



BURNS AND ROE ENTERPRISES, INC.

**ENERGY EFFICIENCY AND
MARKET REFORM PROJECT
CONTRACT NO.: CCN-C-00-93-00153-00
CONTRACT NO.: CCN-Q-00-93-00154-00**

**FINAL PROJECT REPORT
FOR THE CORE AND DELIVERY ORDERS**

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Energy Efficiency and Market Reform Project
Final Project Report**

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EXECUTIVE SUMMARY

Introduction

Burns and Roe Enterprises, Inc (BREI) has been one of the two prime contractors implementing the programs defined by USAID on their Energy Efficiency and Market Reform Project for the Newly Independent States of the Former Soviet Union. Two contracts for this work were signed on September 30, 1993.

The core contract provided for three main activities: 1) management, procurement and administration (MPA), 2) funds for equipment and subcontractors procurement and 3) support of emergent work. The buy-in contract allowed for the implementation of work that would promote the strategic objectives of USAID.

This final report provides an overview of the work performed both in the core and DOs.

2 0 CORE ACTIVITY

2 1 Management, Procurement and Administration (MPA)

MPA provided for the overall management of this work. The core office managed the completion of 30 DOs with a total budget for technical assistance of \$32,118,282 representing 24,398 days of effort. In addition, the core office managed the procurement of over \$20 million in equipment, commodities and services.

2 2 Procurement

Procurement activities were a major part of the work performed under the core and DOs. More than \$22 million dollars in equipment/commodities, local consulting and construction services were procured, resulting in almost 400 contracts or purchase orders. Nearly \$18 million was procured against the core contract equipment/subcontracts budget, while the remaining \$4.5 million was procured directly against various delivery order ODC budgets. These procurements were executed to support and enhance the technical assistance provided via the DOs.

2 3 Emergent Work

The core contract had made provisions for the use of the BREI consortium to provide technical experts for use on emergent work in the NIS. Emergent work, by its nature,

involves activities that suddenly require technical support and a quick response. These activities would require a relatively small level of effort, have a short duration (typically 2-4 weeks), and would not be defined by a DO.

3 0 DELIVERY ORDER (PROJECT) ACTIVITY

3 1 U S Consortium Team

Because of the diversity of projects and countries involved with this work, BREI had developed a consortium of U S companies to provide the necessary experience and expertise. A total of 17 contractors were used on this project.

3 2 Project Activities

Using the consortium, BREI was able to provide support to all of the energy sectors. Some of the general results of this work included but were not limited to the following:

- ESCO development via energy efficiency audits, weatherization projects, and assessments at over 70 power plants and industrial facilities
- Support of private industry via local NIS procurement of equipment, commodities and construction services of about \$15 million
- Preparation of three Least Cost Investment Plans in Russia and Georgia
- Preparation of 10 feasibility reports and condition assessments for the multi-lateral banks to use for loan preparation and
- Preparation of tender documents for 10 projects sponsored by multi-lateral banks
- Preparation of 3 short and long term rehabilitation programs (gas transmission, electric distribution, condition assessments of power)
- ESCO development via weatherization. Eleven hospitals and schools in Yerevan and 14 outside Yerevan were weatherized. Eighty people were trained in weatherization methods. Six ESCOs were awarded weatherization work at four sites based on competitive bidding for the work.
- Preparation of environmental assessments
- Preparation of technical specifications for procurement of equipment and services
- Inspections of installations and commodities at over 100 recipients' facilities
- Assessment reports for U S equipment provided to NIS importers
- Improvement of exploration and extraction and mining capacity for coal, coal-bed methane, oil, and gas by providing operational support, training, and state-of-art equipment

4 0 FINANCIAL SUMMARY

Core

The total core funds spent through September 1998 was 96.7% of the approved budget of \$27,191,579 leaving a balance of \$893,321

Delivery Orders

Out of the total budget for 30 DOs \$32,700,017, 94% was spent leaving a balance of \$1,848,910. It should be noted that for the given scope of work, ceiling budgets were adequate to allow all DOs to be completed without additional funding.

5 0 LESSONS LEARNED

Procurement

- In implementing a procurement program to replace existing equipment in a country whose industry and infrastructure is virtually gone there are excessive inefficiencies
- A \$25 K limit for obtaining OP consent for the procurement work was too restrictive
- Procurement, shipment, customs clearance and local delivery of commodities purchased in the U S is a much more lengthy, time consuming process than was anticipated at the project outset
- Legitimate competitive bidding is possible within most NIS -- more so than anticipated at the outset of the project
- For the most part, NIS companies and consultants proved to be most reliable once under contract
- USAID "Source, Origin and Nationality" regulations proved to be very restrictive and, oftentimes, difficult to meet. This is particularly true in the area of electrical equipment.

Schedules

Schedules on delivery orders and procurement activity have been a significant issue. Some of the most significant delays which contributed to the necessity of extensions were

- Counterpart requests for changes to scope, specifications, procurement lists, etc
- Obtaining information from counterparts
- Political actions
- VAT waivers
- Clearing customs

- Consent on purchase orders or contracts
- Rebidding contracts based on nonperformance for NIS suppliers and contractors

In reality it was usually a combination of these items that would result in the need for a DO extension

Other issues related to schedule are provided in the country discussions in the report

6 0 CONCLUSIONS AND RECOMMENDATIONS

Some general conclusions and recommendations are provided in this summary The report also addresses country specific conclusions and recommendations

6 1 Conclusions

Implementation of aid projects in the countries of the former Soviet Union involved some unique cultural, political, and technical challenges which in many cases caused unanticipated schedule delays

In two cases our inability to obtain extensions to DOs from the CO, even with USAID Project Office approval, resulted in a project unfinished, with little positive results for the funds spent

6 2 Recommendations

Future projects should anticipate potential schedule delays and build in some schedule slack for the unexpected

The process for obtaining consents and extensions to DOs should be accelerated to ensure that overall USAID objectives are met

During periods of peak procurement increases in the Office of Procurement, staffing is needed This will allow for timely support of the projects

1 0 INTRODUCTION

Burns and Roe Enterprises, Inc (BREI) has been one of the two prime contractors implementing the programs defined by USAID on their Energy Efficiency and Market Reform Project for the Newly Independent States of the Former Soviet Union. Two contracts for this work were signed on September 30, 1993. One contract was for core activities (contract #CCN-C-0093-00153-00) and one for the buy-in or delivery order (DO) activities (contract # CCN-Q-0093-00154-00).

The core contract provided for three main activities: 1) management, procurement and administration (MPA), 2) funds for equipment and subcontractors procurement and 3) support of emergent work. The buy-in contract allowed for the implementation of work that would promote the strategic objectives of USAID. The buy-in contract was implemented via DOs, that were based on Statement of Work (SOW) prepared by USAID and a mutually agreed to level of effort (LOE).

This final report will provide an overview of the work performed both in the core and DOs. It will focus on the major results and lessons learned. The report will discuss the core activity in detail. However, since a final report was issued for each DO, this report will not reiterate the details of the work for each DO. Using the results of the DO work, this report will draw general conclusions that are more programmatic in nature.

2 0 CORE ACTIVITY

2 1 Management, Procurement and Administration (MPA)

MPA provided for the overall management of this work. A core staff was assembled in Washington D C, which performed the management of the DOs, including the local (in-country) office operations, procurement of equipment and commodities, contracting with subcontractors, review of subcontractor invoices, review of vouchers (billings) being sent to USAID, interface with USAID (ENI and Office of Procurement), processing of USAID country clearances, financial and progress reporting, etc.

The core office managed the completion of 30 DOs with a total budget for technical assistance of \$32,118,282 representing 24,398 days of effort. Technical assistance was provided by a consortium of contractors formed by BREI. Each contractor was responsible for a particular area of expertise, e.g., power generation, energy efficiency, oil and gas, etc. The use of the consortium is discussed further in section 3.1. In addition, the core office managed the procurement of over \$20 million in equipment, commodities and services. The details of the procurement activity are provided in section 2.2 of this report.

2 2 Procurement

2 2 1 General

Procurement activities were a major part of the work performed under the core and DOs. More than \$22 million dollars in equipment/commodities, local consulting and construction services were procured, resulting in almost 400 contracts or purchase orders. Nearly \$18 million was procured against the core contract equipment/subcontracts budget, while the remaining \$4.5 million was procured directly against various delivery order ODC budgets. These procurements were executed to support and enhance the technical assistance provided via the DOs.

The procurement activity is summarized and illustrated in Exhibits 2 2-1 through 3, which are appended to this report. In each exhibit the data is categorized by 1) the country which received the procured goods and services, 2) origin of the goods and services (i.e., procured from U.S. or from NIS sources), and 3) basic genre or category [i.e., "CS" or construction services, "TS" or technical services, "FF" or freight forwarding (i.e., export shipping of U.S. procured goods and in-country delivery)], and 4) "EQ" or equipment purchases (commodities, materials, supplies, tools and consumables). Exhibit 2 2-1 organizes and summarizes the data by country, Exhibit 2 2-2 does so by origin, and 2 2-3 does so by genre.

The core office procurement manager had overall responsibility for the procurement activity. He was assisted by additional staff in the core office and in-country as required. The core staff performed all commercial aspects of the procurement, such as issuing requests for proposals or bids, receiving and evaluating the commercial terms, negotiating with the bidders, selecting the awardee, issuing the purchase orders or contracts, and administering them through completion. The project procurement manager, ensured that U.S. Government requirements for procurement were satisfied, when necessary, obtained advance consent from the contracting officer (CO) to make the award. The technical assistance for procurement activities included in the DOs provided for working with the in-country experts to develop technical specifications, preparation of technical specifications, performing bid evaluations, review of technical documents, conducting pre-shipment inspections, assisting with customs clearance, receiving and acceptance of the equipment in concert with the end user, provision of training in the use of the U.S.-supplied equipment, and performance of post-installation monitoring as required by individual DOs.

2 2 2 Discussion of Results

This section of the report addresses the major results of the procurement effort. These results are as follows:

- Over \$22 million of equipment/commodities, NIS consulting services, and NIS construction services as well as specialized U S technical expertise was procured. This resulted in over 400 contracts and purchase orders.
- 60% of the procurements were made with private companies or enterprises in the NIS.
- Almost \$2 million was spent on local private NIS companies for technical construction services.
- There were two contracts issued for over \$1 million, one to an Armenian company and one to a US supplier. There were 6 contracts issued for amounts between \$500K - \$1 million. There were 23 contracts issued for amounts between \$100K-\$500K. The remaining 350 contracts were for values less than \$100K.
- Turn-key logistics services to export and deliver U S equipment to the NIS totaled approximately 11% of the total spent to procure and deliver U S commodities.
- 65% of the total procurements and 60% of the procurements for consulting and construction were for Armenia and Georgia. This was the result of both of these countries having emergency conditions that resulted in commodity procurement of urgently needed equipment.
- Of the equipment procurements made in Armenia and Georgia in 1994-1995 about 15% of orders placed had to be cancelled due to failure to complete performance. This represented about \$1,000,000 of un-delivered commodities. Out of \$10,600,000 of commodities procurements, this represents a failure rate of approximately 10%. In the vast majority of these cases, the cancellations were partial cancellations. Virtually all original vendors delivered at least some of the commodities they had been contracted to provide. In essentially all cases, other NIS suppliers were found who successfully completed the procurement action.
- For the most part, BREI was able to negotiate contracts without making down payments. All payments were based on receiving a deliverable.
- Flowdown of the FAR to NIS contractors posed no problem, which means no one read the document.
- BREI had good experience using NIS consultants and construction companies. They worked on a firm fixed price basis and were able to complete the work within budget and within contract and project schedules.

2.3 Emergent Work

The core contract had made provisions for the use of the BREI consortium to provide technical experts for use on emergent work in the NIS. Emergent work, by its nature, were activities that suddenly required technical support and a quick response. These activities would require a relatively small level of effort, have a short duration (typically 2-4 weeks) and would not be defined by a DO.

Projects supported by emergent work were as follows:

- Sent a team to Georgia in December 1993 to prepare a general assessment of the energy sector.
- Sent a team of experts to Kazakhstan in the Summer of 1994 for a scoping mission to evaluate possibilities for an energy savings plan and a power market study.
- Sent an oil and gas expert to Georgia in January 1995 to support a World Bank mission for loan preparation for the power sector.
- Sent a team of hydro engineers in May 1995 to assess the landslide that covered the Gyumush Hydrostation in Armenia. Their assessment was used to justify \$3 million in emergency funds to start the necessary repairs.
- Sent a natural gas transmission expert to Georgia in June 1998 and Armenia in August 1998 to help in development and verification of the emergency procedures for safe system operations. These procedures were part of the MOU between the Government of Georgia and USAID, which required that environmental and operational issues be addressed.
- Supported a UN mission to Abkazia in Georgia to evaluate the energy and infrastructure sectors in April 1998. Abkazia is a disputed territory within the borders of Georgia.
- Technical support of USAID mazut procurement program in Georgia. Specifically provided an independent analysis of the Georgian data to verify the consumption of the mazut was accounted for as stated by the Georgians analysis.

3 0 DELIVERY ORDER (PROJECT) ACTIVITY

3 1 U S Consortium Team

Because of the diversity of projects and countries involved with this work, BREI had developed a consortium of U S companies to provide the necessary experience and expertise. A matrix of the contractors used by country and areas of expertise are provided in Table 3 1-1 and 3 1-2, respectively.

A total of 17 contractors were used on this project. There were also a number of individual consultants used by these 17 contractors to ensure the necessary technical and project management which was brought to bear on these diverse and challenging projects. The largest number of different contractors (8-10) were used in Armenia, Georgia, and Russia. This is because these countries included programs that covered all areas of the energy sector, i.e., power generation, transmission, oil and gas, coal mining, energy efficiency (DSM), and renewable, in addition to commodities supply. The Ukraine and Moldova work focused on energy efficiency and coal-bed methane issues, while the Central Asian Republics (CAR) focused on environmental and power market issues for the most part. The technical assistance for the CAR was significantly less than that for the other active NIS countries.

Energy efficiency was always the number one priority for this project, as reflected in the title of the project. Table 3 1-2 reflects this. There are more contractors working in the area of energy efficiency than any other. It also reflects the need in all energy sectors throughout the NIS for energy efficiency improvements. Table 3 1-2 does not account for the energy efficiency that results from generation projects (Harza), or transmission projects (AEP).

Although many areas of expertise were needed and called upon for this project, the depth of the work and number of projects was not enough to provide work for all of the original consortium members. Some of the consortium members who did not receive (or received very little) work under the BREI contract were NRECA International, Eneritech/CG&E, Core International, and Center for Financial Engineering in Development of Texas A&M University.

Table 3 1-1, Contractors Matrix by Country

| Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|------------|------|-------|-----|-----|-----|-------|-----|-----|-----|-----|------|----|------|-----|-----|-----|-----------|
| Contractor | BREI | Harza | AEP | PTI | RMA | Dries | ARS | F-W | ICF | IGC | G-Ex | W | Gray | C&L | F-D | IRG | ICB MG |
| Country | | | | | | | | | | | | | | | | | |
| Armenia | X | X | X | | X | X | X | | | X | X | | X | | X | | |
| Georgia | X | X | X | | | X | | | X | X | X | | | X | | | |
| Kazakhstan | X | X | X | | | | | | | | | | | | | X | |
| Kyrgyz Rep | X | X | X | | | | | | | | | | | | | X | |
| Moldova | X | | | | | | | | | | | | | | | | |
| Russia | X | X | X | X | X | X | | | X | | | X | | X | X | | |
| Ukraine | X | | | | X | X | | X | | | | | | | | | X |

- | | | | |
|----|--|--------------|---|
| | 12 | Westinghouse | |
| 1 | Burns and Roe Enterprises, Inc | 13 | Gray & Associates |
| 2 | Harza Engineering | 14 | Coopers & Lybrand |
| 3 | American Electric Power | 15 | Fluor-Daniel |
| 4 | Power Technologies, Inc | 16 | Int'l Resource Group |
| 5 | Resource Management Associates of Madison | 17 | International Coal Bed Methane Group |
| 6 | Dries Associates | | |
| 7 | Armenia Relief Society | | |
| 8 | Foster-Wheeler | | |
| 9 | ICF-Kaiser | | |
| 10 | International Gas Consultants | | |
| 11 | GeothermEx Ltd | | |

Table 3 1-2, Contractor Matrix by Expertise

| Contractor Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|-----------------------------|------|-------|-----|-----|-----|-------|-----|-----|-----|-----|------|----|------|-----|-----|-----|-----------|
| Contractor Name | BREI | Harza | AEP | PTI | RMA | Dries | ARS | F-W | ICF | IGC | G-Ex | W | Gray | C&L | F-D | IRG | ICB MG |
| Expertise | | | | | | | | | | | | | | | | | |
| Power Generation | X | X | | | | | | | | | | X | | | | | |
| Transmission & Distribution | | | X | X | | | | | | | | | | | | | |
| Coal | | | | | | | | | | | | | | | X | | X |
| Oil & Gas | | | | | | | | | | X | | | X | | X | | |
| District Heating | X | | | | X | X | | | | | | | | | | | |
| Energy Efficiency | X | | | | X | X | X | X | | | | | | | | | |
| Financial Analysis | | | | | | | | | | | | | | X | | | |
| Environmental | X | X | | | | | | | | X | | | | | | | |
| Geothermal | X | | | | | | | | | | X | | | | | | |
| Least Cost Planning | X | | | X | | | | | X | | | | | | | X | |

- 1 Burns & Roe Enterp , Inc
- 2 Harza Engineering
- 3 American Electric Power
- 4 Power Technologies
- 5 Resource Management Associates of Madison
- 6 Dries & Associates

- 7 Armenia Relief Society
- 8 Foster-Wheeler
- 9 ICF Kaiser
- 10 International Gas Consultants, Inc
- 11 GeothermEx Ltd
- 12 Westinghouse

- 13 Gray & Associates
- 14 Coopers & Lybrand
- 15 Fluor-Daniel
- 16 Int'l Resource Group
- 17 Int'l Coal Bed Methane Group

3.2 Project Activities

3 2 1 General

Using the consortium and bringing in the expertise of other contractors as illustrated in section 3 1, BREI was able to provide support to all of the energy sectors. This work was performed by implementing 30 DOs. A list of these DOs with a very brief description is provided in Exhibit 3 2-1. As can be seen from this list there were DOs or portions of DOs which were not completed for a number of different reasons, such as having to stop work due to unrest in-country, government counterparts not performing as agreed, delays in procurement, etc. Those projects which were cancelled or stopped will not be discussed in this report.

The projects defined for implementation in the NIS were varied and depended on the status of each country's energy sector. Some programs focused more on technology transfer, and other programs were classified as emergency projects because of the dire straits of that country's energy sector. A brief description of the activities are presented below.

The expertise identified in Table 3 1- 2 for the consortium and consultants gives an indication of the types of work performed. The detailed results of this work have been presented in the DOs respective final reports. Some of the general results of this work included but were not limited to the following:

- ESCO development via energy efficiency audits, weatherization projects, and assessments at over 70 power plants and industrial facilities. Recommended changes were implemented at most of these sites.
- Support of private industry via local NIS procurement of equipment, commodities and construction services of about \$15 million.
- Preparation of three Least Cost Investment Plans (the Northwest Region of Russia, Krasnodar in Russia, and Georgia).
- BREI's consortium prepared the technical input to the least cost investment plan, in, the "Joint Energy Power Alternatives Study" (JEPAS).
- Preparation of 10 feasibility reports and condition assessments for the multi-lateral banks to use for loan preparation and approval (new thermal and hydro power plants, rehabilitation of thermal and hydro power plants, new and rehabilitation of electric transmission and distribution systems, district heating systems, and water treatment systems).
- Preparation of tender documents for 10 projects sponsored by multi-lateral banks.
- Preparation of 3 short and long term rehabilitation programs (gas transmission, electric distribution, condition assessments of power).

- ESCO development via weatherization Eleven hospitals and schools in Yerevan and 14 outside Yerevan were weatherized Eighty people were trained in weatherization methods Six ESCOs were awarded weatherization work at four sites based on competitive bidding for the work
- Preparation of environmental assessments
- Preparation of technical specifications for procurement of equipment and services
- Inspections of installations and commodities at over 100 recipients' facilities
- Assessment reports for U S equipment provided to NIS importers
- Improvement of exploration and extraction and mining capacity for coal, coal-bed methane, oil, and gas by providing operational support, training, and state-of-art equipment

3 2 2 Discussion of Results

This section of the report will discuss in more detail some of the results achieved by the DO work implemented under the BREI contract Key results for are as follows

Feasibility Reports for Bankable Projects

One of the key areas that technical assistance was used to promote investment in the NIS countries power sector To support this goal USAID has funded the necessary feasibility reports for various power projects in the NIS The Table 3 2-1 below provides a summary of the projects, for which a feasibility report had been prepared All these projects were considered bankable prior to starting the feasibility work Table 3 2-1 provides summary information of these projects, such as description, country, estimated loan amount and whether the project was implemented Although the primary investors for these projects are the multi-lateral banks the reports are not restricted to that type of financing For example the Shnokh is expected to be funded by private investors As can be seen from this table USAID funding for the feasibility reports has resulted in the actual implementation of \$90 million dollars in loans for power projects Georgia

| Table 3 2-3, Summary of Bankable Projects | | | | | |
|---|--|---------|------------------------------|-----------------------------|---|
| Item | Description | Country | Project Implemented (yes/no) | Estd Loan Amnt \$, millions | Comments |
| 1 | EBRD - Power Rehabilitation a) Water Treatment System for Gardabani b) 2 Hydroturbine sets for Rioni hydro station c) Condenser tube cleaning system for Units 9 & 10 | Georgia | Yes | \$18 | Work has been completed |
| 2 | WB - Tbilisi Thermal Electric Power Station Unit 10 Rehabilitation at Gardabani | Georgia | Yes | \$60 | Work is ongoing and is expected to be completed by the end of 1998 |
| 3 | WB - Hydropower Rehabilitation at Krami II | Georgia | Yes | \$15 | Work is ongoing |
| 4 | WB - Transmission Control and Dispatch Center | Georgia | Yes | \$5 | Work has been started |
| 5 | WB - Krasnodar GRES-Combined Cycle Plant | Russia | No | \$500 | This project is on hold because the beneficiary must finalize tariff, organization and ownership issues |
| 6 | EBRD - Geothermal District Heating System Rehab | Georgia | No | \$40 | Being reviewed by EBRD Increased private equity will be needed |
| 7 | Combined Cycle Plant Repowering at Yerevan Power Station | Armenia | No | \$225 | Report completed Sept 29 1998 |
| 8 | Circulating Fluidized Bed at the Hrazdan Station | Armenia | No | \$60 | Report completed Sept 29, 1998 |
| 9 | Shnokh Hydropower Station | Armenia | No | \$122 | Report completed Sept 29 1998 |

Other key results listed by country are provided below

Armenia

Work in Armenia was started in June of 1994 on an emergency basis. The Armenians had only 1 or 2 hours of electricity a day. Power generation could not meet the demand. A project was developed by USAID to supply urgently needed equipment and commodities. This emergency procurement activity was overseen by the USAID mission in Yerevan and by the Ministry of Energy on a daily basis. There was tremendous concern in seeing that all procurements were completed as fast as possible. The following results were realized by this work:

- During June 1994 - June 1995 over \$7 million worth of commodities and equipment was procured and delivered.

In addition, this emergency work included supply of mini hydroturbine/generator sets, energy efficiency work with industry, weatherization of hospitals and schools, and spare parts inventory program for Hrazdan. The following results were realized by this work:

- Fourteen hospitals and schools in northern Armenia were weatherized by ARS, and eleven in Yerevan by RMA.
- The inventory control reduced a scheduled procurement from \$400,000 to only \$40,000.
- Added 1 26MW of hydro capacity to the energy system in the spring of 1997.

Starting in 1996, the projects developed by USAID were more focused on specific systems and projects that would support other donors or USAID initiatives. The best examples of this are the support of the gas sector in conjunction with USAID's procurement of \$45 million in natural gas over a two year period, and the Environmental Assessment was used to support the electric transmission and distribution loan from the World Bank. A summary of results in Armenia during 1996-1998 are as follows:

- Provided equipment, installation, training and field checkouts for the Seismic Institute. The equipment was used for seismic oil & gas exploration. Upon completion of this project the Seismic Institute was able to contract with the Armenian American Exploration Company to begin their exploration work. The Seismic Institute was paid \$3000/km and grossed over \$500K.
- In order to satisfy the conditions of the MOU between the Government of Armenia and USAID, BREI supplied gas chromatograph and leak detectors, which allowed for the analysis of gas being supplied so that it could be compared to the technical specifications and leaking pipelines could be detected prior to failure.
- Provided spare parts to allow for the operation for the compressor station so that about 20 million cubic meters of gas per day could be stored in the Abovian Gas Storage Facility for use in the winter months.
- Based on the environmental assessment of the energy sector prepared by BREI it was

determined that PCB's were in various locations in Armenia. By quantifying the problem BREI was able to provide mitigation plans for the Armenians, which were required by the World Bank. These plans became part of a \$90 million World Bank loan, which is still being negotiated.

- Based on a Project Selection Report, which identified 12 high priority projects from Armenia's completed Least Cost Plan, three feasibility reports for power generation were developed (combined cycle plant, circulating fluidized bed and Shnokh hydro station) for new power generation. These projects will, if implemented, support the closure of 400MW from the Armenian Nuclear Power Plant (ANPP) scheduled to close at the end of 2004.

Georgia

Work in Georgia was started in September of 1994 on an emergency basis. The Georgians had only 2 or 4 hours of electricity a day. Power generation could not meet the demand. A project was developed by USAID to supply urgently needed equipment and commodities. The following results were realized by this work:

- Rehabilitated four hospital heating systems, which were part of the World Bank priority list of facilities for their \$18 million Municipal Services Loan to Georgia. Total funds for materials and installation works was \$240,000.
- Supplied \$2,452,000 of commodities for Sakenergo.
- Before supply of these commodities by USAID, the Gardabani plant was generating 83 MW from four units, 119 million kWh and consumed 630 g/kWh. In 1996 the same four units were operating at 102 MW and generated 145 million kWh and consumed fuel of 507.7 g/kWh.
- With respect to reliability before 1994 the plant had 23 unscheduled emergency shutdowns. By April 1996 the plant had only 7 unscheduled emergency shutdowns.
- Prepared feasibility reports, detailed design and tender documents for implementation of an \$18 million loan for a makeup water treatment system for all 8 units, condenser tube cleaning systems for units 9 & 10 and two hydroturbine units for the Rioni hydro power station.

Starting in 1996 the projects developed by USAID were more focused on specific systems and projects that would support other donors or USAID initiatives, as was the case in Armenia also.

- In order to satisfy the conditions of the MOU between the Government of Georgia and USAID, BREI supplied gas chromatographs and leak detectors, which allowed for the analysis of gas being supplied so that it could be compared to the technical specifications and leaking pipelines could be detected prior to failure. This also

- supported the gas supply to Armenia since that gas must pass through Georgia. Also training and emergency procedures were prepared and drills were used to verify understanding of the new emergency procedures
- Prepared an assessment report for the Tbilisi District Heating System, which defined nine projects for further consideration. As a follow on activity, BREI developed the design and cost estimates to implement these projects. USAID funded work on four hospital heating systems, two schools and the re-establishment of geothermal heat to about 3,000 people in the Lisi district of Tbilisi. One of the hospitals was refurbished with a solar heating system which will supply 50% of the hot water needed during a year.
 - Prepared a feasibility report to refurbish the Zugdidi geothermal district heating system, which was damaged during the civil war in 1992. In order to establish a cash flow for the project the study also evaluated the rehabilitation needed for the industries in the area. These industries were once part of the local economy and included but are not limited to tea drying, chicken farms, fisheries, greenhouses for vegetables, etc. The EBRD was the sponsor for this project and is evaluating it for implementation.

Kazakhstan

Work started in Kazakhstan in 1994 with a program to assist the Republic of Kazakhstan's Ministry of Economy with preparation of a national program for energy savings, focused on identifying economic and legislative measures, and technical and operational measures for improvements. The resulting report addressed energy sources, generation, transmission, distribution, and consumption of electrical energy and centrally produced thermal energy. Current and projected energy demands were analyzed, and potential energy savings were forecast along with recommendations for energy savings policies.

Privatization of electric utilities became a major program in Kazakhstan in 1995 - 1996, perhaps the report on National Program for Energy Savings was a catalyst for these activities. The program may have benefitted from a follow-on effort which could have provided some measure of the results.

Another project, started in 1994, assessed benefits and costs to be gained by renovation and life extension of thermal/heating plants. Four thermal power plants were evaluated on the basis of technical and cost benefits for renovations and efficiency improvements, and the

opportunities for updating plant instrumentation. The resulting reports were used by investors to evaluate investment opportunities, and, again, may have been a catalyst for the unexpected, swift movement toward privatization.

BREI developed an optimum coal cleaning and mining process for Kazakhstan coals from the Karaganda and Ekibastuz basins, with consideration of coal quality, environment, safety and economics. BREI also conducted a training program on coal cleaning technology and developed an investment program for a coal cleaning plant. USAID funds provided for a significant amount of laboratory equipment to be used toward a clean coal program in Karaganda.

Environmental improvement opportunities with respect to coal plant emissions are abundant in Kazakhstan. BREI trained a team of select local personnel and worked with them to perform environmental audits of four thermal power plants, looking at liquid, solid, and gaseous waste streams. The training included performance of technical and cost analyses to select, design, and implement technologies and practices to control emissions and mitigate environmental damage. The project team selected a prototype facility, monitored effluents, and prepared an implementation plan which could be used to effectively reduce emissions, not only at the prototype plant, but also at similar facilities throughout the country.

Kyrgyz Republic

Two tasks were initiated in 1994 and worked jointly to prepare plans for improving the Bishkek power plant and district heating system and the electrical transmission and distribution system. BREI and subcontractors estimated costs and schedules for power plant and district heating improvements and rehabilitation, and prepared inventory, mapping, recommended upgrading and replacement plans for transmission and distribution. The resulting plans could be used toward obtaining funds for the projects either via loans, investments, or donor organizations.

Central Asia's water sharing and hydroelectric power production was directed under the Soviet system whereby the Kyrgyz Republic was supplied with power from thermal plants in the Uzbek and Kazakh Republics, and in exchange, held water in the river reservoirs until spring and summer to support irrigation needs. Now, with independence, the competing needs for winter electric power (via hydroelectric generation) by the Kyrgyz Republic, and for spring/summer irrigation water by Uzbekistan and Kazakhstan, give rise to necessary water sharing agreements among the countries. To help define how the Kyrgyz Republic's hydrogeneration facilities should be operated to maximize benefits for the region, BREI and Harza Engineering developed marginal costs for increased thermal generation and a simulation model of the Naryn Syr Darya River system. Using data on generation costs, load forecasts, reservoir capacities, stream flows, irrigation requirements, and crop revenues, the model

identifies the optimum water releases during dry, wet, and normal years forecast over a several year period, with emphasis on irrigation or on power generation. With the results, better information about the water use and its value (as compared to thermal generation) is available to the Central Asian Republics for input to future water sharing agreements.

Moldova

USAID established a program for energy efficiency and environmental controls for the Moldova thermal and combined heat and power plants (CHPs), but due to a political situation in the Trans-Dniester region, the U S Ambassador put the project on hold soon after it began. Later, the project resumed, to include two CHPs in the Moldova capital of Chisinau, but to exclude the large thermal plant in the Trans-Dniester region. BREI conducted energy efficiency audits at the two CHPs and presented each with a set of audit equipment.

The audit reports suggested energy conservation opportunities and further equipment to be procured to implement these energy savings. Although the intent of the program was to furnish some of this energy efficiency equipment for the plants to use, the project schedule had been cut short (due to the political hold) and the majority of the project could not be completed. Although a request was made to extend the project duration for this reason, the Office of Procurement did not respond.

Russia

JEPAS -

- JEPAS evaluated the Russian Integrated Planning System (IPS) which was made up of seven regional power systems: the Northwest, Center, Middle Volga, North Caucasus, Urals, Siberia, and the Far East. Out of the existing generation capacity in 1994 of 215 GW, 80 GWs (600 units) of fossil thermal plants and 8 GW of nuclear capacity will reach the end of their service life by the end of 2010.
- The amount of financing needed over the next 10 years, starting in 1995, for high-priority projects could range from \$32 to \$81 billion, depending on demand.
- There is a short term need during 1995 through 1997 for \$2-4 billion from the international financial community. These kind of investments in the Russian energy sector have not been forthcoming.
- Analysis indicated the following ranking of priorities during the period 1995-2000: 1) improvements in energy end-use, 2) nuclear safety upgrades, 3) development of the Integrated Power System, 4) modernization of thermal power stations, 5) completion of the nuclear plants under construction, 6) construct a new combined cycle power station, and 7) completion of the design for new generation nuclear power plants.

World Bank Feasibility Report for Krasnodar Combined Cycle Plant

- Based on the findings in the JEPAS, that the North Caucasus is a electricity deficit region, the World Bank expressed interest in having a feasibility report performed to install a combined cycle power station (Krasnodar GRES) in that region BREI prepared the technical, environmental, financial and tendering documents necessary to support a World Bank loan
- The proposed Krasnodar GRES project is a 900 MW combined cycle power plant to be built at the Mostovskoy site The site and plant design will support expansion to 1,350 MW Procurement of equipment and construction services will be done using multiple bid packages with management of project implementation provided by Kuban GRES and its engineering consultants The project was shown to be technically and environmentally feasible With a \$0.0366/kWh (1995 \$) tariff the project would yield a 15% return on equity The economic rate of return would be 20.2% However, the Kuban GRES has not been able to satisfy the financial, institutional and management conditions that the World Bank requires to ensure a successful implementation of this project Therefore, this project has not been implemented
- This project has not, and may not in the near future, be implemented

Commodities Import Program

The commodity import program (CIP) objectives were to promote energy efficiency, mitigation and monitoring of environmental impacts, and U S A technologies All allocations were to come from the Russian importers based on meeting these objectives The CIP project was developed jointly by the U S and Russian governments, during 1993 A Joint Russian-American Steering Committee was established to oversee implementation of the program A Secretariat (Mr Aram Akopov of BREI) provided the project management to support the CIP

The CIP projects were to also focus on projects that had good demonstration potential and that could be repeated in other areas of Russia Some of the key results of this program are presented below

- Evaluated over 300 applications and made recommendations to the Joint Russian/American Steering Committee for allocations
- Implemented projects with 63 importers for \$53.1 million
- Projects were implemented in the different energy sectors as follows
 - ▶ Four coal projects for \$4.3 million
 - ▶ Five district heating and energy efficiency projects for \$10.1 million
 - ▶ One gas sector project for \$4 million

- ▶ Twelve power sector projects for \$10.4 million
- ▶ Thirty nine environmental projects for \$24.3 million
- All equipment for the 63 projects was delivered
- There are thirteen projects where installation by the importer is not completed, representing \$18.2 million
- Assessments were done on the district heating system energy efficiency improvement for Murmansk, Vladimir, Tver and Zelenograd. Results showed a 5% reduction in fuel usage. These four projects will reduce greenhouse gas emissions by 22,245 tons/yr
- Twenty two percent of the CIP allocations were over \$1 million. The CIP program tried to maximize the amount of each allocation so management of the program is most efficient

Northwest Region Least Power Investment Plan

The JEPAS study identified the Northwest Region as a future deficit region. This deficit will result from the closure of two nuclear power plants in the region in 2005. USAID funded the development of a least cost power investment plan to assist the Russians in planning for the replacement power need in this region. The study used the Russian experts who participated in the JEPAS study and the result was identified the investments needed out through 2010. Prefeasibility reports were developed for 10 high priority projects.

Ukraine

Projects in Ukraine had two main areas of concentration: energy efficiency and coalbed methane. A coalbed methane pilot project was initiated, wherein feasibility of coalbed methane extraction would be demonstrated at an operating mine, in conjunction with the GLOBAL Environmental Facility. The first stage was completed resulting in the plans for drilling and the demonstration project. Since the second stage funding (via GEF) was not available, the project activities were stopped.

Ukraine, however, has some of the best available sites (gassy mines) for coalbed methane extraction and BREI worked toward identifying the routes toward commercialization of this industry. Regulatory, safety, environmental, licensing, and other development issues were identified and BREI worked with the local government bodies (such as the Ministry of Coal, National Academy of Sciences, and the State Committee on Geology) to formulate a structure to encourage coalbed methane development. A handbook for joint-venture activities was prepared to illustrate legal issues, tax issues, and marketing strategies. Further, in order to provide a national resource center, BREI established the Alternative Fuels Center in Kiev which can assist potential investors and developers with the opportunities available for coalbed methane, and the legal and regulatory processes which must be addressed.

The USAID programs in Ukraine involved eight power plants and twenty-nine industrial plants in programs of energy efficiency and reliability. For the Kiev 5 combined heat and power plant, a new water treating system and efficient resins have greatly improved the reliability and capability of Kiev 5 plant to provide power and hot water to the people of Kiev, and at substantial cost savings over the previous methods and equipment. Other power plants and industrial plants were the beneficiaries of energy efficiency audits and corresponding energy saving equipment. The equipment will provide savings of hundreds of thousands of dollars annually for each plant in fuel costs and operations costs, and will result in decreased environmental effects due to the efficiency improvements. An outstanding result of the program is that nine energy services companies (ESCOs) were formed out of the staff which BREI established to perform energy audits. These people received extensive training in business and marketing practices of ESCOs, substantial on-the-job experience in conducting energy audits and identifying energy savings techniques. The companies formed have an excellent opportunity to establish successful businesses which will benefit the Ukrainian energy sector for the future.

4 0 FINANCIAL SUMMARY

Core

Exhibits 4 0-1 through 4 0-3 of this report provide a summary of the core financial status as of September 29, 1998. This table shows the total core funds spent through September 1998 as 96.7% of the approved budget of \$27,191,579 leaving a balance of \$893,321.

BREI did require a redistribution of the core budget to allocate additional funds to the MPA from the equipment. BREI informed USAID of this problem at the project review meeting held in May 1998. A contract modification was issued by the CO, which is reflected in the above numbers. The CO also allowed for charges to be incurred after September 29, 1998, for the completion of this report and for follow-up of equipment delivery which, through no fault of BREI, was not able to be delivered to the Ukraine, and for equipment to be sent to Georgia to support the MOU between USAID and the Government of Georgia. It is expected that these costs will be less than \$100K.

Delivery Orders

Table 4 0-2 provides a breakdown of the budgets, amounts spent and balance for the 30 DOs. Out of the total budget of \$32,700,017, 94% was spent leaving a balance of \$1,848,910. It should be noted that for the given scope of work ceiling budgets were adequate to allow all DOs to be completed without additional funding.

5 0 LESSONS LEARNED

5 1 General

Work that is contingent on the actions of outside agencies, multilateral banks, or host country actions many times is not effective, e g Krasnodor in Russia, Zugdidi Geothermal in Georgia

Procurement

- There were at least 10 USAID contracting officers or contract specialists assigned to handle the BREI contracts over the 5 years of this contract This lack of continuity was a major detriment to the project schedules and implementation
- In implementing a procurement program to replace existing equipment in a country whose industry and infrastructure is virtually gone there are excessive inefficiencies For example, 15% of the purchase orders and contracts in Armenia and Georgia had to be canceled due to non performance
- A \$25 K limit for obtaining OP consent for the procurement work was too restrictive During peak procurement activities (1995-1997) consents took between 1 to 7 months to be authorized, which is not consistent with the DO durations of 12 to 18 months
- Procurement, shipment, customs clearance and local delivery of commodities purchased in the U S is a much more lengthy, time consuming process than was anticipated at the project outset It is fraught with unforeseen difficulties, particularly as it requires dealing with an evolving bureaucracy In general the length of time this process would entail was not adequately taken into consideration account when planning new delivery orders, particularly with regards to their schedule and duration
- Legitimate competitive bidding is possible within most NIS -- more so than anticipated at the outset of the project However, prospective bidders must be checked out carefully to establish their legitimacy proper registration, ownership of the company, physical place of business, business references (must be contacted and verified), bank accounts, and the CV's of the business' principals, if not the business itself, are some of the essential items of research to required
- For the most part, NIS companies and consultants proved to be most reliable once under contract The majority performed their services or delivered their commodities within the original contract price and within delivery/completion schedules Very few change orders to NIS contracts were required
- However, in general, NIS contractors -- particularly suppliers or manufacturers of commodities -- are very concerned with getting every detail of a contract or purchase order correct before they will sign the contract/purchase order and proceed with the work (Most U S suppliers will accept the order, begin the work and agree to make minor corrections via a contract modification or p o amendment) This can stretch out the procurement process by weeks or, in some cases, months, which, of course extends

performance of the task order or delivery order sometimes to the breaking point. This is another element that should be given greater consideration when task orders or delivery orders are being planned and durations are being established.

- USAID "Source, Origin and Nationality" regulations proved to be very restrictive and, oftentimes, difficult to meet. This is particularly true in the area of electrical equipment. Virtually all U S manufacturers make electrically powered equipment to operate on 110 volt/ 60 Hz power. NIS power requires equipment to operate at 220 volt/50 Hz. Also, U S wall plugs are configured differently, and most U S manufacturers are not set up to supply power cords which meet NIS (European) standards. If a U S supplier does manufacture equipment to be marketed in Europe and NIS, most have European or NIS divisions or subsidiaries that manufacture the equipment for that market. However, purchase of a copier from Xerox' European subsidiary, Rank Xerox (Great Britain) would not meet the restrictions of the regulations. On the other hand, Xerox-U S will not sell a copier here in the U S that meets the NIS power standards. USAID should re-vamp its "Source, Origin and Nationality" regulation if it intends to charter its contractors to provide commodities to countries such as the NIS under these prime contracts.

Schedules

Schedules on delivery orders and procurement activity have been a significant issue. BREI had requested and received a significant number of DO extension over the course of this work. In a couple of cases extensions were not granted. Some of the most significant delays, which contributed to needing the extensions were

- Counterpart requests for changes to scope, specifications, procurement lists, etc
- Obtaining information from counterparts
- Political actions
- VAT waivers
- Clearing customs
- Consent on purchase orders or contracts
- Rebidding contracts based on nonperformance for NIS suppliers and contractors

In reality it was usually a combination of these items that would result in the need for a DO extension. The lessons learned are as follows

- The CO should be kept informed of schedule delays as they are occurring this would shorten the time to obtain an extension in the event one is needed
- For projects with a significant number of procurement actions a general consent should be provided based on a list of equipment and estimated costs. This would dramatically reduce the number of consents and thereby improve schedules

- The bilateral agreements for waiver of VAT are not generally honored by the host country USAID should escalate obtaining their acceptance by the host countries or modify the procedure to obtain VAT waivers Perhaps a project waiver at the start of a project Obtaining waiver from paying VAT became much more difficult the last year of this contract
- Even for relatively simple procurements face to face negotiations, between authorized representatives of the US and NIS contractors, have a tremendous effect on speeding up the process
- Customs clearance is impossible to control However, informed customs and having all paper work done prior to arrival of equipment does help speed the process

Other issues related to schedule are provided in the country discussions below

Armenia

Counterparts in country did not necessarily have adequate knowledge of viable NIS suppliers of equipment and commodities, which was an assumption made in developing the procurement plan This fact affected the duration of procurement activities

Armenia required significant management oversight This was due to the very proactive approach our counterparts had in pursuing their agenda They have a large number of English

speaking personnel, which allowed them to effectively lobby their position BREI and USAID should have been much more forceful at the start of the work in establishing the rules and clearly defining what "No" means

The Armenian counterpart expectations of the projects did not always coincide with the USAID Scope of Work Much time was spent in debating and reconciling these issues, especially in 1994-1995

Georgia

Knowledge of suppliers was not always up to date and this created a situation similar to Armenia

Training can not be overemphasized in Georgia Much damage has been done to their electric generation and transmission system due to operator error There were examples of operators allowing pumps to go into reverse rotation, ID fans being destroyed because oil was not added to the bearings, load shedding was not performed causing cable fires, etc On site consultants available to the plant management would enhance their knowledge and perhaps give them more confidence to operate their plant in a technically sound and safe manner

The Georgian counterparts, at a fairly high level were always concerned with how they would be paid. This issue actually caused BREI to remove a team from Georgia for 3 months during the preparation of the World Bank sponsored feasibility studies at the Gardabani plant. This approach worked and the plant provided the personnel to complete the work.

Kazakhstan

Privatization of electric utilities occurred faster than ever expected and resulted in several false starts. More planning is needed which the Kazakhs failed to realize.

Kyrgyz Republic

Data on generation capacities, load forecasts, transmission and distribution networks, irrigation needs, crop yields, and stream flows from each of the five Central Asian Republics proved very difficult to obtain. Further, as privatization of utilities and other entities becomes more prevalent, some data may not even be obtainable, as it will be considered proprietary.

Moldova

Allowing opportunity to reschedule work if delayed by political situations. Project work was stopped and when restarted an extension was needed.

The USAID Office of Procurement needs additional staffing. This project was cancelled because a request for an extension was not acted upon by OP for the 3 month period before project completion.

Russia

Russian importers are not able to provide installation of projects in a timely manner. This is primarily due to lack of funds. As a result there were significant delays and 13 CIP projects remain not installed or the equipment is not being used.

CIP preshipment inspections should have been included in the original scope of work. These inspections were invaluable in ensuring compliance with the specifications prior to shipment to Russian importers.

Ukraine

Technical capabilities of local specialists are great but they lack knowledge of business and marketing practices. Future programs should emphasize business training in ESCO development.

The Energy Efficiency Project was initially envisioned as more than a 22 month project. Due to the contract expiration date, the project had to be scheduled into a 12 month duration. Because of an unexpected difficulty with one of the government counterpart agencies, shipment of equipment had to be held in the U S for about a 3 month period, thus preventing the opportunity to monitor equipment energy savings which was to be done at the end of the schedule. The experience throughout NIS projects has been that original schedules normally need more time. In this case, the protracted schedule certainly was not enough.

Agreements with counterpart government agencies should be firmly established before the contractor begins the project. This will avoid the type of situation we experienced where the state agency wanted to have a major role in the project, wanted to change the scope, wanted to control the equipment budget and have the equipment for its own use, and had the ability to withhold our project registration until these issues were resolved, thereby causing an unrecoverable schedule delay.

6 0 CONCLUSIONS AND RECOMMENDATIONS

6 1 Conclusions

General

Implementation of aid projects in the countries of the former Soviet Union involved some unique cultural, political, and technical challenges which, in many cases, caused unanticipated schedule delays

In two cases our inability to obtain extensions to DOs from the CO, even with USAID Project Office approval, resulted in a project unfinished, with little positive results for the funds spent

Armenia

It is not likely that the Armenia Nuclear Power Plant will be shutdown by the end of 2004, unless replacement power is available

Georgia

Training is very important in Georgia Based on the inspection work done at a number of facilities there has been substantial damage caused by operator error In some cases political decisions over ride technical and safety concerns as a first priority Examples are the fire at Gardabani and the crane failure at Inguri

The projects in rehabilitating the Tbilisi District Heating System were successful and very visible projects to the population of Tbilisi

Continue to support the least cost planning efforts of the Ministry of Fuels and Energy

Search for investors who may wish to take on the medium to small investments for upgrading the 18 sub-districts identified in BREI Tbilisi District Heating Study

Kazakhstan

The environmental work identified the necessary changes to reduce power and industrial plant to reduce plant emissions

Kyrgyz Republic

Further develop the hydropower simulation model and make it and its results available to users in the Central Asian Republics

Moldova

This energy efficiency work was stopped due to political circumstances and therefore the results of this work are incomplete

Russia

Our experience with the CIP indicates that the regional governments are more receptive to change and understand better than the federal government in Moscow what is required to establish a market economy. They have clearer goals of what they wish to achieve and in some cases such as Vologda and Murmansk, they are proceeding with their plans

The Russian government has not been very proactive in attempting to implement the recommendations of the JEPAS report

Ukraine

It is going to be very difficult for the ESCO's to use US supplied equipment because of the difficulty of obtaining spare parts. Suppliers of energy efficient equipment do not have representative offices in the Ukraine

6.2 Recommendations

General

Future projects should anticipate potential schedule delays and build in some schedule slack for the unexpected

The process for obtaining consents and extensions to DO should be accelerated to ensure overall USAID objectives are met

During period of peak procurement increases in the Office of Procurement staffing is needed. This will allow for timely support of the projects

Armenia

Continue to support the implementation of the least cost plan for Armenia's energy sector, which will support the shutdown of the Armenia Nuclear Power Plant

Georgia

It is recommended that additional training be considered for Georgia BREI proposes an onsite manager to support the existing plant managers These would need to be of significant duration about one year This onsite support could also include audits of operations and maintenance procedures

Implement the demonstrative zone project identified in the Tbilisi District Heating Study However, this project should be linked to a concerted effort to address the necessary restructuring of the municipality to ensure that a sustained program is left behind

Kazakhstan

Continue the environmental improvement program with a project that will truly bring results in the form of reduced emissions from one or more power plants Concentrate more on reporting tangible results, less on methodologies and training

To further support privatization a follow-on activity to the initial projects, which would result in an assessment of the value of the program, could be beneficial to program goals and to host country counterparts

Kyrgyz Republic

A hydro power simulation model was successfully developed and illustrated the trade offs between the power and agricultural need on the CAR

Moldova

Finish the energy efficiency program for the Chisinau CHPs (which was cut short by political action) by providing the energy savings equipment which the plants and USAID agreed to, and reporting the results based on implementation of the energy conservation opportunities

Russia

Future programs should focus on regional initiatives that will have a higher likelihood of success

It is recommended that USAID continue to support the 13 CIP projects which were not completed, especially for the largest projects the waste incinerators in Cherepovets and LNG plant in Ural. In addition, USAID may want to consider assistance to the importers to partially finance completion of the construction works

Ukraine

Promote the energy savings potential of the industrial sector by engaging established ESCOs in future energy efficiency programs. Concentrate less on providing U S equipment, concentrate more on domestically available equipment. If Ukrainian industries are to make substantial improvements in efficiency they must be able to obtain the equipment locally. They cannot buy it easily from U S suppliers, because few have representative offices, and because of excessive costs, including customs duties. Encouraging a local market will not only be advantageous to the industries, but will attract the needed representative companies

It is recommended that USAID support the continuation of the demonstration project for the use of coal bed methane (CBM) gas

EXHIBITS

**EXHIBIT 2.2-1:
 ALL PROCUREMENT ACTIVITY BY COUNTRY (SUMMARY)**

| Country | Origin | Genre | POTotalValue |
|----------------|--------|-------------------------|-----------------|
| Armenia | | | |
| | NIS | | |
| | | CS | \$262,838 01 |
| | | EQ | \$8,573,603 84 |
| | | FF | \$20,852 18 |
| | | TS | \$384,430 71 |
| | | <i>Subtotal</i> NIS | \$9,241,724 74 |
| | US | | |
| | | CS | \$63,305 84 |
| | | EQ | \$1,193,563 32 |
| | | FF | \$468,645 48 |
| | | TS | \$245,669 22 |
| | | <i>Subtotal</i> US | \$1,971,183 85 |
| | | SUBTOTAL Armenia | \$11,212,908 59 |
| Georgia | | | |
| | NIS | | |
| | | CS | \$361,494 64 |
| | | EQ | \$2,633,040 04 |
| | | TS | \$270,671 44 |
| | | <i>Subtotal</i> NIS | \$3,265,206 12 |
| | US | | |
| | | EQ | \$226,425 43 |
| | | FF | \$18,492 53 |
| | | TS | \$691,342 08 |
| | | <i>Subtotal</i> US | \$936,260 04 |

LEGEND

Genre = generic category of goods and/or services procured CS = Construction Services EQ = Equipment(Commodities materials, supplies), FF = Freight Forwarding Services (export shipping and local in country delivery of U S commodities) TS = Technical Services Origin NIS = Newly Independent States of the Former Soviet Union, US = United States

| Country | Origin | Genre | POTotalValue |
|------------|--------|----------------------------|----------------|
| | | <i>SUBTOTAL</i> Georgia | \$4,201,466 17 |
| Kazakhstan | NIS | TS | \$9,360 00 |
| | | <i>Subtotal</i> NIS | \$9,360 00 |
| | US | EQ | \$109,066 80 |
| | | FF | \$30,836 00 |
| | | TS | \$128,530 54 |
| | | <i>Subtotal</i> US | \$268,433 34 |
| | | <i>SUBTOTAL</i> Kazakhstan | \$277,793 34 |
| Kyrgyzstan | NIS | TS | \$13,416 00 |
| | | <i>Subtotal</i> NIS | \$13,416 00 |
| | US | EQ | \$64,019 05 |
| | | FF | \$4,940 00 |
| | | TS | \$4,680 00 |
| | | <i>Subtotal</i> US | \$73,639 05 |
| | | <i>SUBTOTAL</i> Kyrgyzstan | \$87,055 05 |
| Moldova | US | EQ | \$47,240 42 |
| | | FF | \$3,640 00 |
| | | <i>Subtotal</i> US | \$50,880 42 |
| | | <i>SUBTOTAL</i> Moldova | \$50,880 42 |
| Russia | | | |

LEGEND

Genre = generic category of goods and/or services procured "CS" = Construction Services, "EQ" = Equipment(Commodities materials supplies), "FF" = Freight Forwarding Services (export shipping and local in country delivery of U S commodities) TS = Technical Services Origin NIS' = Newly Independent States of the Former Soviet Union US = United States

| Country | Origin | Genre | POTotalValue |
|----------------------|--------|---------------------------------------|-----------------|
| | NIS | | |
| | | TS | \$486,748 08 |
| | | <i>Subtotal</i> NIS | \$486,748 08 |
| | US | | |
| | | EQ | \$618,213 00 |
| | | FF | \$62,734 46 |
| | | TS | \$476,901 36 |
| | | <i>Subtotal</i> US | \$1,157,848 83 |
| | | SUBTOTAL Russia | \$1,644,596 91 |
| U S A ("Core" Office | | | |
| | US | | |
| | | EQ | \$100,974 57 |
| | | TS | \$225 68 |
| | | <i>Subtotal</i> US | \$101,200 25 |
| | | SUBTOTAL U S A ("Core" Office) | \$101,200 25 |
| Ukraine | | | |
| | NIS | | |
| | | CS | \$31,419 19 |
| | | EQ | \$232,107 25 |
| | | <i>Subtotal</i> NIS | \$263,526 44 |
| | US | | |
| | | EQ | \$3,928,108 87 |
| | | FF | \$161,405 07 |
| | | TS | \$435,407 86 |
| | | <i>Subtotal</i> US | \$4,524,921 79 |
| | | SUBTOTAL Ukraine | \$4,788,448 24 |
| | | GRAND TOTAL | \$22,364,348 96 |

LEGEND

Genre" = generic category of goods and/or services procured "CS" = Construction Services "EQ" = Equipment(Commodities materials, supplies) FF = Freight Forwarding Services (export shipping and local in country delivery of U S commodities), TS = Technical Services Origin NIS = Newly Independent States of the Former Soviet Union, "US = United States

**EXHIBIT 2.2-2:
 ALL PROCUREMENT ACTIVITY BY ORIGIN (SUMMARY)**

| Origin | Genre | Country | POTotalValue |
|------------|-------|----------------------------|------------------------|
| NIS | | | |
| | CS | | |
| | | Armenia | \$262,838 01 |
| | | Georgia | \$361,494 64 |
| | | Ukraine | \$31,419 19 |
| | | <i>Subtotal CS</i> | \$655,751 84 |
| | EQ | | |
| | | Armenia | \$8,573,603 84 |
| | | Georgia | \$2,633,040 04 |
| | | Ukraine | \$232,107 25 |
| | | <i>Subtotal EQ</i> | \$11,438,751 14 |
| | FF | | |
| | | Armenia | \$20,852 18 |
| | | <i>Subtotal FF</i> | \$20,852 18 |
| | TS | | |
| | | Armenia | \$384,430 71 |
| | | Georgia | \$270,671 44 |
| | | Kazakhstan | \$9,360 00 |
| | | Kyrgyzstan | \$13,416 00 |
| | | Russia | \$486,748 08 |
| | | <i>Subtotal TS</i> | \$1,164,626 23 |
| | | <i>SUBTOTAL NIS</i> | \$13,279,981 39 |
| US | | | |
| | CS | | |
| | | Armenia | \$63,305 84 |
| | | <i>Subtotal CS</i> | \$63,305 84 |
| | EQ | | |
| | | Armenia | \$1,193,563 32 |
| | | Georgia | \$226,425 43 |
| | | Kazakhstan | \$109,066 80 |
| | | Kyrgyzstan | \$64,019 05 |
| | | Moldova | \$47,240 42 |
| | | Russia | \$618,213 00 |
| | | U S A ("Core" Office) | \$100,974 57 |

LEGEND

'Genre' = generic category of goods and/or services procured "CS" = Construction Services, "EQ" = Equipment(Commodities, materials, supplies), 'FF' = Freight Forwarding Services (export shipping and local in country delivery of U S commodities) "TS" = Technical Services ORIGIN "NIS" = Newly Independent States of the Former Soviet Union, "US" = United States

**EXHIBIT 2.2-3:
 ALL PROCUREMENT ACTIVITY BY GENRE (SUMMARY)**

| Genre | Country | Origin | POTotalValue | |
|------------|---------|---------|-----------------------------|----------------|
| CS | Armenia | NIS | \$262,838 01 | |
| | | US | \$63,305 84 | |
| | | | <i>Subtotal, Armenia</i> | \$326,143 85 |
| | Georgia | NIS | \$361,494 64 | |
| | | | <i>Subtotal, Georgia</i> | \$361,494 64 |
| | Ukraine | NIS | \$31,419 19 | |
| | | | <i>Subtotal, Ukraine</i> | \$31,419 19 |
| | | | <i>SUBTOTAL, CS</i> | \$719,057 68 |
| | EQ | Armenia | NIS | \$8,573,603 84 |
| | | | US | \$1,193,563 32 |
| | | | <i>Subtotal, Armenia</i> | \$9,767,167 16 |
| Georgia | | NIS | \$2,633,040 04 | |
| | | US | \$226,425 43 | |
| | | | <i>Subtotal, Georgia</i> | \$2,859,465 47 |
| Kazakhstan | | US | \$109,066 80 | |
| | | | <i>Subtotal, Kazakhstan</i> | \$109,066 80 |
| Kyrgyzstan | | US | \$64,019 05 | |
| | | | <i>Subtotal, Kyrgyzstan</i> | \$64,019 05 |
| Moldova | | US | \$47,240 42 | |
| | | | <i>Subtotal, Moldova</i> | \$47,240 42 |
| Russia | | US | \$618,213 00 | |

LEGEND

'Genre' = generic category of goods and/or services procured "CS" = Construction Services, "EQ" = Equipment(Commodities materials, supplies), FF' = Freight Forwarding Services (export shipping and local in country delivery of US commodities) TS = Technical Services Origin 'NIS' = Newly Independent States of the Former Soviet Union, US = United States

| Genre | Country | Origin | POTotalValue |
|-------|-----------------------|--|-----------------|
| | | <i>Subtotal, Russia</i> | \$618,213 00 |
| | U S A ("Core" Office) | US | \$100,974 57 |
| | | <i>Subtotal, U S A ("Core" Office)</i> | \$100,974 57 |
| | Ukraine | NIS | \$232,107 25 |
| | | US | \$3,928,108 87 |
| | | <i>Subtotal, Ukraine</i> | \$4,160,216 12 |
| | | <i>SUBTOTAL, EQ</i> | \$17,726,362 60 |
| FF | Armenia | NIS | \$20,852 18 |
| | | US | \$468,645 48 |
| | | <i>Subtotal, Armenia</i> | \$489,497 65 |
| | Georgia | US | \$18,492 53 |
| | | <i>Subtotal, Georgia</i> | \$18,492 53 |
| | Kazakhstan | US | \$30,836 00 |
| | | <i>Subtotal, Kazakhstan</i> | \$30,836 00 |
| | Kyrgyzstan | US | \$4,940 00 |
| | | <i>Subtotal, Kyrgyzstan</i> | \$4,940 00 |
| | Moldova | US | \$3,640 00 |
| | | <i>Subtotal, Moldova</i> | \$3,640 00 |
| | Russia | US | \$62,734 46 |
| | | <i>Subtotal, Russia</i> | \$62,734 46 |
| | Ukraine | US | \$161,405 07 |
| | | <i>Subtotal, Ukraine</i> | \$161,405 07 |
| | | <i>SUBTOTAL, FF</i> | \$771,545 72 |
| TS | Armenia | NIS | \$384,430 71 |
| | | US | \$245,669 22 |

LEGEND

Genre' = generic category of goods and/or services procured "CS" = Construction Services, "EQ" = Equipment(Commodities materials, supplies) "FF" = Freight Forwarding Services (export shipping and local in country delivery of U S commodities) TS = Technical Services Origin NIS" = Newly Independent States of the Former Soviet Union, "US = United States

| Genre | Country | Origin | POTotalValue |
|-------|-----------------------|--|-----------------|
| | | <i>Subtotal, Armenia</i> | \$630,099 92 |
| | Georgia | NIS | \$270,671 44 |
| | | US | \$691,342 08 |
| | | <i>Subtotal, Georgia</i> | \$962,013 52 |
| | Kazakhstan | NIS | \$9,360 00 |
| | | US | \$128,530 54 |
| | | <i>Subtotal, Kazakhstan</i> | \$137,890 54 |
| | Kyrgyzstan | NIS | \$13,416 00 |
| | | US | \$4,680 00 |
| | | <i>Subtotal, Kyrgyzstan</i> | \$18,096 00 |
| | Russia | NIS | \$486,748 08 |
| | | US | \$476,901 36 |
| | | <i>Subtotal, Russia</i> | \$963,649 44 |
| | U S A ("Core" Office) | US | \$225 68 |
| | | <i>Subtotal, U S A ("Core" Office)</i> | \$225 68 |
| | Ukraine | US | \$435,407 86 |
| | | <i>Subtotal, Ukraine</i> | \$435,407 86 |
| | | SUBTOTAL, TS | \$3,147,382 96 |
| | | GRAND TOTAL | \$22,364,348 96 |

LEGEND

"Genre" = generic category of goods and/or services procured "CS" = Construction Services "EQ" = Equipment(Commodities materials, supplies), 'FF' = Freight Forwarding Services (export shipping and local in country delivery of U S commodities), 'TS' = Technical Services Origin "NIS" = Newly Independent States of the Former Soviet Union 'US' = United States

Exhibit 3 2-1, DO Summaries

DO-1 Summary

Delivery Order No 1 (Russia) is organized as shown below

- I Joint Electric Power Alternatives Study (**completed**)
 - Task 1 (WG-1) Energy Efficiency Operation
 - Task 2 (WG-2) Upgrading Aging Thermal Power Plants
 - Task 3 (WG-4) (3A) Wheeling, Transmission, and Dispatching
(3B) Rehabilitation of Hydroelectric Power Plants
- II Task 4 Commodity Import Program
- III Task 5 Repowering of Partially Completed Nuclear Power Plants in Support of the Joint Parallel Nuclear Alternatives Study (JPNAS) (**completed**)
- IV Tasks 6 - 11 Krasnodar Power Generation Project (**completed**)

DO-2 Summary

Delivery Order No 2 (Ukraine) Feasibility Study for Global Environmental Facility (GEF) Energy Efficiency and Greenhouse Gas Reduction Report (**Completed**)

DO-3 Summary

Delivery Order No 3 (Georgia) Georgia Power Rehabilitation Project (**Completed**)

DO-4 Summary

Delivery Order No 4 (Ukraine) Coalbed Methane Pilot Project **DO-4 (work activities were stopped pending re-allocation of funds)**

DO-5 Summary

Delivery Order No 5 (Armenia), Critical Energy Needs, includes the following tasks

- Task 1 Mini Hydro-Turbine Generator Replacement (**completed**)
- Task 2 Urgently Needed Commodities (**completed**)
- Task 3 Fast Track Coal Mining Program (**deleted**)
- Task 4 Hydroelectric Rehabilitation and Development Engineering Assistance (**deleted**)
- Task 5 Critical Industries Energy Conservation (**completed**)
- Task 6 Oil and Gas Drilling (**deleted**)
- Task 7 Building Weatherization and Development of Energy Services Companies (**completed**)
- Task 8 Power Plant Outage and Inventory Control Management (**completed**)

DO-6 Summary

Delivery Order No 6 (Ukraine), Energy Efficiency and Reliability Project, includes the following tasks

- Task 1 Kiev No 5 Combined Heat and Power Plant Reliability (**completed**)
- Task 2 Power Plants Combustion Efficiency (**completed**)
- Task 3 Industrial Energy Efficiency (**completed**)

DO-7 Summary

Delivery Order No 7 (Kyrgyzstan) includes the following tasks

- Task 1 Improvement of Bishkek Power Plant and District Heating System (**completed**)
- Task 2 Improvement of the Electrical Transmission & Distribution System for the Kyrgyz Republic (**completed**)
- Task 3 Power Market Study (**completed**)

DO-8 Summary

Delivery Order No 8 (Georgia) includes the following tasks

- Task 1 Accelerated Energy Needs (**completed**)

- Task 2 Urgently Needed Commodities **(completed)**
- Task 3 Fast-Track Coal Mining Program **(deleted)**
- Task 4 EBRD-Loan Assessment-Power Rehabilitation **(completed)**

DO-9 Summary

Delivery Order No 9 (Kazakhstan) includes the following tasks

- Task 1 National Energy Savings Plan **(completed)**
- Task 2 Heat and Power System Efficiency Improvements **(completed)**
- Task 3 Coal Cleaning Program **(completed)**
- Task 4 Regional Environmental Improvement Study (work activities stopped at task expiration date)

DO-11 Summary

Delivery Order No 11 (Georgia) Tbilisi District Heating System Optimization **(completed)**

DO-12 Summary

Delivery Order No 12 (Moldova) Power Plant Combustion Efficiency and Environmental Controls (work stopped without completion)

DO-13 Summary

Delivery Order No 13 (Russia) District Heating CIP Activities, Gas Distribution and Transmission & Distribution Project **(completed)**

DO-14 Summary

Delivery Order No 14 (Georgia) World Bank Loan - Gardabani (Tbilisi) Thermal Power Plant Rehabilitation Study **(completed)**

DO-15 Summary

Delivery Order No 15 (Georgia) World Bank Loan Hydropower Rehabilitation Study **(completed)**

DO-16 Summary

Delivery Order No 16 (Georgia) World Bank Loan - Transmission Distribution and Dispatch System Rehabilitation and Upgrade Least-Cost Analysis Report **(completed)**

DO-17 Summary

Delivery Order No 17 (Russia) CIP Related Activities **(completed)**

DO-18 Summary

Delivery Order No 18 (Russia) Natural Gas Distribution **(completed)**

DO-19 Summary

Delivery Order No 19 (Russia) North-West Power Alternative Study **(completed)**

DO-20 Summary

Delivery Order No 20 (Armenia) Gas Storage & Distribution System Rehabilitation **(completed)**

DO-21 Summary

Delivery Order No 21 (Armenia) Yerevan Electric Distribution System Upgrade **(completed)**

DO-22 Summary

Delivery Order No 22 (Armenia) Energy Sector Environmental Review **(completed)**

DO-23 Summary

Delivery Order No 23 (Armenia) Medzamor Phase Out Plan **(completed)**

DO-24 Summary

Delivery Order No 24 (Georgia) Gas Transmission and Distribution Upgrade **(cancelled)**

DO-25 Summary

Delivery Order No 25 (Georgia) EBRD Feasibility Report for Geothermal District Heating in the Town of Zugdidi **(completed)**

DO-26 Summary

Delivery Order No 26 (Armenia) Seismic Oil and Gas Analysis Exploration **(completed)**

DO-27 Summary

Delivery Order No 27 (Armenia) Weatherization and Energy Services Company Development Program **(completed)**

DO-28 Summary

Delivery Order No 28 (Armenia) Power Generation/Conservation Program **(completed)**

DO-29 Summary

Delivery Order No 29 (Ukraine) Coal Sector Technical Assistance **(completed)**

DO-30 Summary

Delivery Order No 30 (Ukraine) Industrial Energy Efficiency **(completed)**

DO-31 Summary

Delivery Order No 31 (Georgia) Least Cost Plan Development Plan for the Power Subsector **(completed)**

Financial Progress Report

CORE Contract

BURNS AND ROE--Final Report

| Core Contract CCN-C-00-93-00153-00 | Current Obligation | Estimated Expenditures thru Sep 98 | Cum % of Budget | Balance Remaining |
|---------------------------------------|--------------------|---------------------------------------|--------------------|-------------------|
| MPA * | 6,814,053 | 6,731,940 | 98 79% | 82,113 |
| Equipment | 20,377,526 | 19,566,318 | 96 02% | 811,208 |
| Total CORE | 27,191,579 | 26,298,258 | 96 71% | 893,321 |

* Management, Procurement, Administration,

MPA Expenditures through June include estimated 1997 and Jan -June 1998 rate adjustment

| Requirements Contract CCN-Q-00-93-00154-00 | BUDGET | | SPENT | | Cum % of Budget | BALANCE | | Compltn Date |
|--|---------------|-------------------|----------------|-------------------|--------------------|--------------|------------------|-----------------|
| | Work Days | Dollar Amount | Work Days * | Total Amount | | Work Days | Dollar Amount | |
| D O 1 (Total) | 7,907 | 11,744,103 | 7,725 | 11,512,584 | 99% | 182 | 231,519 | |
| Krasnodar/JEPAS | 5017 | 6,365,222 | 4,835 | 6,133,703 | 96% | 182 | 231,519 | 12-31-96 |
| C I P | 2890 | 5,378,881 | 2,890 | 5,378,881 | 100% | 0 | 0 | 09-29-98 |
| D O 2 UKRAINE | 180 | 201,000 | 162 | 181,068 | 90% | 18 | 19,932 | 07-31-94 |
| D O 3 GEORGIA | 239 | 300,000 | 219 | 274,940 | 92% | 20 | 25,060 | 08-31-94 |
| D O 4 UKRAINE | 12 | 131,000 | 9 | 94,559 | 72% | 3 | 36,441 | 08-31-94 |
| D O 5 ARMENIA | 3209 | 2,933,838 | 3,209 | 2,933,838 | 100% | 0 | 0 | 03-01-97 |
| D O 6 UKRAINE | 1331 | 1,324,541 | 1,331 | 1,324,541 | 100% | 0 | 0 | 08-31-97 |
| D O 7 KYRGYZSTAN | 1931 | 2,274,789 | 1,927 | 2,269,789 | 100% | 4 | 5,000 | 09-29-98 |
| D O 8 GEORGIA | 1037 | 1,415,316 | 967 | 1,320,304 | 93% | 70 | 95,012 | 12-31-96 |
| D O 9 KAZAKHSTAN | 2476 | 3,019,040 | 2,273 | 2,770,981 | 92% | 203 | 248,059 | 01-19-97 (T4 |
| D O 10 --not used-- | | | | | | | | 0 |
| D O 11 GEORGIA | 132 | 154,209 | 105 | 123,148 | 80% | 27 | 31,061 | 06-30-98 |
| D O 12 MOLDOVA | 125 | 149,919 | 55 | 66,424 | 44% | 70 | 83,495 | 12-29-96 |
| D O 13 RUSSIA | 480 | 551,103 | 400 | 484,806 | 88% | 80 | 66,297 | 07-31-97 |
| D O 14 GEORGIA | 406 | 568,614 | 382 | 535,127 | 94% | 24 | 33,487 | 10-31-96 |
| D O 15 GEORGIA | 373 | 363,555 | 357 | 348,242 | 96% | 16 | 15,313 | 08-30-96 |
| D O 16 GEORGIA | 342 | 364,021 | 293 | 311,852 | 86% | 49 | 52,169 | 08-29-96 |
| D O 17 RUSSIA | 123 | 123,931 | 123 | 123,931 | 100% | 0 | 0 | 09-29-98 |
| D O 18 RUSSIA | 50 | 69,253 | 50 | 42,706 | 62% | 0 | 26,547 | 02-28-97 |
| D O 19 RUSSIA | 317 | 755,659 | 30 | 755,659 | 100% | 287 | 0 | 09-28-98 |
| D O 20 ARMENIA | 147 | 187,677 | 134 | 170,537 | 91% | 13 | 17,140 | 10-31-97 |
| D O 21 ARMENIA | 101 | 140,025 | 33 | 45,635 | 33% | 68 | 94,390 | 10-31-97 |
| D O 22 ARMENIA | 219 | 216,946 | 159 | 157,040 | 72% | 60 | 59,906 | 05/31/98 |
| D O 23 ARMENIA | 168 | 205,344 | 113 | 138,535 | 67% | 55 | 66,809 | 01/31/98 |
| D O 24 GEORGIA | 189 | 210,954 | 135 | 150,438 | 71% | 54 | 60,516 | 05-16-97 |
| D O 25 GEORGIA | 419 | 484,930 | 389 | 449,908 | 93% | 30 | 35,022 | 08/01/98 |
| D O 26 ARMENIA | 203 | 468,753 | 75 | 271,082 | 58% | 128 | 197,671 | 12-31-97 |
| D O 27 ARMENIA | 165 | 349,644 | 60 | 245,730 | 70% | 105 | 103,914 | 05/31/98 |
| D O 28 ARMENIA | 435 | 1,131,447 | 431 | 1,120,000 | 99% | 4 | 11,447 | 09-29-98 |
| D O 29 UKRAINE | 860 | 1,372,703 | 783 | 1,250,000 | 91% | 77 | 122,703 | 09-29-98 |
| D O 30 UKRAINE | 492 | 995,570 | 438 | 885,570 | 89% | 54 | 110,000 | 09-30-98 |
| D O 31 GEORGIA | 330 | 492,133 | 330 | 492,133 | 100% | 0 | 0 | 09-30-98 |
| Total completed D O 's | 24,398 | 32,700,017 | 22,695 | 30,851,107 | 94% | 1,703 | 1,848,910 | |
| Person-Months | 1,109 | | 1,032 | | | 77 | | |

Exhibit 4 0-3 Expenditures for DOs by Country

