INTRODUCTION

Significant changes in the structure of the electricity industry have taken place, culminating with a major restructuring in July 2001 that unbundled production, transmission and distribution to form 14 power sector companies (PSCs) 100% owned by the Egyptian Electricity Holding Company (EEHC). Current law permits sale of up to 49% of the shares of these companies.

The Regulatory Agency, created in the year 2000, is becoming operational. The Rules of Procedures as well as Generation, Transmission and Distribution licenses have been prepared. Changes in Egypt’s regulatory environment are driving an overall shift in vision in all areas of business.

During 2002, the challenge was developing the cost-based Egyptian Power Pool (EPP) to enable these PSCs to operate through formal agreement among themselves, including a Billing and Payment System, rather than under the direct control of EEHC.

The new companies developed their organization structures to include new activities required by deregulation (e.g., financial management, information technology & financial inspection, quality monitoring, customer service, etc). The CIRED Egyptian liaison committee is following the established terms of reference for power quality for all the PSCs in Egypt during its meetings.

EEHC’s subsidiaries, the Alexandria Electricity Distribution Company and the West Delta Production Company are implementing a pilot-reengineering project to reduce the costs and cycle times of various processes, derive more accurate cost data, increase revenues and enhance competitiveness. The Reengineering started with Activity Based Cost Accounting, Maintenance Management, Inventory and Procurement Management Processes, Alternate Revenue Sources, and Billing&collection processes. To improve the technical, for financial and economic performance, the companies concurrently prepared a “Performance Based Budget” for FY 2003 instead of the traditional “Line Item Based Budget.” The budget includes goals, programs and targeted values of performance indicators.

EGYPTIAN ELECTRICITY SECTOR – HISTORY AND PRESENT STATUS OF LIBERALIZATION

Electricity was introduced in Egypt in 1893. Generation and distribution were privately owned and operated for about 70 years until nationalization took place in 1962. Till then the private owners built only 3000 MW. Since then, the Ministry of Electricity, managing the power sector, has served the country by adding 13,000 MW. Thus continuously keeping supply ahead of demand.

The Government of Egypt was committed to reforming the electric power generation, distribution and transmission components to achieve full commercial operation, and introduce competition. In 1998, the three electricity components were geographically reorganized to form seven vertically integrated electricity companies responsible for generation and distribution. See Figure 1 for the pre-restructuring organization chart. In 2000, these companies were placed under a Joint Stock Company, the Egyptian Electricity Holding Company (EEHC). Until mid-2001, Egyptian electric utility customers bought electricity on a bundled basis that provided a package of services including generation, transmission and distribution as well as a variety of energy management services.

The structure of EEHC before 1/7/2001

EEH_Abouneima_A1 Session 6 Paper No. 4
The current structure

Egyptian Electricity Holding Company

Production Companies
- Coal
- East Delta
- West Delta
- Upper Egypt
- South Delta
- North Delta
- Cairo
- Mid Delta
- Upper Egypt
- Nile Plants

Figure 2: Egypt’s Post-Restructuring Electric Utility Industry Regulatory

REGULATORY ENVIRONMENT

A year 2000 Presidential Decree authorized establishment of the Egypt’s Electric Utility and Consumer Protection Regulatory Agency. The Board of the Regulatory Agency is chaired by the Minister of Electricity and Energy and includes eleven members (three representing the sector, four representing the customers, and three experts in the technical, legal and economic areas).

The responsibilities of the regulatory agency include:
- Ensure legitimate competition in the sector to protect consumer interests
- Protect the interests of all parties concerned within the electricity sector
- Ensure a fair return for the electric utilities to promote the sound financial footing required for sustainable operation
- Ensure the quality of technical and administrative services provided to consumers
- Protect consumers by responding to their complaints and by settling disputes between the various sector participants.
- Grant licenses to establish, manage, operate and maintain electric power generation, transmission, and distribution.

The changes in Egypt’s electric regulatory climate will drive an overall shift in vision in all areas of business. The regulatory agency has already started work on several fronts that needed immediate attention. The agency has already prepared the rules of procedures and licenses for the generation, transmission and distribution of electricity in the country. Currently the agency is in the process of issuing licenses to all the generating entities as well as all the distribution companies that sell electricity to final customers. Concerns over Egypt’s extremely competitive global market have already forced many Egyptian organizations to reevaluate their process and resources. All Egypt’s electricity regulations and policies are, therefore, being reviewed and are in a state of being updated.

As part of its mandate, the regulatory agency will also examine those functions in the companies that are subject to regulated sale and purchase of electricity. These functions are managed by the formal agreements established by the Egyptian Power Pool and supported by a computerized billing system to manage the data and transactions.

EGYPTIAN POWER POOL

Creation of the Egyptian Power Pool (EPP) was deemed essential to the viable operation of the new companies in the restructured electricity industry. The EPP was developed during 2002 with its fundamental characteristic being a cost-based pool designed to link, through formal agreements, the fourteen main PSCs. Challenging aspects of developing the EPP have included: determining the principles governing the mechanisms for Revenue Adjustment, Cash Management, setting the terms of the Purchase Agreements; and terms of the Sales Agreements; and, the basis for allocation of fixed costs and for available forecast profit; impact of collection ratios to end-use customers, and incentives to improve performance. The most prominent function is the Single Buyer residing within the Egyptian Electricity Transmission Company (EETC). EETC will be the sole organization to purchase bulk power from Generation Companies (and other bulk power providers), and the sole organization to sell bulk power to Distribution Companies. (See Figure 3.)

The PSCs are separate organizations linked through formal arrangements. These include a separate agreement between EETC and each Generation Company, and between EETC and each Distribution Company. The existing BOOT and export/import contracts are presently with EEHC. They will be assigned to EETC, or an Agency agreement may be established between EEHC and EETC to manage those contracts.

Based on the terms of the agreements, the National Energy Control Center (NECC), as part of EETC, continues to direct the operation of the generators and the high voltage transmission system to minimize overall costs while maintaining system reliability.

Each Distribution Company will have responsibility for planning its own system, in some cases with assistance
from the Rural Electricity Authority. Each Distribution Company will also be responsible for the load forecast in its own area. EETC will be responsible for forecasting the loads of the UHV and HV customers.

EEHC retains the key generation planning responsibilities, including the timing of new power plants, technology, arranging the financing, assisting with the tender process, and other related responsibilities.

EEHC also plays a primary role in transmission planning. EETC’s Articles of Association provide that it will “…join EEHC in making technical and economic studies for the future transmission plans and projects for achieving stability and for meeting the increased demand, and implementing, with respect to the schedule time, the projects approved by the EEHC Board of Directors which are related to the transmission of electric power of both high and extra-high voltage.”

Based on overall pricing principles and within the framework established by the agreements, the fixed components of charges and all cash payment requirements are determined by the Charges Model on a forecast basis during the annual budget cycle and remain fixed during the year. These forecast values are then used for determining actual monthly fixed charges and cash payment requirements. The variable components of actual monthly charges are determined based on actual hourly metered values for generation output and fuel cost, and based on demand for Distribution Companies. A different measure of demand is used for each category of charge. For example, the costs of transmission service are shared among the Distribution Companies based on their forecast peak MVA demand.

The cash payment requirements are based on the collections rates of the Distribution Companies from their end user customers, and of EETC from the UHV and HV customers it directly serves.

The Distribution Companies makes payments to EETC, which in turn make payments to the Generation Companies and other generators for the power delivered. The charges to the Distribution Companies are set at a level that will permit each Distribution Company to be profitable if well operated. Charges to the end-use customers, including the UHV and HV customers, are based on the uniform national tariff.

The Billing and Payment System implemented includes meter data collection and reporting, invoices and ledger to track payments and running balances between the companies. Figure 4 below shows the computer architecture for this billing system, which will liberalize the data flow and decision process, very centrally controlled in the vertically monopoly of the past.

Whereas the above describes the current operation of the EPP, all of its characteristics, hardware, as shown in figure 4 and software (charges model and billing system) have been designed for future transitions as various constraints are lifted and the PSCs evolve to a more open market environment, and operation.

**COMPANY RESPONSES TO RESTRUCTURING & THE REGULATORY AGENCY:**

Historically, Egypt’s social policy dictated that consumers benefited most by receiving energy services from a monopoly provider in a designated franchise area. The driving force behind Egypt’s electric utility restructuring is now the consumer who demands specialized services and lower costs.

The consumer of electricity in Egypt (as in many parts of the western world) has changed. The consumers of today and their sophisticated appliances require a much improved quality of supply. Furthermore they also require more consistent and a higher degree of customer service from the distribution companies.

The CIRED Egyptian liason committee has developed terms of reference for power quality to be applied throughout the country. All the Distribution Companies have conducted their own harmonics measurements that will be collected jointly to establish a national harmonic map of the high voltage network. Customers anywhere in Egypt would be able to better compensate for power quality issues in a consistent manner. The committee reviews these power quality issues during its regular meetings.

In the meanwhile, for Egypt’s PSCs to successfully provide the required quality of service and electricity in the restructured sector, financial managers and management accountants must make fundamental changes in accounting methods to move the financial and business focus from the normal approval of spending and revenues to performance-based profitability, and customer care.

In Egypt, the profitability of state owned electric utility enterprises have traditionally been evaluated only at the enterprise level. There were no profit centers below this level, and there has been little need for rigorous cost accounting practices beyond monitoring cumulative spending by responsibility center and expense and capital account. Unlike competitive businesses, measurement of profitability at the object (e.g., customer, circuit, territory,
or power units) level has not been part of the electric utility company financial performance equation. Historically, financial success has been primarily predicated on management approval of and adherence to the utility revenue, investment, and expense budgets. If sales and, therefore, revenue are below planned amounts, Egypt’s utilities cannot increase tariff prices to attain the authorized revenue amount.

In Egypt’s post-2001 restructuring environment, electric utility companies that retain current cost accounting practices may face financial difficulties. Distribution companies currently must focus on the efficiency, profitability, and cash flow of the cost objects such as customers, distribution infrastructure, and franchise territories. Other service providers able to more efficiently perform the maintenance and operation activities needed to deliver energy to the end-user could, potentially, contract with asset owners and customers directly.

The new PSCs developed their organization structures to include new activities required by deregulation (e.g., financial management, information technology & financial inspection, quality monitoring, customer service, etc.). They have shifted to using modern computer systems (both hardware and software) to have information on a timely basis for better decision making as well as to support the increasing data demands from the regulatory agency. These systems not only help the companies with cash management and improved loan tracking capabilities, but also provide the necessary data for better planning. As a result the companies are better equipped to provide improved customer service.

As previously indicated, Egypt’s utility companies historically have both owned all the generation, transmission, and distribution assets and retained their own workforce for maintaining and operating the system and serving the customer. Egypt’s competitive electric market will change this traditional utility operating expense strategy. Rather than establishing expense budgets based on the authorized rate of return, Egypt’s utilities will seek to optimize the maintenance and operating costs of the transmission and distribution system in relation to the quality expectations of the end-users (e.g., safety, reliability, and responsiveness). As part of the liberalization scheme EEHC, initiated a pilot reengineering effort which marked several processes for change.

PILOT REENGINEERING PROJECT

EEHC has supported implementation of an extensive pilot project to reengineer business practices in the Alexandria Electricity Distribution Company (AEDC) and West Delta Production Company (WDPC) with a view to replication throughout the EEHC system. The reengineering project seeks to reduce the costs and cycle times of various processes, derive more accurate cost data, increase revenues and enhances competitiveness. The primary project components include process mapping, measurement, standardization, benchmarking, business process improvements and best practices as well as training to provide the appropriate skills. A major milestone in improving the technical, financial and economic performance for both companies was concurrent with the preparation of a “Performance Based Budget” for FY 2003 instead of the traditional “Line Item Based Budget.” The budget includes goals, programs and targeted values of performance indicators. The Reengineering project had several processes that it focused on primarily:

- Activity Based Costing (ABC),
- Maintenance Management,
- Inventory and Procurement Management,
- Alternate Revenue Sources, and
- Billing & collection Processes

ACTIVITY BASED COSTING (ABC)

As Egypt’s vertically integrated electric utility industry is unbundled, electric utility company managers must be able to determine which parts of the entire process, from energy production to end-user delivery, generate the value. The present system allocates spending and revenue only at the enterprise level. Activity-Based Costing (ABC) is a method of cost assignment that evaluates first how resources are consumed by the activities they perform and then how these activities are consumed by, customer classes in the case of distribution and by unit of power generation in the case of the generation companies as an example. Resources are defined as the cost of people and facilities as captured in traditional financial systems such as the companies’ general ledgers, while activities are the tasks people perform and the purposes facilities serve. ABC uses activities data to assign the costs of these activities to end "cost objects" such as products or services, based on relevant drivers. These drivers might be sales or production volumes for some types of costs; but, more importantly, drivers would also be statistics such as number of setups, number of material moves, part existence, number of engineering changes, number of invoices, or number of purchase orders. This activity based costing method, while dependent on identifying and quantifying data that is diverse and sometimes difficult to obtain, provides a much more meaningful depiction of the true economics of businesses.

The determination of the exact cost to generate and eventually sell a kilo-watt hour of electricity is the ultimate objective of the ABC implementation within the AEDC/WDPC. ABC cost data could also be a significant tool for the regulatory agency in negotiating with customers. The ABC model also provides a much more meaningful depiction of the true economics of businesses.

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The determination of the exact cost to generate and eventually sell a kilo-watt hour of electricity is the ultimate objective of the ABC implementation within the AEDC/WDPC. ABC cost data could also be a significant tool for the regulatory agency in negotiating with customers. The ABC model also provides a starting point for operational cost management improvements within the AEDC/WDPC. Activity, process, and product costs highlight excess or non-value-added costs that may be reduced. In the WDPC, for example, ABC can quantify how reduction in outages and power unit repair costs can be calculated and compared with the activity cost savings as part of a process improvement investment justification.
Analysis of the ABC data can also provide decision support for strategic decision-making, such as make-versus-buy decisions. Moving from ABC to an ongoing Activity Based Management (ABM) environment requires that the costing process be executed on a regular basis (e.g., weekly, monthly or quarterly) and that the results be integrated into the AEDC/WDPC’s overall performance management process.

ABC also directly supports the implementation of the new cost centers. These have been designed to follow the revised unified accounting code for the country of Egypt. In this new approach costs are allocated based on the activity in which the cost was actually incurred. For the generation companies these are based on unit of power generation costs. For the distribution companies these are the geographically separated branches, each with its own set of customer classes. Indirect costs would also be allocated based on the activity level now separated by function.

Reengineering the accounting framework will facilitate the determination of the costs of utility services, control of overhead, comparison of revenues and costs for profitability analysis, and strategic planning for positioning the utility for the future. To determine the real value of business and meet profitability and quality challenges, PSCs in Egypt’s evolving competitive value-added energy industry must adopt activity-based, accounting methods. EEHC recognizes that best-practice managerial accounting methods respond well to this need and that utility companies employing such methodologies will be well-positioned in the competitive market. Additionally, large scale integrated ABC systems can guide development of an optimal organization management framework through application of a comprehensive set of business diagnostic models.

Adoption of modern managerial accounting methodologies such as ABC and Activity Based Management, coupled with adoption of global standard best-practice methods, will provide the foundation for moving Egypt’s utilities from a budget system approach to one that drives revenue, operating costs, and investments on a performance basis. This synergistic combination of modern accounting methodologies and best practices will effectively produce (and make available to all stakeholders) the specific information needed for making decisions in Egypt’s electric utility business environment, improve profitability and cash-flow, and streamline processes to accomplish the work that contributes most to meeting customer expectations.

MAINTENANCE MANAGEMENT

EEHC has determined that reengineering maintenance processes will also prove crucial to PSC success in the restructured environment. To that end a computerized maintenance management system has been implemented. At the Abu Qier power plant of the WDPC, work orders that integrate the technical procedure with the spare parts and associated costs is being implemented. It is also providing the schedule for a planned program. The objective of a planned maintenance program is to achieve the efficient and economical operation of plant and equipment, and the profitable utilization of resources (e.g., capital, manpower, materials) while maintaining safe working and environmental conditions. Improved maintenance processes will boast the productivity of income generating assets by reducing the frequency of forced outages and the duration of planned outages.

INVENTORY AND PROCUREMENT MANAGEMENT

Reengineered inventory management and procurement processes, including using a relational data based computer system and bar codes have proven to reduce the investment in spare parts for both Generation and Distribution companies. Within AEDC the inventory levels have dropped from 19,000 to 12,000 parts as a result of the elimination of duplicated parts. WDPC is in the process of adding all their assets and parts to a centralized computer system that integrates the maintenance, inventory and procurement functions of each of the seven power plants. The computer database has identified many duplicated parts, however, the company is still in the process of confirming these since power plant parts may look alike but have different functions. The data base for the WDPC has over 170,000 spare part items.

As most of these are being entered into the computer data base for the first time, proper definition of each part is required, especially as these parts are related to the thousands of assets of each power plant.

Another advantage of an integrated inventory system with cost accounting, procurement and planned maintenance program is the potential for major savings in the cost of spare parts. The total amount of all the distribution, transmission and generation companies is approximately 2.87 Billion Egyptian Pounds. Efforts are already under way to reduce this amount. By knowing the typical life of equipment (and extending this through good maintenance), the companies are substantially cutting their inventory of spares, with corresponding reductions in the capital tied up in spare parts in storerooms.

This pilot effort will result in liberating the PSCs to achieve higher profits and reduce costs as a direct result of the reengineering effort.

ALTERNATE REVENUE SOURCES

The formulation of separate companies underscores the need to shift to obtaining revenues in addition to the main core business of selling electricity. These alternate revenue sources are derived from providing services to the various industrial, commercial and agricultural consumers as well as to the urban and governmental communities.
Some of the distribution companies have been much more successful in providing contracting type services to new infrastructure projects. These have been both in the new industrial zones as well as in the new touristic villages. Other sources of revenue have come from those customers who demand enhanced energy efficiency and power quality services.

DSM programs can also be used to reduce losses driven by sales to consumers in unprofitable sub-sectors, while maintaining the same level of consumer service. The generation companies also have the potential to use their highly skilled labor forces to provide maintenance services to big industrial complexes in the community. The transmission company has found a good alternate source of revenue by selling the dark fibers (ones not used) from the existing extensive telecommunication fiber optic network it has. The PSCs are being creative in opening new markets they have not enjoyed obtaining revenues from before. These new income streams have given new meaning to the liberalization of the companies by providing incentive to diversify and obtain alternate revenues other than just the sale of electricity not subject to the review of the regulatory agency.

BILLING AND COLLECTIONS

The collections component of the Distribution Companies is probably the single most important one as this is where the cash comes in. Although, there has been a lot of progress, reform and restructuring of the companies at the end of the day cash is still what makes the operations all move, CASH is KING!!

The distribution companies are trying many types of incentives to maximize their collections. They are continually trying to reduce the commercial cycle time. For most of them this is still one to two months, however, they all have a target to bring it down to fifteen days. There is a significant shift to use remote electronic metering. The companies are always looking for more efficient, cost effective customer metering applications. Some are experimenting with pre-paid meters as an example.

In order to achieve the highest collection rates the PSCs are continually improving their billing practices. The power pool project has automated the internal billing processes between the companies. The distribution billing for the final end use customers is also continually being modernized. They are evaluating the possibility of doing their own final customer billing, instead of having a third party issuing the bills. For example the printing of a customer bill for AEDC currently costs approximately 16 piasters ($0.035 US per bill). By mapping the process, the reengineering team has demonstrated how this process can both be accelerated and significantly reduced in cost. In addition, valuable customer information can be also be obtained by shifting to the companies relational database. The knowledge of the customers can also help with the collections process. Having this type of data can also be a very important performance indicator to be used by top management for decision-making.

CONCLUSION

The way to liberalization is achieved by restructuring Egypt’s power sector companies (PSCs). This must be driven by changes in the sector’s production, transmission and distribution companies if they are to succeed in the new regulated environment. The formation of the regulatory agency with its array of activities, including the preparation of licenses, is the beginning of liberalization.

The restructuring has also included the formation of the Egyptian Power Pool, which has developed the formal agreements through which the companies relate to each other in a business manner. The charges model provides input to the billing system which underpins the inter-company payment of both variable as well as fixed amounts.

These companies are adopting new approaches and reengineering business and operational practices. The reengineering effort is complex and large-scale. It encompasses many dimensions of the business. As part of the modernization plan, reengineering utilizes computerized maintenance management, inventory and procurement management software and integrates accounting systems to provide managers with the up to date picture of their operations needed for improved decision making.

Egypt’s Power Sector Companies (PSCs) historically operated and maintained their own systems manually but this has changed. As restructuring drives change, every process in the energy services value chain will also be subject to change. Furthermore, the restructuring will enable these electricity companies to pursue new business opportunities and be liberalized to achieve higher profits.

REFERENCES