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ENERGY EFFICIENCY IMPROVEMENT PROBLEM IN COMMUNAL SECTOR OF UKRAINE'S ECONOMY AND TOOL TO OVERCOME IT

Energy efficiency improvement environment, problems and tools to overcome them in communal sector of Ukraine's economy are considered at the case study of municipal water/wastewater and heating utilities. Peculiar properties of Energy Performance Contracting using to finance energy saving projects through Energy Service Companies are analyzed in detail.

Current Status of the Problem in Ukraine

The communal services sector is Ukraine's third largest energy consumer after the metallurgy and chemical industries (and the first in heat consumption). In the period of 1997 through this year, the annual consumption of natural gas by the sector's enterprises nationwide ranged between 8.0 and 8.5 billion m³, and that of electric power was about 10 billion kilowatt-hours. This accounted for 10-12 percent and 5-6 percent, respectively, of total national consumption of gas and electric power.

Serviceable condition of communal service enterprises (CSEs) is characterized as critical [1]. There are about 14,000 boiler plants in the Ukrainian communal sector, including about 6,000 plants in heating CSEs. Since the beginning of 90-th, the technical condition of existing equipment has got considerably worsened. For example, more than half of heat CSEs' boiler plants use low-efficiency, obsolete boilers with an efficiency of less than 82 percent and have been being operated for more than 20 years. More than 3,000 km (14 percent) of heat-supply pipelines are worn-out, and more than 7,600 km (35 percent), amortized. Most of central heating substations (CHSs) run outdated shell-and-tube heat exchangers with a low coefficient of heat transfer, and more than 1,400 CHSs (40 percent) are out of repair.

Water/wastewater CSEs consume most electric power within the communal sector – almost 7.2 billion kWh a year. In 2000, water/wastewater enterprises supplied three billion m³ of water and discharged 2.6 billion m³ of sewage. The technical condition of water/wastewater enterprises is also far from being satisfactory. Presently, 29,300 km of the networks or 25 percent of their total length need repairing. In terms of value, a quarter of water treatment plants and each fifth pump station have exhausted their depreciable life, and 40 percent of pumps need to be replaced.

The following factors should be cited among those that contributed most to the creation of the current situation in the communal sector in

Ukraine: low ability to pay of population and industrial enterprises; imperfection of the current tariffs system; imperfect legislation; lack of economic incentives to improve the energy efficiency; write-off of "energy" debts; excessive centralization of heat supply, and operation of low-efficiency and worn-out equipment.

State Regulation in Energy Efficiency

According to experts' estimates, Ukraine has quite a lot of opportunities to improve energy efficiency in its communal sector – at least 30 percent of the total energy resources consumed. Proper realization of this potential would allow for not only decreasing the costs of services and the tariffs, but also improving the quality of services. Moreover, implementation of energy efficiency and conservation programs would require several times less money than comparable measures to build up supply.

The development of the state energy efficiency and conservation programs was given priority to in Ukraine (much regrettably, only to the development, not implementation). In late 1993 the Cabinet of Ministers of Ukraine drafted, and in February 1994 the Supreme Rada passed, a "Concept of the Fuel and Energy Complex Development in Ukraine until 2010" [2]. On July 1, 1994, the Supreme Rada passed the Law "On Energy Conservation", which defined legal, economic, social and ecological fundamentals of energy conservation for all enterprises, associations and organizations located on the territory of Ukraine, as well as for its citizens. In 1997, the Cabinet of Ministers adopted a "Comprehensive State Program of Energy Conservation in Ukraine" [3]. Measures to implement the mechanism of economic incentives to economical consumption of energy resources and large-scale introduction of energy-conservation technologies, as well as adjusted indicators of implementing the Comprehensive State Program were approved by a CM Decree as urgent measures to fulfill the Comprehensive State Program [4]. Detail analysis of the situation in energy efficiency and conservation in

communal sector of Ukraine as well as short description of the numerous projects of technical assistance implemented in Ukraine you may find in PADCO/PA publication [5].

Nevertheless, the situation remains critical. The energy efficiency and energy conservation projects being implemented in Ukraine are far from being attractive for the national government, local municipalities and CSEs, nor are they considered lucrative by the domestic and foreign investors [1, 4, 6].

Energy Efficiency Improvement Concept

CSEs understand the urgent necessity to improve the energy efficiency but lack of practical experience of work in market conditions does not allow them to implement it easily. In such a case, it is worth turning to the experience of advanced countries, which were able to solve this problem in a positive and prompt manner as early as in the 1970s. Moreover, now there have been already many examples of using this experience in Ukraine [5].

The experience shows [5] that the successful projects undertaken by CSEs throughout the world, including such neighbors of Ukraine as Poland, Czech Republic, Russia, and others have had the following features: joint funding (city, utility, and commercial investor); availability of technical assistance; involvement of third party in funding; "turn key" implementation with a guaranteed energy conservation level; and repayment in full of attracted funds against attained savings.

This concept was widely used before in the USA and West Europe countries for the same purpose – to improve the efficiency and cost-effectiveness of energy utilization and consumption. It is called Energy Saving Performance Contracting (ESPC), a contract with payments based on performance [7, 8]. ESPC is grounded on guaranteed future energy savings and allows the customer (CSE) to use future energy savings to update facilities and cut operating costs now. To make it happened, companies of a peculiar type named Energy Service Companies (ESCOs) are involved to realize projects on turnkey basis. The latter means that responsibility of ESCOs is to provide complete package of energy management services including an engineering and due diligence evaluation of the CSE; arrange financing; purchase, deliver and install energy-saving equipment and maintenance procedures; and provide an agreed upon comfort level for a fee usually guaranteed not to be exceed the CSE's avoided energy costs.

Structure flowchart of the proposed mechanism for energy efficiency (EE) projects implementation is shown in Figure 1.

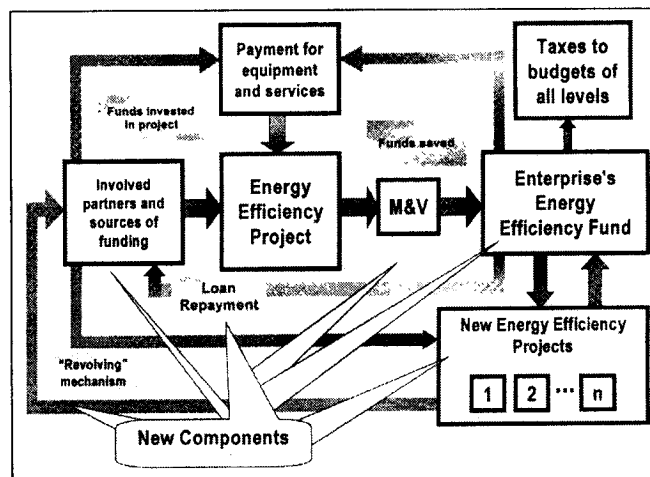


Fig. 1

Special arrows indicated here new for Ukraine's practice components. Among them you may find M&V (Measurement and Verification) block, where saved energy resources transform into saved money, and CSE's Energy Efficiency Fund (Account), where saved money accumulates to be used in new projects.

The traditional (post-soviet) approach to energy efficiency undertaken CSEs usually allows savings based on the technical aspects of the process, i.e. money is invested in one technical modernization project, but without any understanding or commitment of the need to pay money back or recover and set aside the monetary savings to be rolled over again and again into further investments in additional projects ("revolving" feedback).

The proposed mechanism based on Energy Saving Performance Contracting is in much of the world a regular business of its own, which is run on a "revolving" basis, ensuring growing profit today and in the future. This is a business, which is needed by Ukraine's utilities now, since the energy utilization of available new equipment and technologies continues to improve whereas existing infrastructure is fast deteriorating and outdated.

Bankable Proposal Creation

The Ukrainian economy and CSEs offer excellent potential for energy efficiency, but also significant business development risks. The projects should be designed to promote energy efficiency business development and reduce risks. Investors who consider risks by international financing standards need life cycle cost indicators. To do it, first of all special spreadsheet-screening tool is needed, which evaluates the cost-effectiveness of various models on a life-cycle basis [7-9]. This means the spreadsheet takes into account the cost of capital, and it discounts savings and investments over a long

analysis period back to their present value. The life cycle cost indicators produced by the tool usually are net present value (NPV), savings-to-investment ratio (SIR) and simple payback period (SPB), which are absolute and relative values respectively, of the same life-cycle factors. Such study is important in order to "sell the project" to municipal officials, sources of financing, and also to the ESCOs that will be attracted to implement the project (through a competitive tender).

The next one major component of performance contracting is the CSE's need for financing. Prospective project financing sources that include the state and municipality budgets, CSEs' largest customers, multilateral development banks such as EBRD, and Ukrainian commercial banks is shown among others in the Figure 2.

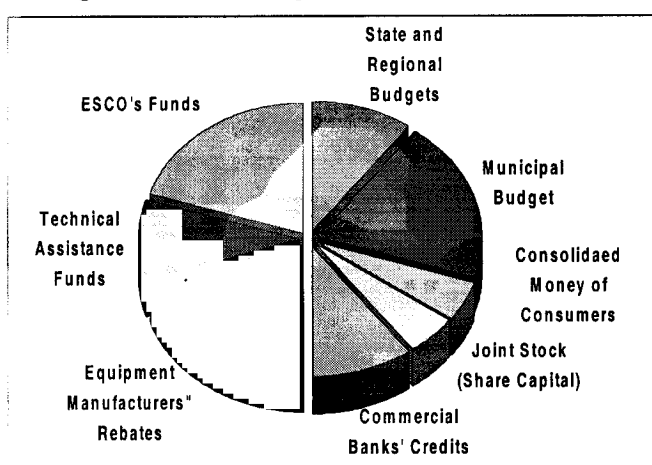


Fig. 2

The municipalities and their enterprises all hope to attract foreign investors, possibly international ESCOs, to the comprehensive projects. The great advantage of performance contracting is that it imposes accountability, both for energy use and financial management, on all concerned parties. ESPC is good for orgs without budget resources because they make capital available for investments that generate cash for their own repayments. An ESPC only works if the CSE protects savings to pay ESCO and others funding parties.

Financing mechanism for repayment money back

After the ESCO portion of each financing package is paid off, the remainder of savings should be set aside and protected. The money should be reserved for capital improvements, many of which can create further savings and multiply the resource. Paying into the funds will also establish a credit history and demonstrate to future investors that CSEs can keep promises to pay back money according to schedule

and on time. This last point is perhaps the most important as CSEs anticipate securing the remaining financial commitments for full-scale system-wide network rehabilitation projects. Good history results and good success with projects give the CSE a good credit rating and will bring it to the attention of international financial institutions and commercial banks, all appropriate sources of follow-on financing.

Energy Efficiency Fund is a special account to deposit the savings created by energy efficiency, i.e., an internal EE revolving fund. Financial and legal specialists need to be involved to establish the fund properly. The fund is for a CSE's own benefit, nobody else's. Its effectiveness depends on how well the new financial resource is managed. Good fund management will attract investment for the next stage of development, possibly involving a large-scale performance contract. This is the path to advancement toward world standards.

Mechanism to create the fund at CSE is shown in Figure 3. The advantage of this mechanism is that it can be created at CSE today. Only a decision of CSE's owner at municipal level is needed.

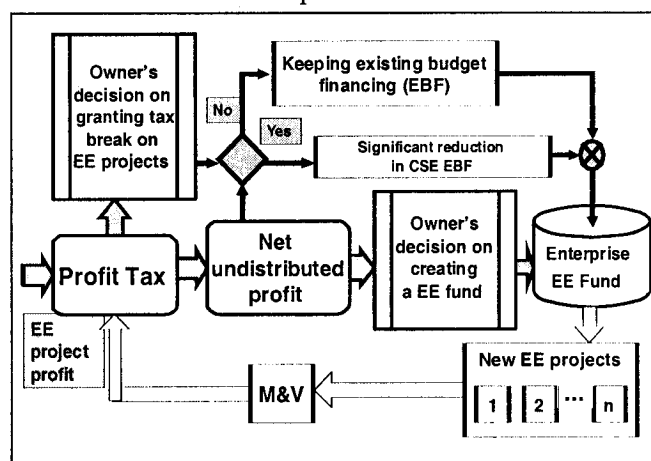


Fig. 3

The fund should be used for payment the loan back and future energy efficiency investments at each enterprise, thus offsetting future city budget demands for capital improvements. This is a city interest. As the CSEs will own the funds, the cities are agreed not to tax the money with one restriction: the savings from energy efficiency should be captured and devoted to future EE improvements only. In such way municipalities create the political, administrative and fiscal conditions for success.

Prospects for the use of ESPC in Ukraine

Ukraine is ready to try an energy savings performance contracting. The great advantage of per-

formance contracting is that it imposes accountability, both for energy use and financial management, on all concerned parties. So far, no known, full-fledged ESPC has been executed in Ukraine.

The proposed concept was tested in four pilot projects at CSEs of the Ukrainian cities of Lutsk and Khmelntysky within the frame of a large-scale Tariff Reform and Communal Services Enterprises Restructuring Program for Ukraine that is being implemented by PADCO with financial support from the USAID [9]. Using of ESPC concept allowed for obtaining of three principal objectives: (1) to encourage ESPC energy efficiency projects development in Ukrainian CSEs and to attract financing to support those projects; (2) to promote the Ukrainian ESCO energy efficiency industry; and (3) to contribute to the larger goal of restructuring and tariff reform in Ukraine's CSEs.

Although pure performance contracting is too large a goal for the Ukrainian CSEs today, the four pilot projects in the USAID program have many ESPC features: partial ESCO financing, guaranteed savings, energy audits, measurement and verification (M&V), and performance-based payments. In the ESPC concept, ESCOs sell services, not equipment. ESCO financing in the pilots is about 20% on average. M&V of savings is important to any organization that cares about the return on its investments in energy efficiency. In a performance contract, M&V is mandatory because ESCO payment depends on it.

ESCO may use a wide variety of cooperation models, and even joint ventures with the CSEs, as the groundwork for the ESCO expanding activities in the communal sector of Ukraine. The noticeable positive changes in the communal service sharing system give good reasons to expect that the CSEs will soon become profitable and financially viable. If so, the CSEs may become a valuable source of finance for ESCO projects that will make them more attractive for potential lending and financing transactions and, at the same time, will secure good collections on the ESCO bills through their settlement system providing a direct access to the customers. CSEs have a high demand for energy management services and investments in their own systems that comprise a promising potential market for the services and equipment offered by ESCO. Relations with the CSEs may be even more important for ESCO if the communal enterprises will advance their privatization programs taking advantage of the efforts of the Ukraine's government to encourage the communal sector privatization.

CSEs represent potential partners for ESCOs in delivering energy and water efficiency services to their customers. Joint ventures with CSEs could become a platform for on-going business development activities of ESCOs in Ukraine. In the competitive environment of the restructured communal services sector, CSEs have a strong incentive to offer value-added services to their customers. Because of their distribution system franchise, CSEs are expected to be profitable, financially stable enterprises. CSEs may be a vehicle for ESCO project financing, helping to secure and obtain debt and other kinds of financing for ESCOs with this base of creditworthiness, while performing ESCO payment collections services on its customers' utility bills. CSEs also have tremendous needs for management services and investments in their own systems, including metering equipment, and thus represent potential markets for services and equipment offered by ESCOs. Such relationships may be attractive to ESCOs since CSEs are increasingly corporatized entities as the result of initiatives to explore the privatization of CSEs by the Ukrainian government.

Program of action

The following is a program of action for CSEs in Ukraine to implement energy efficiency projects on ESPC basis:

1. Studying best practices of ESPC projects undertaken by others.
2. Forming managing team that includes facility, legal and financial people to determine the results they want to have from EE improvement.
3. Training project team in energy management and ESPC.
4. Creating bankable project proposal.
5. Carrying out scoping energy audit and working out of preliminary technical proposals, where these results are put on the paper in the form of proposed EE measures.
6. Carrying out preliminary cost-effectiveness analysis to assess the economics of proposed EE measures.
7. Defining the sources of the proposed EE measures' financing.
8. Creating the financing mechanism for repayment investment money back.
9. Producing the M&V procedure to translate the energy savings into money.
10. Holding a pre-proposal conference for prospective competitors to clarify and expand upon

the enterprise's needs, requirements and conditions.

11. Working out the Request For Qualification/Proposals (RFQ/RFP).

12. Issuing tenders to ESCOs to implement projects and provide services.

13. Undertaking competitive ESCO selection to provide required equipment and services.

14. Entering into a Project Development Agreement.

15. On-site training selected ESCOs and CSEs.

16. Project manager's appointment from ESCO and CSE's sides.

17. Performing an Investment Grade Audit (IGA) to refine measures and predict savings.

18. Obtaining financing commitments.

19. Entering into an Energy Savings Performance Contract.

20. Entering into a Measurement & Verification protocol.

21. Performing installation of EE measures.

22. Making payments in return for savings.

23. Creating an Energy Savings Fund to channel savings from past EE projects back into a fund for future improvements.

Conclusions

CSEs' managers in Ukraine understand the technical solutions for energy efficiency very well but they do not know how to test them for economic feasibility. They are able to solve technical problems having the capital. Attracting the capital and then making new equipment show a profit are out practically of their mentality and business. CSE management needs to learn to recognize what projects are economically acceptable now and which ones must wait for better conditions in the future. They need training in energy management and energy saving performance contracting.

Another facet of the energy efficiency improvement in Ukrainian CSEs is the long distance from the present condition to the desired result. The quantity of obsolete equipment is so great, its cost is so high, and the creditworthiness of the CSEs is so low, that one project will not prepare the way for comprehensive rehabilitation. It should be a revolving procedure, each step of which should build creditworthiness and investor confidence until reaching the point of attracting international investment. Technical improvements should progress hand-in-hand with legislative, normative and financial solutions.

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