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ELECTRICITY DISTRIBUTION COMMERCIALIZATION PROJECT

Contract No CCN-Q-00-93-00152-00
Delivery Order No 12
Improved Commercial Operation of Energy Sector Distribution Companies in Armenia

Final Report

Prepared for

United States Agency for International Development
Bureau for Europe and NIS
Office of Environment, Energy and Urban Development
Energy and Infrastructure Division

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September 25, 1998

CONTENTS

1 Introduction 1

2 Background 1

3 History of Collection Practices 4

4 Description of Pilot Project 6

5 Metering, Billing and Collection Software 11

6 Recommendations 12

7 Conclusions 14

Exhibit A – Approved Pilot Project Workplans

ELECTRICITY DISTRIBUTION COMMERCIALIZATION PROJECT

1. INTRODUCTION

This report describes the pilot project activities undertaken as part of Delivery Order 12 of Contract No CCN-0002-Q-12-3152-3 At the request of the U S Agency for International Development (USAID), Hagler Bailly and its subcontractors, specifically CMP International, were requested to develop metering, billing and collection improvement pilot projects in both the electricity and natural gas distribution sectors This report describes the electricity pilot project and provides recommendations designed to further improve collections in Armenia's electric distribution utilities [1]

2 BACKGROUND

Since the dissolution of the Soviet Union in 1991, the economic collapse of Armenia combined with severe energy crisis conditions contributed to a situation in which the financial position of the power sector deteriorated rapidly Escalation of product input (e g , imported fuel and equipment) prices occurred simultaneously with rampant consumer non-payment By 1994, payment levels were abysmally low at less than 20 percent of metered electricity Theft of electricity was widespread and the power sector enterprises were poorly organized to respond to the problem The problem was management-related, business practices simply did not support aggressive resolution of the non-payment problem The problem was also related to Government policy, there was no resolve to disconnect consumers for non-payment Additionally, there were technical problems as well Operation of the system led to high levels of technical losses At the same time, there was insufficient metering in place to be able to determine areas of excessive losses, be they commercial losses (such as theft) or technical losses

The electric distribution companies, and their predecessors, in Armenia have long been plagued with problems of inaccurate information from poor quality or missing meters at the Company boundaries (so-called commercial, revenue or billing meters), within the Company itself (so-called internal meters), and at end user locations The poor information from the meters causes problems for power purchase and sales transactions as well as determining the causes and location of high technical and commercial losses

[1] A companion report for the natural gas sector is available It is the *Natural Gas Distribution Commercialization Project* report prepared by CMP International and Hagler Bailly (September, 1998)

Technical losses are an inescapable consequence of transporting electricity but they can be kept to acceptable levels through careful system design and operation Commercial losses result from illegal diversion of energy and meter tampering While the exact value of technical and commercial losses is unknown, they are thought to be extremely high in Armenia One recent study estimated the sum of technical and commercial losses to be at least 40% in Yerevan Similar high levels of technical and commercial losses probably occur in other areas also Besides lost revenue, the analysis of distribution networks and equipment, an important component of efficient utility operation, is impeded While the Government of Armenia and the distribution companies are trying to improve their operations, inaccurate information has prevented them from adequately defining the problems let alone solving them

In addition to the problems caused by inaccurate measurement of energy delivered to customers, problems exist at other points of the electric transport system Similar inaccuracies occur at the connection points where electricity is supplied to the distribution companies by Armenergo and other electric energy suppliers (suppliers) There are also points where energy is interchanged with other branch offices or other distribution companies At most of the connection points with suppliers, the only meters belong to the suppliers At the other interchange points there is usually no metering Reconciliation between the suppliers' metered energy sold to the distribution companies and the distribution companies' metered energy deliveries to its customers is very difficult It is a major source of disagreement and payments are nearly always in dispute It is impossible to determine power flows since energy delivered to, or received from, neighboring networks is unknown

The metering, billing and collection information processing within the electric system itself is prone to error and manipulation If the distribution companies possessed complete and accurate metering of energy received from suppliers and delivered to customers, they can determine actual energy flows within their system As a result, they could prepare accurate bills for customers and locate the points within the system where energy is being diverted They can also be assured that payments due to suppliers are correct An added benefit includes the ability to pinpoint those facilities in their system that suffer the greatest overload and the highest technical losses This information will be quite useful when funds become available for system rehabilitation

Much of the information about collections is anecdotal and records are sketchy The one constant factor in the changing collection picture is that all previous and current metering, billing and collection practices were, and are, prone to inadvertent error and deliberate manipulation There is evidence that a significant portion of the revenue that is due to the distribution companies for energy delivery either is not collected or is diverted after collection Other revenue is lost as a result of falsified meter readings and delivery made through illegal, unmetered connections [2]

[2] For further information, see the Hagler Bailly report entitled *Armenia Power Sector Internal Control Review* (April, 1998)

There is still not a clear picture as to where in the path of electricity flow and cash flow the diversion is taking place What is clear is that all parties to the supply and transport of electricity must improve their control of the collection and distribution of revenues EnergyInvest has estimated the sources of commercial losses to be as shown in Table 1 below

Table 1

Comparison of Estimated Causes of Commercial Losses

Commercial Loss Component	Suggested Source	Percent of Total Estimated Commercial Losses
Customer Losses	Non-Payment	7%
	Tampering	2%
	Customer / Distribution Company Collusion	5%
Substation Losses	Contractors and Collectors	5%
	Contractor / Distribution Company Collusion	64%
Technical	Meter Inaccuracies	17%
Total Commercial Losses		100%

Source EnergyInvest

The information in this table indicates that all commercial loss components except Non-Payment, or 93% of the total, can be improved by tightening managerial controls on the collection practices and implementing more accurate metering A brief discussion of how this present collection situation evolved demonstrates some of the difficulties that need to be addressed to improve metering, billing and collections

3 HISTORY OF COLLECTION PRACTICES

Before the dissolution of the Soviet Union, all customers read their own meters, completed a coupon from a coupon book noting the electricity used and presented the coupon at a bank with the required payment It was presumed that all customers read their meters correctly and paid the

amount due Once every six months, an inspector would read the meter to confirm and reconcile the self-reported readings For residential customers, this was not a problem Electricity usage was small, commonly used only for lights, refrigeration and for other small appliances, it was also inexpensive The largest residential energy uses such as space heating, water heating and cooking were supplied by either natural gas or steam/hot water from district heating plants Air conditioning was not widespread Meters were very inaccurate and were seldom verified or calibrated These practices were fairly stable and changed little over the years

After the dissolution of the Soviet Union, fossil fuels became very scarce The period between 1991 and 1994 in Armenia represented an extreme energy crisis Imports of primary fuels dropped by over 90% The limited supply of natural gas and oil that was available was dedicated to generating electricity or for other critical uses (e g , bakeries) Natural gas for residential customer use was cut off entirely Natural gas and oil were also cut off to the district heating plants There was not enough electricity to supply all commercial, industrial, public service and agricultural customers and many of them simply ceased operating

The energy crisis led to a regime of "rolling blackouts" in the country Typically, electricity was available for about two hours per day Since customers did not know which two hours their electricity would be available, they left all electric appliances turned on just to be ready Consequently, residential electrical demand soared for short periods, overloading many components in very localized areas of the transmission and distribution system and causing them to fail The electricity authorities were in disarray and unscheduled service interruptions lasting from hours to weeks were also common Technical losses on the system soared due to the rolling blackout regime With such poor quality service, combined with economic hardship, consumer cash payments for electricity fell to levels well below 20%

During this period, many customers established illegal connections to tap into critical institutions (e g , transportation, and hospitals) to have more reliable electricity This was made possible by the fact that power supply to some critical facilities had been recabled to provide those facilities with close to around-the-clock power

In 1995, the Government of Armenia, in an effort to gain some control over the collections problem and poor financial performance of the sector, issued a decree to install meters in all high and low voltage substations under the control of the transmission and distribution companies Also, the decree specified that all residential and commercial meters were to be relocated from inside apartments or stores to a more secure but accessible location such as building lobbies, stairwell landings or, in rural areas, on poles As part of the meter relocation effort, the meters were generally installed in locked rooms or locked steel boxes

At about the same time, the country began using third party collection contractors to collect bill payments and forward the cash to the distribution company The typical contractor received a percentage of the amount he collected if it exceeded a set proportion of the amount owed While this method resulted in increased collection rates, it is highly susceptible to collusion between the

contractor and the customer, the contractor and the distribution company or all three Further, there were complaints about certain "strong arm" techniques being used and that some consumers were forced to pay more than the tariffed rate as a result of extortionary practices

In some areas, cooperatives were formed to administer the collection of electric payments The cooperatives were typically one or two buildings with 50 to 60 apartments per building The residents of the cooperative selected a person to be responsible for collecting amounts due and forwarding the money to the distribution company The collective could pressure non paying residents to pay their bill or the entire cooperative could have their electricity disconnected for lack of full payment The cooperative model worked reasonably well during the time of energy shortages because in return for payment, the cooperative would receive 24-hour supply of electricity The cash flow coming into the utility could cover the fuel costs and other variable costs necessary to permit dedicated supply to flow to the cooperative However, once the power system was restored nationwide and power outages became occasional rather than constant, the model was less useful Also, the model was not able to address what was rapidly becoming the most significant collection problem, that is, the non-payment of state budgetary enterprises

One factor that has further complicated the collection process has been the management, staff and changes in responsibility resulting from sector restructuring The persons responsible for electricity bill collection changed frequently as the electric operating authorities reorganized both nationally and locally From 1996 to the present, the number of distribution companies changed from one to more than sixty, back down to eleven and then to the four operating today

Current collection practices must be viewed in light of their confusing evolution It must also be recognized that they are still changing - not only in time but also geographically Current collection practices are a mixture of previous practices, interim practices and evolving new practices

At present, it is generally the case that readings of customer meters are reconciled with transformer substation meter readings Distribution company meter readers are now responsible for reading customer meters For industrial customers, State Enterprises and Budgetary (water companies, etc) customers, a representative of the customer must be present when the meter is read and must concur with the meter reading For residential and commercial customers, one or more representatives of the customers metered at a common location must be present and must concur with the readings By Government order, all meters are read on the last day of the month [3] Five days later, a list of the amounts owed by each customer is posted at the common meter location Customers have ten days to pay their bills at a designated bank, Post Office or

[3] This is an unfortunate step, but one that is quite common in the Former Soviet Union The logic behind this idea is that it permits an energy balance to be determined The drawback is the obvious overload and lack of balanced staffing requirements This is one reason why the sector is so heavily-overstaffed, 4,000 meter readers for 750,000 meters nationwide implies one meter reading per hour per staff member for an 8 hour work day The Ministry of Energy has not yet accepted the concept of using billing cycles

distribution company pay station Recently, the Government began requiring payment at a local bank If a customer has not paid his bill after a further 15-day grace period, service should be disconnected until the bill is paid, however, the policy is applied unevenly throughout the sector

Overall, the changes made to improve metering, billing and collections have been positive Collections, although stagnant at 55% overall, are primarily in cash [4] Armenia does not have the same severe collection problem seen in other nations of the NIS such as Georgia, Ukraine and Russia, but at the same time, its performance far lags that seen in other emerging markets such as the Baltics Further, other countries such as Russia and Ukraine have much more developed industrial sectors which helps to explain, in part, the reason for higher levels of non-payment, industrial energy use in Armenia represents a smaller potion of the country's overall energy use

4 DESCRIPTION OF PILOT PROJECT

In an effort to demonstrate ways to improve collections on a sustainable basis, USAID requested Hagler Bailly and its subcontractor CMP International to design and implement a pilot project, including implementation of new business practices and buttressed by limited procurement of equipment (e g , meters)

The objectives of the pilot project are to

- increase the rate of electric revenue collection thus reducing commercial losses,
- gain information about end use electric energy metering needs, revenue collection techniques and the design and use of a computer based billing system,
- help identify the parts of the distribution system most prone to energy diversion for future improvement efforts, and,
- verify or correct statements of metered energy delivered by Armenergo to the distribution company feeders This process is subject to collusion and other types of illegal activities to divert revenues from the distribution company

The methodology selected by Hagler Bailly to accomplish the project's objectives included

- train staff in modern metering, billing and collection practices,
- install or replace inaccurate revenue meters at end user sites,

[4] Cash collections had reached levels of about 65% but there has been a recent decline, attributable at least in part to the recent elections During the election period, the disconnection policy was not enforced

- install accurate revenue meters on apartment building common loads that were previously unmetered, such as stair lighting, elevators and water pumps,
- install accurate meters and instrument transformers at distribution substations on the incoming feeders supplied by Armenergo, these meters are also designed to be more tamper-proof (e g , electronic programmable meters),
- seal all meters in the pilot areas with individually numbered and registered meter seals,
- develop and implement billing software to process record and store energy consumption, meter and customer information,
- instill in the metering, billing and collections software various components designed to improve internal financial controls and support improved business processes (e g , permit billing cycles, innovative rate structures, unalterable audit databases to identify unauthorized changes to data, high/low meter reading checks to indicate unusual meter readings),
- install computer and communications equipment on which to operate the billing software and to transport billing information,
- procure and train staff in the use of modern meter testing equipment to permit more frequent testing and calibration of meters,
- develop and implement a meter testing and calibration program to test, calibrate and seal each meter in the pilot project areas,
- reinstall missing ammeters and voltmeters in distribution substations and transformer substations to help operate a stable test environment

These program components were developed jointly with management of each pilot project area and the Ministry of Energy Workplans for program implementation were developed and approved by the Ministry of Energy (see Exhibit A for translated versions of the approved workplans)

The distribution companies selected for the pilots included the Komitas distribution network, an area of residential, commercial and about 20 small industrial customers in Yerevan, and the Ararat network, a mostly rural area about 30 miles south of Yerevan, with several small communities and some industrial customers

Each of the networks is part of a larger distribution utility For instance, the Komitas network is part of the Yerevan Distribution Company, while Ararat is part of the South Region Distribution

Company These areas were selected for a few reasons First, management in each utility is very supportive of the program Second, these utilities were two of several suggested by the Ministry for consideration [5] Third, the combination of the two areas provides a good indication of the kind of problems likely to be encountered in urban as well as rural areas of Armenia In this regard, the lessons learned from the pilots are of more widespread application to the country overall

Komitas and Ararat, like the other distribution networks, have significant commercial losses comprising uncollected revenues The commercial losses stem from a combination of inaccurate or missing revenue metering and poor financial controls The present business practices, metering equipment, and policies inhibit efforts to properly reduce commercial losses

Two sites were selected in which to install the bulk of the metering equipment They are a portion of the Kievan local area within the Komitas branch office of the Yerevan Distribution Company and a portion of the town of Vedi in the Ararat branch office of the South Region Distribution Company Importantly, the pilot project areas actually include all of the Komitas and Ararat areas The metering, billing and collection software is being installed to cover all customers in each distribution network Similarly, the meter testing, calibration and sealing will be applied throughout the pilot project areas

Regarding the equipment installation portion of the pilot project, the Komitas test area comprises a portion of the distribution network supplied by the Ernim substation in the Kievan district The test area consists of

- portions of five 6KV feeders supplied by Ernim substation,
- fourteen 6KV/0 4KV transformer substations,
- forty 0 4KV service connections,
- installation of 1,500 self-contained single-phase kWh meters at customer sites supplied by the 0 4KV services with accuracy of at least 0 5%, each kWh meter will be paired with a disconnect switch, thereby limiting the need for removal of the meter to disconnect a consumer,[6]

[5] The management and main counterparts in each pilot project area have changed at least once during the project Nonetheless, new management has generally been as supportive of the projects as former management

[6] This is important because during the project preparation, Hagler Bailly discovered that there is significant tampering and collusion that occurs during the disconnection process There need to be in place disconnect switches that will ensure that the only reason for meter removal and breaking of meter seals is due to testing or repair

- installation of 20 self-contained three-phase kWh meters at customer sites supplied by the 0 4KV services with accuracy of 0 2%,
- limited replacement of current transformers with higher accuracy equipment to support the three-phase installations,
- installation of 54 three-phase instrument rated kWh meters on the secondary side of the 6KV/0 4KV transformers,
- installation of 350 three-phase instrument rated kWh meters on the secondary side of the remainder of transformers in the Komitas branch, and,
- installation of 37 instrument rated three-phase kWh meters at points of interconnection with Armenergo and other branch offices

The Ararat branch office is located in a mostly rural area with several towns and villages The branch comprises about 10,000 residential customers in a mixture of private single story houses and multi-story apartment blocks divided among a number of local areas A number of small commercial and industrial customers are also dispersed throughout the area The town of Vedi has been selected for the pilot project as it is typical of small towns in rural Armenia

The Ararat test area comprises a portion of the distribution network supplied by the Khosrov Substation The test area consists of

- a portion of the 10KV "Dairy Factory" feeder,
- thirteen 10KV to 0 4KV transformer substations,
- twenty-eight 0 4KV service connections,
- installation of 1,500 self contained single-phase kWh meters at customer sites supplied by 0 4KV services outfitted with the disconnect switches mentioned previously,
- installation of eight self contained three-phase kWh meters at customer sites supplied by the 0 4KV services,
- installation of 41 three-phase instrument rated kWh meters on the secondary side of the 6KV/0 4KV transformers,
- installation of 160 three-phase instrument rated kWh meters on the secondary side of the remainder of transformers in the Ararat branch office,

- installation of 39 instrument rated three-phase kWh meters at points of interconnection with Armenergo and other branch offices

Two methods for determining the proposed single-phase meter locations were evaluated One option was to select an area that can "stand alone" in terms of the number of single-phase customers, three-phase customers, 0 4KV services, transformer substations, and feeders and their supplying substations so that all of these points can be metered with the new meters A second option was to disperse the meters throughout the branch office by replacing known defective meters and installing meters at locations where meters are now missing

All parties involved in the pilot project discussions including the designee of the Manager of the Yerevan Distribution Company, the Manager of the Ararat Distribution Company,[7] the Managers of the Komitas and Ararat branch offices as well as representatives from the Ministry of Energy, the Energy Institute, EnergyInvest and Hagler Bailly concurred that the first meter installation method should be selected This method provides the most accurate electricity consumption information at the customer, transformer substation and substation levels Further, use of this method also creates an inventory of meters (i e , those that were replaced by the new US equipment) that can be used to address the problem of missing meters Installation is also eased given the different dimensions of the US made equipment when compared with existing equipment In other words, it will be easier to handle the US made equipment installations when all of the equipment is located in the same area (such as within the same locked box for multifamily dwellings)

Use of the first method is warranted to help the distribution companies

- more accurately compute the level of commercial losses and thus reduce them,
- more easily and accurately determine the amount of revenues to be collected from each customer,
- compare the energy consumed by the sum of the individual customers supplied by transformers in the test area with the total energy supplied by their transformer,
- compare energy supplied by the aggregate of the transformers with the energy supplied by their distribution feeder,
- track the person or persons responsible for any differences in electricity supplied,

[7] At the time this decision was made, there were 11 regional distribution companies Ararat Distribution Company was one of the 11 and the Ararat branch office was part of the larger utility In July 1998, the distribution sector was further consolidated into four utilities At that point, the Ararat Distribution Company became part of the larger South Region Distribution Company

- accurately determine electric energy flows,
- more accurately compute the technical losses in the distribution networks,
- provide information (e g , costs, technical losses, efficiency improvements) for the Energy Commission to help determine reasonable costs for tariff-setting purposes

5 METERING, BILLING AND COLLECTION SOFTWARE

In an early review of the metering, billing and collection practices in the distribution sector, a number of problems were noted such as (1) paper records and manual record keeping, (2) data entry errors as information from paper records was recoded into poorly designed databases, (3) inability to adequately age and track customer receivables, (4) inadequate information on specific consumers, (5) poor record keeping regarding usage and bill payment, and, (6) lack of information pertaining to meters, such as when they were last tested or replaced

Given the severity of these problems, Hagler Bailly and CMP International determined that a software program was needed to help improve business processes and address some of the problems noted above Based on the results of a local tender, Taurus Ltd , an Armenian firm, was selected to handle software development The purpose of this component of the pilot was to provide each pilot area with software capable of supporting improved metering, billing and collection practices The implemented program uses a "tree structure" that models the various levels from the bulk supply delivery point to the end user meter By "tagging" each meter with other meters "upstream" the utility has the capability to identify areas of excessive losses (both technical and commercial) The program also has a number of other features, such as the ability to track customer specific usage and debt thus helping to enforce disconnection policies

To address the need for an information system to improve metering, billing and collection, a number of steps have been included in the pilot project These include

- install computer hardware to run the new software at the Komitas and Ararat distribution company main offices and at the Komitas and Ararat branch offices,
- install communication equipment to enable transfer of bill and collection information between the branch offices and distribution company main offices,
- train users at the Komitas and Ararat main offices and branch offices in the use of the system,
- train and develop individuals who can effectively maintain the system once implemented,

- gather, validate and analyze data to demonstrate the degree to which the improved information has enabled the Komitas and Ararat branch offices to
  - increase the accuracy of their electricity purchases and subsequent billings,
  - increase their revenues from sales of electricity to customers,
  - reduce operating costs through meter reading, billing and collection efficiencies,
  - detect locations on the distribution network that may be loaded beyond capacity before failure occurs

For more information about the model, the report *Metering, Billing & Collections System Improvement Report* by Hagler Bailly (September, 1998) provides a more detailed description of the program

6 RECOMMENDATIONS

Based on this work conducted by the project team, there are a number of recommendations that should continue to be pursued in order to boost collections All electric sector companies, including distribution companies, must control collusion between customers and employees, among company employees and between companies Several inter-related corrective actions should be considered

- Pay employees involved in revenue collection at a level high enough to reduce the temptation to engage in theft and collusion This is a serious problem given that wages for meter readers can be as low as $16 a month
- Develop management policies and practices to increase the proper oversight of financial transactions This is a difficult area given the poor quality of internal financial control procedures Nonetheless, improving internal financial controls should be a major area for continued effort
- Provide managers and employees with the skills to detect fraud and collusion Revenue protection training is warranted Also, this is an area where simple low cost measures (e g , registered meter seals) could be very useful
- Prosecute and terminate employees found guilty of illegal activities in the collection process To date, Hagler Bailly is not aware of a single prosecution related to collections abuse

- Define the accountability of managers and employees who are involved in the collection process Clearly identify the specific responsibilities of persons involved with any phase of collection Ensure those persons thoroughly understand their responsibilities

- Establish objectives and standards against which managers' and employees' performance will be measured Regularly and consistently measure the performance of each manager and employee involved with collections

- Establish incentives to reward those managers and employees who effectively perform their duties Provide remedial training or transfer to other duties or terminate those employees who perform below expectations

- Implement those technologies that will reduce the opportunity for any employee to engage in fraud or collusion Computer based technologies hold promise if they are properly used Information about energy consumed and amounts due to the company are more difficult to access except for those persons possessing the correct security codes Revenues received that do not balance with revenues due will be relatively easy to detect The cause of the unbalance and the person(s) responsible can be determined so corrective actions can be taken

- Introduce technologies that will increase employee efficiency and eliminate repetitive and error prone tasks These technologies will also be primarily computer based The handheld meter reading equipment undertaken as part of Delivery Order 15 and implemented in the Komitas pilot area is an example of one such potentially useful technology

- Increase the accuracy of electric energy measurement at all levels by maintaining and calibrating existing meters or, where necessary, by replacing existing meters with new, more accurate meters

- Eliminate the requirement that all meters be read on the same day Introduce meter reading cycles to balance work load requirements

- Eliminate the requirement that customers' representatives observe the meter reading and concur with the values read Instead, develop a mechanism to resolve customer disputes regarding meter readings

- Increase regulatory involvement in the collection process Although regulatory bodies are often not involved in such oversight activities, in Armenia, the condition at present warrants the attention of the regulatory commission

- Codify the necessary legal provisions to ensure that electricity meters are owned by the utility, not by the consumer

7 CONCLUSIONS

The pilot project as designed yields a number of benefits These include

- Demonstrating ways in which collections can be restored to high levels using a combination of hardware related "fixes," information management tools, but most importantly, improved business practices An objective of the pilot project is to demonstrate the need for a comprehensive solution to the collections problem rather than simply assuming that a technical change alone can solve the problem

- Implementing a metering, billing and collection system that, if successful, can be replicated throughout the country,

- Practical experience and training in new technologies, including higher accuracy and more tamper proof metering equipment,

- Achieving field experience with some of the technologies employed to determine their applicability in Armenia for future investment consideration,

- Demonstrating to potential investors the kind of results that can be achieved using improved management and business processes and limited equipment

Finally, Armenia has already taken many steps to improve collections The experience learned, combined with the results gained from this pilot project may furnish useful experiences that can be applied to other emerging markets, especially those in the NIS

EXHIBIT A
APPROVED PILOT PROJECT WORKPLANS

Approved by
First Deputy Minister of Energy
_____ G Galustian
"_____" _____ 1998

Implementation Schedule of the USAID-Sponsored Project to Improve Metering and Billing System at "Komitas" Branch of "Yerevan Electrical Network" SCSC

N	Actions to be Implemented	Person Responsible for Implementation	Date of Implementation	Notes
1	2	3	4	5
	Actions to be Implemented for Metering and Billing Project Developed by Hagler Bailly			
1	Verify the dimensions and installation sizes of electric meters and circuit breakers to be provided by Hagler Bailly	Hagler Bailly K Aghlamazyan	30 04 98	USAID Ministry of Energy
2	Define the volume and format of the information to be transferred from "Komitas" Branch to "Yerevan Electrical Network" SCSC and the terms	Hagler Bailly K Aghlamazyan S Gabrielyan	15 05 98	USAID Ministry of Energy "Yerevan" DC
3	Select the Division where the modernization (replacement) of the electric meters is rather reasonable	L Yeghiazaryan K Aghlamazyan Hagler Bailly Y Bashughyan K Darbinyan	25 04 98	Institute of Energy Ministry of Energy USAID "Yerevan" DC "Komitas" Branch
4	Draw the single-line scheme of the selected division including	Y Bashughyan K Darbinyan L Yeghiazaryan Hagler Bailly	10 05 98	"Yerevan" DC "Komitas" Branch Institute of Energy USAID
	a) The quantity of the customers for each direction (separating the tenants of private houses and buildings)	"		

1	2	3	4	5
	b) The quantity of the installed boxes separating those to be installed in the buildings and out door poles (including the quantity of the meters the boxes are planned for)	"		
	c) The quantity of the installed three-phase meters (provided for water pumps elevators and lighting of corridors for common use)	"		
	d) The quantity of the installed commercial three-phase, master meters to be installed at the substations	"		
	e) Availability of the current and voltage transformers	"		
5	While determing the quantity of single phase meters and disconnectors (circuit breakers) to be replaced allocate correspondingly 50 meters and circuit breakers as reserve (to be used during the operation period)	Y Bashughyan K Darbinyan Hagler Bailly	After receipt	"Yerevan" DC "Komitas" Branch USAID
6	Make a proposal to Hagler Bailly to provide spare parts equivalent to the quantity of equipment to be allocated	K Aghlamazyan Hagler Bailly Y Bashughyan	30 04 98	Ministry of Energy USAID "Yerevan" DC
7	Develop the technical task including all the activities to be undertaken necessary financial investments and the expected economic efficiency	L Yeghiazaryan Y Bashughyan	10 05 98	Institute of Energy "Yerevan" DC
8	Develop the working drawings of the boxed designed for the installation of the meters and curcuit breakers (in compliance with the technical safety norms and Rules for Energy Use)	L Yeghiazaryan K Aghlamazyan Y Bashughyan	15 05 98	Institute of Energy Ministry of Energy "Yerevan" DC
9	Develop the draft drawings and the scheams for installation of boxes transmission lines' and other assembling activities	Y Bashughyan K Darbinyan L Yeghiazaryan	15 05 98	"Yerevan" DC "Komitas" Branch Institute of Energy
10	Prepare and approve the estimate of expenditure for improvement activities and co-ordinate with the Ministry the right to finance from the internal sources of the distribution company	Y Bashughyan K Darbinyan K Aghlamazyan	25 05 98	"Yerevan" DC "Komitas" Branch Ministry of Energy

1	2	3	4	5
11	Manufacturing of the boxes according to the working drawings	Y Bashughyan K Darbinyan	15 06 98	"Yerevan" DC "Komitas' Branch
12	Shipping of the equipment and computers necessary for the improvement of the metering system by Hagler Bailly	Hagler Bailly Y Bashughyan K Darbinyan	31 05 98	USAID "Yerevan" DC "Komitas" Branch
13	Procurement of all necessary materials	Y Bashughyan K Darbinyan	31 05 98	"Yerevan" DC "Komitas" Branch
14	Training courses on operation and design of the meters and other equipment provided by Hagler Bailly for the Meter Repair and Adjustment appropriate Laboratory staff of "Yerevan Electrical Network" SCSC	K Aghamalyan V Davidova Y Bashughyan K Darbinyan Hagler Bailly	25 06 98	Ministry of Energy Armenergo SCSC "Yerevan" DC "Komitas" Branch USAID
15	Training courses on software provided by Hagler Bailly for "Komitas" Branch staff	Hagler Bailly K Darbinyan K Aghlamazyan	25 06 98	USAID "Komitas" Branch Ministry of Energy
16	Implement computerized system at "Komitas" Branch provided by Hagler Bailly	Hagler Bailly Y Bashughyan K Darbinyan K Aghlamazyan	30 06 98	USAID "Yerevan" DC "Komitas" Branch Ministry of Energy
17	Establish a commission and accept-transfer the results of the activities according to the established order	L Yeghiazaryan K Aghamazyan Hagler Bailly V Davidova Y Bashughyan K Darbinyan	15 07 98	Institute of Energy Ministry of Energy USAID "Armenergo" SCSC "Yerevan" DC "Komitas" Branch

A Galstyan

Translated by S Mkhitarian

Approved by
First Deputy Minister of Energy
_____ G Galustian
"_____" _____ 1998

Implementation Schedule of the USAID-Sponsored Project to Improve Metering and Billing System at "Ararat" Branch of "Araratyan Regional Electrical Network" SCSC

N	Actions to be Implemented	Person Responsible for Implementation	Date of Implementation	Notes
1	2	3	4	5
	Actions to be Implemented for Metering and Billing Project Developed by Hagler Bailly			
1	Verify the dimensions and installation sizes of electric meters and circuit breakers to be provided by Hagler Bailly	Hagler Bailly K Aghlamazyan	30 04 98	USAID Ministry of Energy
2	Define the volume and format of the information to be transferred from "Ararat" Branch to "Araratyan Regional Network" SCSC and the terms	Hagler Bailly K Aghlamazyan A Sargsyan K Safaryan	15 05 98	USAID Ministry of Energy "Araratyan" Reg "Ararat" Branch
3	Select the Division, where the modernization (replacement) of the electric meters is rather reasonable	L Yeghiazaryan K Aghlamazyan Hagler Bailly A Sargsyan K Safaryan	25 04 98	Institute of Energy Ministry of Energy USAID "Araratyan" Reg "Ararat" Branch
4	Draw the single line scheme of the selected division including	A Sargsyan K Safaryan L Yeghiazaryan Hagler Bailly	10 05 98	"Araratyan" Reg "Ararat" Branch Institute of Energy USAID
	a) The quantity of the customers for each direction (separating the tenants of private houses and buildings)	"		

19

1	2	3	4	5
	b) The quantity of the installed boxes separating those to be installed in the buildings and out door poles (including the quantity of the meters the boxes are planned for)	"		
	c) The quantity of the installed three-phase meters (provided for water pumps elevators and lighting of corridors for common use)	"		
	d) The quantity of the installed commercial three-phase master meters to be installed at the substations	"		
	e) Availability of the current and voltage transformers	"		
5	While determing the quantity of single phase meters and disconnectors (circuit breakers) to be replaced allocate correspondingly 50 meters and circuit breakers as reserve (to be used during the operation period)	A Sargsyan K Safaryan Hagler Bailly	After receipt	"Araratyan" Reg "Ararat" Branch USAID
6	Make a proposal to Hagler Bailly to provide spare parts equivalent to the quantity of equipment to be allocated	K Aghlamazyan Hagler Bailly A Sargsyan	30 04 98	Ministry of Energy USAID "Araratyan" Reg
7	Develop the technical task including all the activities to be undertaken necessary financial investments and the expected economic efficiency	L Yeghiazaryan	10 05 98	Institute of Energy
8	Develop the working drawings of the boxed designed for the installation of the meters and curcuit breakers (in compliance with the technical safety norms and Rules for Energy Use)	L Yeghiazaryan K Aghlamazyan A Sargsyan K Safaryan	15 05 98	Institute of Energy Ministry of Energy "Araratyan" Reg "Ararat" Branch
9	Develop the draft drawings and the scheams for installation of boxes transmission lines' and other assembling activities	A Sargsyan K Safaryan L Yeghiazaryan	15 05 98	"Araratyan" Reg "Ararat" Branch Institute of Energy
10	Prepare and approve the estimate of expenditure for improvement activities and co-ordinate with the Ministry the right to finance from the internal sources of the distribution company	A Sargsyan K Safaryan K Aghlamazyan	25 05 98	"Araratyan" Reg "Ararat" Branch Ministry of Energy

1	2	3	4	5
11	Manufacturing of the boxes according to the working drawings	A Sargsyan K Safaryan	15 06 98	"Araratyan ' Reg "Ararat" Branch
12	Shipping of the equipment and computers necessary for the improvement of the metering system by Hagler Bailly	Hagler Bailly A Sargsyan K Safaryan	30 06 98	USAID "Araratyan" Reg "Ararat" Branch
13	Procurement of all necessary materials	A Sargsyan K Safaryan	30 06 98	'Araratyan" Reg "Ararat" Branch
14	Training courses on operation and design of the meters and other equipment provided by Hagler Bailly for Meter Repair and Adjustment Regional Laboratory staff	K Aghamalyan V Davidavo A Sargsyan K Safaryan Hagler Bailly	25 07 98	Ministry of Energy Armenergo SCSC "Araratyan" Reg "Ararat" Branch USAID
15	Training courses on software provided by Hagler Bailly for "Ararat" Branch staff	Hagler Bailly K Safaryan K Aghlamazyan	25 07 98	USAID "Ararat" Branch Ministry of Energy
16	Implement computerized system at "Ararat" Branch provided by Hagler Bailly	Hagler Bailly A Sargsyan K Safaryan K Aghlamazyan	31 07 98	USAID "Araratyan" Reg "Ararat" Branch Ministry of Energy
17	Establish a commission and accept transfer the results of the activities according to the established order	L Yeghiazaryan K Aghamazyan Hagler Bailly V Davidova A Sargsyan K Safaryan	10 08 98	Institute of Energy Ministry of Energy USAID Armenergo SCSC "Araratyan" Reg "Ararat" Branch

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Translated by S Mkhitarian

12