulting in inaccurate consumer billing and increasing revenue outstanding and uncollectible revenue. Changes to current meter reading policies, processes, procedure and practices are required. PDP has successfully implemented Improved Meter Reading (IMR) Project under Component 2, with several DISCOs showing excellent results in terms of reduction in

losses, increased revenue and decreased consumers' complaints. As a result of the Program's success, some DISCOs have expanded the activity using their own resources.

IMR will be implemented in the Model DISCO's<sup>17</sup> selected subdivision(s) including conducting a consumer enumeration, an audit of existing meter configurations, procurement of HHUs for meter reading and training of meter readers in best practices meter reading for selected subdivisions. The implementation strategy will include PDP technical assistance with resources and material to be provided from the Model DISCO.

**Schedule:** April 2013 – June 2015

The meter change and replacement activities through PDP's supervision and DISCO's resources will be initiated in April 2013. As IMR project is currently being implemented in almost all the DISCOs, PDP can scale it up in the Model DISCO. Meter change activity will be followed by correction of the baseline losses and then HHUs with picture taking capability will be possibly introduced to ensure accurate meter readings in the future and more control over the meter reads. PDP will move sub-division by sub-division to cover possibly up to a circle level.

**Result:** IMR will increase the accuracy of meter reading resulting in reduced losses, improved revenue and decreased consumer complaints.

**Deliverables:** This activity includes the following deliverables:

- Improved commercial processes
- HHU with picture taking capability

### Activity 3: Line Staff Skill Development

This is covered in Activity 5 below.

### Activity 4: Governance

PDP will support policy and governance assistance aimed to support policy making at the national level national government and as well as enhanced director training for DISCO boards. The Component 3 improved governance activities will be designed to promote improved transparency in decision-making and overall improved governance in the power sector as a whole, and of the DISCOs in particular.

#### Sub-Activity 1: Governance at MWP

The Ministry of Water and Power (MWP) is the principal body within the GOP responsible for review and formulation of power sector policies needed to resolve power sector challenges including massive capacity shortfalls and mounting circular debt. Power sector governance has in the past been hampered by a lack of transparency, lack of implementation of policies and conflicting political objectives.

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<sup>17</sup> This activity is not planned for Turnaround DISCO i.e. PESCO because of the baseline accuracy issues.

To assist in improved policy analysis and macro-level decision making, the governance team will continue to provide support to the MWP to play a role that is in line with its stake as the principal shareholder in the DISCOs, while encouraging the DISCOs to achieve increasing levels of operational independence. The governance team will achieve this goal by continuing to provide high level policy support to MWP in the form of policy analysis and policy advisory services.

In addition, the governance team will work with the Security and Exchange Commission to define a public sector code of corporate governance. The primary focus of the Component 3 governance assistance will be to continue to strengthen the understanding and capacity of DISCO BODs vis-à-vis in creating an framework to enhance communication with DISCO unions and evaluate and define improved employee relations policy which will be adopted by the DISCOs. The governance team will be working closely with MWP in providing them not only technical assistance but also help them in improving their capacity at the ministry level.

The implementation strategy for the governance team is split into various activities which are described below, with major deliverables for all given at the end.

### **Sub-Activity 1.1: Assist MWP in Amendment of Legal Acts and Laws in the Power Sector**

**Scope:** A major activity of this component is to provide assistance to MWP in amending the Legal Acts and laws. The Governance Team will assist MWP in amending the Electricity Act so as to bring it in line with international best practices and to make power theft a criminal offence. The team will also assist MWP in paving a road map for market reform and where it wants to take the sector in the future.

**Schedule:** March 2013 – January 2015

A draft of amendments to the Electricity Act will be prepared and got reviewed by GOP and other stakeholders by August 2014. PDP will simultaneously work on adoption of these improvements followed by a notification by GOP by January 2015.

**Result:** Overall improvement in power sector governance, improvement in power sector operations and reduction in energy losses.

### **Sub-Activity 1.2: DISCOs Reform**

**Scope:** Support will be provided to DISCO BOD's through MWP for their reforms so as to operate in a commercially rational manner. A comprehensive report/policy note for the reform of DISCO governance and proposals for adjustment of roles of MWP and NEPRA will be produced. The team would also work with the Security and Exchange Commission of Pakistan (SECP) on defining a public sector code of corporate governance for public companies.

**Schedule:** June 2013 – June 2014

Within the period mentioned above a Committee will be formed for defining Public Sector Code of Corporate Governance. The code will be then reviewed by GOP and all other stakeholders, followed by its adoption by June 2014.

**Result:** Improved governance in the sector and realignment in the role of MWP as a policy maker rather than owner of these public sector entities.

### Sub-Activity 1.3: Prevent Accumulation of Circular Debt

**Scope:** Provide assistance and advocate MWP to have the Ministry of Finance to make timely subsidy payments to the power sector and work with other ministries/provincial government to clear up arrears.

**Schedule:** March 2013 – June 2015

Within the period mentioned the review of current policies and procedures will be conducted, there will be policy intervention to improve collections and GOPs policy will be adopted by all the ministries.

**Result:** Will help reduce the circular debt by improving cash flows into the system. Will help improve overall power sector operations.

### Sub-Activity 1.4: Implementation of Power Purchase Agreements

**Scope:** Assist power sector entities and MWP with Power Purchase Agreements (PPA) between DISCOs and CPPA.

**Schedule:** March 2013 – December 2013

Within the period mentioned the proposed PPA will be prepared and got reviewed by the stakeholders. The PPA will be adopted by December 2013.

**Result:** PPAs will result in DISCOs taking ownership of the energy they procure from CPPA. By doing so, they can then be responsible which will make them accountable for all their losses and inefficiencies which are currently being burdened on CPPA.

### Sub-Activity 1.5: Assistance to MWP on National Safety Code

**Scope:** Assist MWP for adoption of safety code for the protection of linemen, public and system assets.

**Schedule:** March 2013 – March 2015

Within the period mentioned the National Safety Code will be created, got reviewed by stakeholders, notified by MWP and adopted by the entities by March 2015.

**Result:** Improved governance and management of public energy sector entities and reduction in fatal and non-fatal accidents.

### Sub-Activity 1.6: Dissolution of PEPCO

**Scope:** This is a continuation of Component 2. Dissolution of PEPCO is extremely important for the structural reform and commercialization of power sector entities.

**Schedule:** Ending December 2013

Within the period mentioned the “Solvency” documents will be filed with SECP, a liquidator will be appointed by MWP, and the Prime Minister will sign the closing of PEPCO.

**Result:** Dissolution of PEPCO.

**Deliverables:** This activity includes the following deliverables:

- Amended Electricity Act
- DISCOs Reform Implemented
- Improved cash flows and reduction in circular debt
- Execution of PPAs
- EE & Conservation Policy
- National Safety Code implemented
- Dissolution of PEPCO

### Sub-Activity 2: Governance at DISCOs Level

**Scope:** Good corporate governance contributes to sustainable economic development by enhancing the performance of companies and increasing their access to outside capital. In emerging markets good corporate governance serves a number of public policy objectives. It reduces vulnerability of the financial crises, reinforcement property rights; reduces transaction cost and cost of capital and leads to capital market development. Corporate governance concerns the relationship among the management, board of directors, controlling shareholders, minority shareholders and other stakeholders.

A corporate governance system is comprised of a wide range of practices and institutions, from accounting standards and laws concerning financial disclosure, to executive compensation, to size and composition of corporate boards. A corporate governance system defines who owns the firm, and dictates the rules by which economic returns are distributed among shareholders, employees, managers, and other stakeholders. As such, a country's corporate governance regime has deep implications for firm organization, employment systems, trading relationships, and capital markets. Thus, changes in Pakistani system of corporate governance are likely to have important consequences for the structure and conduct of country business.

Based on the feedback received from the participants of different workshops arranged by PDP for BODs of DISCOs during Component 2, it is now realized that the corporate governance is one of the areas in power DISCOs that requires an immediate training and development program to equip Board members with modern skills in corporate governance.

PDP has decided to roll out its corporate governance improvement program in Turnaround and Model DISCOs. The program has two main components:

1. Impart trainings on Corporate Governance Leadership skill for the development of BODs of both the DISCOs by engaging professional institutions, such as the Pakistan Institute of Corporate Governance (PICG).
2. Provide assistance to initiate the board assessment process for the identification of areas of improvement in BOD functions.

**Schedule:**

**For Turnaround DISCO (PESCO): Start Date:** February 2013      **End Date:** June 2015

**For Model DISCO: Start Date:** June 2013      **End Date:** Aug 2015

**Turnaround DISCO:** For turnaround DISCOs, Directors of PESCO Board and key senior executives of the company will undergo the Corporate Governance Leadership Skill program. A number of further workshops will be arranged in-country to for a better understanding of utility specific corporate governance improvement action plans.

**Model DISCO:** In Model DISCO, a similar program will be rolled out.

**Deliverables:** This activity includes the following deliverables:

- To help the DISCOs to have effective BODs
- Ensure polices in the DISCOs reflect the mandate given by MWP
- Have an oversight over financial and operational discipline within the DISCOs
- Assist MWP to develop monitoring and evaluation (M&E) plan to oversee the BOD’s performance
- Initiate the certification program for the Board of Directors of the DISCOs
- Provide guideline to BODs to devise corporate improvement action plans
- Introduce an assessment process to see the areas of improvement within Board function

**Results:** The anticipated results in Turnaround and Model DISCOs are introduction of sustainable corporate governance in DISCOs, infusing a sense of ownership and responsibility within power utilities, autonomy of effective BODs and to help make utilities financially and operationally viable.

**Activity 5: Lineman Training**

**Scope:** A good portion of the technical line losses at this time, are a direct result of inadequate tools, materials, training and procedures. The quality of current tools and materials employed by the DISCOs cannot be used to rectify the situation. Current training has no direct application to the reality in the field and is at best an attempt to apply outdated techniques on unavailable tools on useless materials. Line workers with no applicable training, using tools, which are unsuitable, are attempting to keep the system operational with

materials that are unsuitable for recycling. As a result, transformers are damaged and line losses continue to escalate as the death toll climbs.

Linemen Training, Tools and Equipment is an essential intervention for transforming DISCOs front-line operations to match that of well-run utilities. Tools and equipment will be procured (in conjunction with the transportation intervention) and consolidated at a central location. The DISCO<sup>18</sup> will be required to provide some equipment, which has been determined to be of acceptable quality. Groups of line staff from the subdivisions will be brought to the location and trained in the use and care of the tools. A practical test will be used to determine the ability of the line staff and those who show ability to perform adequately shall be issued tools when they return to their respective sub-division. It is planned that this will reduce the number of non-working line staff issued tools. The training segments will build skills and safe working practices over a two year training horizon through a combination of intensive training sessions designed to develop skills, such as proper installation of compression connectors, installation of complex three-phase AMR metering sets, conductor splicing, advanced transformer installations, and meter tampering inspections. The skills training will be rolled out to all DISCOs through a video training program supported by hands on training activities at the subdivision level as is commonly used in most advanced utilities. In addition, a team of advanced linemen will be provided more formal training in advanced skills and loss reduction techniques. These linemen will provide training and mentoring to linemen from underperforming subdivisions.

Crew tools will be procured for the crew transport to facilitate team or individual activities, maximizing the utility of the transportation. Low-cost line worker transportation prototypes will be updated and purchased, providing transportation of workers, tools, and materials to the worksites. Materials will be identified and procured based on surveys at the sub-divisions. These materials will allow the newly trained and tooled line staff to begin improving system losses and reducing outages immediately upon returning to work. PDP will train PESCO planning engineers who will begin audits of major feeders. This will identify major loss connections and allow work plans and material lists to be developed. PDP procurement specialists will work with PESCO standards writers to develop specifications and procedures to minimize quality issues in procurements in the future. During the course of project implementation, PDP will also work to identify local manufacturers who have the ability to manufacture and mass produce these items. This intervention is expected to take between 12 and 18 months for the prototypes to be developed.

PDP HR and change management staff will work with the PESCO HR, sub-division officers and other related staff to develop and monitor procedures designed to maximize transformer life and reduce losses on a continuing basis.

**Schedule:** October 2012 – July 2015

Bill of Quantities and specifications will be prepared by March 2013 and RFP will be issued. Procurement will be completed by June 2013. For Turnaround DISCO (PESCO), significant progress has been made in identification of the Linemen and preparing the training plan for them a) for routine operations and maintenance work and b) for PDP's field installation work.

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<sup>18</sup> As per direction from USAID this activity will now focus on Model & the Turnaround DISCOs.

**Deliverables:** This activity includes the following deliverables:

- Develop a lineman training program that will consist of a combination of classroom, video, and hands-on training sessions provided at the sub-division level, implemented on a monthly basis.
- Updated specifications and procedures
- Lineman trained for PESCO and the Model DISCO
- Tools such as rubber gloves, hard hats, tools to put on the connectors and hot sticks Equipment such as transport, grounding sets, proximity detectors, isolating gear and cover-up

**Results:** The Lineman Trainings, Tools and Equipment is the intervention PDP is planning to implement for improving the binding of joints in the distribution system that will just not only save MWs and improve revenues for the DISCOs, but also improve upon the safety (employees and general public), reliability of supply and customers satisfaction. The methodology developed to quantify the results from this intervention is placed at **Annex-4**.

**For Turnaround DISCO (PESCO):<sup>19</sup>**

- For Peshawar Circle: If we change only the connectors of HT/Transformers/LT main of Peshawar Circle, the MWs saved comes out to be 4 MWs translating into annual energy savings of 21 Million KWh and annual cost savings to PESCO of US\$ 1.63 million. Deferred investment in generation is \$4.7 million.
- For Entire PESCO (indicative): <sup>20</sup>If we change only the connectors of HT/Transformers/LT main of entire PESCO, the MWs saved comes out to be 16 MWs translating into annual energy savings of 84 million KWh and annual cost savings to PESCO of US\$ 6 million. Deferred investment in generation is \$19 million
- Reduction in major accidents
- Reduction in transformer damage. Equip and train in one circle with quality protective equipment
- Tool provided for line workers and for up-fitting lineman transport at one circle
- Improved specifications for tools provided to manufacturers and DISCOs

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<sup>19</sup> The results for the Model DISCO will depend upon its selection and will be calculated using the same methodology.

<sup>20</sup> For the Model and Turnaround DISCOs the plan is to train the staff, provide them with tools & equipment and transportation for one model circle and help the DISCO to scale this to the other circles.

## Section 3: Cross-Cutting Activities

### Activity 1: Gender Strategy

**Scope:** DISCOs are generally considered male dominated organizations with women number as little as 1% of the employed staff. As a result, opportunities for career advancement are limited and women rarely succeed in climbing the corporate ladder to a senior managing level.

PDP's approach is focused on mainstreaming gender where applicable to be fully aligned with USAID policy on gender equality and women's empowerment. Gender strategy will remain cross-cutting all interventions commercial, finance, HR, and engineering divisions to facilitate transformation of target DISCOs into competitive, diverse, profit-making entities in the long term.

Elements of PDP's Gender Strategy include:

- **Gender Equity Trainings:** To be held for all managers and supervisors as well as all women at all levels, will facilitate the development of a DISCO gender strategy in three critical areas (i) employment, (ii) career development and (iii) workplace conditions to reduce recruitment disparities and to facilitate women's entry into the power sector.
- **Gender and Energy Policy Workshop:** Will educate regulatory officials and policymakers on challenges facing women in the power sector and promote policies and practices that will increase the number of women managers and directors.
- **Women in Leadership:** Long term engagement of women in power sector will be increased by increasing the number of women interns at DISCOs in technical positions and increasing the number of women DISCO employees in leadership and decision-making levels.

PDP will focus on rapid impact in three critical areas:

**Employment:** Promoting policies for the target DISCOs that will attract and, most importantly, retain women employees (e.g., flexible work hours, extended maternity leave with guaranteed return to employment within an agreed time period). Furthermore, internship programs will increase the number of women graduates' exposure to the power sector.

**Career Development:** To facilitate rapid scaling of women in leadership positions PDP will initiate our *Women In Leadership* initiative that will identify existing female employees in technical areas at target DISCOs. The initiative will facilitate their advancement through training in areas such as leadership development and best practices management training, ensuring significant knowledge in area of expertise and providing supplemental training as needed, and facilitating increased responsibilities with regular performance assessments.

**Improvement of Work Place Conditions:** The work place environment is as important as providing equal salary for equal work for ensuring that women graduates and current DISCO female professional staff seek employment or remain within the power sector. PDP will work with DISCOs to develop policies that

mandate and maintain basic requirements in all new construction such as at least one women-only washroom on work premises and Customer Service Centers that respect the cultural sensitivities of women clients.

#### Schedule:

**Turnaround DISCO:** August 2013 – June 2015

**Model DISCO:** April 2013 – June 2015

RFQ for the selection of the consultant partner to impart trainings will be prepared in July 2013. Selection of consultant firm will be finalized by mid-August 2013 and trainings will be scheduled September 2013 onwards at turnaround DISCO's Head Office level and in all the circles and divisions.

**Deliverables:** This activity includes the following deliverables:

- Implementation of policies to attract women employees
- Career focused trainings for women employees
- Provision of improved working conditions to female staff

**Results:** Build capacity of and increase the number of women in technical leadership and decision-making positions at the Model and Turnaround DISCOs including commercial, finance, and engineering divisions to facilitate transformation of DISCOs into competitive, diverse, profit-making entities in the long term. The PDP Gender Strategy for Component 3 is to engage and assist the Model and Turnaround DISCO through our *Women In Leadership* program to recruit, develop, support and retain women as electrical engineers, IT specialists, and revenue officers with a clear strategy for merit-based career advancement.

## Activity 2: Internship Program

**Scope:** PESCO is facing prominent challenges in their operations stemming largely from deficiencies of human resource, recruitment embargoes, political pressures in respect of hiring practices, and a shortage of funds restricting hiring. The PDP internship programs will attract new talent with appropriate skills suited for a modernizing power sector. PDP's unique program is designed to build capacity of PESCO and Model DISCO and increase the number of young professionals in the power sector to facilitate bottom-up transformational change. The program will also support the delivery of PDPs activities at the two DISCOs.

#### Schedule:

**Turnaround DISCO:** October 2012 – June 2015

**Model DISCO:** April 2013 – June-July 2015

A gap analysis conducted by PDP identified staffing requirements for the Turnaround and Model DISCOs, and interviews for interns are scheduled during February 2013. After selection expected in March 2013, orientation of trainee interns in batches will continue up to April 2013. Equipment for workspaces will be procured.

**Deliverables:** This activity includes the following deliverables:

- Staff needs report and associated JDs developed
- Hiring internees from multi-dimensional academic portfolio for PESCO
- Development and implementation of a comprehensive orientation program for interns

**Results:** The program is designed to support the Turnaround and Model DISCOs as young professionals will bring tech-savvy skills and meet short term needs for extra assistance. This will not only assist PDP in its smooth implementation of activities but will also increase the chances of sustainability of interventions at the two DISCOs.

### Activity 3: Communications

**Scope:** DISCO's Public Relations departments mainly comprise of one Public Relations Officer who most of the time issues rebuttals to the media reports. There is no linkage between Public Relations and customer services, resulting in a widening gap between DISCOs and its consumers and contributing to the DISCO's generally poor reputation of among its consumers and media.

PDP's Communication & Outreach Program for Turnaround and Model DISCOs will demonstrate the importance of communications and outreach functions through a set of activities that will help in strengthening PR departments. DISCO Communications and Outreach Program comprises of establishing a Communications and Outreach office, delivering communications and outreach campaigns, community and schools events, text messaging (SMS) service, revamped websites, establishing corruption reporting hotlines possibly through Call Centers, regular communication channel with the targeted customers facilitating smooth delivery and improved DISCO corporate branding.

PDP will also develop communications protocols and a strategy that will address the DISCO's long term objectives and PDP's implementation of the Component 3 activities. Trainings will be delivered to DISCO staff to empower them on designing strategies and campaigns for consumer awareness, energy conservation and improvements in customer services. DISCO senior staff will be involved in outreach campaigns especially in the community meetings on energy conservation and theft issues. Regular internal communication regarding PDP activities will also be ensured using appropriate tools.

#### Schedule:

**Turnaround DISCO:** November 2012– June 2015

**Model DISCO:** April 2013– June 2015

**Turnaround DISCO:** PDP started preparations for Turnaround DISCO in November 2012. PESCO allocated office space, which will be refurbished by mid-February 2013, after which the planned activities for public relations and communications will immediately start. Many interventions such as branding material,

website, text messaging service and a localized campaign will be launched on immediate basis to produce results before July 2013.

**Model DISCO:** After selection of the Model DISCO (assumed in April 2013) PDP will follow similar approach as in the Turnaround. As DISCOs do have similar public relations related issues, Model DISCOs initiatives will be rolled-out starting in April-May 2013 and will continue up to June 2015.

**Deliverables:** The following are the deliverables from this intervention:

- Establishment of a Communications and Outreach Office
- Communications and outreach campaigns
- Text messaging service
- Revamping DISCO official website
- Revamping DISCO corporate branding

PDP will submit regular monthly and quarterly communications reports. Press coverage received for various activities will regularly be shared with USAID. Documentaries on projects at both the Turnaround and Model DISCOs will be produced and will be aired on local TV and cable channels.

**Results:** Improved DISCO's image as a dynamic and customer friendly entities through external communications that will help Model & Turnaround DISCO to smoothly implement anti-theft campaigns, empowered DISCOs Public Relations departments will also help in the aggressive communications and outreach of DISCOs, improvement in DISCOs branding and internal effective communication with the DISCOs staff will mitigate the resistance to PDPs initiatives

## Section 4: Engagement Strategy

USAID Power Distribution Program (PDP) is in line with the GOP objective to improve the operational, technical and financial performance of the DISCOs to eliminate circular debt in supply chain and reduce depends on government subsidy in phased manner. In order to achieve the stated objectives of the program and to effectively implement the tasks stated in the technical proposal for C 3 for both turnaround and model DISCOs USAID PDP has well define stakeholder engagement strategy. All DISCOs are regulated by NEPRA and all the prudent costs and investments programs are being determined/approved by NEPRA annually. The delayed determination of tariff is adding to the circular debt issues as well as negatively impacting the DISCO ability to operate effectively.

Similarly GOP, being owner of DISCOs, is extending its role in the management causing confusion and conflicts between the CEO and BOD. Further, the DISCOs also require support from the Provincial Governments for pursuing war against theft and clearance of government dues by provincial government departments in timely manner. Under the Company’s Ordinance 1984, the BOD of DISCOs are sole decision making authority including the appointment of CEO and senior management and accordingly the BOD is responsible for compliance with all the rules and regulation applicable to the company and enact policies for the company under the guidelines issued by the GOP and approve operating procedures for the company consistent with the laws and regulations.

In order to effectively deliver the program the following are the main stakeholders identified, their requirements and PDPs high level actions to meet those requirements in-order to engage these stakeholders.

Stakeholders	Stakeholders Requirements	Actions
MWP	Reduce circular debt, improve load management and manage the power crisis to an acceptable level	<ul style="list-style-type: none"> <li>Initial meetings within MWP to apprise them about PDP’s alignment with their priorities. Make them Champion of this change.</li> <li>Develop a strategy for raising funds from donor agencies for Model &amp; Turnaround DISCOs. Pursue MWP to get fast track approvals for investments by Planning Commission that involve GOPs/other Donor funding that require GOPs guarantees. Quarterly PDP progress meetings with MWP.</li> </ul>
NEPRA	DISCOs to provide the tariff petitions with supportive analysis as well as develop long term business plans.	<ul style="list-style-type: none"> <li>Facilitate PESCO and Model DISCO in preparing a multiyear tariff petition so that risk in regulatory approval can be eliminated. It would be essential for Model DISCO before privatization. This multiyear tariff petition will be aligned with the long term strategic business plans for the DISCOs.</li> </ul>
BOD of PESCO and Model DISCO	Develop long term vision and goals setting, coupled with a resource plan to deliver it. Increase the autonomy of the DISCOs to achieve the strategic objectives of the companies. Quick fixes to improve operational performance.	<ul style="list-style-type: none"> <li>Facilitate in developing the short term, medium term and long term strategic objectives and target setting through development of business plans</li> <li>Make the BODs champion and sponsors of all PDPs interventions by conducting periodical meetings on the implementation of business plans including the PDP’s program including identifying the program support requirements.</li> </ul>

		<ul style="list-style-type: none"> <li>Placing technical advisors in each functional area within the DISCOs to support delivery of the project and to enhance the capacity of DISCO management.</li> <li>Employ college graduate interns to assist DISCOs management and PDP advisors with program delivery.</li> </ul>
<b>PDP</b>	Support from MWP/BODs/CEOs/senior level DISCO management. Support from DISCO operations for program delivery.	<ul style="list-style-type: none"> <li>USAID to add covenants in agreements with MWP/GOP as rules of engagement such as level of BOD autonomy, tenure postings of CEO, hiring and firing power for senior management, etc.</li> <li>USAID support to pursue donor agencies for leveraging additional funds for long term sustainability.</li> </ul>
<b>Functional Heads of DISCOs</b>	Assigning shadow advisors to specific DISCO area and require clear understanding about the role and responsibilities of the shadow advisors	<ul style="list-style-type: none"> <li>Develop clear role and responsibilities for shadow advisors.</li> <li>Developing close coordination and working relationships with the functional heads by the shadow manager. Solicit periodic and regular feedback from the functional heads regarding performance of the shadow managers.</li> </ul>
<b>Provincial Government</b>	Support of the provincial government is required for the program execution and for utility to improve performance. Need support of local administration for contentious interventions and or areas.	<ul style="list-style-type: none"> <li>Develop presentations to provincial governments about the program and seek agreement on the support required from them.</li> <li>Quarterly update meetings and sharing of program benefits accruing to the general public and consumers.</li> </ul>
<b>CBA Union of DISCOs</b>	Need to develop a creative and aligned approach to the DISCO staffing	<ul style="list-style-type: none"> <li>Develop an effective communication plan so as to have specific messages focused towards the work force with a goal of keeping them engaged with the transformation</li> <li>Change management interventions will be specially designed to involve Union members, especially the heads to become part of the change</li> </ul>
<b>Energy Policy Project</b>	Energy Generation, Transmission and Distribution system plans coordination	<ul style="list-style-type: none"> <li>Bi-monthly coordination meetings to ensure integrated power planning for generation, transmission and distribution network.</li> </ul>
<b>USAID</b>	Achievement of committed results and timely completion of the project. Positive visibility of program results.	<ul style="list-style-type: none"> <li>Program will be designed and planned in detail. PDP will prepare and manage internal detailed project planning documents, aligned with this Work Plan to ensure timely achievement of committed results.</li> <li>PDP will devise a comprehensive communication strategy with detailed action plan to ensure success of the program and ensuring visibility of the USAID efforts to reform the sector amongst the masses.</li> </ul>
<b>DISCOs</b>	NEPRA to approve timely tariff petition and approve long and short term business plans.	<ul style="list-style-type: none"> <li>Timely preparation and submission of tariff petitions.</li> </ul>
<b>Consumer Groups</b>	Improvement in load shedding, customer service and availability of power	<ul style="list-style-type: none"> <li>Prepare communications and share with consumers to highlight achievement in power availability, reduced load shedding and customer services.</li> </ul>

## Section 5: Sustainability Strategy/Plan

The sustainability of the USAID PDP is vital for long term operational sustainability of the DISCOs in general and particularly for the projects which USAID PDP has envisaged to implement under Components 3 especially for Model and Turnaround DISCOs.

Following are the key steps which PDP will facilitate to be taken by different entities within the Power Sector:

### Government of Pakistan

- Empower NEPRA to directly notify tariffs after determination. This will increase substantially the autonomy and credibility of the regulatory regime. The government should issue a policy guideline on how it plans to phase out the tariff differential subsidy, including a budget and timeframe.
- NEPRA to then determine cost-reflective tariffs and a rate design that will take into consideration the subsidy. This will also credibly signal investors and development partners that the government will not default on its plan to phase out the subsidy.
- Ensure competent Board of Directors for DISCOs with full autonomy.
- Timely and full payment of subsidies which means the government must reduce them to a level it can pay and eliminate over medium to long term.
- Pursue Federal and Provincial government institutions to clear their electricity bills.

### Board of Directors

- Set long term corporate objective in line with overall sector policies and regulatory framework.
- Approve of the corporate business plan to achieve the long term financial sustainability of the organization.
- Approve filing of multiyear tariff petition in accordance with the business plan with NEPRA.
- Appointment of CEO and senior management of the company and their evaluation based on the objectives set in the business plan.
- Approve the restructuring of the organization to facilitate the introduction and sustainability of new technologies in the company.

### Management of DISCOs

- Management must be guided by a corporate business plan including objectives and goals for which the Chief Executive and the senior management shall be held accountable.
- Preparation of multiyear tariff petition in accordance with the business plan with NEPRA.
- Full autonomy over their operations, including staffing, procurements, commercial operations, stock management policy and investment programs. For commercial operations it is crucial to install an appropriate mechanism for checks and balances. Commercial operations will not be achieved, neither in public sector nor in private owned utilities, if politicians interfere in utilities' operations.
- The DISCOs must (i) formulate clear, well-specified JDs for each position including the tasks for which the staff member will be held accountable (ii) improve the transparency in recruitment processes by establishing clear process rules how to execute the selection process, and (iii) establish a system to regularly appraise staff combined with the adoption of performance-based salary structures in the medium to long term once they are able to implement them.

- DISCOs should collect revenues from their electricity sales (including subsidies from the government for DISCOs) that fully cover the costs of supply and distribution and generate an appropriate return on capital invested.
- Organizational restructuring approvals to support new technology and hiring of qualified resources or training of existing ones to take on new positions.
- Approvals from the BOD to provide resources for field installation work.
- Ensuring availability of resources for PDP's IT interventions, such as IT support teams i.e. application support, technical support and IT help desk including the proper physical infrastructure space for IT data center/server room.
- Active participation of DISCOs staff in IT and trainings on new technologies.

### Power Distribution Program

- Stakeholders will be engaged thoroughly at all phases of program delivery including design, implementation and closeout. A communications program will ensure stakeholders are continually informed as to what has been, is being, and will be done, and what the impacts were, are or will be
- An effective change management strategy will be implemented with focus on internal champions and considering the organizational culture.
- PDP will work with MWP to get the support for the DISCOs for successful implementation of the program.
- For improving the relationship between the regulator and the DISCOs, workshops, conferences, dialogues, and meetings will be arranged on the relevant issues.
- DISCOs will be assisted in filing a tariff petition based on the cost of service study, and to streamline the process for tariff determination for both DISCOs and NEPRA.
- For sustainability of the PDPs interventions at the Model and Turnaround DISCOs, organizational structure will be improved to augment the physical and human capacity of these DISCOs, enabling them to operate and maintain what has been delivered during the program.
- Costs associated with the continued delivery of program activities after PDP's closeout will be calculated and shared with counterpart DISCOs so as to be incorporated into their own budgets during the annual budgeting cycle.
- PDP will conduct training of the Lineman for skill enhancement and for improved field installation work and they will be involved in execution of the relevant PDP's projects in their DISCOs to some extent.
- Upon completion of the industrial and municipal DSM program, all equipment and hardware used for the energy auditing of industrial motors/municipal pump sets will be handed over to the DISCOs.

## Section 6: Program Management Office

### Main Objective

The Program Management Office (PMO) serves as a centralized facilitating management structure for group of projects being executed at PDP, aimed at ensuring standardization, control of the overall scope, cost and schedule, centralized coordination among teams and aligning the vision-strategy of the management with the project delivery teams.

### Functions of PMO

PDP's PMO is performing the following functions:

1. Program Management
2. Monitoring & Evaluation (M&E)
3. Environmental Compliance

#### 1. Program Management

PMO is involved right from the design work i.e. development of the Work Plans to development of PDP's detailed internal Project Design Documents (PDDs) derived from the Work Plans. The PDDs entail detailed estimates for scope, schedule, cost and procurements that form the baseline for further project's monitoring. The PMO assists the management to monitor and track project progress, resolve issues and facilitate implementation by coordination between the on-site PMU for Turnaround DISCO<sup>21</sup>, other delivery teams assigned to the tasks that are spread all across DISCOs and centralized project finance/procurement teams. PMO also facilitate and help senior management to manage the interdependencies between the PDPs delivery teams.

#### 2. Monitoring & Evaluation

This important function by the M&E Team is assuring a standard process of M&E of outcomes. M&E Team coordinates and works closely with PDPs field implementation team and the sub-contractors to ensure that the results achieved by physical process are validated by conducting data quality assessment to physical sample site visits. These results are then shared with the management of PDP for result based monitoring.

M&E core activities include the following:

**Performance Management:** In order to measure project performance, PDP maintains a Performance Management Plan (PMP) based on the performance indicators identified by USAID Pakistan in its Results Framework. PDP's PMP ensures that collection and reporting of performance indicators is timely and useful to the project team and to USAID. PMO works with teams to come-up with the solid methodologies which are then utilized to report results in certain interventions.

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<sup>21</sup> An onsite PMU will also be established for Model DISCO in March 2014; dependent on its selection by USAID.

**Data Collection and Management:** As part of the M&E function, performance results with respect to USAID Mission RF are collected from each PDP team including respective sub-contractors on monthly and quarterly basis. On the other hand subcontractors are required to submit, on a weekly basis, their data in form of progress reports.

**Data Quality Assessments:** Overall quality of data and conformity with standards and procedures is maintained through evaluation and analysis of processed data. The sub-contractors are responsible for ensuring the overall quality of data at site through pre-entry verification, authenticating data entered against filled forms and pictures taken at the field and filing of paper version of forms as per the agreed statement of work. In order to further validate the quality of data collected from the sub-contractors and PDP teams, internal Data Quality Assessments (DQA) are performed by central M&E team on periodic basis; focusing on validity, integrity, reliability, precision & timeliness.

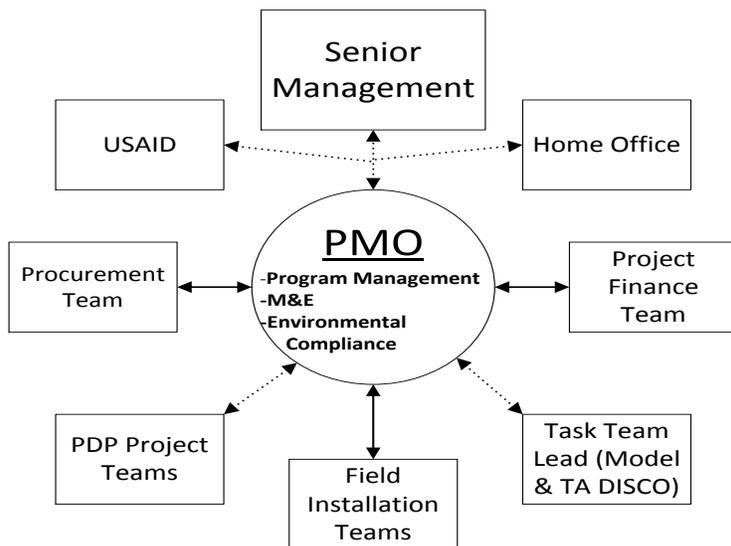
### 3. Environmental Compliance

As per US Regulation-216, an Initial Environmental Examination (IEE) for PDP was carried out in July 2010. Based on the IEE’s recommendations and in compliance with overall USG environmental requirements, an Environmental Mitigation and Monitoring Plan (EMMP) was developed to incorporate environmental considerations in all aspects of the program.

The PMO has been tasked work with the external environmental consultants and program delivery teams to ensure all interventions developed under PDP are compliant with the EMMP requirements. Should the program scope change drastically, the PMO will work with external consultants to update the EMMP appropriately.

#### PMO Interfaces

The following are the PMO’s interfaces that facilitate it to deliver the above mentioned functions.



## Section 7: Component 2 Activities Continuing In Component 3

The activities moving from Component 2 to Component 3 are those that achieved tremendous results and those that make logical sense to be continued. Component 2 covers all DISCOs, including PESCO and the potential Model DISCO, the high impact activities that are being executed under Component 2 are continued and augmented in PESCO and planned to be augmented in the Model DISCO. Apart from these, the activities like capacitor work and motors and pumps replacement that showed excellent results across DISCOs are being continued in Component 3 for all the DISCOs, with the strategy to give implementation priority to the Model and Turnaround DISCOs. The following are the major activities moving into Component 3.

### 1. DISCO HT Power Factor Improvement

The DISCOs have committed under Component 2 to repair or replace most of installed HT capacitors. PDP will continue under Component 3 to assist the DISCOs to complete this on-going effort. Improved distribution system power factor will reduce the technical loss along with million volt ampere reactive (MVAR) demand with improved voltage resulting in customer satisfaction.

### 2. Congested Area Strategy

Under Component 2 congested area work is being carried out in PESCO, HESCO and LESCO. Under Component 3, PDP will assist the DISCOs to plan congested areas, focusing in the Model and Turnaround DISCO, and install ABC extend HT lines by shortening LT lengths, install new high efficiency transformers, switches and outage reduction equipment. To achieve this improvement it is planned to purchase and install the bulk of the material with DISCO participation. This activity will lead to reduced losses and increased revenue in congested and high theft areas with improved customer safety and satisfaction.

### 3. GIS Survey & Engineering Analysis

In Component 2, PDP carried out feeder mapping and analysis of one sub-division per DISCO. PDP initiated a program to enable all nine DISCOs to develop geo-database containing accurate mapping and location information of all field installations. To date eight DISCO P&E computer centers have been made operational. Under Component 3, PDP will continue this effort and build DISCO capacity to map entire divisions and circles. High emphasis on this activity will be focused at the Model and Turnaround DISCOs. 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.

### 4. Demand Side Management Program

Industrial motors are estimated to contribute between 60%-80% of industrial electricity consumption in most Pakistani industrial sectors. Therefore under Component 2, PDP is installing 1055 energy efficient motors in industries. Under Component 3 of the program, PDP will replace around 2,000 motors initially focusing on the Turnaround DISCO (PESCO) and then onwards in the Model DISCO, followed by the other DISCOs.

Another activity under this program is replacement of inefficient pump-sets in the publicly-owned water and sewerage utilities. Under the ongoing Component 2 of the Program, PDP is replacing 597 inefficient municipal pump-sets in CDA Islamabad, KPK Local Government and Rural Development Department, and Karachi Water & Sewerage Board. In Component 3, PDP is planning to install 600 municipal pump-sets and it has already initiated discussions with the KPK Irrigation Department, the Public Health and Engineering Department, and the KPK Communications and Works Department.

## 5. LT Capacitor Installation Program

Under Component 2, the PDP is installing 24,400 LT capacitors for the purpose of improving pump-set power factor correction (LT capacitors) on distribution feeders in MEPCO, FESCO, LESCO, IESCO and QESCO. Based on the successful results of this project, PDP has started the national capacitor installation project under Component 3 with 151,986 LT capacitors, addressing the challenges faced during the pilot project, to maximize the nationwide program's success and peak demand savings. The total installation of 176,386 LT capacitors on tube-wells (combined Component 2 73) will improve their power factor and would lead to releasing demand of peak generation capacity.

## 6. Cost of Service Study

In Component 2, the COS for IESCO is being undertaken. The initial study has been completed and the COS team is currently working with IESCO for preparation of its tariff petition based on the results of Cost of Service Study. The work at IESCO will be completed in June 2013. In view of the paramount importance of Cost of Service Study in assuring the adequacy of revenue stream of DISCOs, it was decided to extend the Cost of Service work to the eight remaining DISCOs in Component 3.

## 7. Enterprise Resource Planning

Under Component 2, ERP work was limited to preparation of As-Is & To-Be for financial processes manuals, along with the road map for implementation for DISCOs for its implementation. Both deliverables were completed in July 2012. Based upon the knowledge and experience gained from the development of the ERP Documentation Manual (Manual) under Component 2, PDP will implement the ERP initiative at both Model and Turnaround DISCOs in accordance with the guidelines outlined in the manual. The ERP Documentation Manual covers the following modules, which will be layered in the ERP system under Component 3.

## 8. Organizational Assessment & Restructuring

Organizational assessment & restructuring project is currently in progress at MEPCO, a similar project will be carried out in PESCO and the Model DISCO as a part of Component 3 activities. The main difference is that in PESCO and the Model DISCO PDP will play a role in both developing the change strategy as well as implementing reforms whereas at MEPCO PDP focused solely on the strategy development phase, providing a revised Organizational Structure, new JDs, and position KPIs

## 9. Linemen Training in DISCOs

In Component 2 linemen training was focused on all nine DISCOs. Component 3 will see efforts largely focused at the Model and Turnaround DISCOs. Efforts will be continued at the remaining seven DISCOs albeit on a comparatively smaller scale. The intervention will be titled as Lineman Tools and Training.

## 10. Dissolution of PEPCO

This is a continuation of Component 2. Dissolution of PEPCO is extremely important for the structural reform and commercialization of power sector entities and is expected to be completed by December 2013. Within the period mentioned the “Solvency” documents will be filed with SECP, appointment of liquidator by MWP followed by Prime Minister to sign the closing of PEPCO by end of December 2013

Annexures

**Annex 1: Life of Project Schedule**

**Annex 2: Task Summary Matrix**

**Annex 3: Risk Matrix**

**Annex 4: Methodology for Quantifying the Results from Linemen Training, Tools and Equipment Intervention**

Annex 1: Life of Project Schedule

Annex-1

ID	Name	Start	Finish	Timeline											
				May	Jul	Sep	Nov	Jan	Mar	May	Jul	Sep	Nov	Jan	Mar
1	<b>PDP WORK PLAN FOR COMPONENT-3</b>	<b>Aug 1 '12</b>	<b>Oct 15 '15</b>	[Gantt bar from Aug 1 '12 to Oct 15 '15]											
2	<b>Initiation Phase</b>	<b>Aug 1 '12</b>	<b>Jul 31 '15</b>	[Gantt bar from Aug 1 '12 to Jul 31 '15]											
3	<b>PDP's</b>	<b>Aug 1 '12</b>	<b>Jul 31 '15</b>	[Gantt bar from Aug 1 '12 to Jul 31 '15]											
4	Consultation with Turnaround DISCO for Buy-In	Aug 1 '12	Feb 28 '13	[Gantt bar from Aug 1 '12 to Feb 28 '13]											
5	Get Ownership of Turnaround DISCO for the Program	Aug 1 '12	Jan 28 '13	[Gantt bar from Aug 1 '12 to Jan 28 '13]											
6	Setting up Offices at Turnaround DISCO	Oct 2 '12	Feb 28 '13	[Gantt bar from Oct 2 '12 to Feb 28 '13]											
7	Mobilization of PDP Advisors	Mar 1 '13	Mar 29 '13	[Gantt bar from Mar 1 '13 to Mar 29 '13]											
8	Hiring of Interns	Aug 1 '12	Feb 28 '13	[Gantt bar from Aug 1 '12 to Feb 28 '13]											
9	Mobilization of Interns to PESCO	Mar 1 '13	Apr 30 '13	[Gantt bar from Mar 1 '13 to Apr 30 '13]											
10	Training of PESCO's Linemen to Support Field Implementation Work	Jan 30 '13	Jul 29 '13	[Gantt bar from Jan 30 '13 to Jul 29 '13]											
11	Selection of DISCO Personnel for Secondment	May 30 '13	Jun 13 '13	[Gantt bar from May 30 '13 to Jun 13 '13]											
12	Active Stakeholder Engagement	Oct 2 '12	Jul 31 '15	[Gantt bar from Oct 2 '12 to Jul 31 '15]											
13	<b>USAID's</b>	<b>Feb 15 '13</b>	<b>Jul 31 '15</b>	[Gantt bar from Feb 15 '13 to Jul 31 '15]											
14	<b>Model DISCO Selected</b>	<b>Apr 15 '13</b>	<b>Apr 15 '13</b>	[Gantt bar from Apr 15 '13 to Apr 15 '13]											
15	USAID Agreement with GoP including Covenants of Engagement	Apr 30 '13	Apr 30 '13	[Gantt bar from Apr 30 '13 to Apr 30 '13]											
16	Signing of Collaboration Agreements with DISCOs	May 29 '13	May 29 '13	[Gantt bar from May 29 '13 to May 29 '13]											
17	Donor Coordination with PDP's Support	Feb 15 '13	Jul 31 '15	[Gantt bar from Feb 15 '13 to Jul 31 '15]											
18	<b>Planning Phase</b>	<b>Aug 1 '12</b>	<b>May 29 '13</b>	[Gantt bar from Aug 1 '12 to May 29 '13]											
19	Designing of Program	Aug 1 '12	May 29 '13	[Gantt bar from Aug 1 '12 to May 29 '13]											
20	Preparation & Approval of Workplan	Jan 1 '13	Mar 15 '13	[Gantt bar from Jan 1 '13 to Mar 15 '13]											
21	<b>Execution Phase</b>	<b>Aug 1 '12</b>	<b>Aug 31 '15</b>	[Gantt bar from Aug 1 '12 to Aug 31 '15]											
22	<b><u>Task 1 A Model DISCO (Model DISCO Assumed to be Selected in April, However Preparatory Activities Like Preparation of Bidding Documents, Specifications, Design Work starts before April)</u></b>	<b>Apr 1 '13</b>	<b>Aug 28 '15</b>	[Gantt bar from Apr 1 '13 to Aug 28 '15]											
23	<b>Activity 1 - Modernization of Business Systems</b>	<b>Apr 1 '13</b>	<b>Aug 28 '15</b>	[Gantt bar from Apr 1 '13 to Aug 28 '15]											
24	Sub Activity 1.1 - Enterprise Resource Planning System	Apr 1 '13	Aug 28 '15	[Gantt bar from Apr 1 '13 to Aug 28 '15]											
25	Sub Activity 1.2 - Effective & Accurate Metering System	Apr 1 '13	Jun 30 '15	[Gantt bar from Apr 1 '13 to Jun 30 '15]											
26	Sub Activity 1.3 - Upgrading Planning & Engineering with GIS Mapping	Apr 1 '13	Jun 30 '15	[Gantt bar from Apr 1 '13 to Jun 30 '15]											
27	<b>Activity 2 - Change Management &amp; Human Resource Development</b>	<b>Apr 1 '13</b>	<b>Jul 31 '15</b>	[Gantt bar from Apr 1 '13 to Jul 31 '15]											
28	Sub Activity 2.1 - Organisation Restructuring / Process Re-Engineering	Jul 1 '13	Jul 31 '15	[Gantt bar from Jul 1 '13 to Jul 31 '15]											
29	Sub Activity 2.2 - HR Development / Training & Capacity Building	Apr 1 '13	Jul 31 '15	[Gantt bar from Apr 1 '13 to Jul 31 '15]											





## Annex 2: Tasks Summary Matrix

### TASK 1: Preparing DISCOs for Commercialization

The purpose of this task is to implement such interventions in the selected Model & Turnaround DISCOs that would help them to operate independently and effectively.

#### TASK 1a: Preparing a Model DISCO

The purpose of this task is to work with one selected DISCO to improve its operations, increase transparency and improve the overall performance by providing technical assistance coupled with significant investment in infrastructure.

Activities	Sub-Activities	Lead	Support	Start Date	End Date	Comments	Output/Milestone
<b>Activity 1:</b> Modernization of Business Systems	<b>Sub-Activity 1.1:</b> 1) Enterprise Resource Planning System (ERP)	IRG / Engility	NRECA /External Sub	Apr-13	Aug-15	ERP and CIS will be coordinated under one umbrella for strong integration and to maximize benefits	<ul style="list-style-type: none"> <li>• Baseline report for collecting and validating existing data</li> <li>• Phase – 1 implemented modules:               <ul style="list-style-type: none"> <li>○ General ledger</li> <li>○ Accounts payable</li> <li>○ Accounts receivables</li> <li>○ Fixed assets</li> <li>○ Cash management</li> <li>○ Human resource</li> </ul> </li> <li>• Phase – 2 implemented modules:               <ul style="list-style-type: none"> <li>○ Material management</li> <li>○ Project management</li> <li>○ Project costing</li> <li>○ Payroll</li> </ul> </li> </ul>

	2) Customer Information System (CIS)	IRG / Engility	NRECA/ PITC/ Telconet/ External Sub	Apr-13	Aug-15	<ul style="list-style-type: none"> <li>• Phase– 1 activities: <ul style="list-style-type: none"> <li>○ Development of Customer Database (C&amp;I customers), Networking and IT infrastructure</li> </ul> </li> <li>• Phase– 2 activities: <ul style="list-style-type: none"> <li>○ Customer database and mapping for model circle customers</li> <li>○ Handheld meter reading system</li> </ul> </li> <li>• Phase – 3 activities: <ul style="list-style-type: none"> <li>○ Replacement of Legacy billing system with state-of-the-art Customer Information System,</li> <li>○ One-window customer service centers</li> </ul> </li> <li>• Phase – 4 activities: <ul style="list-style-type: none"> <li>○ Centralized Call Center with IVR</li> </ul> </li> </ul>
	<b>Sub-Activity 1.2:</b> Effective & Accurate Metering System	IRG / Engility	NRECA/ PITCO/ External Sub	Apr-13	Jun-15	<ul style="list-style-type: none"> <li>• Installation and commissioning of: <ul style="list-style-type: none"> <li>○ AMR/GPRS meters</li> <li>○ RF enabled meters</li> <li>○ Electronic meters</li> <li>○ HHUs</li> </ul> </li> <li>• Remote data acquisition</li> </ul>

	<b>Sub-Activity 1.3:</b> Upgrading Planning & Engineering with GIS Mapping	IRG / Engility	NRECA/ PITCO	Apr-13	Jun-15	<ul style="list-style-type: none"> <li>center</li> <li>• Establishment of a consumer metering unit</li> </ul> <p>For targeted divisions / subdivisions:</p> <ul style="list-style-type: none"> <li>• Complete GIS survey</li> <li>• Geo-database</li> <li>• Network analysis</li> <li>• Load flow analysis divisions</li> <li>• Establish GIS department</li> </ul>
<b>Activity 2:</b> Change Management & Human Resource Development	<b>Sub-Activity 2.1:</b> Organization Restructuring / Process Re-Engineering	IRG / Engility	EMG/ NRECA/ PITCO/ External Sub	Jul-13	Jul-15	<ul style="list-style-type: none"> <li>• Revised and improved <ul style="list-style-type: none"> <li>○ Organizational chart</li> <li>○ JDs</li> <li>○ HRM policies &amp; procedures</li> </ul> </li> <li>• Improved health policy</li> <li>• Upgraded training and safety units</li> <li>• HR manual</li> <li>• Improved accountability systems and social audit mechanism</li> </ul>
	<b>Sub-Activity 2.2:</b> HR Development / Training & Capacity Building		EMG/ NRECA/ PITCO/ External Sub	Apr-13	Jul-15	<ul style="list-style-type: none"> <li>• Upgrading of training centers</li> <li>• BoD development program</li> <li>• Management development programs</li> <li>• Functional training</li> </ul>

	<b>Sub-Activity 2.3:</b> Additional Change Management Initiatives		EMG/ NRECA/ PITCO/ External Sub	Apr-13	Jul-15	<p>programs</p> <ul style="list-style-type: none"> <li>• Train the trainers courses</li> <li>• Updated curriculum and training material</li> <li>• Strengthened capacity of IT dept</li> <li>• Improvement in system and process changes</li> <li>• Training programs</li> <li>• Change agents embedded in various DISCO functional areas</li> </ul>
<b>Activity 3:</b> Introducing Modified SCADA to Improve Power Flow Monitoring		IRG / Engility	NRECA/ PITCO/ External Sub	Apr-13	May-15	<ul style="list-style-type: none"> <li>• Installation of remote and local monitoring and control capability</li> <li>• Complete installation and commissioning of the AMRs: <ul style="list-style-type: none"> <li>○ on all incoming and outgoing feeders</li> <li>○ at common delivery points</li> <li>○ at interfaces with other DISCOs, etc.</li> </ul> </li> <li>• Improved data management at the Model DISCO, leading to a reduction in unscheduled load shedding</li> </ul>

<b>Activity 4:</b> Improving Operations & Maintenance Processes and Procedures	<b>Sub-Activity 4.1:</b> O&M Infrastructure	IRG / Engility	NRECA / PITCO	Apr-13	May-15	<ul style="list-style-type: none"> <li>• Training and capacity building of the line staff</li> <li>• Field supervision for to install the new line hardware</li> <li>• Enhanced ability to follow the new designs for meter installations, connectors, compression joints, etc</li> <li>• Improvement in subdivision office and storage areas</li> <li>• Standardize designs</li> <li>• Replacement of bare conductor with insulated conductor</li> <li>• Provision of vehicles, linemen tools, protective gear and maintenance material</li> </ul>
	<b>Sub-Activity 4.2:</b> Work Planning		NRECA/ PITCO	Apr-13	May-15	<ul style="list-style-type: none"> <li>• Implementation of software for             <ul style="list-style-type: none"> <li>○ work scheduling</li> <li>○ work flow management</li> </ul> </li> <li>• Development and implementation of:             <ul style="list-style-type: none"> <li>○ material and tool management process</li> <li>○ lockout-tag out process</li> </ul> </li> </ul>

	<b>Sub-Activity 4.3:</b> Data Gathering		NRECA / PITCO / PITC	May-13	May-15		<ul style="list-style-type: none"><li>• Databases for managing data collected from the Load Data Improvement Project</li><li>• Deployment of an outage management system</li><li>• Development of an operations management information system reporting strategy</li></ul>
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**TASK 1b: Turnaround DISCO**

The purpose of this task is to work with PESCO which is selected as Turnaround DISCO to improve its commercial, technical and financial performance by modernizing policies, processes and procedures by providing technical assistance along with modern infrastructure.

Activities	Sub-Activities	Lead	Support	Start Date	End Date	Comments	Output/Milestone
<b>Activity 1:</b> Wide Scale Electronic Metering & Reconductoring Program	<p><b>1.1:</b> Large Scale Meter Replacement Program</p> <p><b>1.2:</b> Replace of Bare Secondary Conductor with Insulated Aerial Bundled Cables (ABC)</p>	IRG / Engility	PITCO / NRECA	Sep-12	Jul-15		<ul style="list-style-type: none"> <li>• Improved metering system in targeted circles in PESCO by installing:               <ul style="list-style-type: none"> <li>○ RF meters</li> <li>○ Electronic meters</li> <li>○ Service drops security</li> <li>○ Pre-paid meters with disconnect facility</li> </ul> </li> <li>• Installation of ABC on the secondary network to prevent direct connections</li> <li>• Project task force deployment</li> <li>• Monitoring program covering consumer census</li> </ul>
<b>Activity 2:</b> AMR on High End Bulk, Industrial and Commercial Consumers	<p><b>2.1:</b> AMR Metering on B2, B3, B4 Consumers</p> <p><b>2.2:</b> Pilot a Prepayment Meter Application</p>	IRG / Engility	PITCO / NRECA / External Sub	Sep-12	Jul-15		<ul style="list-style-type: none"> <li>• Installation of AMRs on targeted high end               <ul style="list-style-type: none"> <li>○ Industrial</li> <li>○ Commercial</li> <li>○ Bulk consumers</li> </ul> </li> <li>• Implementation of GSM/GPRS networks</li> <li>• Installation of head-end system</li> <li>• Prepayment meter application</li> </ul>

<p><b>Activity 3:</b> Public Awareness - Energy Theft</p>	<p><b>3.1:</b> Designing of Campaign</p> <p><b>3.2:</b> Production of Awareness Material</p> <p><b>3.3:</b>Implementation of Campaign</p>	<p>IRG / Engility</p>	<p>External Sub</p>	<p>Nov-12</p>	<p>Mar-15</p>	<p>These activities will be implemented in PESCO headquarters and circles. While Security remains a challenge, branding waiver will be applied.</p>	<ul style="list-style-type: none"> <li>• Execution of a PESCO wide public awareness campaign on electricity theft</li> <li>• Consumer awareness material on electricity theft and penalties including: <ul style="list-style-type: none"> <li>○ Public service announcements</li> <li>○ Information brochures</li> <li>○ Billboards and posters</li> </ul> </li> <li>• Public awareness sessions at schools and community level to educate students and the general public</li> </ul>
<p><b>Activity 4:</b> Implement Enterprise Resource Planning (ERP)</p>	<p>Already Covered under Task 1a: Activity 1</p>						
<p><b>Activity 5:</b> Organizational Assessment &amp; Restructuring, Training &amp; Capacity Building</p>	<p><b>5.1:</b> Redefinition of Job Description</p> <p><b>5.2:</b> Designing &amp; Development of Performance Based Evaluation System</p> <p><b>5.3:</b> Drafting of HR Manual</p> <p><b>5.4:</b> Implementing HRIS</p>	<p>IRG / Engility</p>	<p>EMG/ NRECA/ PITCO/ External Sub</p>	<p>Sep-12</p>	<p>Jul-15</p>		<ul style="list-style-type: none"> <li>• Improved &amp; corporatized organizational structure with improved: <ul style="list-style-type: none"> <li>○ JDs &amp; KPIs</li> <li>○ PMS</li> <li>○ Compensation &amp; benefits</li> <li>○ Safety etc</li> </ul> </li> <li>• HR manual</li> <li>• HRMS implementation</li> <li>• Training &amp; capacity building <ul style="list-style-type: none"> <li>○ BoD development</li> <li>○ Management development</li> <li>○ Functional trainings</li> </ul> </li> <li>• Establishment of PMU</li> <li>• Deployment of change agents</li> </ul>

## TASK 2: Energy Conservation and Demand Side Management

The purpose of this task is to implement industrial and municipal DSM programs in the Model and Turnaround DISCOs by installing energy efficient motors, VSDs in the industry, and pump-sets in the publicly-owned water and sewerage utilities, and evaporative cooling units in urban areas.

Activities	Sub-Activities	Lead	Support	Start Date	End Date	Comments	Output/Milestone
<b>Activity 1:</b> Development of Capacity of Utility Energy Audits		IRG / Engility	PITCO	TBD	TBD	This activity is currently under review and will be reevaluated in FY 2014	
<b>Activity 2:</b> Design and Execution of DSM Programs	<p><b>Sub-Activity 2.1:</b> Urban DSM Program</p> <p><b>2.1.1:</b> Engagement of Key Stakeholders</p> <p><b>2.1.2:</b> Location Mapping of Urban Sites</p> <p><b>2.1.3:</b> Energy Auditing of Urban Sites Followed by Installation of Evaporative Coolers</p> <p><b>Sub-Activity 2.2:</b> Industrial DSM Program</p> <p><b>2.2.1:</b> Engagement of Key</p>	IRG / Engility	<p>PITCO / External Sub</p> <p>PITCO / External Sub</p>	<p>TBD</p> <p>Oct-13</p>	<p>TBD</p> <p>Jul-15</p>	<ul style="list-style-type: none"> <li>• Turnaround and Model DISCOs engaged</li> <li>• Potential sites for implementation of DSM initiatives identified</li> <li>• Evaporative coolers properly sized and installed resulting in energy savings of 9.5 MW achieved for Urban DSM Program</li> <li>• Monthly progress reports</li> <li>• Energy efficient motors properly sized and installed. Moreover VSDs replaced. Thus resulting in energy savings of 16.81 MW</li> </ul>	



**TASK 3: Cost Reflective Tariff**

The purpose of this task is to ascertain the actual cost of service for various consumer categories in each DISCO for determination of DISCO specific cost reflective tariffs. Another aspect of this task is to strengthen NEPRA to effectively regulate the electricity sector in Pakistan. The task will essentially focus on improving the internal and external capacity of the regulator.

Activities	Sub-Activities	Lead	Support	Start Date	End Date	Comments	Output/Milestone
<b>Activity 1:</b> Cost of Service Study & Tariff Design for all DISCOs	<b>1.1:</b> Data Collection and Analysis	IRG / Engility	PITCO / Smart Systems	Feb-13	Dec-14		<ul style="list-style-type: none"> <li>• Customized cost of service model and user manual</li> </ul>
	<b>1.2:</b> Customization of COS Model			Feb-13	Dec-13		<ul style="list-style-type: none"> <li>• Cost of service study for each DISCO</li> </ul>
	<b>1.3:</b> Cost Allocation & Tariff Design			Oct-13	Mar-15		<ul style="list-style-type: none"> <li>• New tariff design proposal</li> </ul>
	<b>1.4:</b> Installation of AMR Meters on selected Feeders			Oct-13	Mar-14		<ul style="list-style-type: none"> <li>• Installation of AMRs at all feeders across DISCOs for data collection</li> <li>• Tariff petitions filings based on cost of service study results</li> </ul>
	<b>1.5:</b> Assist in Preparation of Tariff Petition			Apr-14	Jul-15		<ul style="list-style-type: none"> <li>• Capacity building of DISCOs in preparation and filing of tariff petitions based on Cost of Service</li> </ul>

<b>Activity 2:</b> Assistance to NEPRA	<b>Sub-Activity 2.1:</b> Organizational Restructuring of NEPRA	IRG / Engility	External Sub	Jun-13	Jun-14	The tasks being cross cutting both internally (PDP) and externally (NEPRA) will be coordinated by PESCO Lead but functionally handled by the support teams as indicated and the consultant engaged for the purpose	<ul style="list-style-type: none"> <li>• Org assessment and report</li> <li>• Market roadmap</li> <li>• Tariff structure as per market requirements</li> <li>• Back bone IT structure provided to NEPRA</li> <li>• Better awareness of the changing world within the regulatory environment. Number of employees trained in specific fields</li> <li>• More realization and ability to adopt to the Best international practices</li> </ul>
	<b>Sub-Activity 2.2:</b> Review of Electricity Sector Market Framework			Mar-13	Jun-15		
	<b>Sub-Activity 2.3:</b> Modification in Tariff Rules and Regulations			Jan-14	Dec-14		
	<b>Sub-Activity 2.4:</b> Equipment and Software Upgrade			Mar-13	Jun-15		
	<b>Sub-Activity 2.5</b> Regulatory Partnerships			Nov-12	Jun-15		
	<b>Sub-Activity 2.6</b> Regulatory Changes			Mar-13	Jun-15		

<b>TASK 4: Capacitors at Tube-wells for Power Factor Improvement and Loss Reduction</b>							
<b>The purpose of this task is to reduce the peak MW demand through installation of 151,986 LT capacitors across 8 DISCOs in Pakistan.</b>							
Activities	Sub-Activities	Lead	Support	Start Date	End Date	Comments	Output/Milestone
<b>1: Preparations and Arrangements</b>	<b>1.1:</b> Engagement of Key Stakeholders <b>1.2:</b> Material Procurement & Logistics	IRG / Engility	External Sub	Dec-12	Jul-15		<ul style="list-style-type: none"> <li>DISCOs engaged in providing support to the LT Capacitor Installation teams</li> <li>Feeder-wise selection of consumers with low power factors</li> <li>Establishment of comprehensive Material Logistics System</li> </ul>
<b>2: LT Capacitor Installation</b>	<b>2.1:</b> Energy Audits of Sites <b>2.2:</b> Installation of LT Capacitors <b>2.3:</b> Monitoring & Evaluation	IRG / Engility	External Sub	Dec-12	Jul-15		<ul style="list-style-type: none"> <li>A maximum of 151,986 LT Capacitors properly sized and installed resulting in energy savings of 218 MW</li> <li>Proper sized capacitor installations ensured</li> </ul>
<b>3: Capacity Building of DISCO Line Staff</b>	<b>3.1:</b> Classroom and on-field Trainings <b>3.2:</b> Provision of Tools and Equipment used for Energy Auditing	IRG / Engility	External Sub	Dec-12	Jul-15		<ul style="list-style-type: none"> <li>DISCOs (including the Model and Turnaround DISCOs) having the technical capacity and the equipment needed to undertake future LT Capacitor installation activities on their own</li> </ul>

TASK 5: Feeder Optimization for Loss Reduction							
Activities	Sub-Activities	Lead	Support	Start Date	End Date	Comments	Output/Milestone
Feeder Optimization	<b>1:</b> Implement Feeder Optimization and Congested Area Strategies on High-loss Feeders <b>2:</b> Implement Outage Reduction Improvements <b>3:</b> Feeder Power Flow Analysis Using new Technology and Software <b>4:</b> Installation of Proper 11kV HT Capacitors	IRG / Engility	NRECA / PITCO	Sep-12	Jul-15		<ul style="list-style-type: none"> <li>• Installation of improved distribution equipment on high loss feeders and in congested areas</li> <li>• Installation of outage reduction equipment</li> <li>• Installation of 11 kV HT capacitors on feeders and in grid stations</li> </ul>

**TASK 6: Expansion of High Impact Opportunities and Governance**

The purpose of this task is to identify and implement a number of high impact short lead-time activities.

Activities	Sub-Activities	Lead	Support	Start Date	End Date	Comments	Output/Milestone
<b>Activity 1:</b> Load Data Improvement Project	<p><b>1.1:</b> Obtaining Load Flow Information</p> <p><b>1.2:</b> Installation of AMR-data Acquisition Meters</p> <p><b>1.3:</b> Information Supplied to NPCC &amp; DISCO Power Dispatch Centers</p>	IRG / Engility	PITC	Aug-12	Jul-13		<ul style="list-style-type: none"> <li>• Installation of data gathering devices /AMRs on all incoming and outgoing feeders in 9 DISCOs</li> <li>• Near real time data provided to NPCC and all DISCO Power Dispatch/Control Centers</li> </ul>
<b>Activity 2:</b> Improved Meter Reading	<p><b>2.1:</b> Selected of Target Subdivision</p> <p><b>2.2:</b> Consumer Census</p> <p><b>2.3:</b> Meter assessment</p> <p><b>2.4:</b> Implementing HHUs</p>	IRG / Engility	NRECA / PITCO	Apr-13	Jun-15		<ul style="list-style-type: none"> <li>• Improved commercial processes</li> <li>• HHU with picture taking capability implemented</li> <li>• Project close-out report for USAID</li> </ul>
<b>Activity 3:</b> Line Staff Skill Development	Covered in Activity-5 below						

<b>Activity 4:</b> Governance	<b>Sub-Activity 4.1:</b> Governance at MWP Level:	IRG / Engility	NRECA	Mar-13	Jan-15	Assistance to be provided to both MWP & MOF and training and capacity building of DISCO BoD	<ul style="list-style-type: none"> <li>• Electricity Act amended resulting in improved power sector governance</li> </ul>
	<b>Sub-Activity 1:</b> Assist in amendment of Electricity Act						<ul style="list-style-type: none"> <li>• Realignment of MWP role as policy maker rather than owner</li> </ul>
	<b>Sub-Activity 2:</b> DISCOs Reform						<ul style="list-style-type: none"> <li>• Will help reduce the circular debt by improving cash flows of TDS</li> </ul>
	<b>Sub-Activity 3:</b> Prevent Accumulation of Circular Debt						<ul style="list-style-type: none"> <li>• Implement PPAs</li> </ul>
	<b>Sub-Activity 4:</b> Implementation of Power Purchase Agreements						<ul style="list-style-type: none"> <li>• Adoption of National Safety Code</li> <li>• PEPCO dissolved</li> </ul>
	<b>Sub-Activity 5:</b> Assistance to MWP on National Safety Code						<ul style="list-style-type: none"> <li>• Development of corporate improvement action plans</li> </ul>
	<b>Sub-Activity 6:</b> Dissolution of PEPCO	<ul style="list-style-type: none"> <li>• Adaptation / approval of revised polices</li> </ul>					
<b>Sub-Activity 4.2:</b> Governance at DISCO Level	IRG / Engility	Feb-13	Aug-15	<ul style="list-style-type: none"> <li>• Development of monitoring and evaluation plan – for DISCOs</li> <li>• Training of BOD through professional institutions; and Certification of Directors</li> </ul>			
<ul style="list-style-type: none"> <li>• Development of Policies in line with Mandate by MWP</li> <li>• Oversight over Financial and</li> </ul>							

	operational discipline <ul style="list-style-type: none"> <li>• Facilitation and Development / Training Program</li> <li>• Assessment of BOD Functions</li> </ul>						<ul style="list-style-type: none"> <li>• Develop a BOD function assessment process and plan</li> </ul>
<b>Activity 5:</b> Linemen Training		IRG / Engility	NRECA	Oct-12	Jul-15		<ul style="list-style-type: none"> <li>• Reduction in fatal / non-fatal accidents</li> <li>• Improved quality of maintenance work leading to reduction in losses</li> <li>• Up gradation of RTCs / CTCs</li> <li>• Provision of tools to linemen</li> <li>• Delivery of training and training material</li> </ul>

### Cross-Cutting Activities: Gender Strategy

The purpose of this activity is to build capacity of and increase the number of women in technical leadership and decision-making positions at the Model and Turnaround DISCO including commercial, finance, and engineering divisions to facilitate transformation of DISCOs into competitive, diverse, profit-making entities in the long term.

Activities	Lead	Support	Start Date	End Date	Comments	Output/Milestone
<b>Activity 1:</b> <ul style="list-style-type: none"> <li>• Gender Equity Training</li> <li>• Women &amp; Energy Workshop</li> <li>• Women in Leadership</li> </ul>	IRG / Engility	External Sub	Apr-13	Jun-15	<ul style="list-style-type: none"> <li>• Reduce recruitment disparities and to facilitate women's entry into the power sector</li> <li>• Supports increase the number of women managers and directors</li> <li>• Increase the number of women in technical positions and decision making level</li> </ul>	<ul style="list-style-type: none"> <li>• Implementation of policies to attract women employees</li> <li>• Career focused trainings for women employees</li> <li>• Provision of improved working conditions to female staff</li> <li>• Long-term engagement of women in power sector</li> </ul>

### Cross-Cutting Activities: Internship Program

The purpose of this activity is to build capacity of PESCO and Model DISCO employees and graduates, instill best practices and increase the number of young professionals in the power sector to facilitate bottom-up transformational change at the DISCOs. This opportunity will provide valuable professional experience and build leadership skills of new graduates.

Activities	Lead	Support	Start Date	End Date	Comments	Output/Milestone
<b>Activity 2:</b> Facilitate Bottom-up Transformational Change at the DISCO by Hiring & Deputing Interns	IRG / Engility	Local Universities	Oct-12	Jul-15	Link internship program with model and turn around DISCO with specific focus on planning, or other areas	<ul style="list-style-type: none"> <li>Hiring of interns from multi-dimensional academic portfolio for PESCO</li> <li>Development and implementation of a comprehensive orientation program for interns</li> </ul>

**Cross-Cutting Activities: Communications**

The purpose of Communications Program is to build capacities of both Turnaround and Model DISCOs in communications and outreach and assist them in use of streamlined techniques and tools to improve their outreach and service to consumers.

Activities	Sub-Activities	Lead	Support	Start Date	End Date	Comments	Output/Milestone
<b>Activity 3:</b> Communications	<ul style="list-style-type: none"> <li>• External DISCO Communications</li> <li>• Internal DISCO Communications</li> <li>• PDP Project Communications</li> </ul>	IRG / Engility	External Sub	Nov-12	Jun-15	These activities will be implemented in PESCO headquarters and circles. While Security remains a challenge, branding waiver will be applied	<ul style="list-style-type: none"> <li>• Establishment of a Communications and Outreach office</li> <li>• Communications and Outreach campaigns</li> <li>• Community / Schools events</li> <li>• Text Messaging (SMS) Service</li> <li>• Revamping DISCO official website</li> <li>• Revamping DISCO's corporate branding</li> </ul>

## Annex 3: Risk Matrix

Task	Objectives	Risks / Challenges	Mitigation Approach
<b>Task 1a. Activity 1, Sub-Activity 1.1 &amp; Task 1b. Activity 4. relating to ERP / CIS</b>	<p>1. The availability of timely and accurate business information through back-office automation</p> <p>2. Integrate and automate commercial operations to reduce commercial losses and improve efficiency and quality</p>	<p>1. DISCO staff lack skills and aptitude to adopt to ERP environment</p> <p>2. DISCO staff may resist this change</p> <p>3. ERP system may not provide information in accordance with regulatory requirement</p> <p>4. Labor Union might resist this change by perceiving that ERP implementation will result in job layoffs</p> <p>5. Transition from manual to automated/semi-automated process flow</p>	<p>1. To build capacity by providing trainings to DISCO staff, involving them right from design to implementation and provide day to day support through PDPs advisors placed at the DISCOs</p> <p>2. To establish steering committee comprising board members to champion this change and conduct monthly review of status of ERP project. Moreover, PDP will conduct awareness workshops and reach out to the internal stakeholders through publication of ERP newsletters periodically</p> <p>3. To conduct periodic meetings with NEPRA and MWP to ensure that regulatory requirements are incorporated in 'to be' documentation for implementation of ERP</p> <p>4. Awareness strategy starting from the BOD down to all levels of the organization, especially addressing the labor unions, giving the message that the ERP implementation will not result in reduction of jobs but increase productivity of employees</p> <p>5. Change management, capacity building, phased implementation</p>

Task	Objectives	Risks / Challenges	Mitigation Approach
		6. Selection of correct/appropriate information systems that will fulfill DISCO needs	6. Detailed user requirements analysis and participation of users and managers during the selection and design phase
<b>Task 1a. Activity 1, Sub-Activity 1.2 &amp; 1.3, Activity 3 &amp; 4 and Task 1b. Activity 1&amp;2 relating to technical interventions</b>	To improve the technical performance of DISCOs by providing modern technology and infrastructure	<p>1. Inadequate coordination between Technical Team and other PDP teams could result in late discovery of conflicts and less than optimum results</p> <p>2. Funding by the DISCOs for sustainability and maintenance are issues which can impact success of technical projects</p> <p>3. GPRS reliability, particularly during times of civil unrest when gov't shutdown of GPRS network may occur</p> <p>4. Installation of new RF or AMR meters require verification proper communications and operation</p> <p>5. Customer resistance may delay schedule</p> <p>6. Higher quantity requirements in specified subdivision due to addition of new customers or bifurcation between order placement and installation</p> <p>7. Delay in DISCO installation support impacting schedule</p>	<p>1. Identification interdependencies followed by communication on frequent basis with other teams to keep each other informed</p> <p>2. High priority on having clear understandings with DISCO management, with specific commitments in writing</p> <p>3. Develop strategies and procedures to cope with such occurrences with users</p> <p>4. Establish capability of on-site acceptance testing using PDP personnel</p> <p>5. Work with DISCO to establish customer preparation and communication ahead of installation, learn from current HESCO experience</p> <p>6. Close coordination with DISCO on expected totals and allowances</p> <p>7. Obtain strong CEO and BOD agreement with MWP concurrence for DISCO services to be provided. PDP to closely monitor and control the installations</p>

Task	Objectives	Risks / Challenges	Mitigation Approach
		8. Law and order situations impacting ability to complete work	8. Close coordination with DISCOs to plan work in areas with low probability of law and order issues
		9. Material delivery delay	9. Plan for contingency in schedule- specify standard product
		10. Design completion delays	10. Plan for contingency in schedule and keep design simple and make maximum use of current practices
<b>Task 2: Energy Conservation and Demand Side Management</b>	1. To replace inefficient motors and install/replace Variable Speed Drives in the Industrial Sector  2. To replace and inefficient municipal pump-sets in the publicly-owned water and sewerage utilities	1. The environmental risk of having the inefficient replaced pump-sets and motors getting re-installed into the system  2. The disposal of inefficient replaced pump-sets and motors in a safe and environmentally friendly manner	This will be achieved through the implementation of the USAID Environmental Mitigation and Monitoring Plan (EMMP), covering all aspects of the task i.e. removal of old motors and pump-sets, their transportation, storage and final disposal
<b>Task 3, Activity 1: Cost of Service Study</b>	To ascertain the actual cost of service for various consumer categories in each DISCO for determination of DISCO specific cost reflective tariffs	1. Lack of cooperation from DISCOs  2. Poor data quality  3. Acceptability of the model and methodology  4. Delays in load measurements at due to delay in metering equipment installation	1. Constitution of liaison committees in each DISCO  2. Detailed data analysis, scrutiny and cross verification from multiple sources  3. Ensure presentations to all stakeholders to seek their buy-in through workshops  4. Use of alternate allocation criteria in case of delay in data collection due to delay in installation of AMR meters on selected feeder
<b>Task 3, Activity 2: Assistance to NEPRA</b>	To improve the overall environment of Governance of the sector through strengthening the regulatory	1. Non-committal approach by NEPRA management	1. Frequent and regular meetings with members and professionals of NEPRA. Engaging them through workshops, seminars and discussion forums with

Task	Objectives	Risks / Challenges	Mitigation Approach
	environment/ regime	<p>2. NEPRA management changes during the tenure of the program</p> <p>3. Non related trainings</p> <p>4. NEPRA does not provide client end equipment for IT infrastructure provision</p>	<p>notes and action items as outputs and circulated to all</p> <p>2. Constant engagement with all Sr. management. Even if some of the members are changed, the others and the Sr. professionals can keep the pace and scope of the project intact</p> <p>3. Trainings will be jointly identified by NERPA and PDP by performing Trainings Need Assessment (TNA). A guide line will be provided for NEPRA to remain focused</p> <p>4. PDP will provide the infrastructure of creating a back bone system for NEPRA's IT system. It will not provide end machines. It will be a self-executed project till its end point</p>
<b>Task 4: Capacitors at Tube-wells for Power Factor Improvement and Loss Reduction</b>	To reduce the peak MW demand through the installation of capacitors for the purpose of power factor correction	<p>1. Oversized installation of capacitor which may result in a power factor correction that goes as high as 99% or even greater than 1, leading to long term damage to the farmer's motor</p> <p>2. DISCOs are short staffed, and the risk of getting linemen to locate tube-well sites and assist in their installations is crucial</p>	<p>1. The PDP methodology for Capacitor sizing has stringent rules for establishing only 95-96% Power Factor. PDP will supervise and conduct regular spot checks of LT capacitor installations to ensure that capacitor installations are carried out by the installation teams according to the guidelines for the installation and capacitor sizing provided by PDP</p> <p>2. PDP will work with DISCO senior management to ensure requisite linemen are made available. PDP management has secured commitment from the CEOs and senior management of all DISCOs</p>

Task	Objectives	Risks / Challenges	Mitigation Approach
		<p>3. Rural areas of Pakistan suffer extreme load shedding, most often 16 hours a day. This can hamper an installation team's work as no pre-audit and right capacitor sizing can take place</p>	<p>already</p> <p>3. PDP Senior Management will coordinate with the DISCOs and seek their support in coordinate load shedding on feeders where LT Capacitors are being installed</p>
<b>Task 6: Activity-Governance</b>	<p>Improve governance in the sector and realignment in the role of MWP as a policy maker rather than owner of these public sector entities</p>	<p>1. Risk of not to complete the task in the allotted time period with agreement of multiple stakeholders</p> <p>2. Lack of support and cooperation from employees and unions</p> <p>3. Weak financial position of the government</p> <p>4. Financial and operational independence of DISCOs</p> <p>5. Lack of support from the stakeholders</p>	<p>1. Find champions and stakeholders wanting the same objective</p> <p>2. Find champions to facilitate the process</p> <p>3. Strong Donor conditionality for the government to improve its overall governance</p> <p>4. Strong USAID's conditions with GOP for lending funds</p> <p>5. Find champions and stakeholders wanting the same objective</p>
<b>Cross-Cutting Task: Internship Program</b>	<p>Instill best practices and increase the number of young professionals in the power sector to facilitate bottom-up transformational change at the DISCO</p>	<p>1. DISCO staff unwilling to accept new interns</p> <p>2. Unavailability of space for interns and other initiatives</p>	<p>1. In order to avoid resistance on part of DISCO staff, the resource gap analysis, the respective positions, JDs and their section will be prepared keeping the DISCO Section Heads on board. Interns will be mentored under DISCO TLs</p> <p>2. DISCO section heads have agreed to attach their team members with the trainee /interns – who will be working together in collaboration, thus reducing the eventual “work in isolation”</p>

Task	Objectives	Risks / Challenges	Mitigation Approach
		<p>3. Lack of intern capability to perform according to PDP and DISCO standards</p> <p>4. Obstacles in the sustainability of project</p>	<p>3. The number of interns, their placement and other initiatives are to be taken with the buy in of DISCO senior management that will ensure space availability</p> <p>4. Interns will be monitored and evaluated under a strict performance management system, by PDP Internship team, PDP respective team members and DISCO management. Interns will be disengaged if performance is below standard. In order to ensure sustainability of the project, interns are to perform all tasks with two or one appointed DISCO staff. This staff will be trained in the process of two years. Measures to keep Interns on board will also be encouraged in discussions with DISCO HR management</p>
<b>Cross-Cutting Task: Gender Strategy</b>	Mainstreaming gender in target DISCOs where applicable to be fully aligned with USAID policy on gender equality and women's empowerment	<p>1. Culture of respective DISCO regions might be resistant to gender equity trainings (GET)</p> <p>2. Lack of females willing to work at DISCOs</p> <p>3. DISCO employee might be resistant to change</p>	<p>1. In order to avoid resistance, DISCO HR staff will be taken on board and accompany trainer where necessary. Undertaking GET will be mandatory for all the employees of all levels</p> <p>2. Measures will be taken to promote female employment in DISCOs, especially at policy level, with the help of the Governance Team. All employment opportunities will encourage females to apply</p> <p>3. All changes shall be taken at policy level through regulatory bodies and Governance Team. Gender equity trainings will be made mandatory for all employees</p>

Task	Objectives	Risks / Challenges	Mitigation Approach
		4. Resistance in advancement of female employees stuck in dead end jobs	in order to help mainstream gender initiatives  4. Policy level changes will be encouraged to promote advancement of women and change in job transfer and promotion strategies within the organization
<b>Cross-Cutting Task: Communications</b>	Improve USAIDs and DISCO's image and promote energy conservation	<p>1. Lack of cooperation from DISCO staff</p> <p>2. PR is a neglected area in DISCO business</p> <p>3. Lack of ownership and resources availability at DISCOs</p> <p>4. Weak internal coordination and information sharing among DISCO departments</p> <p>5. Limited use of DISCO official logo and uniform branding on stationery and events</p>	<p>1. Form a forum of DISCOs staff and meet periodically to discuss interventions</p> <p>2. DISCO management will empower PR department to effectively coordinate internal and external communications</p> <p>3. DISCO nomination of a fulltime focal person dedicated to website and branding</p> <p>4. Proposing internal coordination system and information system to DISCOs for implementation</p> <p>5. Change management at all levels to stop "WAPDA" branding and encourage DISCO's branding</p>





## Annexure 4: Linemen Training, Tools & Equipment Methodology

### Executive Summary

Investment in linemen through the provision of proper training, tools and transportation provides a positive return to the DISCOs in many ways. Improved customer satisfaction and decreased technical losses, are they direct result from the proper tooling and training of linemen as workmanship in line maintenance leads to improved system performance.

The Lineman Trainings, Tools and Equipment Intervention is an activity PDP is planning to implement for improving the revenues and saving the MWs through improved O&M techniques specific to line maintenance leading to proper power line binding techniques. Below is a brief write-up of the logic chain used and benefits to be incurred through this activity, with supplemental information immediately thereafter.

**Impacts Due to Improved O&M Line Binding Techniques:** DISCOs experience high technical losses due as poorly trained and equipped linemen carry out distribution system repairs in a sub-standard manner. Sub-standard binding of connections in the system (connecting a power lines to a transformers, connecting power lines to other power lines when extending a system, or connecting power lines to other power lines when repairing a snapped or sagging line) are routinely carried out as linemen lack basic training, tools, equipment and transportation. As a result, an estimated 60% to 70%<sup>1</sup> of all binding points in the system are sub-standard in quality and result in unnecessarily high technical losses. With proper training and access to proper tools and equipment, linemen will address poorly bound connections currently in the system as well as address properly future repairs. An investment of \$1.8 million in training/tools/equipment will result in 4 MWs saved, translating into annual energy savings of 21 million KWh and an annual cost savings of \$1.63 million. Deferred investment in generation is \$4.7 million.<sup>2</sup>

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<sup>1</sup>However, in our methodology (attached), we have calculated benefits by assuming replacement of 40% sub-standard joints. This is conservative.

<sup>2</sup> The proposed activity is modular. If we change only the connectors of HT/TRFs/LT main of entire PESCO, the MWs saved comes out to be 16 MWs at CDPs translating into annual energy of 84 Million KWh and annual cost savings to PESCO of \$6 million. Deferred investment in generation is \$19 million.



## Narrative on Methodology for Quantifying the Results from Linemen Training, Tools and Equipment Intervention

### Background:

Linemen Training, Tools and Equipment is an essential intervention for transforming DISCOs front-line operations to match that of well-run utilities. The broad spectrum of benefits reaping out from this intervention range from reduction of the linemen injuries to MWs saved and improved revenues for the DISCOs. The methodology is placed at Annex-4.1, with validation check for the methodology performed in the same Annexure; Table-4. The quantification of results will not only help USAID PDP to report quantifiable results reliably but will also make DISCOs to see value in this high impact intervention and continue this good work in the long-run.

Losses in the distribution system are broadly attributed to HT line losses, transformation losses and LT line losses. The three main components of losses do also include the losses due to connectors, as connectors are used to bind line with line and line to the transformers. If these connectors become loose (have air gaps over time) due to substandard material used for the connectors and the workmanship to install them, than the power losses in the connector becomes high. Even further adding to the problem are the environmental affects that increase the power losses of the loose joints.

In Pakistani DISCOs, the 'binding method' (see picture 'A'; Annexure-4.2) is used on large scale to bind conductors at HT & LT lines and transformers. Unskilled labor and negligence results in improper joint formation (loose joints with substandard material). In due course of time it is observed that loose connections, improper binding, faulty method of construction, pole bending, increase of sag tension and use of substandard material for jointing loosen the joints further, thus increasing the power losses.

The Lineman Trainings, Tools and Equipment is the intervention PDP is planning to implement for improving the binding of joints in the distribution system that will just not only save MWs and improve revenues for the DISCOs, but also improve upon the safety (employees and general public), reliability of supply and customers satisfaction.

### RF Indicator:

- **IR 1.2-1:** Megawatts (MWs) of electrical power added or saved as a result of United States Government support to distribution companies.
- **IR 1.3-1:** Revenue at distribution companies.
- **IR 2.3-2:** Percent change in the number of linemen injuries and deaths (PDP).
- **Proposed**
  - Deferred Investment in New Generation.
  - Improvement in System Average Interruption Duration Index (SAIDI).
  - Improvement in System Average Interruption Frequency Index (SAIFI).

### Definition of New Proposed Indicators:

- **Proposed**
  - Deferred Investment in Generation: This indicator measures the deferred investment in new generation in the system by the extent of savings in megawatts.
  - Improvement in System Average Interruption Duration Index (SAIDI): Means the average duration of consumer power supply interruptions per consumer occurring in a given year, determined by dividing the aggregated sum of all consumers' power supply interruption durations in minutes by the total number of consumers served by a distribution company in a given year.
  - Improvement in System Average Interruption Frequency Index (SAIFI): Means the average frequency of consumer power supply interruptions per consumer occurring in a given year, calculated by dividing



the total annual number of consumer power supply interruptions by the total number of consumers served by a distribution company in a given year.

### Data Source:

The data used in calculations for the methodology is taken from the following reliable sources:

1. DISCOs Performance Statistics Report (Fiscal Year 2010-11 & 2011-12).
2. USAID-PDP's Analysis of Technical & Non-Technical Losses of DISCOs, based on the Engineering Studies Conducted under Component 1, the Operational Audits. (Annex 4.1; Table 5).
3. Modeling of Power Loss in Joints of Power Distribution Systems, by National Power Institute, Faridabad, India (Annex-4.3).

### Methodology for Calculation:

This narrative will be referring to the Tables (1-5) and their respective columns of the calculation sheet placed at Annex-4.1.

The Tables-1&2 of Annex-4.1 entails the losses for connectors coming out of the study mentioned at data source item number 3 above. Table-1 entails the analysis done on an 11 kV feeder with the attributes and conditions that match the overall attributes and conditions of the distribution network of PESCO. Compatibility analysis is also performed (Annex-4.1) just to make sure that the study done in India is applicable to our conditions here. Two major factors were compared to do this analysis, which are; a) the amount of load flows from the distribution system and b) the temperature of the environment, as the losses of a 'same connector' are directly proportional to these two factors.

The compatibility analysis reveals that the average load flows through the feeders at PESCO on HT and LT level and the temperature are even more than at Faridabad. Therefore, this study conducted in India is applicable and is used to form the basis of our analysis given in Annex-4.3.

Table-3 in Annex-4.1 is used to estimate the power connector losses for PESCO, Peshawar Circle in particular and then expanding it to overall PESCO covering all six circles. Table-3, contains 24 columns in total, this narrative will be referring to the columns of the Tables for clear understanding of the reader. The first five columns 1-5 are taking values of average number of joints and total losses from Table-1&2, which are then used to calculate the loss per connector in Column 5 by dividing Column 4 (total loss of all the connectors) by Column 2 (number of connectors contributing to the loss). E.g. the loss per connector of 11 kV line comes out to be 5 Watts.

Columns 6-15 are used for Peshawar Circle calculations. Using conservative estimates, in Column 6 (the total number of binding connectors per km of line or on distribution transformer for Peshawar Circle). It is conservatively estimated that at least 40% of the connectors are unhealthy; therefore the total number of unhealthy connectors are calculated in Column 7 by multiplying Column 6 with a fraction of '0.4'. Column 8 has the data for the total length in km of HT/LT line and the total number of transformer. Now, the total power saved in MW (Column 9) by replacing the unhealthy connectors is calculated by multiplying Column 5, 7 and 8, e.g. 0.11 MW would be saved for 11 kV line which is 5667 km in length and has around 4 unhealthy connectors per km by multiplying these with average loss per connector i.e. 5 Watts. MW saved are converted into an equivalent annual energy in million KWh (Column 10) by multiplying with number of hours in a year i.e. 8760 and considering a load availability factor of 60%.

In Column 11, power lost in MW at Common Deliver Points (CDPs) is calculated by multiplying the power saved in Column 9 with respective loss percentage (based on the % losses values in different sections of the Transmission & distribution systems for PESCO; Table-5). The narrative of the losses considered is given in Column 11. Column 12 is used to calculate an equivalent annual energy in million KWh on CDPs by multiplying MW power lost in Column 11 with number of hours in a year i.e. 8760 and considering a load availability factor of 60%. The energy saved mentioned in Column 12 is converted into equivalent annual



revenue savings by PESCO in Million US\$ (Column 13) by multiplying units of energy in KWh with average sale rate for PESCO ending FY 2011-12 (without taxes and duties) per unit of PKR 7.32, at a forex rate of PKR 94.5 (ending June 2012). Column 14 is calculating MW saved at generation end by adding 1.41% additional losses of NTDC's transmission system. In Column 15, deferred investment in generation in million US\$ is calculated by multiplying Column 14 with a US\$ 1.171 million, which is an average cost to add 1 MW of new generation. There are total six Circles in PESCO, in Columns 16-20, extrapolation of the benefits are done by applying the same methodology. Through Columns 21-24, the benefits from Peshawar Circle and other five Circles are aggregated to compute the DISCO-wide benefits. The results are given as under:-

#### **Results:**

For Peshawar Circle: If we change only the connectors of HT/Transformers /LT main of Peshawar Circle, the MWs saved comes out to be 4 MWs translating into annual energy savings of 21 Million KWh and annual cost savings to PESCO of US\$ 1.63 million. Deferred investment in generation is US \$ 4.7 million.

For Entire PESCO: If we change only the connectors of HT/ Transformers /LT main of entire PESCO, the MWs saved comes out to be 16 MWs translating into annual energy savings of 84 Million KWh and annual cost savings to PESCO of US\$ 6 million. Deferred investment in Generation is US \$ 19 million.

Table-5 is an extract of losses study of DISCOs by PDP, conducted in 2010 under Component 1. It contains the break-up of losses for all DISCOs including PESCO, in-terms of Transmission losses and distribution losses (technical and non-technical). These values as mentioned above are utilized for calculations in Table-3.

#### **Validation of the Results:**

Table-4 is based on the fact that the overall losses of the connectors for PESCO come out to be 5.3% of the total technical losses i.e. 15.6%. Therefore, 5.3% of 15.6% comes out to be 0.83%. This means that the total technical loss is 15.6% and only 0.83% of the losses are attributable to bad connectors and the rest of 14.7% are attributable to HT/LT line losses and the transformation losses, which is acceptable by engineering standards.



## Sub-Annexure



## Linemen Training, Tools & Equipment Methodology-Calculation Sheet

The excel workbook has two sheets, one on the compatibility analysis and the second with detailed calculations for Linemen Training, Tools & Equipment methodology.



# Lineman Tools & Trainings Methodolog



## Baseline Condition of Connectors at DISCOs

Picture 'A' shows the poor conductors existing in the distribution system of the DISCOs incurring losses. On right side of picture 'A', picture 'B' depicts the proper connectors installed on the distribution lines.

The pictures 'C' & 'D' shows the existing connectors utilized at the DISCOs, incurring technical losses. Through this intervention DISCOs linemen will be trained and equipped to install the connectors shown in the picture 'E' & 'F' on the distribution system resulting in savings in revenues and MWs.



Picture 'A': Poor Connectors

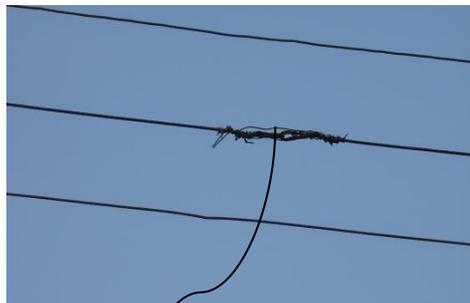


Picture 'B': Proper Line Binding

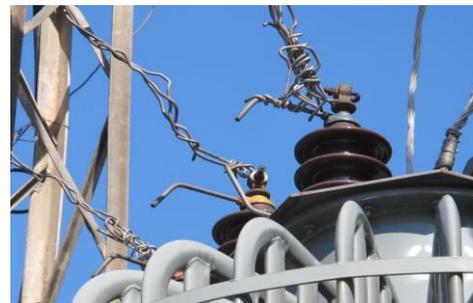
### *Line Connectors*

### *Transformer Connectors*

**BEFORE**



(Picture 'C')  
Binding Connector



(Picture 'D')  
Binding Connector

**AFTER**



(Picture 'E')



(Picture 'F')



Modeling of Power Loss in Joints of Distribution System



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