



Project no. EIE-05-155

Project acronym: SEC-Tools

Energy Performance Contracting

Method Description and Application

WP7 leader:



Date: April 2008

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A INTRODUCTION

To decrease energy demand means, among others, to decrease adverse environmental impact of power engineering. This may be achieved either by higher efficiency of utilization of energy sources or by more effective energy consumption. Effective energy utilization becomes priority in a number of countries.

A.1 EPC method characteristics

This is a form of projects, within which scope the appropriate measures making energy production, distribution and consumption with the final energy consumer more effective are found and subsequently installed by the Energy Services Company. The contractual relationship usually exists from four to eight years, while the spent investment means, costs of granting of financial means and costs of related service activity are gradually paid throughout this period. The Energy Services Company shall ensure through a contract that minimum agreed level of energy savings as well as saved up costs will be achieved throughout the duration of the contractual relationship.

A.2 Suitable type of measure

The long-term guarantee for achieving of energy savings can be taken into account for measures, where bad behavior of the user of energy system causes usually non-fulfillment of the expected amount of savings. This area includes especially the type of measures of energy consumption management organization, energy consumption control and installation of other process equipment. It is not necessary to guarantee for volume of energy consumed for the “functionality” of measures of building character (insulation, window replacement), which are installed in a proper manner. The above mentioned shows, that it is convenient to solve the “building” measures using the mentioned method only complementarily.

A.3 Financing forms

The investments in installation of the necessary equipment may be repaid only from saved up costs for an acceptable period of time. However, if the contractor shows an interest to implement measures with longer period of return, the form of combined financing of the project may be selected and it depends on the investor, for which actual composition of financial resources it decides.

A.4 Project preparation process

In the first instance, the contractor should always make a decision if it wishes to reconstruct the energy system. It should then find out what possibilities can be taken into account and decides on the way and scope of system reconstruction. It shall either have the project documentation prepared for a certain solution or have the bid for project solution using the EPC method prepared. It makes finally a decision on project financing.

A.5 EPC method application

The EPC projects occur in the area of educational system (elementary and high schools as well as universities), in the national health sector (hospitals, medical institutions) and for other public buildings (swimming pools, ice-stadiums, cultural buildings etc.). However, the EPC projects find their use even in private sector.

B METHOD DESCRIPTION

The Energy Performance Contracting represents an untraditional approach to energy management, which enables the energy consumer to realize the energy saving project. In doing so, the energy consumer has to invest almost no financial resources in advance. Most risks are assumed by the specialized company carrying out the project. All costs of project are gradually repaid by amounts derived from the achieved energy cost savings.

In a restricted concept, the EPC is often understood as an untraditional financing method and the consumers are mainly interested therein since it facilitates them in accessing the source of financing. However, securing financing is only the mere part of the whole complex of services included in the EPC: preparation of energy analysis, preparation of proposal of appropriate measures decreasing energy consumption, their implementation in the form of application of organizational changes and installation of the relevant equipment, supervision or eventually securing functionality of the implemented measures and long-term monitoring and evaluation of efficiency of the implemented measures.

In countries, where application of the EPC method expanded, the method has a number of various modifications and different names are used. Different designation used in different countries such as Third Party Financing, Contract Energy Management, Contract du Resultat, Performance Contracting and the following ones, express generally various modifications of the EPC. Only the Performance Contracting is sometimes slightly wider service within the meaning of decrease in all operating costs.

Essential characteristics of the EPC differentiating this service from other procedures are at least two:

- Investments in higher efficiency of energy utilization are repaid from the achieved savings of operating costs,
- Energy Services Company (ESCO) offering the EPC assumes a part of the risks connected with investment implementation and repayment.

The specialized companies oriented on the EPC method are called the Energy Service Company (also ESCO). Typical Energy Services Company always offers the energy consumer (customer) a complex of services related to energy savings. These are designing, engineering, technical, managerial and financial services. The purpose of these services is to reduce customer's energy costs or enable more effective utilization of energy.

Services provided in this way are usually nothing new. The way they are provided is new. It is the turn-key project, which takes account of all areas of energy

utilization and includes all activities necessary for achievement of energy savings. The project is adapted to a certain customer and it includes the following:

- Energy analysis (it can be in the form of energy audit, however, it is more exhaustive in some parts),
- Proposal of energy saving and cost reduction measures,
- Equipment installation and commissioning,
- Project financing,
- Operator training,
- Measurement of the achieved results,
- Long-term supervision of functionality and performance of the installed equipment,

The Energy Services Company is paid for its services based on achieved energy savings. Company income including its profit is derived either from direct decrease in energy costs or from improvement of energy efficiency. Accurate method of establishing repayments and further details depend on contractual stipulations between the supplier (the Energy Services Company) and the customer. In principle, the amount of repayment is always connected with the achieved savings.

The EPC represents a viable way of enhancing energy efficiency in public as well as in private sector. However, it is more effective for public sector. The EPC method offers an integrated and long-term access to energy management, therefore, the achieved results are also comprehensive and long-term.

The energy consumer using the EPC method gains especially the following:

- A substantial decrease in energy costs, possibly other operating costs,
- Improved working environment,
- Reduced costs of equipment maintenance,
- Trained and motivated equipment operator,
- In replacing production technologies, usually enhancement of production quality,
- An access to external financial resources.

Utilization of the EPC method is not general-purpose. It always depends on how the contractor values the guarantees for achievement of savings, which play the most significant role in energy services of this type, and what is the ratio between the necessary volume of investment means and the potential of operating cost savings with the objects.

C FORMS OF PROVIDING THE ENERGY SERVICES

Needs of the end user in reducing energy costs can be satisfied by the Energy Services Companies on different levels, which in the given place and time solves best the problem in question.

The **Energy Contracting**, when energy is supplied on the basis of the long-term contract. The supplier can extend services by savings in energy conversion, which may be ensured by reconstruction of energy source and/or energy distribution systems, modifications connected with savings in final energy consumption or by both ways. Services and supplies can be paid in different ways from immediate payment through supply in the form of supplier credit to service provided by the EPC method without taking over operation of energy management.

The **Energy Supply Contracting**, during which the range of operating the energy management is very wide. The first contact can arise already with the offer of preparing the energy audit. Technically, it is takeover of care of client's energy system. The relationships can be agreed upon in different way from mere operation of energy source through securing optimum amount of energy to comprehensive service including investment actions with long-term guaranteed price for energy supplied. Service can be provided by distribution energy company, energy equipment supplier or company ensuring administration of economic operation of clients.

The **Energy Demand Contracting** is an equivalent of previous method of energy contracting provided that the company does not operate the energy source, however, contracts all energy flows and relations to make the customer fully satisfied.

The **Energy Performance Contracting**, within the scope of which the offer of comprehensive energy service contains implementation of measures on the energy source side as well as on the energy consumption side. The service provider offers all services for high-quality supplies and consumption of energy so that the customer does not pay more for energy consumption. The service is complemented by granting the necessary financial means, which are gradually repaid from saved up operating costs within the scope of the long-term contract with the guaranteed result.

The **Facility Management Service** represents an upgrade of energy management, when the service is complemented by comprehensive care of all services connected with operation of the building (cleaning, venting, security service etc.).

D EPC BENEFITS

In case of standard way of supplies, the supplying company shall not responsible for achievement of total cost savings. The end user – customer, who bears all risks, shall be fully responsible for payment of supplies and possible credit as well as for equipment operation and savings.

When using the EPC, one company shall be responsible for achievement of total cost savings. This company shall be fully responsible for equipment operation and savings and it shall be liable for payment of supplies as well as possible credit.

The EPC is a comprehensive service – most (all) supplies and services are provided from one place, which guarantees final effect of the project – cost savings while maintaining the required standards of thermal, light etc. comfort.

A part of the service is the following:

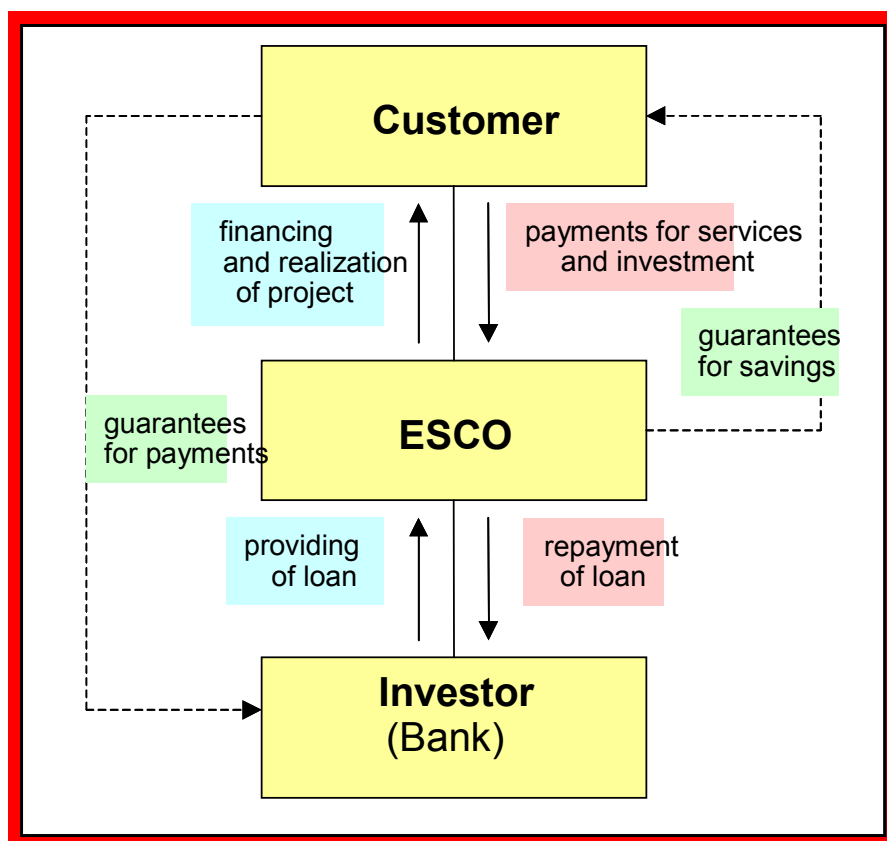
- Preliminary assessment of energy consumption
- Conclusion of a framework agreement on cooperation
- Proposal of system modifications, determination of possible cost savings
- Project by customer needs and facilities, project documentation
- Provision of financial resources
- Technology delivery and implementation
- System monitoring and evaluation of the achieved results (savings)
- Guarantee for technical level as well as for effective equipment operation. Failure to achieve the contractual parameters shall become evident in the form of lower payments for ESCO.

E FINANCING METHODS WHEN USING THE EPC METHOD

The principle of financing the energy-saving measures consists in realization of savings in costs of provision of energy. Such savings are used for repaying the initial investments into equipment, maintenance costs and equipment operating costs to the ESCO.

In principle, there are two kinds of mutual relationships between the beneficiary, the ESCO and the financial resources (e.g. banks).

E.1 Direct relationship between the customer and ESCO



In direct relationship, the customer does not at all enters into a relationship with the financial resource. The project financing is secured by the ESCO in its name and the company bears thus the whole risk of failure of the project although its is beyond its control due to circumstances.

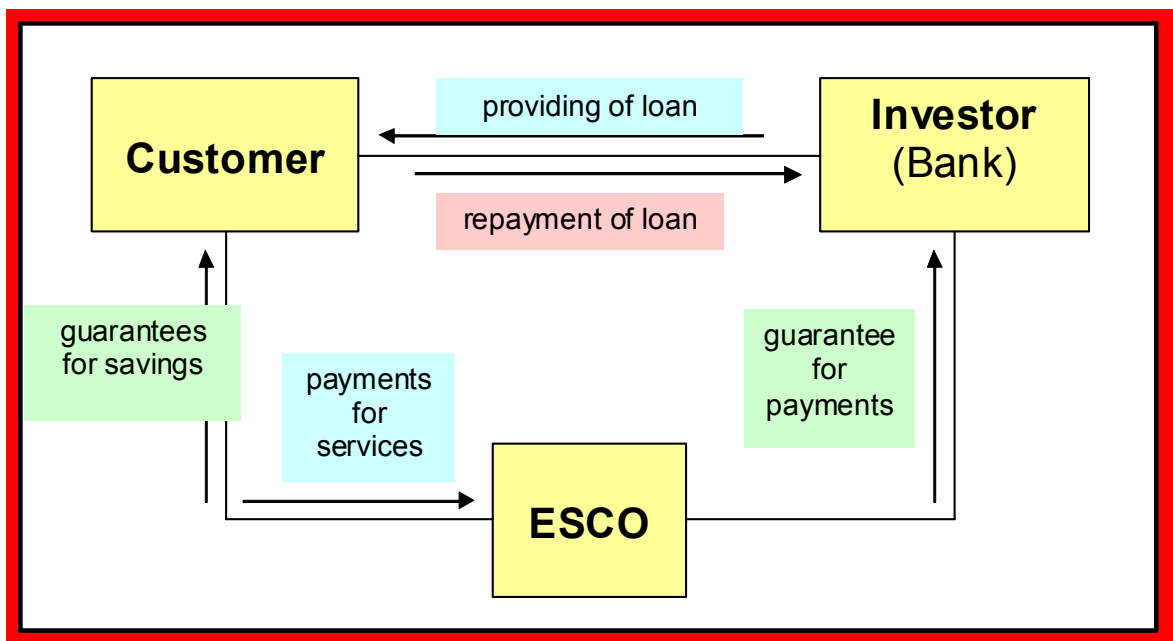
This method of financing is very attractive for the customer, however, for ESCO it can represent a substantially high risk. Other problems should be solved in the

relationship between the ESCO and the financial institution. In order to obtain financial means in tens or hundreds of millions of CZK in the company name, the Energy Services Company must be sufficiently capital-strong and credit-worthy. Therefore, this concept cannot be applied by smaller, management-oriented Energy Services Companies but rather by energy suppliers or large producers of energy-saving technologies.

Another disadvantage for the customer is (slightly) higher price of such provided means. The ESCO usually uses resources from investment funds, which are often more expensive than the means gained in the form of credit. In the case the ESCO is granted credit, it can be more expensive if the ESCO is a small company with lower banking credibility.

This concept is suitable for the public sector, which is not subject to cyclical fluctuations as much as the private sector and the bankruptcy risk is here insignificant. Other possibility of reducing the ESCO's risk when using this scheme, is request of guarantees from the customer.

E.2 Indirect relationship between the customer and ESCO (run-off triangle)



The advantage of this method of financing is lower price of credit provided that the customer has a sufficient credibility. In both cases, the guarantees are identical and enforceable under contract worded in a proper manner.

The disadvantage for the entities of public administration is direct indebtedness projected into debt service, amount of which is monitored by the Ministry of Finance.

E.3 Combination of financial resources

“Clean” EPC method assumes that the services connected with the adoption of economy measures including their delivery and installation will be fully paid from savings of energy consumption costs as well as other costs connected with the consumption (wages, maintenance etc.).

However, this scheme is not general-purpose applicable to all cases connected with the energy consumption cost savings. If there are not sufficient savings in the system, either due to absolutely small total consumption (although the proportion of savings is significant) or their proportion is small, customer’s resources or other financial resources must be partially used.

F UNFITNESS OF MEASURES OF BUILDING CHARACTER

There is an opinion that construction-design changes of buildings consisting in external insulation or window replacement may be paid from the achieved savings and the EPC method may be thus applied thereto.

This is an illusion. This reconstruction is returnable from savings in a long-term time horizon (20 to 50 years). In addition, such building operations already carried out are definitive – they do not respond to changing external and internal conditions. The reconstruction itself requires no special sophisticated know-how as it involves selection of construction materials with appropriate properties.

The goal of the EPC method is to adopt such technology measures to enable the energy system to react flexibly to changing utilization of buildings and any parts thereof, respond promptly to changing external as well as internal conditions (external as well as internal temperature, lighting intensity in response to daylight etc.). In this case, savings are significantly higher and the corresponding economy measures have shorter repayment time. Considerable demands are made on technology know-how and level of services provided by the supplier during the course of the contractual relationship.

It is thus better contract and finance building enclosure reconstruction including window replacement directly without further costs connected with the guarantees for achievement of savings. If enclosure and window condition requires reconstruction from the appearance or physical condition point of view, the EPC project along with the project inclusive of reconstruction may be time-connected with an independent financing of each project.

G OTHER FEATURES OF THE EPC METHOD

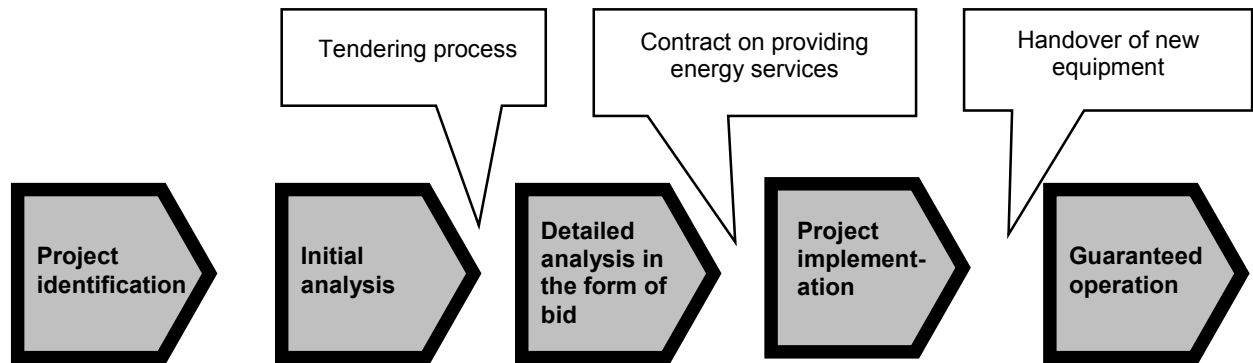
G.1 Transaction costs

Transaction costs are costs connected with project identification, analysis and design, amount of which is different for ESCO with different size. Smaller companies are able to react to demand with lower total cost savings, and greater companies can meet more customer needs by offering various means of financing and guarantees, which is more evident in the case of larger projects. Transaction costs are almost always the same regardless of contract size, and application of the method is not efficient where savings are low.

G.2 Accumulation of cases

In order to achieve a sufficient size of the project, it is appropriate to combine several similar smaller projects in single buildings. This will reduce the proportion of transaction costs of the ESCO as well as costs connected with preparation, organization and evaluation of public contracts. In addition, energy-saving measures, which could not be adopted, due to small range of the individual project, for low period of return, can be applied in this case. However, they can be applied within the scope of a greater complex (and greater total savings) without endangering efficiency of the whole project.

H COURSE OF THE EPC PROJECT



Project preparation and implementation proceed usually in several phases.

H.1 Project identification

The Energy Services Company or the consultancy company assisting in project preparation enters into contact with the owner of certain buildings (potential customer) and collects the required information for preparation of the initial proposal.

H.2 Preparation of initial analysis

Based on the primary information and the initial inspection of buildings, the initial draft solution is prepared (listing of measures to be taken into account, gross volume of necessary investment means and gross volume of reduction of energy consumption costs), while the customer makes a decision if further procedure is acceptable for him. If the customer decided to proceed with the project preparation, the draft contract of the future contract could be prepared defining especially relationship, when the customer decides, after preparation of a detailed analysis, to implement the project differently and is thus obliged to remunerate the company for work already performed.

The public sector is bound to put out public tenders for preparation and implementation of energy-saving project. In this case, it is necessary to prepare the relevant tender in cooperation with specialized company, which is able to define the correct criteria and prepare the contract documentation and will help to evaluate the obtained bids.

H.3 Preparation of a detailed analysis in the form of bid

The goal of the public tender, a part of which is the prepared contract documentation, is to obtain bids dealing with the required problems. Well prepared contract documentation serves as basis for follow-up process to prepare the relevant bids of the companies tendering for a contract. It is necessary to enable inspections of the relevant buildings and provide the required information necessary for bid preparation. The tenderers shall prepare a detailed analysis of the existing condition and propose all suitable measures reducing the operating costs. Based on the detailed examinations and calculations, the exact scope of installed measures is then proposed defining the expected volume of energy savings, achievement of which the supplier is able to guarantee, and the volume of investment means for installation of the proposed measures. A part of this process is to find optimum form of financing the proposed form of the project. Outputs of the steps carried out are included in the bid. Once the optimum bid is selected, all is led up to preparation of a draft contract on providing energy services with guaranteed result.

H.4 Project implementation (installation of the agreed measures)

On completion of the contract on providing energy services, steps leading to installation of the agreed measures are commenced. Based on the prepared project background documents, the comprehensive project documentation shall be prepared and all proposed measures are immediately installed. One of the implemented measures can involve installation of the energy consumption control and measuring system and its remote control, which enables high-grade and continuous supervision of subsequent operation of the installed equipment. Project implementation is financed in compliance with wording of the relevant contractual relationship.

H.5 Guaranteed operation

Based on the concluded contractual relationship, a long-term professional supervision and check of running and functionality of the measure takes place after implementation of the proposed measures and handover of the installed equipment with a view to achieving minimum agreed level of energy savings.

I STANDARD TIME SCHEDULE OF THE EPC PROJECT

In most cases, the projects designed using the EPC method pass through the following time schedule ensuring client's needs.

- 1) Project identification and project preparation in the form of work on detailed analysis of energy situation – 3 to 6 months
- 2) Preparation of a detailed analysis of energy situation based on contract documentation and preparation of the bid – 2 to 4 months
- 3) Discussion and conclusion of the Contract on Providing Energy Services – 1 to 2 months
- 4) Period of implementation of the proposed measures (equipment installation) within the scope of the Contract on Providing Energy Services – 2 to 6 months (on completion of the contract)
- 5) Trial operation of installed equipment – 1 to 2 months
- 6) Guaranteed operation of installed equipment – individually by project composition

It is necessary to take account of the fact that detailed analysis of energy situation should be prepared during heating season and based on this, an exhaustive installation of equipment should be prepared for the period outside the heating season in the next year.

The above mentioned shows, that preparation of the tender for the project in question should begin not later than at the end of summer of one year in order to carry out a detailed analysis during winter months and install the proposed measures during summer months in the next year.

J DETERMINATION OF THE REFERENCE VALUE OF OPERATING COSTS

Determination of the reference value of operating costs (base-line) or the initial level of costs connected with the energy consumption is one of the most important items of the future contractual stipulations. Both the bids of the tenderers (for the private sector – the addressed companies) and the calculation of savings or the determination of annual expected as well as actual results of the project within the contract refer to this level.

A part of the reference value of operating costs is also description of external as well as internal conditions, under which the initial level has been achieved (e.g. for heat consumption – climatic conditions of the year in question, number of operated units – number of pupils, patients, timetable, number of beds, one-shift, multi-shift operation etc.).

For projects, which involve only reduction of energy consumption costs, the initial level of costs shall be calculated as a level of consumption in physical units multiplied by reference price. This price shall be fixed in the last known amount or taken from the price list of the relevant distribution company.

Where the subject of the contract involves also reduction of other costs, both the physical units (e.g. for wages – current number of persons operating the energy system) and the “price” per unit (e.g. average wage) must be defined. This can be very difficult sometimes. For example, in case of wage costs, the energy system operating personnel are often maintenance personnel being in charge of all operation and intervening where necessary.

Along with determination of the reference value of operating costs, the standards for required levels of heating, lighting etc. must be determined to avoid savings on the expense of environmental quality.

K DETERMINATION OF THE EVALUATIVE CRITERIA FOR EVALUATION OF BIDS

The EPC projects are very comprehensive service, where the output (or “performance”) depends on many factors and where the cheapest does not mean the best. The goal of the public contract is to find the best solution of the problem – achievement of maximum savings of energy consumption costs at minimum costs of the supplier. As with the public contract for delivery or building (construction) work, the contractor does not know the lowest possible market price and tests it thus with demand in the form of public contract not knowing all possible solutions. A set of appropriate criteria is the tool to help the contractor in solving this problem.

K.1 Qualitative evaluative criteria

Based on various experience, the following qualitative criteria are used:

- Compatibility of the proposed energy-saving measures with the existing system
- Energy management level (proposal of system behavior measuring and monitoring)
- Method of problem solving and maintenance level
- Level of proposal of motivating the user’s personnel
- Quality, lifetime and future availability of spare parts
- Reduction of CO₂ emissions

However, practice shows that evaluation of such criteria can be very subjective and rather complex. According to recent experience, the use of one qualitative criterion “Quality of technical design, scope of services offered” may be recommended. The following is then assessed with the quality of technical design: if the design includes the intended technical measures in sufficient detail, if the evaluation of the scope of services offered deals with the number of buildings included in the contract etc.

K.2 Quantitative evaluative criteria

These criteria are based on evaluation of benefits of services offered by the tenderer for the contractor. This can be divided into benefits in two time horizons.

The first one is the period throughout the duration of the contractual relationship (during which the technical improvement of the energy system takes place); the second one is the period after termination of the contract.

While in the first period the contractor supervises continuously system functioning and monitors energy consumption, or intervenes in the case of undesirable course, when the contract is terminated, the contractor is fully responsible for operation. Physical lifetime of technical equipment of the energy systems in the buildings is approximately 15 years. Length of the evaluation period, which should be the same for all tenderers, is usually derived therefrom.

The quantitative evaluative criteria are based on cash-flow comparisons. The following criteria may be involved, for example:

- Net current value of contractor's cost savings throughout the duration of the contract (annual savings of energy consumption costs minus annual remunerations of the contractor for all services)
- Net current value of contractor's cost savings after termination of the contract (annual savings of energy consumption costs after termination of the contractual relationship until the expected end of lifetime of the delivered technical elements)
- Money supply of technical elements (economy measures)
- Tender price (sum of money supply of technical elements and price of other services – its amount does not play a significant role and it is a criterion with little weight of importance).

L CONTRACTUAL RELATIONSHIP

The tender including all actions in its course leads towards conclusion of the most favourable contract for the contractor, which gives a sufficient opportunity to the supplier to implement the measures reducing energy consumption.

The tendering process showed that if the draft contract is not a part of the contract documentation, it is often a problem for the contractor to compare the contract conditions in the individual bids and to make sure that other data in the bid found its corresponding place in the contract.

If the draft contract is used as a part of the contract documentation, such problems may be avoided. The tender conditions are then the same for all participants and the evaluation of the bids transparent.

M EPC METHOD-PUBLIC PROCUREMENT ACT RELATIONSHIP

The Public Procurement Act does not apply to private sector, where mutual relationships between the customer and the ESCO are governed by the Commercial Code. However, some essential parts may be used to obtain the best bid (e.g. bid evaluation, demand definition, etc.).

Utilization of the EPC method in the public sector should be commenced by consent of the building owner for the EPC project, or exercise of the proprietary right for the owner should be verified (e.g. in the case of elementary schools in towns, these can be town districts or schools themselves), although the final contract will be concluded with the effective owner, i.e. other legal entity.

The owner decides on utilization of the building as well as on his willingness to guarantee maintenance of its actual utilization to the service provider, or define way and scope of its future utilization.

With respect to duration of the EPC contract, it is always helpful to have the decision on future way of utilization of the building or premises accepted by the approving authority (competent to approve the future commitments of the contractor, i.e. building owner).

M.1 Obligatory measures

The customer (contractor) can have his own requirements or ideas of improving the equipment of the building or premises in question. They can be included in the public contract in the form of obligatory measures and specified in the contract documentation.

M.2 Selection of professional consultant

Preparation of the public contract, contract documentation and subsequent evaluation of the public contract is not a simple matter. Therefore, it is sometimes better to entrust organization of the contract to an independent consultancy company with a sufficient knowledge in the area of energy savings and project evaluation, which is not a company delivering technology or providing financial means.

N QUESTIONABLE ITEMS IN THE EPC PROJECT AND THEIR ELIMINATION

N.1 Insufficient information about buildings

The contractor does not have available current or accurate information about function and operating costs of the system. It sometimes happens that parts of the technical documentation are missing or accounting data does not cover the required information structure.

In this case, the preparation of the contract is rather complex. However, it is necessary to realize that the bids of tenderers (or addressed companies in the private sector) compete and the experts in the experienced ESCO are able to appraise the possible benefits of the project (savings) as well as to complete the technical part of the documentation. However, this costs more time and money.

N.2 Significant changes in utilization of buildings/premises

Sometimes, the contractor is not able to hundred-percent guarantee utilization of the building/premises for a longer period in advance. Due to changing internal as well as external conditions, which can be neither influenced nor foreseen, significant changes may occur in utilization resulting in the corresponding significant changes in energy consumption. Very important factor in the contractual relationship is to distinguish the effect of such changes from fluctuations in response to climatic conditions.

In the case of other than standard utilization of the building in question, the principle of recalculation of the reference value of operating costs (base-line) must be agreed in the contract.

N.3 Problems on the part of the supplier

Problems on the part of the supplier may occur, for example, during changes in ownership structure resulting in different orientation of the supplier company, or in other changes (e.g. in composition of the implementation team due to personnel changes).

As for supplier's solvency, the contractor should verify the hitherto history by comparing the accounting statements and other information for last years, which is important for smooth financing of the project. Of course it always depends on the

size and length of the project – lower data reliability may be accepted for smaller projects than for large projects.

N.4 Common goal of the partners

In the contracts of the EPC type, both parties are interested in the same output – in this case, in savings. Any deviation from the expected parameters must be first negotiated and a viable solution should be found.

Non-conformances often occur due to lack of communication, unclearly defined procedures and misunderstanding of presented results.

N.5 Disadvantage of higher price

The advantages of the EPC method prevail, however, it is necessary to warn of one disadvantage. At the first sight, it is the price of the project, which is higher than in the case of classical delivery of the installed equipment.

Nevertheless, it is necessary to compare what is comparable because price for the EPC project includes in addition to volume of investments into installation of a new equipment also all services of the ESCO as well as risk assumed by the ESCO by paying the investment means and providing a guarantee for the agreed volume of operating cost savings.

In addition, continuous supervision of energy system operation increases substantially the return of spent financial means. In case of classical delivery of the installed equipment, it often happens that cost savings in initial setting of the installed equipment decrease substantially after several months of routine operation.