

UKRAINE ENERGY EFFICIENCY EVALUATION FINAL REPORT

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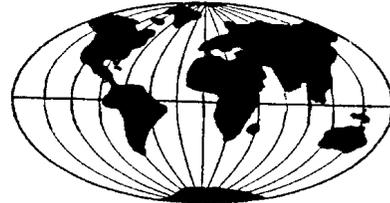
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In collaboration with:

International Programs Consortium, Inc.



Prepared by:

**Dr. Michael Willingham
Dr. George Laszkiewicz
Jonathan Elkind
Sergei Schevchenko**

Submitted by:

Development Associates, Inc.

*1730 North Lynn Street
Arlington, VA 22209-2023
(703) 276-0677
(703) 276-0432*

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ACRONYMS

AEE	Association of Energy Engineers
AFC	Alternative Fuels Center
ARENA-ECO	Agency for Rational Energy Use and Ecology
ASE	Alliance to Save Energy
CEEA CT	Center for Environmental and Energy Audit and Clean Technologies
CCI	Climate Change Initiative
CHP	Combined Heat and Power Plant
COP	Conference of Parties
CSE	Communal Services Enterprises
DANCEE	Danish Cooperation for Environment in Eastern Europe
DSM	Demand Side Management
EBRD	European Bank for Reconstruction and Development
EEWG	Energy Efficiency Working Group
ESCO	Energy Service Company
GOU	Government of Ukraine
IMF	International Monetary Fund
IWMP	Industrial Waste Minimization Project
IPCC	Intergovernmental Panel on Climate Change
IRE	Industrial Real Estate
LTKE	Lviv Teplokomunenergo (Lviv City District Heating Utility)
MLCCWG	Multilateral Climate Change Working Group
MOU	Memorandum of Understanding
PADCO	Planning and Development Collaborative International
PEER	Partnership for Energy and Environmental Reform
PNNL	Pacific Northwest National Laboratory
SCEC	State Committee for Energy Conservation
TACIS	Technical Assistance to Commonwealth of Independent States
UkrESCO	Ukrainian Energy Service Company
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
URA	Hryvnia (Ukrainian currency)
WEC	World Environment Center
WTO	World Trade Organization
ZhEK	State Housing Maintenance Agency

UKRAINE ENERGY EFFICIENCY EVALUATION

FINAL REPORT

I. BACKGROUND

The Energy Efficiency Evaluation Team was requested (a) to carry out an evaluation of energy efficiency activities funded by USAID/Kyiv, starting with activities implemented during 1993/94, and (b) to provide a guide for USAID/Kyiv in terms of future contributions towards improved energy efficiency in Ukraine. This evaluation was to be conducted with reference to the strategic objectives pursued by the mission. In particular, the Team was asked to evaluate the results attained in terms of the objectives of the individual activities, and, to the extent that it can be captured, in the broader context of their impact in the energy economy. According to USAID/Kyiv, a large number of activities have been implemented by different USAID contractors and grantees, as well as the Department of Energy (through interagency funds transfers). The activities have aimed at (a) policy reform and institutional development; (b) municipal energy; and (c) finance and investment.

With the exception of two activities ending in 2001 and one that is starting, the Team focused on projects that have been completed, per the recommendation of USAID/Kyiv. To assist in this task, USAID provided the contractor with reports and other written materials, as well as contacts in the Ukrainian private, municipal and national agency sectors.

A. PROGRAMS EVALUATED

USAID/Kyiv implemented energy efficiency activities starting in 1993 prior to the elaboration of a formal framework of strategic objectives. The energy efficiency program has been pursued through three components:

- policy reform and institutional development;
- municipal and sectoral energy upgrades; and
- finance and investment.

In December 1995, the Memorandum of Understanding on the closure of Chernobyl was signed by Ukraine and the G-7 countries. The MOU included a commitment by the US Government for a \$15 million grant program focused on energy efficiency. The activities directly support USAID/Kyiv strategic objective SO 1.5 -- A More Economically Sustainable and Environmentally Sound Energy Sector, I.R. 1.5.3 -- A More Efficient and Effective Utilization of Energy, and SO 1.6 -- Increased Environmental Management Capacity to Promote Sustainable Development. The activities being evaluated are funded by SO 1.5 and SO 1.6. They also contribute to SO 2.3 -- More Effective, Responsive and Accountable Local Government, IR 2.3.1.1 -- Improved Management of Municipal Services and Assets, and to cross-cutting objectives on climate change.

B. EVALUATION METHODOLOGY

Due to the overlapping nature of many programs with respect to USAID strategic objectives, the Evaluation Team and USAID agreed that it would not be productive to attempt to report the results of this evaluation in terms of existing SO 1.5. The Evaluation Team, therefore, decided to employ the following taxonomy of activities, based on the structure identified in the Statement of Work, which was presented to USAID at the initial meeting on 4 September 2001:

- policy and legal reform;
- institutional development;
- industrial energy efficiency;
- municipal energy efficiency;
- project identification and financing; and
- climate change

Upon completion of the in-country mission, the Evaluation Team further refined the categories (which the sections hereafter reflect) in the following manner:

- Policy Reform and Institutional Development;
- Municipal & Sectoral Energy Efficiency;
- Energy Efficiency Project Identification and Financing; and
- Climate Change

The principal guideline for the Evaluation Team was based on the purpose described in the SOW, namely, "to a) provide USAID with an assessment of the results of the energy efficiency program in terms of the broad goal of reducing the waste in energy use in the country; b) provide a diagnosis of the barriers that act as a deterrent to the implementation of energy efficiency; and c) recommend an approach consistent with USAID/Kiev strategic objectives that can lead to an effective (sic) to energy efficiency." In order to translate the purpose into an effective work plan, the Team relied on the list of Evaluation Questions provided in the Statement of Work. However, due to the limited time available for the evaluation as well as the cross-cutting nature of many of the activities, the Team and USAID agreed they would not address the questions for each activity, and instead focused on their implications for the overall program, with emphasis on Implementation, Strategic Aspects, Flexibility and Institutional Sustainability. All questions are answered in the report except the Results, Monitoring and Reporting questions. The Team found insufficient data to adequately address the questions related to Results, Monitoring and Reporting and Linkages at the programmatic level.

Background briefings and documentation were provided to the Evaluation Team by both USAID Kyiv and USAID Washington. The other main sources of information were US contractors (Alliance to Save Energy [ASE]; CH2MHILL; PA Consulting; Planning & Development Collaboration International, Inc. [PADCO]; Industrial Real Estate [IRE]; and Pacific Northwest National Laboratory [PNNL]); Ukrainian counterparts (ARENA-ECO and State Committee for Energy Conservation [SCEC]); municipalities of Lviv, Ivano-Frankivsk and Kharkiv; local utilities in Lviv and Kharkiv; energy engineering companies; and industrial facilities (Lviv Bakery, Lviv Bus Factory, Gostomel Glass Factory). Additional information was obtained from international financial organizations (World Bank, EBRD) and a Ukrainian financing institution

(UkrESCO). A general overview of energy efficiency prospects in Ukraine was provided by the president of the Ukraine Association of Energy Consulting Companies. Information related to donor coordination was obtained from the EU (TACIS) and Denmark (DANCEE). Lists of enterprises and individuals included in the mission interviews are included as Appendices I and II respectively.¹

The Team's methods for the evaluation included document reviews, structured and unstructured interviews, site visits and rapid appraisal techniques. In various cases, USAID and/or contractors provided data to the team. Wherever possible, the data were verified. However, there were gaps of information in USAID files. As a result, some records were not available. The Team attempted to fill gaps when it could but certain gaps still remain which are beyond the team's control.

The report is organized to assist the reader in quickly finding information. The next section is a complete presentation of all major Findings, Conclusions and Recommendations. The report is a long section presented in accordance with the four major focus areas. In these sections are subsections covering discrete topics and each contractor. The report concludes with a series of Appendices.

II. CONCLUSIONS & RECOMMENDATIONS

To facilitate reader review, the team has chosen to present first its major conclusions and recommendations followed by the evaluation's principal findings. All data and other materials on programs are then presented in the next sections.

- ▶ At the macro level, energy efficiency is a (and possibly the most) critical ingredient for economic success in Ukraine in the near term, with attendant large social and political benefits. Prolonged energy inefficiency could jeopardize both political stability and economic reform, and as a result impede the ability of the Ukraine economy to be a world-class performer.

- ▶ Ukraine's recent economic turnaround and positive GDP appear to be strongly fueled by private sector growth.² Continued USAID support of energy efficiency investment financing for this sector will accelerate this growth, particularly if accompanied by reforms in the banking sector. The Evaluation Team believes that this growth will have demonstrable macroeconomic implications: increased productivity and employment; increased tax

¹ Not all source material and personnel were available to the EE Team during the mission. This was true in the case of Burns & Roe DO #30, where neither B&R or USAID/Kiev managers were interviewed. In addition, although the climate change program was listed in the SOW, the Evaluation Team was not able to meet with the Climate Change Center project USAID/Kiev manager or with the staff of the implementors (PA Consulting) or with the counterparts of the Ukraine Ministry of Environment.

² According to economic data obtained from the Kyiv-based Institute for Economic Research And Policy Consulting (IER) in July 2001, "over the January to May 2001 period the real GDP growth reached 9.0% yoy (year to year) cumulative supported by an impressive 18.8% growth of industrial production. Internal factors, first of all domestic consumption, are at the core of this continuing tendency." For August 2001, IER reported that "the real GDP grew by 9.1% yoy cumulative (9.2% yoy in June) during the first half of 2001, with the highest growth of value-added occurring in the manufacturing industry, in construction, and in the wholesale and retail trades."

revenues and decreased subsidies to employee families; and increased monies for public works investments such as district heating, water supply and wastewater treatment.³

- ▶ Enterprise-level energy efficiency improvements in Ukraine offer positive net present value, long term investment opportunities. However, a major impediment to these domestic investments is the inability to secure domestic loans at commercially attractive rates for the requisite long-term project financing. According to Alan Roe, the World Bank's principal economist for Europe and Central Asia, industrial and agricultural companies are desperate for funds to modernize but are unable to attract long-term loans at favorable rates chiefly because of the banking sector's high operating costs.⁴
- ▶ The USAID Energy Efficiency Programs have made a demonstrable contribution to USAID strategic objectives in regard to Ukraine development, and the Mission is well positioned to make even greater contributions as national reforms are implemented. However, in order to insure these contributions, the relevant Mission project officer should build in local counterpart project 'ownership'.
- ▶ The project financing approach developed by PNNL, ARENA-ECO and Industrial Real Estate (IRE) has been excellent in design and well implemented, and has been critical for achieving demonstrable energy efficiency improvements in the industrial sector. An additional benefit of this activity is that several of these industries (primarily Avdeevka Coke Chemical Plant, Gostomel Glass Plant, Rosava Tire Plant and Stalkanat) have been able to expand production and provide increased employment, with significant multiplier effects in the local economy.
- ▶ Ultimately, domestic banks in Ukraine will have to be relied upon to provide the capital for energy efficiency investments in the private sector. Narrowing the large gap in private sector energy efficiency investment development will require a two-part approach, to apprise both bankers and company officials regarding their roles in dealing with the specific requirements of energy efficiency investments.
- ▶ USAID should support this additional private sector development financing by providing interested banks and viable, highly privatized private sector firms with training and workshops on energy accounting and financial evaluation of energy projects. It is important that the training require hands-on analyses and problem solving based on domestic case studies. Training for senior officials from both sectors should be provided through plenary sessions in order to build joint corporate understanding; follow-up training (primarily separate) would provide technical staff with specific tools and methodologies.
- ▶ USAID also should consider supporting the establishment of domestic investment banks, which are better able to invest in long-term project financing than their commercial counterparts. There currently is no enabling legislation for such banks.

³ According to SCEC statistics for year 2000 provided by USAID Washington, the industrial sector accounted for over 58 percent of total gas use in Ukraine.

⁴ KYIV POST TUESDAY, OCTOBER 23, 2001 VOL. 1, ISSUE 122 "World Bank urges Ukraine to Reform Banking."

- ▶ In order to accelerate the Ukrainian private sector growth and ability to compete on the international level, USAID should foster industry training in ISO 9000 and ISO 14000 standards.⁵ While these standards do not address energy efficiency per se as a primary objective, it is internationally recognized that energy efficiency is a fundamental component of clean production technology. These tools will permit Ukrainian firms to understand what is required to extend their products and services to foreign markets.
- ▶ The establishment of as many as four technology and business centers in key industrial regions, financed by USAID and the Department of Commerce, would provide information regarding US technologies and companies, training opportunities and domestic (Ukraine) energy efficiency success stories to Ukraine private sector firms and local governments. Such information is at a premium in Ukraine, and its potential usefulness was conveyed to the Evaluation Team through conversations with municipal officials and industrial sector representatives. At a minimum, USAID might wish to conduct an internal benefit-cost study of this concept, drawing on experiences from other country programs.
- ▶ The municipal energy efficiency (gas, heat and water) and rollout programs implemented by the Alliance to Save Energy (ASE) and CH2MHILL are highly cost-effective and, in specific instances, critical to the energy efficiency programs of local government. These programs, which have been implemented at relatively low cost, are visible manifestations of USAID that should be continued and expanded throughout Ukraine beyond the planned 'roll-out' cities, particularly as they have the potential to yield major quality-of-service improvements for social infrastructure such as health care and educational institutions. The Evaluation Team feels that curtailment of the ASE program in Ukraine would be extremely counterproductive, and recommends that USAID should make every effort to avoid this outcome.
- ▶ USAID should consider replicating the ASE model for use elsewhere in Ukraine, particularly in the eastern and southern parts of the country. One means of doing this would be to support the establishment and financing of a Ukrainian private company as an ASE clone, composed of selected individuals who have received ESCO training but who currently are not functioning in this capacity.
- ▶ Many smaller ESCOs do not appear viable at this time; considerable benefits in equipment utilization and expertise could be obtained by supporting the consolidation of smaller ESCOs into larger ones or into pre-existing larger firms with broad portfolios of energy efficiency projects and services. As part of its future assistance to small and medium enterprises (SME), USAID could facilitate this as a follow-up to its initial ESCO training programs and equipment supply activities. In conjunction with this initiative, USAID might consider

⁵ ISO 9000 is a series of international quality standards addressing the prevention of defects through the planning and application of best practices at every stage of business. ISO 14000 is an international voluntary environmental standard recognized by major trading nations and trade regulating organizations such as GATT and the World Trade Organization. While registration with ISO 14000 is not mandatory, many foreign trading partners are expected to require registration by import manufacturers.

assisting ESCOs with tools and training for marketing their services (brochure design, website creation, etc.).

- ▶ Future USAID-sponsored activities directed at helping Ukrainian counterparts to develop legislative initiatives (e.g. draft documents) in the energy sector should assist the counterparts in drafting specific legislation that reflects ownership by the counterpart. The Tariff Reform and Communal Services Enterprise Restructuring activity being implemented by PADCO, which will address both new accounting standards and efficiency and cost-effectiveness of energy utilization in water-wastewater and district heating services incorporates this approach; broader cooperation between PADCO, other US contractors (e.g. Industrial Real Estate) and relevant Ukrainian counterparts is critical to the success of this project.
- ▶ The PADCO tariff reform and communal services enterprise restructuring program is viewed by the Evaluation Team as a critical activity, and its success will yield immediate benefits to Ukrainian society. However, this success will only be assured with a Ukrainian counterpart to assume full ownership. If possible and feasible, USAID should give consideration to shortening the lead time for PADCO's initial outputs, because of their role as building blocks in future development. This would allow their earliest possible use in structuring the implementation of demonstration projects in the pilot cities as well as the subsequent dissemination of results and lessons learned to other target cities across the country.
- ▶ Positive developments in Ukraine's economy during the last year, along with privatization of the regional distribution companies, now provide improved conditions for implementation of demand side management (DSM) programs in the industrial sector. USAID should consider technical assistance and professional support for Ukrainian entities introducing such programs.⁶

III. PRINCIPAL FINDINGS

A. UKRAINE

- ▶ Information gathered by the Evaluation Team indicates that recent changes in the management of Ukraine's economy, most importantly that, as of early this year, payments for gas and electricity must be made in cash (confirmed by interviews with the State Committee for Energy Conservation (SCEC) and U.S. State Department), are leading to major changes in the way energy efficiency needs to be addressed, especially in relation to a future role led by commercial banks in financing infrastructure upgrades.⁷
- ▶ Data obtained on 31 August 2001 from the Ukraine State Statistics Committee indicates significant (+10.5 percent) GDP growth in Ukraine for January-July 2001 compared to the

⁶ The PNNL, ARENA-ECO program is a good example of an industrial DSM activity. The Evaluation Team believes that industries not included in the program offer equal, if not greater savings potential on a percentage reduction basis. These firms are less likely to have implemented low-cost, no-cost energy efficiency activities than their larger, more privatized counterparts, and also would be less able to afford the cost of a detailed energy audit.

⁷ Interview with Chairman, SCEC on 12 September 2001; interview with Director, Eurasian Economic Programs, Office of the Coordinator of U.S. Assistance to Europe and Eurasia on 5 October 2001.

same period in 2000.⁸ The Evaluation Team also met with representatives of the World Bank, EBRD, and US Treasury Department, who confirmed the positive economic growth in the last 18 months. As a consequence, the World Bank released the first tranche of its First Programmatic Adjustment Loan (PAL) - \$150 million, with an additional \$100 million expected before year-end; additional PALs are scheduled for 2002 and 2003. The International Monetary Fund (IMF) resumed disbursements under its Extended Fund Facility (\$377 million disbursed last month).

- ▶ The national decrease (3%) in energy consumption during 2000, even as GDP grew by more than six percent, underscores the recognition by Ukrainian counterparts that energy efficiency improvements offer considerable cost savings; the changing national and local legal structure should enhance this potential in the future.⁹ In particular, this finding appears to be in marked contrast to a statement contained in internal correspondence (SO 1.5 meeting [April 23, 2001]) made available to the Evaluation Team by USAID/Kyiv that stated "Now that Chernobyl has been closed, interest in energy efficiency has dropped." The Evaluation Team finds that this statement is untrue insofar as it pertains to Ukraine priorities, and thus potentially counterproductive if viewed in that context.
- ▶ USAID support to the banking sector, specifically directed at bank reform at the national level, has facilitated a macro-level framework that has allowed qualified private sector firms to secure financing. Similar assistance is now needed at the micro-level for local commercial banks. Increased support of energy efficiency investments at the micro-level is critical for growth because this will be the primary source of additional investment funds until such time as investment banks are established in Ukraine.
- ▶ Even successful Ukrainian companies are not financially able to analyze their operations to international standards, and cannot develop the concomitant necessary business plans. Even where a firm's interest in pursuing energy efficiency investments is high, the cost of preliminary audits and pre-feasibility studies can be prohibitive.¹⁰ AID support through PNNL and ARENA-ECO, in conjunction with financial appraisal and packaging provided by the U.S. subcontractor Industrial Real Estate (IRE), has provided the financial wherewithal to permit qualified firms to overcome this barrier. However, relatively few firms have benefited from this program, and continued support in the future can be expected to yield even greater savings as more projects are developed.
- ▶ Most domestic banks are not prepared or capable to evaluate energy efficiency proposals from private sector firms, and often must rely on external consultants. Training for bank staff organized through USAID and provided by ARENA-ECO and IRE has begun to address this issue; considerable more training will be required in the future to realize the full investment potential of energy savings from qualified firms.

⁸ Reuters, 31 August 2001, based on data provided by the State Statistics Committee, governmental institutions, the Central Bank and exchanges.

⁹ In the industrial sector, for example, process-specific energy savings of 30 percent or greater have been achieved. Similar savings have been documented for municipal school energy efficiency programs.

¹⁰ Costs reported from interviews with IRE (21 September 2001) and PNNL (9 October 2001) range from \$5,000 to \$1000,000 depending on type of project.

- ▶ Credit Prom, a Ukrainian commercial bank, has a great interest in energy efficiency, and has been willing to invest in energy efficiency improvements in the private sector, with loans up to two years, and is considering three year periods. Loans are for a minimum \$1M, and projects up to \$10M are considered. However, the Bank lacks the in-house capacity for evaluating energy efficiency projects.
- ▶ Many firms are concerned about negotiations with project appraisers that they associate with either the Ukraine (e.g. UkrESCO) or the US (e.g. IRE) governments, particularly where proprietary corporate information must be made available. In this regard, involvement of a local commercial bank as an intermediary has been a necessary first step before even being able to proceed to the feasibility and financial appraisal stages for project development.¹¹
- ▶ The Municipal Energy Efficiency Program implemented by the Alliance to Save Energy (ASE) in Lviv has been well defined and able to achieve its initial objectives at relatively low cost. This experience provides a good template for the follow-on six-city rollout program. The program has initiated specific energy efficiency legislative action adopted by the Lviv municipality, and was cited as essential for the establishment of the first city-level Energy Conservation Department in Ivano-Frankivsk.
- ▶ The Industrial Energy Efficiency programs implemented during the early stages of the review period were characterized by the absence of an overall strategic framework responsive to the realities of project implementation in Ukraine. Although success was achieved when Ukraine ownership of assistance was established *ab initio* (e.g. Dnipropetrovsk Oblast), this at times resulted in lack of coordination between contractors, overlapping activities, or activities undertaken with limited possibilities of sustainability.

B. USAID

- ▶ The Evaluation Team finds that the USAID energy efficiency program in Ukraine is marked by both distinctive successes and some significant failures. The programs implemented by ASE, CH2MHILL and the consortium of PNNL, ARENA-ECO and IRE provide templates for future significant gains in energy efficiency, if their efforts are sustained.
- ▶ At the same time, the Evaluation Team found that some AID assistance was premature and improperly targeted, specifically the training of ESCOs and equipment provided under Burns & Roe DO #30. Technical assistance and equipment provision at times appears to have been done with insufficient consideration of the surrounding economic, legal and social context in Ukraine; this has resulted in significant expenditure and little sustainable to show for it, due in great measure to lack of local ownership of project activities. Project development and planning has suffered from a lack of reality with respect to approach and timing. There was little or no institutional follow-up for many projects and, in one case, it resulted in the inability to account for approximately \$20,000 in delivered equipment.
- ▶ The Evaluation Team's mission was made inherently difficult due to the large number of EE-related activities undertaken since 1994; this difficulty was further compounded by the short mission period. Many

¹¹ Corporate technical and financial information is still considered highly proprietary and confidential in Ukraine. As such, it is not readily made available to outside sources due to concerns about either taxation or providing an economic advantage to foreign firms.

implementers and USAID project managers had long since left Ukraine and therefore were unavailable to meet with the Team. Furthermore, due to institutional factors at USAID, the Kiev/OER Office funded the EE Evaluation, even though many past projects were managed by the Kiev/DST Office.

IV. ORGANIZATION OF PROJECT-LEVEL FINDINGS

As indicated in the Methodology section, the report is divided into four main areas, namely, a) Policy Reform and Institutional Development; b) Municipal & Sectoral Energy Efficiency; c) Energy Efficiency Project Identification and Financing; and d) Climate Change. The sections that follow are consistent with this structure, and all projects examined by the Evaluation Team are included under this format.

V. POLICY REFORM AND INSTITUTIONAL DEVELOPMENT

A. POLICY REFORM

1. Policy and Legal Reform Activities

Over the past eight years, the Government of Ukraine (GOU) has begun to introduce legal and regulatory reforms to accelerate the transformation to a market-oriented economy. The Power Sector Restructuring and Regulatory Reform Program of the GOU was authorized by the Decree dated April 21, 1994.

This reform program aims to establish a new regulatory and legal framework including tariff mechanism, to promote competition, transform the governance and regulation of state-owned enterprises in the power sector. The reforms are expected to revitalize the energy sector, enhance its financial viability, and develop ground for investment to enhance efficiency and increase the value of enterprises to be privatized.

USAID has supported the Government of Ukraine in its regulatory and policy reform efforts by sponsoring:

- Demand Side Management (DSM) Project managed by Hagler Bailly (1994 through 1998) to:
 - a. Identify and assess potential DSM programs and evaluate the cost and benefit of such programs;
 - b. Initiate load research programs to generate data for effective program design; and
 - c. Demonstrate potential economic benefits.
- Promotion of local legislative action to promote and enable sustainable energy efficiency activities through activities of Alliance to Save Energy (ASE).
- Assisting US-Ukraine Energy Efficiency and Energy Conservation Working Group as an effective forum for formulating sound positions on policy, institutional and legal reforms and for policy dialogue and advocacy for energy sector restructuring and privatization.

- Assisting the Government of Ukraine in "Tariff Reform and Communal Services Enterprises (CSE) Restructuring."

Each of these activities is evaluated below.

1.1 Demand Side Management.

The DSM Project was developed by Hagler Bailly Inc. (since acquired by PA Consulting) and completed in 1998. The Evaluation Team had an opportunity to discuss briefly the DSM program results with Mr. D. Wolcott of PA Consulting prior to undertaking the mission. No DSM documentation was available either at that time or at the USAID Mission in Kyiv. The Evaluation Team had no opportunity to discuss the current status of DSM-related activities in Ukraine resulting from USAID-sponsored project or related legislative initiatives with Ukrainian partners to whom the DSM project was addressed. The Hagler-Bailly Final Report was made available in the USAID DC office only after the Team returned to the U.S.

The DSM project as implemented consists of a national DSM assessment that identifies potential DSM programs and estimates cost and benefits, and design of two industrial pilot programs. A baseline load research program was undertaken to generate data for the design of the proposed potential DSM programs.

The equipment provided to some enterprises and organizations will enable more reliable data collection and assessments if used, and used properly. DSM-related software transfer should help Ukrainian organizations in the design and management of future DSM projects. Presentations of project-based technical approaches to DSM design help Ukrainian partners in developing their own programs.

The program as outlined probably had limited chances for implementation due to several factors deriving from the existing economic conditions in the country as well as the inadequate legislative and regulatory base (tariffs). Capital funds required to implement the proposed DSM program were estimated at \$129 million for the 1996-2001 time period. In the opinion of the Evaluation Team, the assumption that this level of funding would be made available is highly unrealistic. In this respect, this project has more of an "educational" value, and should be seen as an engineering exercise for promoting the DSM concept in Ukraine as an important tool to enhance energy efficiency and foster the effective and economical use of existing energy resources. The DSM project developed some general observations and recommendations; however, these have been widely known for years in the NIS and recognized in Ukraine, and offer little value added. In fact, the final project report does not provide any action plan outlining the necessary requirements for successful DSM implementation in 'real world' Ukrainian conditions.

Further, it would be more beneficial if the DSM programs outlined in the final report were designed "for real conditions" and included realistic approaches for financing. Other USAID contractors (PNNL) have successfully developed and demonstrated such possibilities.

Subsequent to the team departing Ukraine, a new energy tariff structure was announced by the Cabinet of Ministers on October 2, 2001. Time has precluded the team determining whether the new structure includes recommendations suggested by USAID programs.

Due to positive developments in Ukraine's economy during the last year, as well as the privatization of the regional distribution companies, the Evaluation Team feels that the development and introduction of DSM programs will find better conditions for implementation in the present day than were in force several years ago. Technical assistance and professional support for Ukrainian entities introducing DSM programs will be necessary and should be considered.

1.2 Local Policy Development

The only local legislative policy initiatives related to energy efficiency that the Evaluation Team was informed of have been undertaken by ASE in Lviv. The Alliance did not undertake activities specifically directed at identifying legislative issues and proposing reforms, but focused on promoting specific local legislative action. Their initiative resulted in an Education Department Order approving an energy consumption data collection mechanism for Lviv Schools. During 2001, a separate Energy Accounting System order from the Director of Education Department created a working group to establish accounting standards that relies on the use of Alliance-developed software in three pilot schools. Finally, Energy Efficiency Training by ASE for ZhEK (State Housing Maintenance Agency) was supported by Lviv Mayor's Decree #423 dated August 7, 2000.

1.3 US UA Energy Efficiency and Energy Conservation Working Group

Background

In April 1997, the Energy Conservation Working Group — established under the USAID-supported Program for Sustainable Development of Ukraine — began bringing together nearly eighty energy professionals from the Parliament, national, regional and municipal government, the State Committee on Energy Conservation, academia, state enterprises, private companies (including a number of the ESCO representatives), international donor and financial institutions, and USAID-funded organizations. The Working Group began by assessing barriers to implementation of energy saving measures in Ukraine and developed recommendations for policy and legal reforms to promote energy efficiency and energy efficiency business development as well as the creation of favorable market conditions in the energy sector. Three key areas were addressed with significant energy efficiency implications, resulting in recommendations for future national legislation. They were:

- **Reforming Profit Tax to Encourage Implementation of Energy Efficiency Measures**
Among the key elements of the Working Group's Profit Tax Recommendation was a provision calling for a profit tax credit for investments in energy efficiency measures. This has resulted in a Protocol Decision instructing the relevant state agencies to draft a law providing for a profit tax credit.
- **Streamlining Procedures for Certification of Imported Energy Efficiency Equipment**
The Working Group submitted a recommendation calling for simplification of the certification procedures for energy efficiency equipment certification. As a result, the Ukrainian certification agency Derzhstandart organized its own task force to oversee efforts to harmonize Ukraine's certification requirements with those of the WTO.
- **Self Investment in Energy Saving Projects**
A series of related proposals designed to encourage development of energy service companies (ESCOs) were developed under the leadership of representatives of ESCO-East of Zaporizhia. These recommendations, which focused on tax and economic incentives, have been disseminated through the Working Group to the Ministry of Finance, the Ministry of the Economy, the State Committee on Energy Conservation and the National Energy Regulatory Commission.

Current Status

The Financial Recovery Plan for the Power Sector of Ukraine, approved by Resolution of the Cabinet of Ministers of Ukraine, 18 April 1998, #508, includes a proposal developed by the Working Group reallocating monies targeted for fuel to a program to install time-of-day and hourly meters at the largest consumers' facilities.¹² This is a significant example of cooperation

¹² "Draft appeal to the World Bank to reinstate EMDP loan based on the initial performance of the Financial Recovery Plan, including a request for reallocation of loan proceeds for acquisition of metering and communication technology required to implement hourly tariffs and voluntary demand curtailment."

between two USAID-funded programs — the Environmental Policy and Technology Project's Working Groups and Hagler Bailly's Power Sector Restructuring Activity.

While none of the initiatives described above has resulted in corresponding legislation, this may be a result of merely recommending legislative initiatives as opposed to providing draft legislation in coordination with the appropriate Ukrainian counterpart institutions. In retrospect, reliance on legislators to have the specialized expertise to draft such legislation was misplaced, and assumed a degree of familiarity with the subject matter that was not available. This approach, a variant of 'reinventing the wheel', has resulted in a lack of forward-looking legislative activity. In fact, according to background information in the Statement of Work supplied to the Evaluation Team, the Parliament previously had "rejected a legislative initiative originated as a recommendation of the EEWG to overhaul Ukraine's onerous equipment recertification procedures, which effectively stop imports of instrumentation needed to manage energy more efficiently."¹³

In contrast, with respect to efficiency standards as an example, the certification process for importing equipment for environmental and energy efficiency purposes in both Poland and Kazakhstan was simplified by adopting pre-existing internationally accepted protocols.

1.4 Tariff Reform and Communal Services Enterprises Restructuring

USAID has recognized the need to restructure communal services and introduce market principles to communal service delivery systems. In October 2000, USAID launched the assistance initiative "Tariff Reform and Communal Services Enterprises (CSE) Restructuring". This project is being developed in close cooperation with Ukrainian organizations and authorities. PADCO is implementing this project. The main objectives of the Project are as follows:

- Design a communal services sector reform strategy;
- Improve the laws and regulations that govern tariff setting and collection;
- Improve CSE's access to capital;
- Design and implementation of system for setting communal services tariffs;
- Improvement of financial and operational management of CSEs;
- Improvement of efficiency and cost effectiveness of energy use;
- Citizen participation in tariff development process; and
- Improvement of assistance for low-income families.

The Evaluation Team interviewed city officials and local CSEs in Lviv, Ivano Frankivsk and Kharkiv, evaluated USAID-sponsored municipal energy efficiency projects implemented by ASE in those municipalities as well other municipal projects undertaken by ARENA-ECO and PNNL (municipal project for EBRD and WB financing) and discussed issues related to tariffs and communal services restructuring. The Evaluation Team found that this USAID assistance initiative has great significance and value - it is being executed at the right time, when the

¹³ **Background paper prepared by AID/W in September 1998.** The legislation extended to a wide range of imported equipment; the Evaluation Team is concerned specifically with energy efficiency implications.

importance of economically sound tariffs is being recognized at all level of government and has support of the CSEs themselves. In order to guarantee its success further, the team recommends that Ukrainian counterparts should assume full “ownership” of all jointly developed proposals. The Team had the opportunity to review and discuss the scope of the ongoing project with PADCO. The Evaluation Team believes benefits could be derived from compressing the time frame for this project, particularly in view of the noticeable improvement in economic conditions in Ukraine, coupled with the need for timely implementation of proposed reforms.

B. INSTITUTIONAL DEVELOPMENT

1. NGO Development

1.1 Establishment of ARENA-ECO

ARENA-ECO is a non-governmental, not-for-profit organization founded to promote energy efficiency and environmental protection in Ukraine. It was established in 1994 through partnership between National Academy of Sciences of Ukraine, Battelle - Pacific Northwest National Laboratories (PNNL) and the World Wildlife Fund, with support of USAID and the US Department of Energy.

ARENA-ECO has three main areas of concentration: industrial energy efficiency; municipal energy efficiency; and climate change. ARENA-ECO's primary focus in energy efficiency is directed at investment project development, energy audits, and training.

Although ARENA-ECO has developed expertise in conducting initial audits and pre-feasibility studies, this is only part of the process required for ultimate project financing. Even viable projects in Ukraine can languish without a full energy audit and financial appraisal as first steps. Part of the success of ARENA-ECO lies in its recognition of this need and in its ability to work with firms capable of conducting the requisite business valuation, asset appraisal, auditing, and financial and economic analysis according to international standards. One such Ukrainian-American firm, Industrial Real Estate (IRE), has participated in developing several successful investment projects in the private sector. During the past few years, ARENA-ECO has been essential for the development of bankable municipal and industrial projects for financing by the World Bank, EBRD and domestic financial sources such as UkrESCO (revolving fund established by the EBRD).

ARENA-ECO is the only energy efficiency NGO organization in Ukraine; currently, USAID accounts for forty percent of its funding. The Evaluation Team believes that although ARENA-ECO is reportedly moving toward self-sustainability as private sector demand for its services grows, USAID continued financial support is critical for its viability in the near term. The Evaluation Team also believes, based on recent economic data, that the private sector offers considerable and growing attractive investment opportunities in energy efficiency projects. Based on this belief, we believe that ARENA-ECO's role and importance for the Ukraine economy will continue to grow, particularly when accompanied by modernization of the banking sector. In the further sustainable development ARENA-ECO should use more tender procedure in selection of the experts and sub-contractors to implement energy, financial audit and services, as well as reorganize it's staff structure and allocation accordingly to the demand.

1.2 NGO Climate Change Working Group

When ASE began its program in Ukraine, there was little understanding of climate change issues among Ukraine's environmental NGOs, and no organization to address these issues. Since the Alliance's program supports environmental NGOs interested in global climate change issues, ASE brought these NGOs together for regular meetings and training, and supported them as they developed position papers on issues and voiced their concerns to Ukrainian government representatives. The Alliance also assisted them in organizing their attendance at and actively participating in two international conferences: COP VI in The Hague and COP VI Part 2 in Bonn. Their organization, known as the NGO Climate Change Working Group, came to the attention of OVE, the Danish Organization for Renewable Energy, which is funded by DANCEE. OVE representatives recently visited Kyiv where they met with Working Group members at the Alliance's offices to discuss their plans to support the Working Group's continued activities with approximately \$125,000 to \$250,000 over the next two years. This development appears consistent with USAID's development philosophy and objectives, in that ASE was able to create an organization where there had been none, and build its members' capacity to the point of sustainability.

2. *Private Sector ESCO Development*

USAID support to the development of the Energy Service Company (ESCO) sector in Ukraine appears to have been a long-standing, overly ambitious and often unrealistic part of the energy efficiency portfolio. First, it is necessary to understand that the acronym 'ESCO' is incorrectly applied for companies in Ukraine, as the services normally provided by ESCOs (e.g. shared savings programs or performance contracting) are illegal under current Ukraine law. All firms discussed in this context in Ukraine therefore should be understood to be energy contractors or consultants. Of greater importance, however, is the recognition that there has been little or no market for most of the individuals trained, particularly where these individuals have been marketed as 'individual ESCOs'. As a consequence, much of the skill sets acquired by these people will have been diminished or lost. Although seminars and workshops continue to attract a relatively high number of (the same) participants, this may in fact be indicative of their relative lack of work. The Evaluation Team feels that USAID should explore mechanisms capitalizing on the training and equipment, including assimilation of skilled individuals into existing energy services firms.

A primary constraint has been the lack of capital by municipalities and smaller private sector firms for energy efficiency investments, coupled with the practical inability to secure requisite financing through domestic banks. Larger firms, in contrast, have relied on expertise from the 'west', and have had no incentive to contract with small domestic ESCOs with unproven track records.

For their part, domestic banks would be necessary partners for ESCOs negotiating with capital-short firms or municipalities, but the banking sector has heretofore lacked the tools to evaluate energy efficiency projects. Although this lack is being addressed, particularly within the past year, it has meant that financing earlier projects was 'dead on arrival' at the bank door.

The Evaluation Team met with the president of the Ukrainian Association of ESCOs, (UAESCO) who stressed the importance of continued USAID assistance for professional development, particularly in financial project evaluation, energy accounting and technology transfer. In particular, he cited the difficulty for Ukrainian professionals in obtaining state-of-the-art information regarding US technology and equipment, and proposed that USAID establish 'business centers' in key industrial regions of Ukraine.

For the most part, the Evaluation Team finds that USAID support of ESCOs, primarily through ASE and Burns & Roe programs, was conceived and implemented in anticipation of a market environment that has yet to emerge. As a result, much of the technical assistance, equipment and training has not been put to its highest use. Significant USAID resources could have been allocated much more effectively. Specifics of individual initiatives are discussed below.

2.1 Alliance to Save Energy (ASE)

The ASE ESCO Development Project is a tripartite effort focusing on three main areas: technical training, business training and business association capacity building:

- Technical Training activities have addressed low-cost energy efficiency options such as industrial steam traps and boiler efficiency, and technology transfer workshops to familiarize ESCOs with products and services of western Energy Efficiency industry representatives operating in Ukraine.
- Business Training efforts have been designed to promote ESCO organizational and managerial capacity, as well as to identify potential financial resources for energy efficiency projects, with specific focus on the municipal sector.
- Business Association Capacity Building has included roundtables to facilitate development of the UAESCO, as well as a workshop designed to facilitate the creation and operation of business associations.

Although many ESCOs in Ukraine appear to exist primarily on paper, with little or no actual energy efficiency activities in their portfolio, ASE support to ESCOs has resulted in specific instances of significant energy savings.

ESCO ECO-Sys, Zaporizhia — One of the first ESCOs established in Ukraine, ESCO ECO-Sys specializes in providing energy audits in public buildings and district heating companies, as well as the metallurgical and food processing industries. Through the support of ASE's technical skills transfer activities, ECO-Sys has established partnerships with leading US, western and Ukrainian energy efficiency manufacturers. In cooperation with these partners, ECO-Sys provided energy audits and installed electricity metering systems at Zaporizhia ore, brewery and coke plants that resulted in 8% to 15% reductions in electricity costs.

ESCO-West, Ivano-Frankivisk — ESCO-West specializes in energy auditing, municipal energy efficiency, design and installation of electricity and gas metering systems, and automation and control systems. From the year prior to the ASE program inception through 2000, ESCO-

West nearly tripled its revenues, and undertook its first municipal energy project in 2000. ESCO-West has provided energy audits and installed energy efficiency equipment at the Ivano-Frankivsk thermal power plant, Kalush chemical plant, Dolyinsky oil and gas plant and Ivano-Frankivsk meat plant that resulted in monthly savings of between \$2,000 and \$3,000 per project.

ESCO-Kharkiv — The company's core business includes energy auditing and consulting services in heavy industry, power generation and district heating systems. Using technology and procedures covered during ASE workshops, ESCO-Kharkiv performed energy audits and implemented energy efficiency projects at a Kharkiv school, food processing and tractor plants that generated an average of \$7,000 to \$9,000 in monthly savings.

ESCO-Energoprom, Kyiv — The company provides energy auditing services and consulting for heavy industry, municipalities and district heating companies. The company performed an energy audit and made recommendations for the Alchevsky coke plant that resulted in annual savings of over \$110,000. An energy audit and installed electricity metering system at the Yalta meat plant reduced monthly electricity bills by \$11,000.

2.2 Burns & Roe

Delivery Order No. 30 had as one of its stated aims "to assist in the development of a private sector energy service industry, including energy sector services companies (ESCOs) which together with the local equipment representatives will create a sustainable capability in the country." The relevant program indicators stated that "implementation by the joint U.S. Ukraine teams will result (sic) in an experienced and trained group of Ukrainian private sector energy companies (ESCOs), linked to U.S. practices and equipment that can continue the work on a commercial basis. The success of the development of ESCOs can be measured by such indicators as: the number of private companies created or strengthened, the commercial transactions undertaken, the financial performance and employment in the companies, and/or the number of representatives and/or service agreements reached with U.S. vendors."¹⁴

Under USAID sponsorship, nine ESCOs were trained and equipped (and in some instances established) by Burns & Roe in 1998 under Delivery Order 30. However, the Evaluation Team found that only three (Optimenergo in Kharkiv, Energopro in Kyiv and REGUL in Nikolaev) are still in operation, energy efficiency projects comprise only a small fraction of their portfolio, and that all three firms had been established prior to the training activities.¹⁵ The Evaluation Team interviewed a representative from one of the three firms, as well as the president of the UAESCO and both confirmed that there had been little development. In the words of the UAESCO president, USAID assistance was like "family without kids."¹⁶

¹⁴ Contract CCN-Q-00-93-00154-00, Delivery Order No. 30

¹⁵ Interview with Alexander Filippov, 7 September 2001.

¹⁶ Interview, Mr. Stepanenko, President, Eco-Sys, 11 September 2001.

2.3 World Environment Center (WEC)

During 1996-97, the WEC trained over 80 engineers, energy consultants, SME energy companies and administrative staff in energy efficiency and energy conservation techniques using in-country case studies. Although the creation of ESCOs was not a goal of the project, the Evaluation Team found that, as a direct result of the training, a successful company was established in Dnipropetrovsk that is currently working on energy efficiency projects, while another participating company subsequently added energy efficiency services to its portfolio.

2.4 Hagler-Bailly

Hagler-Bailly trained more than fifty energy engineers in Ukraine, in order to have counterparts for energy projects. Hagler-Bailly also was instrumental in establishing the Ukraine Chapter of the Association of Energy Engineers (1997) which was affiliated with the AEE National Chapter in Atlanta, Georgia; all fifty engineers subsequently received AEE certification. According to the AEE website, these certification programs are recognized by such government agencies as the U.S. Department of Energy and the U.S. Agency for International Development, as well as by corporations, utilities and energy service companies. However, the Evaluation Team was not able to determine the value of this certification in securing energy efficiency projects, and was told by one PA staff member that the Ukraine chapter was essentially inactive.

VI. MUNICIPAL & SECTORAL ENERGY EFFICIENCY

A. MUNICIPAL ENERGY EFFICIENCY

In order to evaluate USAID energy efficiency initiatives in the municipal sector, the Evaluation Team visited three representative cities in Ukraine. As requested by USAID, two cities (Lviv and Ivano-Frankivsk) are located in western Ukraine, while the third (Kharkiv) is in eastern Ukraine. While the cities differ in size and geography, they face similar obstacles - technical and regulatory - in implementing energy efficiency activities. These activities are summarized below:

1. Lviv Municipal Energy Efficiency Project (ASE)

1.1 Municipal Building Program

At present in Lviv, there are no municipal staff members with responsibility for energy oversight. As a consequence, USAID contractors have played a critical role in promoting energy efficiency in Lviv. The importance of these activities is underscored by the large energy share of the total city budget (approximately 30%), and the fact that 18% of the education budget is allocated for energy in municipal schools.¹⁷

With the support of ASE, the Lviv Board of Education established an energy efficiency pilot project in a demonstration school. The resulting annual energy savings, based on quantity of gas consumed, range between 30% (2000) and 39% (1999).

¹⁷ Interview with Paulo K, 9/08. According to Paulo, heat represents 85-87% of school energy budget.

The staff of a local private weatherization company, Universe Ltd., was trained by ASE on the school project, and subsequently weatherized 1000 windows in Lviv, installed 15 heat meters, and installed its first control system. In addition, the city has invested its own money for energy efficiency, and has incorporated elements of the Lviv school project in ten additional buildings.

Although it is not possible to state with complete certainty, the impact of ASE-related energy efficiency improvements in Lviv already may be significantly influencing the city's budget. For calendar year 1999, expenditures for energy services in Lviv City were 10,519,422 URA, which represented 7.2 percent of the total municipal budget (147,000,000 URA). Although the city's budget grew by 35 percent (to 198,000,000 URA) in year 2000, the city's energy budget was reduced to 10,404,267 URA, representing only 5.3 percent of the total. While this may appear as small savings, the normalized energy savings (year to year) represent a 26 percent reduction in energy costs.¹⁸

These results are consistent with the expected savings from the Kyiv Institutional Buildings Energy Efficiency (KIBA) Program, which projected a weighted average efficiency improvement estimate of 26.8%.¹⁹

The ASE Lviv project is serving as a model for other schools in Lviv, other cities included in a six city "Roll Out" program (also coordinated by ASE), as well as other cities affiliated with the Association of Ukrainian Cities (AUC). The ASE also assisted in preparing a funding proposal to a western Ukrainian bank for an energy efficiency project for five additional schools; the costs were \$30K per school, with a three-to-four-year payback. According to a Lviv City Council official who serves as the Board of Education President, the ASE functions as a municipal agency. In his words, "If the Alliance dies, the project dies." This appears to be due in large part to the current budget structure and regulations, which do not allow energy efficiency savings to be utilized directly by the implementing organization.

1.2 District Central Heating Program

The Lviv city district heating utility (Lviv Teplokomunenergo, or LTKE) is being assisted by the ASE in restructuring operations, cost recovery and human development, and new energy-based financial management systems. As part of this activity, ASE organized seminars and training in Poland, which allowed the Ukrainian participants to be the beneficiaries of technology transfer. Of particular note to the Evaluation Team was the statement that the utility recognized that future successful operation would require "a change in philosophy", with increased emphasis on human development and further management training. An additional concern recently has arisen now that LTKE has begun to handle large sums of money, which has placed new demands on their accounting system and accounting principles.

Based on the Polish experience, LTKE has decided to change its billing system to contract with building owners as opposed to individual apartment occupants. Through this approach, LTKE hopes to facilitate collection of combined utility services, and to significantly improve on overall

¹⁸ Correspondence from A. Kopets (ASE Lviv office), 4 October 2001

¹⁹ Summary Description: Kyiv Institutional Buildings Energy Efficiency Program, provided to Evaluation Team in electronic format by ASE on 4 October 2001.

collections, which the Evaluation Team recognizes as a major impediment to rationalizing the energy sector throughout Ukrainian cities.

LTKE is currently seeking EBRD financing, and has been assisted in proposal preparation by ASE.

2. Roll-Out Municipal Energy Efficiency Project (ASE)

As a follow-up to its activities in Lviv, the ASE has developed a Municipal Roll-Out program for six additional cities - Ivano-Frankivsk, Kharkiv, Ternopil, Lutsk, Slavutych and Khmelnytskyi. The Evaluation Team met with representatives of two cities, as reported below:

2.1 Ivano-Frankivsk

The Evaluation Team met with Myroslaw Melnykovich, Chief of Energy Division of the Department for Rational Use of Energy Resources, City of Ivano-Frankivsk. According to Melnykovich, as part of the rollout program activities, building level controls (two buildings) and weatherization (one building) programs were undertaken, with associated energy reductions averaging 32%. These savings represent a considerable benefit to the municipal budget, as heat energy is 70% of the municipality's total energy bill, according to Melnykovich. He indicated that the payback period for the three schools already upgraded is nine months.

The City subsequently applied for a grant from the State Committee for Energy Conservation (SCEC), which allocated 300,000 UAH this year, and an equivalent amount is expected for next year, for energy efficiency improvements in fifteen (15) buildings. Project implementation and proposal preparation have relied in large measure on ASE and ESCO-WEST. After completion of the fifteen projects, Ivano-Frankivsk officials want to create a center to assist people throughout the region to undertake similar programs. As they do not have the degree of specialization to do this, the support of ASE would be critical in this endeavor.

Based on its association with ASE and the results of ASE's activities in Lviv, Ivano-Frankivsk established a Department of Rational Use of Energy Resources in 1998. The Evaluation Team was informed that Ivano-Frankivsk is the only city in Ukraine to have established such a department, and that five percent of energy savings go to a special energy account for the city. The city also initiated an extensive program to meter public buildings, and currently has more than 90 per cent of public buildings metered. To the Evaluation Team's knowledge, this also is the only city in Ukraine where all schools and hospitals are metered.

2.2 Kharkiv

As part of the ASE roll-out program activities, building level controls (two buildings) and weatherization (one building) programs were undertaken, with the City of Kharkiv providing approximately 115,000 UAH. The measures resulted in energy savings of between 40-50%, and the City subsequently budgeted an additional 120,000 UAH for similar projects to be undertaken in Fall 2001.

The Evaluation Team visited one of the schools weatherized under the ASE program. The Team was told that energy savings during the past two years ranged from 30 percent (2000-01) to 39 percent (1999-2000). According to director of the holding company that implemented the project, several private firms had inquired about replicating the school experience, but there was no obvious mechanism for follow up.

3. Lviv Municipal Services Energy Efficiency

USAID-sponsored activities in Lviv include increased Energy Efficiency at Lviv Vodokanal. This program was coordinated and completed by CH2MHILL. In Lviv, as in most Ukraine cities, about half of Vodokanal operating costs are for energy. Since salaries can't be cut and taxes have to be paid, savings from energy efficiency improvements are the only real option for reducing costs. Following a general study of the Lviv Vodokanal system, USAID funded a pumping station with significant in-kind contribution from the municipality, as well as pump replacement and several other energy efficiency improvements in the city distribution system. This work helped the Lviv Vodokanal qualify for a World Bank loan for financing water infrastructure improvements in Lviv. Similar work is being undertaken with eight other vodokanals across Ukraine, in which vodokanals are trained in water system assessment and identification of low-cost projects with significant energy efficiency benefits.

However, as vodokanals have little or no operating capital, commercial banks are reluctant to invest in energy efficiency improvements, particularly in light of long payback periods and low (subsidized) tariffs.²⁰ Absent significant investments in this sector, which lie well beyond USAID capabilities, the implementation of low-cost, no-cost energy efficiency improvements offers the only reasonable energy efficiency alternative with immediate benefits. Interest in these low-cost, no-cost options is evidenced by a recent CH2MHILL workshop in July 2001, which attracted 19 cities that paid their own way, primarily from western Ukraine. However, the Evaluation Team was told that two self-financed participants from a small city in easternmost Ukraine also participated. Participants in the workshop indicated the need for new methodologies, expert advice, techniques for system 'self-evaluation' and financing. The Evaluation Team was informed that EPA-based "EPANET " software is already being employed by several cities to model hydraulic systems, size pumps, detect leaking check valves and identify motor replacements.

The Evaluation Team believes that USAID should continue to support this work throughout Ukraine, with particular attention to workshops, personal training, accounting and management, and technical project design training.

²⁰ Although energy efficiency improvements in water systems would have relatively short payback periods if vodokanals were readily able to recover their costs, difficulties in cost recovery make these investments less attractive to commercial banks.

4. *Kharkiv District Heating*

PNNL and ARENA-ECO conducted a pre-investment study of the Kharkiv district heating system (KTPE), which was the basis for a pending application for World Bank financing. As a first step in the investment process, the U.S. Trade and Development Agency (TDA) awarded a feasibility study to Parsons Engineering, with ARENA-ECO as the Ukraine counterpart. ARENA-ECO and PNNL are helping the company in economic restructuring, including financial management. The president of KTPE cited ARENA-ECO's long-term involvement and pragmatic approach, and stressed that the heating system company wants to continue working with ARENA-ECO. They believe that this arrangement will facilitate eventual economic independence. In addition, KTPE feels that continued financing should be done in small trenches, in contrast to the level of funding sought from the World Bank.

5. *Kyiv Institutional Building Retrofit (PNNL)*

The Evaluation Team did not examine this municipal project, which expects to measure the initial energy savings during the 2001-2002 heating season. However, the project is a well-documented example of a program that has benefited from USAID support. Following completion of the mission, the Evaluation Team was told by World Bank Washington staff that the feasibility study conducted by ARENA-ECO and PNNL which led to World Bank financing was based on an exhaustive and high-quality examination of all energy efficiency measures, and served as a catalyst for the ongoing Bank program.²¹

B. *SECTORAL ENERGY EFFICIENCY*

1. *Industrial Energy Efficiency Initiative*

1.1 *Burns & Roe*²²

DELIVERY ORDER NO. 6

The Statement of Work and Delivery order No. 6 described the program objectives as ...”the thrust of this Delivery Order is to provide services and , where appropriate, US and local products, directed toward improving energy and operating efficiencies in power generation, and in the equipment and controls required to use energy efficiently and cost effectively.”

The Task Order specified the Tasks as 1. Kyiv Combined Heat and Power Station #5 Increased Reliability, Improved Efficiency and Reduction of Environmental Impact; 2. Power Plant Combustion Efficiency; and 3. Industrial Energy Efficiency.

Although the Evaluation Team found that Task 1 was successful in achieving some project objectives, neither this nor the other two Tasks could be judged truly successful. Details concerning the three Tasks are as follows:

²¹ Interview with Carolyn Gochenour, World Bank, Contact Officer for the Ukrainian-Kiev Public Buildings Energy Efficiency Project, 10/02/01.

²² Incomplete documentation was provided to the Evaluation Team for both Burns & Roe and Hagler-Bailly activities, which precluded any documentation of cost-benefit analysis.

Task 1

This project should be seen as an emergency-type intervention to mitigate various technical problems that, if not unabated, could cause the heating system failure and place the citizens of Kyiv in jeopardy. Furthermore, unnecessary waste discharge to the Dnipro River posed an environmental risk. This Task was successfully implemented with the cost of \$1.9 million (upgrading of plant instrumentation and control systems and supply of US manufactured high efficient resin for makeup water treatment and demineralized water systems). The introduction of improvements and training of plant staff resulted in savings of \$900,000 per annum, by eliminating loss of electrical generation worth \$500,000 and reducing the use of chemicals and fuel.

This successful project was never replicated at any similar Ukrainian combined heat and power plant (CHP), because in the Team's opinion there was no "institutional owner" responsible in Ukraine for this type of assistance and responsible for the reduction of country fuel "bills". This is in sharp contrast with actions undertaken by the Dnipropetrovsk Oblast Administration with respect to replication of similar USAID assistance programs and initiated by WEC.²³

Task 2

Between 1994 and 1997, Burns & Roe conducted energy efficiency audits in five thermal power plants, five industrial plants and two CHPs, to identify low-cost, no-cost energy conservation opportunities that would provide improvements in energy efficiency with cost payback of one year or less. The program was implemented with a cost of \$1.38 million (equipment cost of \$705,000).

Energy efficiency programs implemented by Burns & Roe resulted in some increased energy efficiency at selected enterprises, but real results reported by the participating plants during the Result Workshop were substantially lower than initially estimated by Burns & Roe. In many instances, real savings were only 25% to 50% of the initially estimated level. This is attributed to low plant loads, with many plants running at a maximum of 50% load. In the majority of plants typically only two units of 6, 7 or 10 are operating at 60 to 70% MCR. Many proposed energy and reported energy conservation measures were not implemented. This could be attributed to the selection of plants to participate in the program without initial screening and evaluation of their real economic and operational conditions, as well as the level of commitment by the management along with an evaluation of real potential for savings by the USAID contractor. Projects were proposed by US consultants probably without sufficient "reality check" or extensive involvement of plant personnel, and as a result the projected benefits and saving were substantially overestimated.

²³ Based on the success of the USAID/WEC projects with oblast industrial enterprises, the Oblast Administration authorized the Pridneprovsk Research Center of the National Academy of Science (NASc) to develop an Oblast Energy Conservation Program. Details of the program are included in Appendix III.

It seems that it was an “ad hoc” assistance program with no institutional “ownership” on the Ukrainian side and no follow up. The Team had no opportunity to evaluate program sustainability with participating enterprises.

The USAID contractor concluded that “since the plant load is down about 50%, we estimate under present conditions the benefit will be under \$100,000 per year (50% lower than estimated).” In reality, however, this was the plant load at the start of the project. Furthermore, the contractor concluded that there were problems because the employees couldn’t be paid, which also was the case at the beginning. This raises questions about the due diligence done prior to the start of the project, as well as the lack of flexibility to change and reprogram by both USAID and the contractor when dictated by events. This may also call into question the quality and accuracy of reporting received by USAID, but no reports were available for the Team to review.

Task 3

Burns & Roe implemented an energy efficiency program in five large industrial enterprises with the total cost of \$900,000 and provided equipment valued at \$440,000. The selected plants were from the “largest and most electrical energy consuming sectors”: metallurgical, glass, construction materials, coke and chemical and automotive. Projected annual savings for this program were estimated at \$5 million. However, the Contractor in the final report provides the following comments pertaining to the automobile plant, where the savings were estimated at \$1.53 million: “Manufacturing operations were severely reduced due lack of customers and product demand. Plant was not operating and has been shut down for about 3 months. Equipment ordered was still under customs control. Estimated savings are based on normal production and operation loads”. It is known that this plant was semi-idle during the program start-up with no prospects for short-term recovery. The Evaluation Team had no opportunity to evaluate the current status and real energy savings of projects at all five enterprises, but it appears that all estimates were based on unrealistic production level (100%) and projected savings were highly overestimated.

DELIVERY ORDER NO. 30

Delivery Order #30, which was implemented between October 1997 and September 1998, consisted of 24 walkthrough audits of industrial facilities, described as being selected "on the basis of their commercial viability and present financial condition"; however, the selection of industries also suffered from outside pressures, in response to USG and Ukrainian interests. After completion of audit reports and analyses of energy conservation opportunities, energy efficiency equipment (primarily from the US) was supplied to these plants, averaging \$40,000 - \$50,000 per plant. Due to the time constraints and project registration problems, the equipment procurement and shipment were delayed by several months. As a result, according to a Burns & Roe final report, by the end of the project, all equipment was purchased and shipped from the United States to Ukraine, but only about 60% of it was delivered to the plants by the end of the project. No information regarding follow-up for use of the equipment was provided to the Team, which was informed that information related to the Burns & Roe program results was not available.

According to USAID Washington staff, the project had a very limited timeline of exactly 12 months because the contracting vehicle, a regional project with Burns and Roe, expired after a five year time limit for such USAID contracts on September 30, 1998. This was known to the USAID project managers, and prompted the decision to only procure “generic” equipment to speed up the process and to select only small medium enterprises. The “project registration problems” were due to the refusal of the State Committee of Energy Conservation to allow the project to be registered, even though the SCEC was not a counterpart – they took the initiative to write a letter to their government asking them to deny its registration as a way to force USAID to give equipment to them instead. USAID/Kiev held many discussions with SCEC, eventually succeeding in having SCEC back off, but as a result of the delay in registration due to SCEC interference, the shipping of the equipment was delayed.²⁴

On September 30, 1998 Burns & Roe closed its project while a large amount of equipment was still in transit to Ukraine. USAID/Kiev subsequently gave a short contract to Hagler-Bailly to help get this equipment into the country and delivered to the recipients. A report by the Hagler-Bailly subcontractor Alexandrina, which summarizes this phase of the project, was made available to the EE Evaluation team.

Following the mission, the Team contacted a Burns & Roe representatives in the United States, who indicated that the total value of missing equipment was about \$15 to \$18,000, but almost no information could be obtained about the ultimate fate of the remaining portion of the \$400,000.²⁵

The Evaluation Team did visit two of the 24 firms. At the Lviv Bakery #1, the Team learned that equipment provided by Burns & Roe was still in use, although obtaining replacement parts was quite difficult. Of greater importance, the Bakery also had implemented several energy-saving measures (including furnace replacement) based on the initial audit, investing approximately 600,000 URA of its own financial resources. The associated cost reduction for gas use had decreased by almost 30 percent.²⁶ In the Team's opinion, the Bakery would be a suitable candidate for energy efficiency financing by commercial or investment banks.

The Team also visited the Lviv Bus Company, where Burns & Roe had conducted an audit and provided a stationary energy metering system. Based on information provided by the plant director and the Team's on-site observations, the Company appears almost defunct. It operates with at minimal production (300 buses per year where its designed capacity is 25,000 cars per year). The equipment provided cannot be used and the plant is being offered for sale. In the Team's opinion, an improper assessment was made for providing technical assistance in terms of the plant's future economic development. The plant was practically idle even at the time of assessment and selection for assistance was not justified.

In attempting to evaluate DO #30, the Evaluation Team interviewed only one principal, the Burns and Roe local manager Mr Filipov, but was unable to interview any Burns and Roe US-

²⁴ Information provided by A. Doernberg, USAID Washington.

²⁵ Communication from Richard Edelman, Vice President, Energy Technology, Burns and Roe Enterprises, Inc on 6 November 2001.

²⁶ According to information provided by the Lviv Bakery #1 Plant Manager, gas consumption has been reduced over the past three years from 350,000 m³ per month to 250,000 m³ per month.

based staff or any USAID/Kiev project managers. The project files and documents were unavailable to the team during the mission. Following the team return to Washington, USAID made some documentation available.

1.2 Hagler-Bailly

In 1995 Hagler-Bailly was contracted to conduct a national Demand Side Management (DSM) assessment in order to identify suitable candidates for programs; the assessment also included an evaluation of costs and benefits for these programs. Total net demand savings for year 2001 were estimated at 2,768 gigawatt hours (apparently based on 1995 forward projections). However, the Evaluation Team was provided with no corroborating information, and in fact had no way to verify that the programs were actually implemented. The team will attempt to interview staff of PA Consulting (successor firm to Hagler-Bailly) who might be familiar with these activities upon return to the US, but staff familiar with the activities were not available.

1.3 World Environment Center (WEC)

Industrial Waste Minimization Program

The Industrial Waste Minimization Program *under the Cooperative Agreement* was implemented from 1995 through 1999 as part of USAID SO 1.6. At the request of USAID, the Industrial Waste Minimization Program focused on energy conservation because of the high total energy consumption and energy intensity of the selected industries, especially natural gas in the chemical, steel and metallurgical sectors. As a consequence, 20 of the 21 projects implemented were identified as “Energy Conservation” Projects. Enterprises participating in the program were prescreened and selected on the basis of their economic viability.

The Program was implemented in four industrial sectors (steel, metal works, chemical and rubber) in thirteen industrial enterprises, including three industrial boiler plants. Twenty-one energy conservation and one industrial waste minimization projects were implemented. “Low cost or no cost” improvement in processes and combustion control equipment (portable and stationary) with the cost of USD 226,300 (USAID contribution USD 210,000) resulted in savings of USD 2,595,000 (Net Present Value, based on annual discount rate of 5% and average life of equipment of eight years).²⁷

The Evaluation Team received information on the results of the energy conservation program implemented by WEC from the Economic Department of Dnipropetrovsk Oblast Administration, which supervised implementation of USAID technical assistance and organized dissemination of results and program replication through the industry.²⁸

²⁷ WEC Final Report: Industrial Waste Minimization Program in Central and Eastern Europe and Central Asian Republics, March 2001.

²⁸ See attached correspondence from Dnipropetrovsk Regional Administration, October 4, 2001.

Local Capacity Building

According to information received from Dnipropetrovsk Regional Administration on the impact and continuation of the USAID/WEC EE Program in Dnipropetrovsk Region, a "Program for Energy Conservation in Dnipropetrovsk Oblast to 2100" was developed as a result of the USAID EE program implemented by WEC. The Regional Energy Conservation Program was developed in 1997 for period of 1998/1999 and 2000/2010. This information describes the impact, continuation activities initiated by USAID energy efficiency technical assistance and - of particular interest for project sustainability - details how Ukrainian "ownership" was established at the Oblast level.

The main goal of the program for 1998-99 was to achieve conservation of fuel and energy resources, with an established target of 1.5 million tons of standard fuel. The plans were to meet the objective by energy conservation (energy management) and implementation of low cost energy conservation measures and R&D developments at industrial enterprises in the region. The project activities actually led to real savings in the amount of 1.03 million tons of standard fuel. In comparison with 1998, energy demand in 1999 for electricity decreased by 1.2 billion Kilowatt-hours (or 5%), while natural gas demand decreased by 190.9 million cubic meters (2%). Similar rates of energy consumption reduction were recorded in 2000 and first half of 2001.

In order to speed up the process and implement "Oblast energy conservation program", the Head of the Oblast Administration issued the executive orders: "Measures for energy consumption reduction by budgetary organisations", 5 August 1999, # 370; and "Improvement of energy conservation activity", 14 May 2000, #187/1.

In addition to the follow-on Dnipropetrovsk Oblast activity described above, as well as the Workshops and Manuals on Energy Conservation, two private companies have benefited from the USAID program. The first, the Center for Environmental and Energy Audit and Clean Technologies (CEEAA CT) was established as a result to provide a variety of energy efficiency services to the region. The second firm, Dnepr Desna, which was already established, added energy efficiency programs to its portfolio.²⁹

2. *Natural Gas Pipeline Energy Efficiency*

PNNL in cooperation with ARENA-ECO and JSC VNIPI TRANGAS developed a feasibility study for "An Examination of Financial Options For the Upgrade of Compressor Stations On the Natural Gas Transmission System in Ukraine". This study was developed under the Memorandum of Understanding between the State Committee on Oil, Gas and Oil Refining industry of Ukraine, the US DOE and State Committee for Energy Conservation dated October 15, 1997. The proposed project, which was designed to secure a loan for new compressors, was developed as a supplement to an earlier project "Investment Program: Energy Efficiency Upgrades to Compressor Stations of Ukrainian Gas Transmission System".

²⁹ For further details, see the following websites: www.dnepr-desna.dp.ua; also www.dneprdesna.dp.ua

The Evaluation Team was provided with documentation on this activity before traveling to Ukraine. However, since since Ukraine failed to obtain the loan, the Team was instructed by the USAID Kyiv Office not to evaluate this activity.

VII. ENERGY EFFICIENCY PROJECT IDENTIFICATION AND FINANCING (DOE)

Ukraine's commitment to close the Chernobyl Nuclear Plant initiated a variety of US assistance programs to help stabilize Ukraine's electricity sector. Industrial energy efficiency has been an important area of this assistance program. PNNL developed an energy efficiency program consistent with long-term U.S. policy toward Ukraine by stimulating private investment, stimulating private enterprise profitability and growth and developing sound financing tools for private enterprises. The PNNL program also contributed to the increased environmental management capacity and emission reduction.

Nineteen industrial enterprises have participated in the program since 1997, investing more than \$2 million of their own funds in recommended energy efficiency projects. These enterprises range from large energy consumers such as the Avdeevka Coke Chemical Plant and Gostomel Glass Plant to small companies such as the Rosich Food Processing Plant. These plants have also signed or are close to signing financing for an additional \$12 million in energy efficiency projects.

PNNL teamed with ARENA-ECO and Industrial Real Estate (IRE) Co. for this project development and implementation. IRE is an American/Ukrainian consulting firm rendering services in business evaluation, asset appraisal, and auditing, financial and economic analysis and investment management assistance. Energy efficiency projects are identified through energy audits performed by ARENA-ECO. PNNL, ARENA-ECO and IRE jointly prepare feasibility assessments for identified energy efficiency measures. IRE — usually in cooperation with a local bank — is responsible for the economic and financial part of the projects. This approach to project identification and financing has achieved substantial success because of the high professional reputation of ARENA-ECO, along with IRE's credibility and 'Western' experience in appraisal, auditing and financial planning that is required by foreign (EBRD) and, increasingly, domestic financial institutions.

The Evaluation Team visited the Gostomel Glass Plant in Kyiv region. Energy costs are a major component of production costs, and represents 25% of total costs. According to plant Financial Director Mr. Lysenko, the Gostomel plant to date has invested \$5.7 million of its own funds in energy efficiency, including heat recovery boilers, steam insulation and reconstruction of furnaces (\$3.5 million in 2000, \$1.5 million in 2001). The company also negotiated the first true "performance contract" in Ukraine and all the FSU countries with UkrESCO. This \$380,000 contract is paying for compressor upgrades. A local private bank is providing Gostomel with \$2 million in debt financing to modernize one of its glass furnaces. In addition, Gostomel is in discussion with EBRD for a \$10 million loan for energy efficient new furnaces and related equipment. The project, implemented to date with a cost of \$800,000, resulted in annual savings of over \$220,000, including over two million cubic meters of gas and 1.3 million Kwh per year.

According to PNNL, the implemented measures have internal rates of return ranging from 20 to 53%.

Gostomel's Financial Director Mr. Lysenko stressed the great value of USAID assistance. It initiated energy efficiency awareness and PNNL's services made it possible to implement energy conservation measures. The company was not prepared to undertake such an initiative on its own. According to the Financial Director, energy efficiency measures at the plant would have been delayed by several years (four or five) if USAID assistance had not been available. In his opinion, Ukrainian industrial enterprises require technical assistance in project formulation and financial planning, as well as an introduction to and training in advanced quality and environmental management techniques. PNNL Senior Research Scientist Ms. Meredydd Evans reported to the Evaluation Team on similar results at other participating enterprises.

The Evaluation Team finds that the assistance program in Energy Efficiency Project Identification and Financing -- developed and provided jointly by PNNL, ARENA ECO and IRE -- is well designed and effectively executed. The program incorporates American expertise in energy efficiency, understanding of Ukrainian industrial operational practices and technology levels, and western expertise and credibility in financial planning. Its exceptional value can be attributed to the development of an innovative financial scheme specific to Ukrainian conditions, while at the same time meeting the high requirements of western banks (such as EBRD). Recent positive economic developments, along with new tariffs and increased privatization, will provide good conditions for further implementation in the industrial sector, with attendant significant energy savings benefits.

VIII. CLIMATE CHANGE

A. ALLIANCE TO SAVE ENERGY (ASE)

The Alliance to Save Energy formed a Multilateral Working Group (MLCCWG) to provide a forum for international donors to increase the effectiveness of efforts and avoiding duplication, exchange information and experiences, develop and coordinate an effective approach to the Ukraine government in relation to the International Committee on Climate Change, and organize local NGO initiatives to disseminate information on climate change.

ASE organized a number of workshops and roundtable discussions on climate change, and facilitated ties between the NGO community and the Ukrainian government, and was the primary catalyst in forming the Ukrainian Environmental NGO Working Group on Climate Change (NGO CWG).

Assisted by the ASE, the NGO CWG initiated broad activities in climate change and assisted the Ukrainian Government in their climate change activities related to the UNDP, World Bank and other international donors. The NGO CWG consulted with the Government of Ukraine on international activities related to climate change and participated in the U. N. Framework Convention on Climate Change (UNFCCC) COP VI. The USAID Mission in Kiev invited the NGO CWG to cooperate with the US Climate Change Initiative Center.

B. CLIMATE CHANGE INITIATIVE CENTER

The Center, which since 1999 has been managed by PA Consulting Group, was established as an outgrowth of the USAID Climate Change Initiative (CCI) to provide information on climate change and links to international programs and organizations. The CCI goal is to assist Ukraine in adopting internationally recognized methodologies needed to implement its national program, including an emissions inventory, and in monitoring and evaluating emissions reductions. The CCI provides training for Ukrainian experts in “best practices” approved by the Intergovernmental Panel on Climate Change (IPCC). The CCI also is assisting Ukraine in conducting its inventory of Greenhouse Gas (GHG) emissions from the energy sector. Participation in the UNFCCC paves the way for Ukraine to attract international investments in GHG emission reductions.

C. PARTNERSHIP FOR ENERGY AND ENVIRONMENTAL REFORM (PEER)

In July 1998, the Alternative Fuels Center (AFC) was established by the Ministry of Coal Industries in conjunction with the Ukraine National Academy of Science. The Center received technical assistance from USAID to pave the way for investments in Coal Bed Methane (CBM) development. However, the Evaluation Team was informed by PEER that establishing an appropriate legislative base regarding ownership rights is a necessary prerequisite for any such development; at this time, no legislation has been enacted. The Evaluation Team was informed that a production sharing agreement was recently approved by the Parliament, and that there is a possibility that it will be expanded to include CBM, particularly in light of heightened national focus on CBM as a premium fuel, with additional benefits related to mine safety and global climate change.