OVERVIEW OF THE EPC POTENTIAL AND MARKET

NATIONAL REPORT FOR POLAND WP3

COMBINES PROJECT

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CONTENT

LIST OF FIGURES AND TABLES

List of Figures

List of Tables

Abbreviations

EBRD	European Bank for Reconstruction and Development
EE	energy efficiency
ESM	energy saving measures
EPC	energy performance contracting
ESCO	energy service company ESP(s) energy saving project(s)
ESC	energy supply contracting
FEWE	Polish Foundation for Energy Efficiency
IEE	Institute of Environmental Economics , Instytut Ekonomiki Środowiska
IPMVP	International Performance Measurement and Verification Protocol
IEEFP	International Energy Efficiency Financial Protocol
IRR	internal rate of return
KAPE	Polish National Energy Conservation Agency (Krajowa Agencja Poszanowania Energii)
M&V	measurement and verification
NFOS	The National Fund for Environmental Protection and Water Management
NPV	net present value
O&M	operations and maintenance
PBP	payback period
RES	renewable energy sources
WFOS	The Regional Fund for Environmental Protection and Water Management

EXECUTIVE SUMMARY

Poland is facing unprecedented challenges resulting from forthcoming need to reconstruct its power plants or build new ones. Construction the first nuclear power plant is nowadays under serious consideration. On the other hand energy efficiency (EE) is a valuable mean to address that challenge. Increase EE would improve the Poland's security of supply by reducing primary energy consumption and decreasing future energy imports need. It would, in addition, help to reduce greenhouse gas emissions in a cost-effective way. Shifting to a more energy-efficient economy could also accelerate the spread of innovative technological solutions and improve the competitiveness of industry. Energy efficiency improvement measures can be financed both from public and private funds.

"Energy performance contracting" (EPC) is defined as a contractual arrangement between the beneficiary and the provider (normally an ESCO) of an energy efficiency improvement measure, where investments in that measure are paid for in relation to a contractually agreed level of energy efficiency improvement. If properly constructed it may guarantee the beneficiary effects without any additional costs or risks within agreed period of time.

Typical models of EPC are Shared Savings model and Guaranteed Savings model.

Poland as a member of UE has been obliged to implement Directive 2006/32/EC of the European Parliament and of the Council of 5 April 2006 on Energy End-use Efficiency and Energy Services (Energy Services Directive), which has had a crucial role in establishing EPC and ESCO related terminology. That terminology has also been used in 2nd NEEAP (National EE Action Plan) but is absent in Act of 15 April 2011 on energy efficiency which is also a cornerstone for implementing the mentioned in the directive system of white certificates in Poland.

Lack of the proper legislation and related to it concise terminology as well as viable financing is believed to be one of the crucial barriers in developing an ESCO and EPC market in Poland. That market and its development are still driven not by the customer –demand side, but is created by few "ESCOs".

ESCOs are trying to reach with their offer a wider range of institutional clients, but it's ordeal, where obstacles aren't other competing companies, but the maze of regulations, a complete lack of adequate incentives and preferences with public administration. After a few years of experience on the Polish market, there is no "boom" for this type of activity. Some spectacular failures (Łódź, Bielsko-Biała projects') are still remembered. Having a look from the demand side Polish municipal and industrial sites have (or used to have) well-trained energy managers as a positive legacy from the previous planned economy system. These customers have the necessary in-house expertise that enables them to make investment decisions based on their understanding of the meaning of an energy audit therefore the ESCO's are trying to sell the product (guarantee) which is not required. The potential customers have direct access to different support systems and are very reluctant to outsource energy services. The survey and analysis of the public calls of tenders proved that even if an "investment is to be paid from savings" very often no special performance based contracts are required nor guarantees issued. Despite these unfavourable conditions, since 2009 the consistent development of the EPC market has become a fact.

The estimation of the energy savings potential performed in Chapter 5 confirms a very optimistic perspective for the further development of that market.

Unfortunately energy efficiency is neither considered as the core of the Polish energy strategy nor a vehicle which could decouple energy use from so needed economic growth this can be changed in the nearest future on the other hand the suggestion to implement the "ESCO formula" is repeated many times in official high rank documents.

Table 1 Overview on energy savings potentials, the EPC potential in 2020 per sector.

	Sector	Final Energy consumption in 2011, Mio €	Potential energy saving in 2020, Technical, Mio €	Potential energy saving in 2020, Economical, Mio €	EPC potential (BAU) in 2020 in Mio € (revenues)	EPC potential (ambitious) in 2020 in Mio € (revenues)
1	Industry	10 902	2 104	1 285	42.4	70
	Heating	6320	716	437		
	Electricity	4582	1388	848	42.4	70
2	Residential buildings	13 074	5 653	2 369	28.8	104
	Heating	9 668	4 659	1 375	29	104
	Electricity	3 406	994	994		
3	Tertriary sector (including public building)	8 057	584	454	56	201
	Heating	2 653				
	Electricity	5 404				
3.1	Public buildings	2 186	584	454	56	201
	Heating	1 418	422	292	56	201
	Electricity	768	162	162		
4	Street lighting	262	156	77	47	118
5	Transport	32 640				
	Energy of fuel	32 291				
	Electricity	349				
6	Agriculture	1977				
	Heating, Energy of fuel	1787				
	Electricity	190				
7	TOTAL	66911	8498	4186	174	492

Source: http://www.eepotential.eu/potentials.php; calculation FEWE.

The detailed description of **BAU scenario** and **Ambitious scenario** has been presented in section 5.1 (Methodology).

1. EPC MODELS (TASK 3.1.3)

1.1 Typical EPC models in public sector

The Permanent Project , the part of which has been realised in Poland, has popularized two international concepts the *International Performance Measurement and Verification Protocol* (*IPMVP*) *International Energy Efficiency Finance Protocol* IEEFP. The predominant savings-based structures to be provided by ESCOs are Shared Savings and Guaranteed Savings, summarized below.

Shared Savings The ESCO provides all upfront capital needed for their "turnkey" development and installation of the ESPs (energy saving project). The Host is only responsible to repay the ESCO a defined share of the savings which the Host realizes from the ESPs. As depicted in the diagram below, the ESCO assumes the credit risk, in addition to all project performance risks. Shared Savings is the primary introductory model used in developing markets because Hosts assume no risks. However it limits long-term growth and competition within the ESCO industry because only large ESCOs with large balance sheets can access financing from LFIs for their ESPs [1].

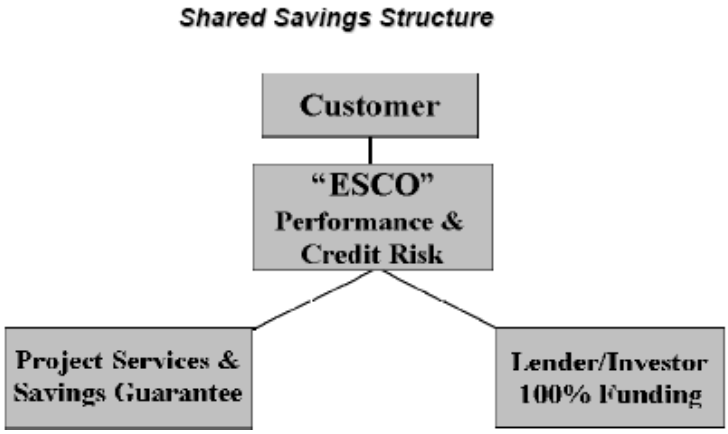

Figure 1 Shared Savings Structure.

Guaranteed Savings. As depicted below, the Host enters into a separate loan or lease with a full obligation to repay the LFI or lesser. This obligation of the Host is backed by an energy savings guarantee agreement with the ESCO. The savings guarantee demonstrates to the Host that the savings from the ESPs will generate sufficient cash flow for the Host to make the term payments for the loan/lease. This structure is very difficult to use in introducing the ESCO concept in countries or markets because it requires Hosts to assume investment repayment risk. However, it does foster long-term growth of the ESCO Industry and it is the predominant one used in

[1] Efficiency Valuation Organisation, International Energy Efficiency Financing Protocol. Standardized Concepts, April 2009.

mature markets like North America because smaller ESCOs do not have to provide large balance sheets or collateral in order to access financing from LFIs for their ESPs [2].

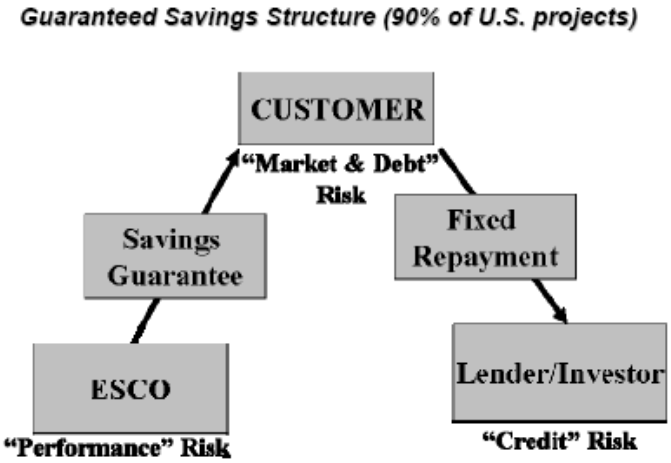

Figure 2 Guaranteed Savings Structure.

ESCOs can structure their payments from Hosts in many ways. One of the more risk-free ways that creates a very secure mechanism for LFIs to get repaid is a "fixed payment" based on measured or agreed savings from the project. Under this mechanism the ESA (energy savings agreement) includes fixe payments from the energy user to the ESCO matched to the amount needed to amortize the ESCO's capital investment in the project. This enables the ESCO to more readily borrow against this payment stream, or even, as in a factoring transaction, sell off this payment stream to finance the project.

1.2 Typical EPC models in private sector

A small share of EPC projects are implemented in the industry sector. The precise data is unavailable due to professional secrecy. Usually outsourcing of services is delivered. The Shared Savings model is used. Some projects which were first conceived as EPC via a third party have been later converted into in-house interventions.

1.3 Special EPC models (PPP formula)

In 2010 the Radzionków community concluded a Public-Private Partnership on thermal modernization of one kindergarten and four schools. The private partner has issued savings guarantees that the heat consumption will drop by 54% , electricity (replaced lighting) by almost 40%. The 'Guaranteed Savings Model' has been applied. The PPP solution was necessary to exclude the off balance sheet liabilities of the public partner related to an EPC agreement from the public debt. The pioneers in Radzionków and their project have been controlled by all

[2] EVO, International Energy Efficiency Financing Protocol. Standardized Concepts, April 2009.

possible state control authorities for two years. The other new-solutions interested municipalities waited for the outcomes of verification procedures. The next announcement of public procurement with PPP solution came on 24th January 2012. The competitive dialog rules were implemented. The final contract was signed on 2nd January 2013 in Karczew. This contract is promoted by the Ministry of Regional Development as a first combining EPC with a subsidy. In the beginning of year 2013 three other public procurement procedures combining PPP with thermal modernization are carried. As the agreements are not signed yet it is not certain that EPC will succeed.

2. LEGISLATIVE REQUIREMENTS (TASK 3.1.3)

Poland as a member of UE has been obliged to implement Directive 2006/32/EC of the European Parliament and of the Council of 5 April 2006 on Energy End-use Efficiency and Energy Services (Energy Services Directive), which has had a crucial role in establishing EPC and ESCO related terminology. That terminology has also been used in 2nd NEEAP (National EE Action Plan) but is absent in *Act of 15 April 2011 on energy efficiency* which is also a cornerstone for implementing the mentioned in the directive system of white certificates in Poland. In art.1 par. 12 it introduces the concept of ESM, and new group of energy services defined it as *project to i*mprove energy efficiency - the act of making changes or improvements to the property, a technical device or system, resulting in energy savings achieved.

Under article 10 (Chapter 3 describing responsibilities of public sector energy efficiency) is written:

1. Public sector entity carrying out their tasks, apply at least two of the energy efficiency improvement measures referred to in paragraph 2.

2. Means (ESM) of improving energy efficiency is:

1.the agreement, the subject of which is the implementation and financing of projects aimed at improving energy efficiency;
2.the acquisition of new equipment, installation or vehicle with low power consumption and low operating costs;
3.the exchange operated device, system or vehicle equipment, installation or vehicle referred to in paragraph 2, or their modernisation;
4.purchase or rent energy-efficient buildings or parts thereof or reconstruction or renovation of buildings used (e.g. thermal modernisation)
5. prepare an energy audit (…) for the buildings with a useful area of more than 500 m^2 of which the unit of the public sector is the owner or manager.

As there is no definition of a completely new concept one can find different governmental documents referring to the "ESCO formula", ESCO concept, contracting of energy performance, ESCO mechanism which in legal term is meaningless. Lack of the proper legislation and related coherent terminology, lack PN/ISO standards is believed to be the first and crucial barrier in developing an EPC and ESCO market in Poland. Without common, understandable, language it is very difficult to communicate and disseminate knowledge or good practices.

On the field of the Polish tax law ESCOs has not found special provision neither for project financing nor for performance contracting. This is often mentioned as an obstacle for developing more cost efficient EPC agreements. Moreover some local governments has been obliged to increase their public debt indicators by adding the total value of an EPC contract concluded on assumption of 'the shared savings model' (most of the risks are borne by an ESCO) that hindered their development. This despite of the provisions of the 2nd NEEAP:

It is intended that the implementation of public tasks in the ***ESCO formula*** *will be facilitated by changes to the provisions concerning the detailed manner of classification of debt instruments considered as public debt. The*

changes will apply to agreements related to financing services, supplies and construction works in the scope in which the repayment is made from financially guaranteed energy savings. The provision will constitute an additional incentive for local government units to carry out investments reducing current expenditure.

The lack of coherent terminology makes impossible the creation of coherent policy and impedes the awaited and needed changes. The same Act on EE made provisions for the minister responsible for the economy to:

1) monitor the use of energy efficiency measures;
2) include in the Public Information Bulletin of the Ministry of Economy:
a) information on the instruments used to finance energy efficiency measures and the way they capture,
b) guidance on how to take into account the energy efficiency criteria in the procedure for awarding a public contract.

These obligations have been just fulfilled that makes possible that the public procurement process would change, and will be more green (or greener). Unfortunately the concept of EPC was not introduced in the project of the *National Action Plan on Sustainable Public Procurement for 2013-2016*.

Polish authorities, had foreseen that 'due regard should be accorded to the cost-effectiveness of implementing energy efficiency measures on the basis of an appropriate level of analysis and evaluation' and had assumed for the 2nd NEEAP that (ESM):

- the suggested measures will be based on market mechanisms to the maximum possible extent, and budget funding will be limited to a minimum,

- the targets will be achieved following the minimum cost principle, that is by the maximum use of existing mechanisms and organizational infrastructure,

- all entities are expected to participate in order to use the entire national potential for energy

3. BARRIERS (TASK 3.1.3)

The Polish Foundation for Energy Efficiency since the previous century has been disseminating the concept of EPC energy performance contracting, "green investments" paid from savings. Acting within one of the most energy intensive economy in Europe Polish ESCO – energy service companies offering ESM should have found flourishing market and be the market leaders.

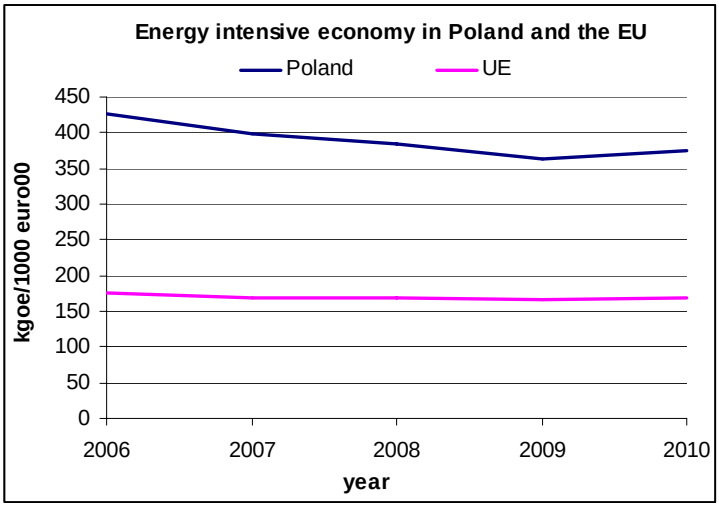

Figure 3 Energy intensive economy in Poland and in the UE (UE 27).

Source: Eurostat

It has never become a true success story. EPC and ESCO market in Poland for years has been in a standstill and its development is still driven not by the customer – demand side, but is created by few "ESCOs".

The lack of the development indicates presence of severe barriers. Some of them can be found across the Europe, but some are specific only to Poland.

These most common European barriers were described in the works of European Commission, DG Joint Research Centre team (EC DG JRC) carried within years 2005-2010. [3] [4]

The European ESCO Status Report 2007 listed 10 major barriers in Europe:
• Low awareness of and lack of information about the ESCO concept;
• Mistrust from the clients;
• High perceived technical and business risks;

[3] European Commission, DG Joint Research Centre (EC DG JRC), Authors: Bertoldi, P., Boza-Kiss B. and Rezessy, S. Ispra, *Latest Development of Energy Service Service Companies across Europe. A European ESCO Update.* Italy 2007.

[4] European Commission, DG Joint Research Centre (EC DG JRC), Authors: Angelica Marino, Paolo Bertoldi, Silvia Rezessy, *Energy Service Companies Market In Europe, Status Report 2010.* Italy 2010.

• Public procurement rules and accounting rules (including off balance sheet regulations);
• Lack of accepted standardized measurement and verification procedures;
• Administrative hurdles and consequently high transaction costs;
• Principal/agent dilemma with split incentives in the housing sector;
• Aversion to outsource energy;
• Lack of appropriate forms of finance;
• Low priority of energy efficiency measures.

Eight years ago in the year 2005 the experts describing the situation in Poland found some unique problems. Most of them are still unchanged/untouched, therefore statement that the Polish market is not suitable for exactly that what ESCOs offer is valid. First of all, clients are not interested in the EPC guarantee. The guarantee represents costs for clients (a service delivered by the ESCO) that the facility owners/managers are not willing to pay for. Polish municipal and industrial sites have well-trained energy managers as a positive legacy from the previous planned economy system, indeed many other employees have an engineering background. These customers have the necessary in-house expertise the ESCO is trying to sell, and they do not require a guarantee because they understand the meaning of an audit, and can already make investment decisions based on that. The potential ESCO clients can find other sources of financing because the administration has had a number of different schemes that available for energy efficiency projects. The biggest source is the National Fund for Environmental Protection and Water Management (NFOS), which operates in conjunction with Poland's Environmental Protection Bank. The NFOS provides investment support to – among others – energy savings projects at national, regional and municipal level. Support is available in the form of loans, joint funding, credits and project subsidies. There has been funding from the Structural and Cohesion Funds and EEA funds from the EU. These can finance as much as 75% of the EE investments. The Thermomodernisation Fund established in 1998 dedicated to refurbishment of residential buildings that can finance up to 20% of the modernisation investment. An ESCO cannot compete with such strong support schemes..

Energy Service Companies Market in Europe - Status Report 2010 pointed that some of the specific Polish problems.

- availability of other support schemes, limiting the need for an ESCO for project implementation (EC DG JRC 2007).
- clients are not willing to pay to outsource the risk of energy efficiency measure performance due to in-house expertise in the municipal and industrial sites (EC DG JRC 2007).
- lack of the capital base of most of Polish ESCOs to finance projects themselves or through commercial banks.
- clients mistrust, lack of appropriate forms of finance
- public procurement rules,
- lack of experience in ESCO projects among public customers

The lack of the development of an EPC market has also been caused by

- the lack of recognition of the EPC model in the Polish law which reduces the confidence of potential customers.

- some unusual decisions of electricity providers hindering the realization of projects in the scope of street lighting.
- expectations of very high security for opening credit lines by financial institutions
- lack of formal and financial support from the government and local authorities

Moreover the financial crisis has increased the cost of borrowing ("spreads") which has always been relatively high.

The key barriers are extensively presented in the final report of the Permanent project.

Competition from available financial support

At present, the major barrier can be identified in the market position of the ESCOs. The EPC (described also as the 'ESCO formula') is potentially attractive, however, in the Polish practice, energy efficient undertakings in the sectors that are predominantly carried out using any available forms of subsidies, donations, grants etc, wherever such opportunity can be used. This means, that if an energy efficiency oriented investment can be co-financed from e.g. a National budget financing line (like it is in case of thermal retrofitting law) such option is always approached in the first order, by potential investors / ESCO clients. ESCO promises energy effects but requires investment and active participation of the investor during the entire project lifetime, while effects can come relatively late after the investment money has been spent. In opposite to this, supported / subsidized EE undertakings give energy effects in a way "for free" which situation generates a strong market competition against EPC. This case can be specially exemplified in the construction sector, including public service buildings, such as education objects or health care objects. Operator and managers first of all search for EU funds or support from domestic subsidies. Availability of supporting financial opportunities 'moves' the ESCO proposals to a more remote position in investment rankings.

Project preparation procedure

Another question that is a strong barrier is related to the technical complexity of energy efficiency undertakings. Usually it is pretty difficult to prepare a good EE project, if numerous technical details must be thoroughly analyzed and selected. Usually, those potential ESCO clients who are obliged to run the Public Procurement procedure have not enough skilled staff that would be technically educated in a way to prepare tender materials and to correctly define an EE project. Such project planning needs to take into account definition of operational criteria, project lifetime, obligations of the operator and precisely defined financial engineering. These aspects require different works to be done by profile-skilled staff. In order to make a correct plan and tender documentation, a specialized entity should be invited, but here another problem appears: an ESCO company that might help in that respect, should rather be excluded from tendering in that project.

These reflections do less apply to private companies (as ESCO clients) who are not obliged under law to follow the Public Procurement regulations.

Lack of an Facilitator institution

The situation described above is well known to any ESCO in Poland and to many public investors as well, and potentially could be solved by establishing, under relevant legal regulations, the institution of project facilitator, like it is practiced in other countries. The facilitator could be an independent body involved to support public investors in correct preparation of tender documentation, including detailed technical aspects and legal formulas and provisions to be put

into the future EE contract. Unfortunately, such institution does not exist in Poland. Because most of potential ESCO clients are state owned or public entities, obliged to follow the Public Procurement Law, the complicated PPP or EPC (with its the need to set trustworthy baseline) will always struggle problems until the facilitator institution is not established. The process of preparing all documents and action plans is very complicated and it is hard to require from the potential ESCO clients. This is why a facilitator would be very helpful in preparing a project from the very beginning through the entire planning process up to the moment of signing up the contract.

The insight in the Polish EPC market of 2010 gives the following table that presents averaged results of 12 questionnaires filled-in by different experts involved with the energy efficiency issues that are subject to this report.

The responders have been selected among individual stakeholders groups Some of the responders have filled-in all columns and some of them only the columns directly addressing their professional profile.

The detail source result table of this questionnaires can be delivered at the request.

Table 2 Averaged results of questionnaires disseminated by FEWE.

AVERAGED RESULTS OF 12 QUESTIONNAIRES DISSEMINATED BY FEWE AMONG SELECTED STAKEHOLDERS AND PRACTITIONERS					
BARIER **Score „2" – very important** **Score „1" – important** **Score „0" – not affecting**	**"EE" STAKEHOLDERS AFFECTED**				
	Energy Users	**Lenders (Debt)**	**Investors (Equity)**	**EE Product & Service Suppliers**	**Public Interest NGOs & Gov't Agencies**
Fragmented and diverse industry of energy users and product/service suppliers	1,0	1,0	1,0	0,9	1,3
Inadequate legal/regulatory Framework	1,6	1,3	1,2	1,3	1,7
Lack of knowledge of EE benefits and techniques for managing risks	1,6	0,9	1,2	0,9	1,4
Lack of commercially viable financing (unattractive terms)	1,6	0,4	0,8	1,4	0,9
Small investments and benefits, and high transaction costs	1,7	1,1	1,5	1,1	1,7
Complex transactions with energy service companies (ESCOs)	1,9	1,1	1,5	1,3	1,7
Some complex technologies	0,7	0,4	0,3	0,3	0,6
Low priority and rates of return	1,6	1,1	1,5	1,1	1,3
Limited technical capabilities	0,8	0,0	0,2	0,3	0,3
Low (subsidized) energy prices	1,0	0,4	0,8	1,0	0,7
Other	1,0	1,0	1,0	2,0	1,0

Source: Project Permanent

Specific comments attached by the experts:

Expert FEWE:

- Lack of aid financing
- Distinctly higher level of Polish interest rates for credit denominated in PLN.

The most details and the most recent description of the market barriers can be found in a publication of Institute of Environmental Economics prepared for a meeting of the Polish National Energy Conservation Agency (KAPE), the National Fund for Environmental Protection and Water Management (NFOS) and the European Bank for Reconstruction and Development dedicated to the ESCO Fund. This publication was prepared thanks to the financial support of the European Climate Foundation. Authors of ESCO market in Poland current state and development perspective are: Andrzej Guła, Łukasz Pytliński, Marek Zaborowski with consultations of Janusz Mazur from POE ESCO Sp. z o.o.

In 2011 IEE conducted in-depth interviews with representatives of eight institutions that undertake ESCO-related initiatives or plan activities in this area. The interviews served as a basis for analysing the current situation on the ESCO market and identifying barriers that hinder its development. Some identified barriers refer to the whole market while others to its respective segments (e.g. street lighting, public buildings). Barriers in the public and private sector are to a certain extent different. Most of the respondents agreed that low recognisability of ESCO services and lack of appropriate legislation constitute the main factors impeding growth of this market.

Table 3 Barriers in the public and private sector.

Barrier type	Market segment	Comments
Lack of legal regulations	Street lighting, public buildings	Lack of legal regulations that define ESCO contracts constitutes a significant barrier. ESCO representatives argue that officials are concerned whether this form of contracting is legally allowed in the public sector (there are concerns that control bodies will question it
Unfamiliarity with the ESCO contracting	Street lighting, public buildings	ESCO representatives claim that EPCs have low recognisability among public administration bodies
Public debt	Street lighting, public buildings	Some ESCOs and local authorities claim that ESCO contracts increase municipal debt. They argue that the Regulation of the Minister of Finance of 2010 brought ESCO investments in the public sector nearly to a standstill (especially in street lighting). It should be noted, however, that public private partnership enables implementation of EPCs without increasing the debt level of a particular local government unit2. It would be worthwhile to develop guidelines for local government units on definition and allocation of risk under EPCs.
Ownership issues	Street lighting,	A lot of lighting systems in Poland (casings, poles, networks, control mechanisms) are owned by energy utilities. These subjects also sell electricity and maintenance services. Replacement of old lighting with modern and energy efficient solutions, which leads to reduction of energy costs, goes against the interest of such companies. They use their monopolistic position to impose on municipalities difficult conditions for conducting modernisation work (which in many cases finishes with a court case).
Ownership" of energy savings	public buildings	If energy renovation investments are conducted in public buildings (e.g. schools or offices), generated profits from energy savings do not stay in the budget of a particular unit. Instead, in the following year the budget for energy costs in these

		units is reduced (it is adjusted to the level after modernisation). This discourages managers of these buildings from reducing energy consumption and leaves them without funds to pay for the performed ESCO services
Competition from subsidies	Street lighting, public buildings	Subsidies available for thermal renovation of public buildings in practical terms eliminate the possibility of ESCO co-financing. High subsidy rates discourage local government units from using other forms of financing. If co-financing of such projects with subsidies is decreased and ESCO co-financing is allowed, allocation of public funds will become more efficient
Reluctance to PPP	Street lighting, public buildings	Public private partnership has been unpopular among local government units for many years. Only recently interest in this mechanism has been increasing. Institutional capacity of Polish local government units to use this form of project financing needs to be increased (contracting, risk identification and allocation, etc.).
In-house implementation of projects	Industry, SME	Low-cost investments or projects with a short payback period are frequently implemented by industrial units and SME on their own, without a third party. Investments with longer payback periods are not so attractive for ESCOs. Purchase of long-term receivables by the ESCO Fund could stimulate this area of investments
Reluctance among company's engineers (chief energy engineers, process engineers)	Industry	In particular in large industrial facilities, engineering staff responsible for energy management is reluctant to allow for external intervention into industrial processes. They are also afraid that consultants' work may undermine their professionalism (or lack of thereof)
Energy savings may account for a small part of operational costs	Industry, SME	In such cases even relatively high financial profitability may fail to act as a sufficient incentive
Decision-making processes	Housing cooperatives, housing communities and social housing associations	Complicated decision-making structures (inhabitants, supervisory boards, managements) impede implementation of more complex ESCO projects
Competition from subsidies	Housing cooperatives, housing communities	Wide availability of a thermal modernisation premium encourages to use this form of financing. This offer is competitive with respect to ESCO services

Source: IEE

Conclusions

Capacity building is a need. A facilitator should be created. As a separate entity it can be any independent organization, which could help investors to prepare ESCO undertakings, and follow the Public Procurements Law, at the same time. This Law – unfortunately – in very most cases promotes the price as the main bidding criterion which provision is often 'inconvenient' to the ESCO companies. However, in that respect some positive changes can already be observed: also the 'in-merits' contents of tender offers can be taken into account during the selection procedure. The rules for the competitive dialog have been introduced. This means that criterion of the lowest price usually reflecting of the just the value of up-front investment and ignoring operational cost will be not the only one in the process of public tender.

Driving factors enabling the development of the ESCO market were also indentified in the Status Report 2007. The liberalisation of the gas and electricity markets and increasing energy prices together with governmental support and capacity building were highlighted as having an

important impact on the market development. Successful governmental support came in the form of dissemination of idea, mandatory audits, energy efficiency certificates and climate change policies but yet there is a lack of supportive and favorable legislative framework, reliable information, properly organized availability of subsidies for energy efficiency investments and dedicated state funds. Capacity building is found to be important in order to build a comfortable and confident market by creating standardized contract models, terminology and procedures, as well as establishing an accreditation system and bundling projects in order to overcome high transaction costs related to small size of projects. The above barriers and drivers are explained (including details and examples) in the Status Report 2007, in which additional literature can be found

4. ANALYSIS OF THE CALLS OF TENDER (TASK 3.1.2)

The analysis calls of tender has been performed on the basis of the Supplement to the Official Journal of the European Union (TED) and national websites Official Journals with publication of calls of tender.

The results of analysis of contracted calls of tender (i.e. announced as accepted) are shown in the following figures:

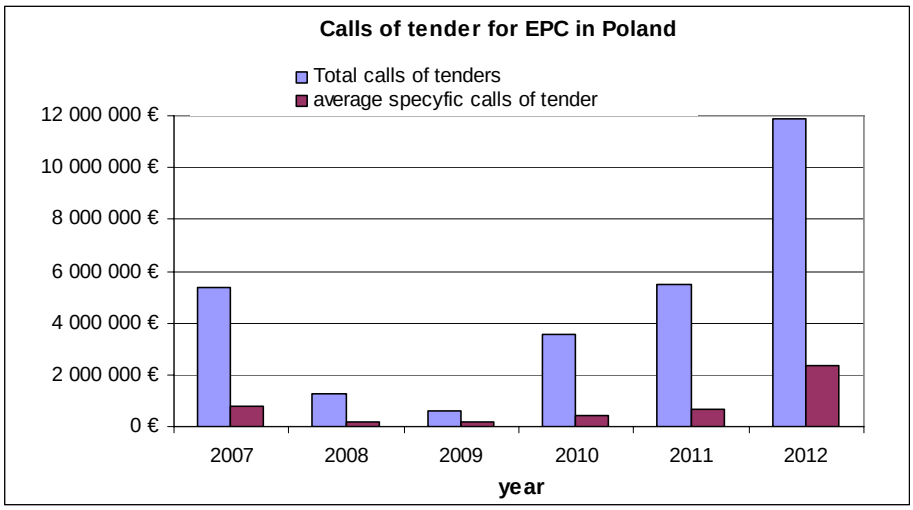

Figure 4 Calls of tender for EPC in Poland.

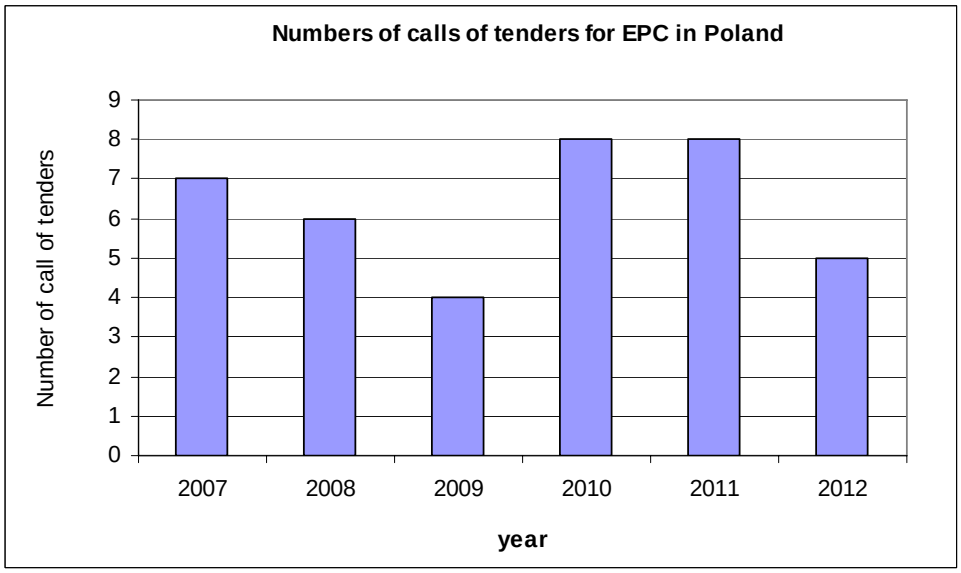

Figure 5 Numbers of calls of tender for EPC in Poland.

Source: http://ted.europa.eu/TED/main/HomePage.do
http://www.oferent.com.pl/

The figures above show an increasing trend of the average value of contracts since 2009 year. The number of the calls of tender has also been increasing for the last four years. Total value of all identified EPC contracts is € 28 200 000.

Altogether 38 tenders for EPC have been indentified since 2007. Only three of contracted calls of tender have been published in Supplement to the Official Journal of the European Union. The average number of tenders per year was 6. At the very beginning of 2013 another 3 tenders have been announced. They are still not "contracted" and may be cancelled, the procedures *are ongoing*. These calls of tender have not been included in the next presentations.

The figure below presents the distribution of numbers of calls of tender by EPC customer groups and encompasses last six years.

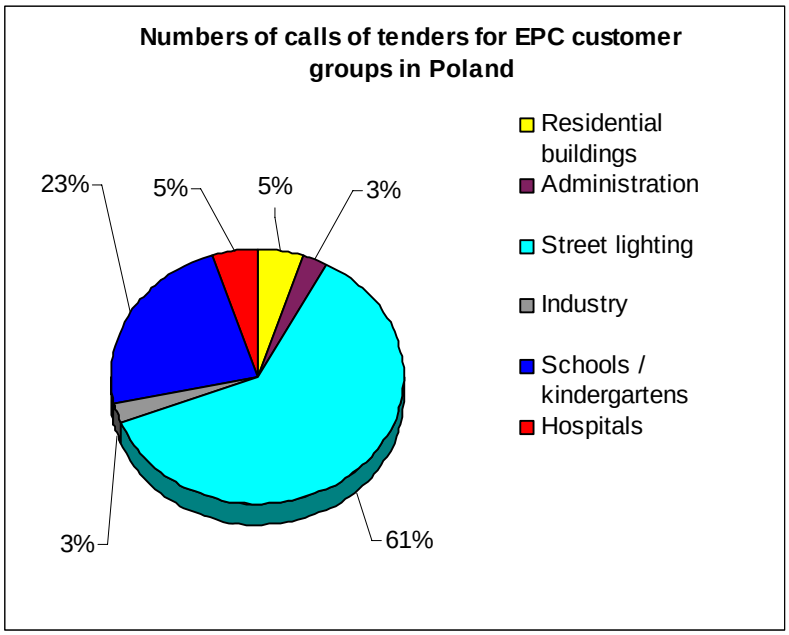

Figure 6 Distribution of number of calls of tender by EPC customer groups in Poland in 2007-2012.

The majority of calls of tender have been found in the street lighting (61%). Almost every fourth (23%) call of tender was related to school segment (schools and kindergartens).

This picture is significantly different from another one presenting the distribution of **the value** of calls of tender by EPC customer groups the segment of public buildings made almost three quarters of the total market. To be precise the market share of schools and kindergartens was 57.8%. One sixth of the market (16.6%) was created by hospitals. The expenditures in street lighting segment amounted only to 22.2% of the total market as it is shown bellow.

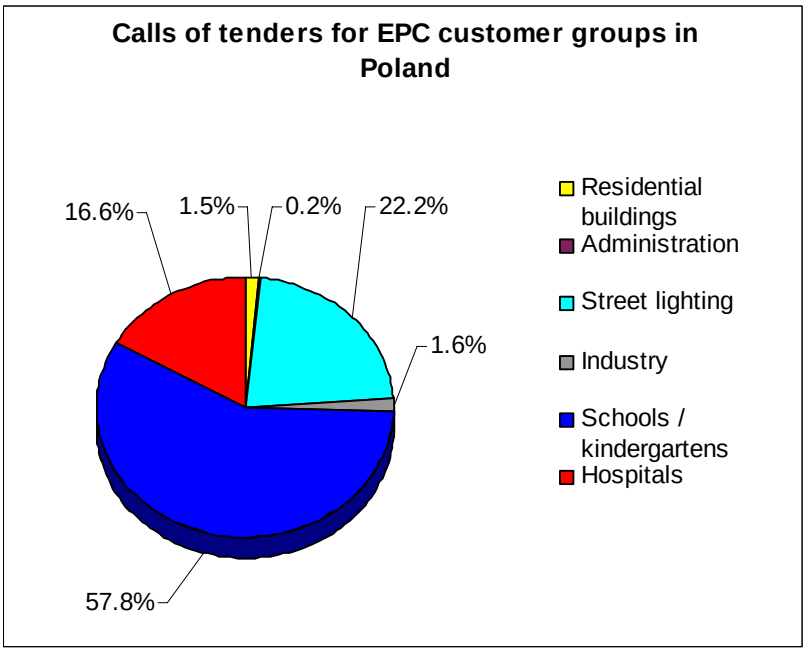

Figure 7 Distribution of the value of calls of tender by EPC customer groups in Poland in 2007-2012

5. ESTIMATION ENERGY SAVINGS POTENTIAL (TASK 3.1.2)

5.1 Methodology

In action 3.1 of WP3 FEWE had to assess the technical energy savings potential, describe current EPC market in Poland and the economic energy savings potential, in sectors such as: multi family residential buildings, public sector including street lighting, industry sector and commercial and trade sector.

The estimation of energy savings potential follows a clear distinction between the general technical potential and the economic potential. Definitions *for* different potentials are the following:

- **Technical potential** – It is the theoretical maximum amount of energy use that could be displaced by efficiency, disregarding all non-engineering constraints such as cost-effectiveness and the willingness of end-users to adopt the efficiency measures
- **Economic potential** – It refers to the subset of the technical potential that is economically cost-effective as compared to conventional supply-side energy resources. According to the methodology, the economic of energy savings potential applies to projects with simple payback period (PBP) to 8 years.

The assessment of technical and economic potential is based on publicly available documents, articles, publications, databases and FEWE analysis. Estimates of potential both energy savings of fuels and electricity in different sectors i.e. residential sector, public sector, industry (in this case only electricity savings potential) were based on the report *"Potencjał efektywności energetycznej i redukcji emisji w wybranych grupach użytkowania energii. Droga naprzód do realizacji pakietu klimatyczno-energetycznego*" [5].

Technical energy savings potential was determined for all cost-effective and not cost-effective projects (project with a longer simple payback period than established in methodology). To determine the cost-effective energy savings was used life cycle cost method (LCC).

In this study, as a source of energy savings of fuels potential in industry was used available in the EU Data Base on Energy Saving Potentials [6].

The economic potential used refers to the Low Policy Intensity (LPI) scenario, which is defined as follows:

- **Low Policy Intensity (LPI)** scenario is characterized by low policy intensity, i.e. by considering an additional technology diffusion of best available energy savings technologies beyond autonomous diffusion only to a realistic level driven by increases in market energy prices and comparatively low level energy efficiency policy measures

[5] FEWE, INFORCE, Raport *Potencjał efektywności energetycznej i redukcji emisji w wybranych grupach użytkowania energii. Droga naprzód do realizacji pakietu klimatyczno- energetycznego*, Katowice 2009.

[6] http://www.eepotential.eu/potentials.php

as in the past in many EU countries. In this case it is rather likely that consumer decisions will be motivated by cost-effectiveness criteria based on usual market conditions. Barriers to energy efficiency persist.

After estimating the technical and economic energy savings potential, both potentials have been multiplied with average prices for the final consumers in order to provide an estimate of the potential future EPC market volume.

From the economic potential, the EPC potential is further derived by reflecting the existing barriers to realisation of the existing economic energy saving potential in two scenarios:

- **Business as usual (BAU)** EPC potential 2020, defined as extrapolation of the historical market development until the year 2020 and the opinion from ESCOs.
- **Ambitious EPC** potential 2020, defined as EPC potential in 2020 under the assumption of changing of the framework (changes in legal framework, knowledge, model documents and effects of combining EPC with national subsidy/support programs).

The EPC potential is estimated as a share of economic potential, which is considered realistic to be realised under the BAU conditions or the changes which could occur in the ambitious scenario.

5.2 National energy consumption

The level of final energy consumption in Poland tended to increase in years 2000-2011. The average annual growth of consumption amounted to 1.9%. Total final energy consumption in Polish economy has reached 779 TWh in the year 2011 [7]. Electricity consumption was 123 TWh (about 16% total energy consumption). The other main energy carriers are: gas, coal, oil, and heat. The structure of final energy consumption by energy carrier in 2011 is shown in the table below.

Table 4 Final energy consumption by main sectors in 2011 year.

Sector	Energy consumption of fuel and heat, TWh	Electricity consumption, TWh	Total Energy consumption, TWh	Estimated value of consumed energy Mio. €
Industry	147.5	41.8	189.3	10 902
Residential buildings	219.7	28.6	248.3	13 074
Tertiary sector	28.1	38.9	67.0	5 871
Public buildings	32.2	6.4	38.7	2 186
Transport	188.4	2.9	191.3	32 640
Street lighting	-	2.2	2.2	262
Agriculture	40.6	1.6	42.2	1 979
Total	**656.4**	**122.6**	**779.0**	**66 913**

Source: GUS (Central Statistical Office): Energy Statistics 2010, 2011.

[7] Source: GUS (Central Statistical Office): Energy Statistics 2010, 2011.

5.3 Energy saving potential.

The calculation of energy saving potential for the whole economy is very difficult and the estimates in this area have a lot of uncertainty. The potential has been estimated in key sectors of the economy on the basis available sources, research and own calculations. Due to lack of data the calculations have not been performed in transport and commercial and trade sector.

The table below presents the technical and economic potential for energy savings in various sectors of the economy. The data source is the European Data Base on Energy Savings Potentials (http://www.eepotential.eu) which provides harmonised energy savings potentials for each EU Member State.

Table 5 Technical and cost-effective energy saving potential by main sector in Poland.

No.	Sector	Technical energy saving potential, , TWh/year	Economical, energy saving potential, TWh/year
1	Industry	28.1	18.3
	Heating	16.7	8.7
	Electricity	11.4	9.6
2	Residential buildings	51.5	17.3
	Heating	42.6	12.7
	Electricity	8.9	4.6
3	Total tertriary sector (including public building)	35.8	10.7
	Heating	30.1	5.1
	Electricity	5.8	5.5
4	Street lighting	0.8	0.8
	TOTAL	106.4	56.9

Source: www.eepotential.eu

Some figures of the European database according to experts are FEWE doubtful especially in the residential sector. In depth FEWE experts' analysis in this sector shows a much greater technical and economic potential for energy savings than the potential described by the European Data Base on Energy Savings Potentials (EDBSP). In other sectors, energy saving potentials shown in EDBSP are similar to the FEWE's calculations. The data analyzed in energy efficiency and estimate the EPC market in the report are based on EDBSP data and calculations FEWE. The table below summarizes the estimated potential energy savings in various sectors of the economy by the year 2020.

Table 6 Technical energy savings potential by main sectors in Poland by FEWE.

Sector	Energy of fuel saving potential, Technical, TWh	Electricity saving potential, Technical, TWh	Energy saving potential in total, TWh	Cost of energy saving potential, Technical, Mio. €
Industry	16.7	12.7	29.4	2 104
Residential buildings	105.9	8.3	114.2	5 653
Public buildings	9.6	1.4	10.9	584
Street lighting	-	1.3	1.3	156
TOTAL	**132.2**	**23.7**	**155.9**	**8 498**

Source: *Raport - Potencjał efektywności energetycznej i redukcji emisji w wybranych grupach użytkowania energii - Droga naprzód do realizacji pakietu klimatyczno- energetycznego.* PKE OG, FEWE, INFORSE, financed by European Climate Foundation.

The total technical energy efficiency potential in these sectors is about 156 TWh. The largest technical potential is in residential buildings (114 TWh). It represents 73% of total energy efficiency potential. About 70% of the energy consumed in residential buildings is used for heating, 15% for prepare hot water, 8% for cooking meals, and 7 % of electric consumption [8] . In the industry the technical energy savings potential is 16%. The exchange of electric motors, pumps and other electric equipment, application of high efficiency cogeneration, system of recovery energy are its main contributors/ shareholders. In public buildings energy savings potential is 7% and in the street lighting 1%.

Table 7 Cost-effective energy saving potential by main sector in Poland by FEWE.

Sector	Fuel energy saving potential - Cost effective TWh	Electricity saving potential - Cost effective TWh	Total energy saving potential - Cost effective, TWh	Cost of energy saving potential - Cost effective, Mio. €
Industry	10.2	11.5	21.7	1 700
Residential buildings	31.3	8.3	39.6	2 369
Public buildings	6.6	1.4	8.0	454
Street lighting	-	0.7	0.7	77
TOTAL	**48.1**	**22.5**	**70.6**	**4600**

Source: *Raport - Potencjał efektywności energetycznej i redukcji emisji w wybranych grupach użytkowania energii - Droga naprzód do realizacji pakietu klimatyczno- energetycznego*. PKE OG, FEWE, INFORSE, financed by European Climate Foundation.

Total cost -effective energy saving potential is 70.6 TWh which represents about 45% of the technical energy savings potential. In total more than half of the projects are not profitable. In street lighting all projects are cost-effective and have a very short payback period. There are about 75% of the cost effective projects in industry, 63% cost effective projects in public sector and 35% cost effective projects in residential buildings.

5.4 EPC market.

The IEE's (Institute of Environmental Economics) approach based on knowledge of experts (mostly representatives of the highly active ESCOs), leads to similar outcomes and defines threshold values specifying the scale of ESCO investments in Poland. Although experts differ rather significantly in their estimates, they agree that last year the ESCO market turnover was not lower than EUR 10 million in previous 3 years. This value should be treated as the lower range estimate. Opinions voiced by some large market players suggest that the ESCO market turnover may in reality be much higher – its upper range value is estimated at EUR 25 million. Representatives of companies that specialise in lighting and electricity investments also within the industry and residential sector tend to define the turnover of ESCO contracts in electricity at the level of EUR 13 million annually (revenues). This confirms the claim that the assumed lower band value of EUR 10 million for the whole EPC market is a significant underestimation and the actual turnover is much higher.

The relatively low energy costs (lower savings in monetary value) with the combination of high interest rates has been hindering development of the EPC market in Poland as well as a need for an intensive investments. The costs of financing in Poland are higher in national currency than in Euro because basic interest rates are higher by 2-4% p.a. Therefore the ESCO's clients usually

[8] GUS: Efektywność energetyczna w latach 2000-2010.

require higher level of savings (about 35% on average). On the other hand the broader scope of investment is pushing the ratio investment/baseline (costs of energy) over "2" factor.

Public sector:
Investments in modernisation of street lighting usually have short payback periods and are relatively easy to contract and implement. ESCO investments in this sector have been popular with local authorities in Poland (the authors believe that this was the largest segment of the ESCO market in terms of the number of signed contracts). Representatives of ESCO companies active in this market segment estimate that around 30% of Polish municipalities have already modernised their street lighting. This still leaves a significant investment potential. The reasons behind the decrease of the investment volume in this sector that has been observed in recent years are discussed in the section on barriers for development of ESCO services (provisions on public debt and issues related to the ownership of lighting infrastructure). *Energy renovation* of public buildings constitutes the second area of investments in the public sector. It is characterized by greater complexity than the segment of street lighting. Projects in *energy renovation* of buildings have long payback periods. Low financial profitability of such investments (or their selected components) requires involvement of subsidies or grants from public funds. However, it is currently almost impossible to combine subsidies with the ESCO mechanism. Such a combination would force more efficient public funds management – subsidies could be lower than currently and an EPC would guarantee that energy savings are achieved. As far as thermal renovation of buildings and heat supply to buildings are concerned, at present the space for EPC services is rather limited due to availability of subsidies and lack of possibilities to combine them with EPC. Contracts in reduction of electricity consumption are not very common among local authorities. Integrated services for energy optimization in public buildings within public private partnership constitute one of development perspectives for ESCOs.

Industry

ESCO representatives tend to agree that large industrial units offer the most considerable investment potential in EPC. The large scale of ESCO services and the short payback period make these projects attractive to ESCOs as well as their clients. Moreover, decision makers in this sector focus on achieving tangible financial profits, which favours rational arguments for applying the ESCO mechanism. In other sectors (the public sector, residential buildings) decision making processes depends also on the other factors than purely economic ones. Construction of electricity generation units with gas turbines (small CHP) or expansion turbines in existing steam systems constitutes a frequently implemented type of projects in this sector. Installation of equipment for adjusting and improving energy quality under a mechanism similar to ESCO (lease or quasi leasing) is also offered by ESCOs. to avoid in-house interventions by ESCO's clients.

5.5 Residential buildings

Total energy consumption in households for heating and hot water is 220 TWh (790 PJ). There is 37% of area of multi-family buildings in the total area of apartments in buildings [9] . Total number of multi family buildings is about 885 000 while the total floor area multi family buildings is about 350 Mio m^2. The average energy consumption in this type of building is 238 kWh/m^2. Energy

[9] GUS: Narodowy Spis Powszechny 2011: Wyniki Narodowego Spisu Powszechnego Ludności i Mieszkań, 2011 – Podstawowe informacje o sytuacji demograficzno – społecznej ludności Polski oraz zasobach mieszkaniowych, marzec 2012

consumption for heating and domestic hot water systems in multi-family buildings amounted to 83.5 TWh[10]. In the residential sector the ESCOs usually operate in the multi family building segment only. The effect of the scale allows absorption of the transaction costs. The other part of the sector is considered too fragmented (e.g. single houses) to be an attractive target for EPC. We expect that EPC market in multi family building segment will grow about 20% annually and will reach 29 Mio € (revenues) until year 2020. The successful implementation of EPC in the residential sector (within the BAU scenario) could save about 0.08 TWh energy (this is about 0.2% of cost effective energy saving potential in residential buildings). The evaluation of savings in the ambitious scenario, when due to subsidies significant part of economical energy saving potential is realized, has presented of value of on 104 Mio €, or 0.28 TWh.

5.6 Tertiary including public buildings

Due to the limited data the technical and cost effective energy saving potential has been estimated only for public building (schools and kindergartens). Projects related to complex energy renovation of buildings (implementation efficiency controls combined with better insulation of the envelope) frequently have long payback periods. ESCO business opportunities are limited in thermal renovation of buildings and heat supply to buildings due to availability of subsidies and lack of possibilities to combine them with EPC - (ESCO formula). Low financial profitability of such investments (or their selected components) necessitates involvement of subsidies or grants from public funds or significant client's contribution. Nowadays, it is almost impossible to combine subsidies with the EPC mechanism, whereas a combination would enable more efficient public funds management. The school segment is the vital part of the public building sector. It can be described by:

- Number of schools and kindergartens– 54 535 [11] ;
- Indicator of energy consumption in baseline by floor area – 186.1 kWh/m^2 ;[12]
- Total floor area of "school buildings" - 140.8 Mio m^2;
- Total energy consumption (heating) – 21.1 TWh[13] ;
- Total electricity consumption- 4.2 TWh;

The evaluation of the EPC market performed during the analysis of the Polish calls of the tender as well as the outcomes of the survey, lead us to the conclusion, that in the BAU scenario with the average annual growth rate of 25% the market will expand and reach 56 Mio € until the year 2020. The estimation done within the ambitious scenario shows that in the year 2020 in comparison to baseline year 2011 it would be possible to save up to 0,53 TWh of final energy. The size of the EPC market would exceed 201 Mio € (revenues)in the year 2020.

[10] FEWE: energy audits database for residential buildings.

[11] GUS: Rocznik statystyczny 2012.

[12] FEWE: energy audits of education buildings database (energy used and cost data, statistics on the thermal properties of buildings and thermal modernisation scope).

[13] Own calculation

5.7 Street lighting

The replacement of old lighting with modern and energy efficient solutions could bring significant energy savings but faces unique problem. A lot of lighting systems in Poland (casings, poles, networks, control mechanisms) are owned by energy utilities. These subjects also sell electricity and maintenance services. Such a replacement leads to reduction of energy costs, that goes against the interest of these companies. They use their monopolistic position to impose on municipalities difficult conditions for conducting modernization. Some of the cost effective investments are carried to perform the reduction of flux lighting (by implementing the provisions of PN-EN 13201 standard). Technical and cost effective, economic energy savings potential in street lighting is assessed at 1.3 TWh and 0.7 TWh respectively [14]. Modernization of street lighting has relatively short simple payback period. The average payback period is usually about 4-5 years.

5.8 Industry

The representatives of ESCO are agreed that, as far as industry sector is concerned, the greatest potential of EPC is in large industrial units. Both the scale of ESCO projects and very short simple payback period make EPC projects attractive for ESCO and their customers. The most popular undertakings are: building and construction of electricity generator based on gas engines (small CHP), as well as new expanders in existing steam systems. The replacement of old electric motors or lighting systems in the whole facility are also considered as noteworthy. According to 'ODYSSEE" the biggest energy savings potential in industry remains in paper, cement and steel branches of relatively high energy intensity[15]. Another OECD report points that the implementation of Best Available Technologies (BAT) in industry could bring up 16% energy savings. [16]

Three proven ESM has been chosen to present the potential of energy saving in industry. These measures are: electric motors, control system, workshops and halls lighting. They have been addressed because the cost effective potential for electricity savings is significant and rather poorly used. The investments in those measures have short simple payback period so that they could be realized in EPC. It results i.e. from the difference in the efficiency older engines to efficiency new engines and using modern control systems with frequency converters. The size of the potential by replacement three-phase asynchronous motors is estimated at 2.7 TWh, lighting production halls and workshops at 0.3 TWh and control systems at 8.5 TWh. In total it gives 11.5 TWh of total electricity savings.

[14] Jan Grzonkowski. Racjonalna modernizacja oświetlenia ulicznego. Przegląd elektrotechniczny – konferencje. R.5 nr 1/2007.

[15] ODYSSEE, Energy Efficiency Trends in the Industrial Sector in the EU.

[16] Energy Technology Perspectives. Scenarios & Strategies to 2050. OECD/ International Energy Agency 2010.

5.9 Summary

The table below provides an overview of the final energy consumption in the year 2011, the technical and economic saving potentials and as well as the potential energy savings in EPC estimated for the Poland in the year 2020 in BAU and in the ambitious scenario.

Table 8 Energy savings and EPC potential by sector in Poland.

No.	Sector	Final Energy consumption, TWh/year	Potential energy saving in 2020, Technical, TWh/year	Potential energy saving in 2020, Economical, TWh/year	EPC potential (BAU) in energy saving in 2020 year, TWh/year	EPC potential (ambitious) in energy saving in 2020 year, TWh/year
1	Industry	189.3	29.4	21.7	0.05	0.08
	Heating	147.5	16.7	10.2		
	Electricity	41.8	12.7	11.5	0.05	0.08
2	Residential buildings	248.3	114.2	39.6	0.08	0.28
	Heating	219.7	105.9	31.3	0.08	0.28
	Electricity	28.6	8.3	8.3		
3	Total tertriary sector (including public building)	105.7	10.9	8.0	0.15	0.53
	Heating	60.3	9.6	6.6	0.15	0.53
	Electricity	45.4	1.4	1.4		
3.1	Public buildings	38.7	10.9	8.0	0.15	0.53
	Heating	32.2	9.6	6.6	0.15	0.53
	Electricity	6.4	1.4	1.4		
4	Street lighting	2.2	1.3	0.7	0.10	0.35
5	Transport	191.3				
	Energy of fuel	188.4				
	Electricity	2.9				
6	Agriculture	42.2				
	Heating, Energy of fuel	40.6				
	Electricity	1.6				
7	TOTAL	779.0	155.9	70.0	0.38	1.24

Source: http://www.eepotential.eu/potentials.php; GUS Energy Statistics 2010, 2011.; *Raport - Potencjał efektywności energetycznej i redukcji emisji w wybranych grupach użytkowania energii - Droga naprzód do realizacji pakietu klimatyczno- energetycznego*. PKE OG, FEWE, INFORSE, financed by European Climate Foundation.

There is a great technical energy saving and EPC market potential in the industry. Unfortunately in this sector EPC can usually be used in projects with very short payback period (max. 2 years) because only these kind of investments are considered as a noteworthy by company management. However industry sector is a little motivated to utilise the EPC. The EPC potential in the industry has been estimated for the BAU and ambitious scenario at 0.05 TWh and 0.08 TWh respectively in the year 2020. The BAU scenario assumes the growth rate at 30% annually. The ambitious scenario assumes about 0.6% (0.08 TWh with 11.5 TWh the investments which have

short simple payback period (up to 2 years) would be realized in EPC (lighting, control system, replacement of old electric motors) .

In residential buildings sector technical and economic saving potential is the largest one, but this sector is difficult to be addressed by EPC. Compared with this the saving potential for public buildings sector seems to be very low (0.08 TWh) nevertheless the public sector has the highest EPC potential available. The successful implementation of EPC in the residential sector (within the BAU scenario) could save about 0.08 TWh of final energy (this is about 0.2 % of cost effective energy saving potential in residential buildings). The intense utilization of EPC in the ambitious scenario could increase the savings up to 0.28 TWh.

In public buildings segment the EPC market is emerging rapidly. The evaluation of the EPC market performed during the analysis of the Polish calls of the tender has shown, in the BAU scenario with the average annual growth rate of 25% that the market shall expand quickly and reach 56 Mio € (revenues) until the year 2020. The large scale implementation of EPC in the BAU scenario could save about 0.15 TWh of final energy (schools and kindergartens only) whereas the savings in the ambitious scenario could reach 0.53 TWh.

In the analyzed all sectors the implementation of EPC in the BAU scenario could save up to 0.38 TWh of energy per year, while realisation the ambitious scenario could bring up 1.24 TWh of energy savings in the year 2020. The EPC potential in money value in Mio € revenues is shown in the following Table 9. The estimation of EPC market volume has been the first step. The ESCO survey has enabled broadening results of the analysis of calls of tender. It has become possible to enriched the volume of the tender market data with information about real market share of the industry and residential sectors in EPC market, doubling it eventually.

Table 9 Current on EPC market volume and the EPC potential in 2020 per sector (revenues)

No.	Sector	EPC market volume in Mio. € (revenues)	EPC potential (BAU) in 2020 in Mio € (revenues)	EPC potential (ambitious) in 2020 in Mio € (revenues)
1	Industry	5.3	42.4	70
	Heating			
	Electricity	5.3	42.4	70
2	Residential buildings	7.0	28.8	104
	Heating		29	104
	Electricity			
3	Tertriary sector (including public building)	9.0	56	201
	Heating			
	Electricity			
3.1	Public buildings	9.0	56	201
	Heating		56	201
	Electricity			
4	Street lighting	3.7	47	118
5	Transport			

	Energy of fuel			
	Electricity			
6	Agriculture			
	Heating, Energy of fuel			
	Electricity			
7	TOTAL	25.0	174.2	491.7

Source: http://www.eepotential.eu/potentials.php; calculation FEWE.

Starting from the actual level of 13 Mio € - 25 Mio € the EPC market volume, with the perspective of steady support market shall enter in a new phase. Table 9 Estimates of the market value the BAU scenario is a simple forward projection of the current EPC market under the assumption that the EPC market will increase annually by; 20% in residential sector, 25% in public buildings sector, 30% in industry and finally by 35% in street lighting sector, and reach the volume of 174 Mio €. It would be about 7 times larger than today's relatively small one.

The recalculation of the EPC market volume into the level of energy costs and the level of EPC revenues is based on the following relation and facts,

Total Polish EPC market volume is composed of :

EPC market volume (revenues) = energy costs x 2 (factor for average investment; ESCO's experience in Poland for the total investment in EPC) x 1.51 (factor for financing and other services; experience in Poland).

Therefore combined the EPC market volume has been divided by factor 3.02 to reach the level of energy costs.

Table 10 Overview on energy saving potentials and the current EPC market volume and the EPC potential in 2020 per sector in energy costs and energy cost savings

No.	Sector	Final Energy Costs in 2010 in Mio.€	Technical Energy Saving Potential in Mio. € in 2020	Economical Energy Saving Potential in Mio. € in 2020		EPC market volume in Mio € (energy cost)	EPC market volume in Mio € (energy cost savings)	EPC energy saving potential in 2020 in Mio € (BAU)	EPC energy saving potential in 2020 in Mio € (ambitious)
1	Industry	10 902	2 104	1 285		1.8	0.6	5.1	8
	Heating	6320	716	437					
	Electricity	4582	1388	848		1.8	0.6	5.1	8
2	Residential buildings	13 074	5 653	2 369		2.3	0.8	3.4	12
	Heating	9 668	4 659	1 375				3.4	12
	Electricity	3 406	994	994					
3	Tertriary sector (including public building)	8 057	584	454		3.0	1.1	6.5	23
	Heating	2 653						6.5	23
	Electricity	5 404							
3.1	Public buildings	2 186	584	454		3.0	1.1	6.5	23
	Heating	1 418	422	292		0		6.5	23
	Electricity	768	162	162				0	0
4	Street lighting	262	156	77		1.2	0.4	5.5	14
5	Transport	32 640							
	Energy of fuel	32 291							

	Electricity	349							
6	Agriculture	1 977							
	Heating, Energy of fuel	1 787							
	Electricity	190							
7	TOTAL	66 911	8 498	4 186		8.3	2.9	20.5	57.4

Source: http://www.eepotential.eu/potentials.php; calculation FEWE.

In a second step the yearly energy savings in new agreements have been calculated under the assumption that the average level of 35 % of the savings of the final energy consumption is required by most ESCO's clients to take the investment under consideration.

In BAU scenario of the implementation EPC could save 0.38 TWh energy which is just 0.5% of total cost effective energy saving potential. In the ambitious scenario EPC market in Poland could reach 491.7 Mio €. The market share of the residential buildings sector alone would be 21%, the share industry 14%, while the shares of tertiary sector (schools segment) and street lighting would be 41% and 24% respectively.

6. RESULTS OF THE EPC SURVEY (TASK 4.2.1)

18 questionnaires were sent to companies declaring knowledge of EPC - ESCOs and other 5 questionnaires ESCO's clients. Several others stakeholders were informed about possibility of the free questionnaires downloading. Only four completed filled questionnaires returned from ESCO's and only three filled in questionnaires from clients. All but one has been completed after either personal meeting or phone conversations. Due to limited participation of ESCOs in this survey the results have limited meaning.

Financing EPC projects

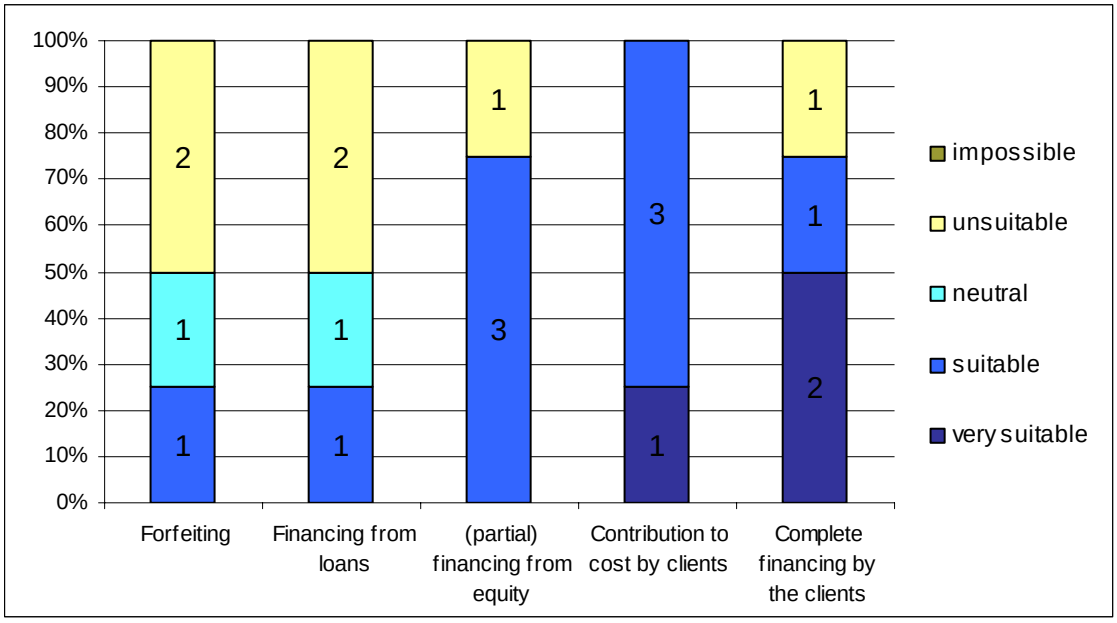

Figure 8 Suitability of different types of EPC financing

EPC allows choosing different financing options. Regarding two extreme opinions: 50% of respondents claims that fully financing of EPC is suitable the other half that's unsuitable. 75% of ESCO's accepts partial financing from equity all welcomes contribution to cost by clients just one ESCO claims that complete financing ESM by clients is impossible.

All but one ESCO are public sector oriented, and they notice improvement in the market conditions. The municipalities start to create specialized internal units monitoring or managing energy issues or to employ "city engineers" who shall deal with EE problems. The PPP mechanism for thermal modernization has been tested in Silesia Region and is a proof that EPC can be successfully implemented. The ESCOs share the belief in fast development of the market.

Use of subsidy programs

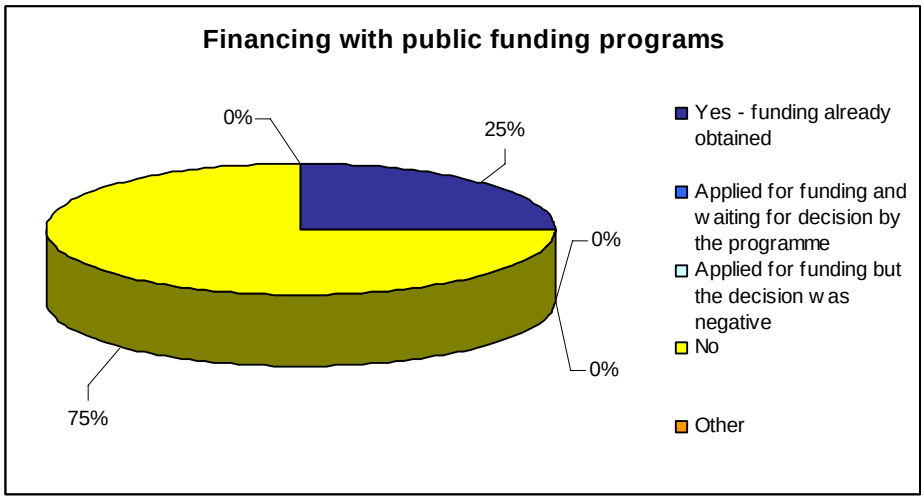

Figure 9 Public funding programs in combination with EPC projects.

The conjunction of EPC with subsidy schemes is not popular. First there is very limited number of EPC projects secondly only public entities can apply for them. Those who have already obtained usually have low awareness of and lack of information about the ESCO concept and simply mistrust them. They are oriented for physical output and not for difficult to calculate and compare savings. Long-lasting procurement procedures could impede timely usage of subsidies.

The PPP mechanism for thermal modernization demonstrates the routes of organizing and financing EPC projects. The accounting standards and methods of reporting public debt indicators play vital role in decision making process. Few being carried out projects are still case studies as there are 16 independent Regional Courts of Auditors representing different opinions in can't be said that these projects are easily replicable.

The subsidy programmes are not ready to deliver its support to complicated structures like PPP and many justifications, explanations, interpretations creates new risk factors.

6.1 Products and services

The figure below presents declared significance of products and services in the ESCOs' market offer.

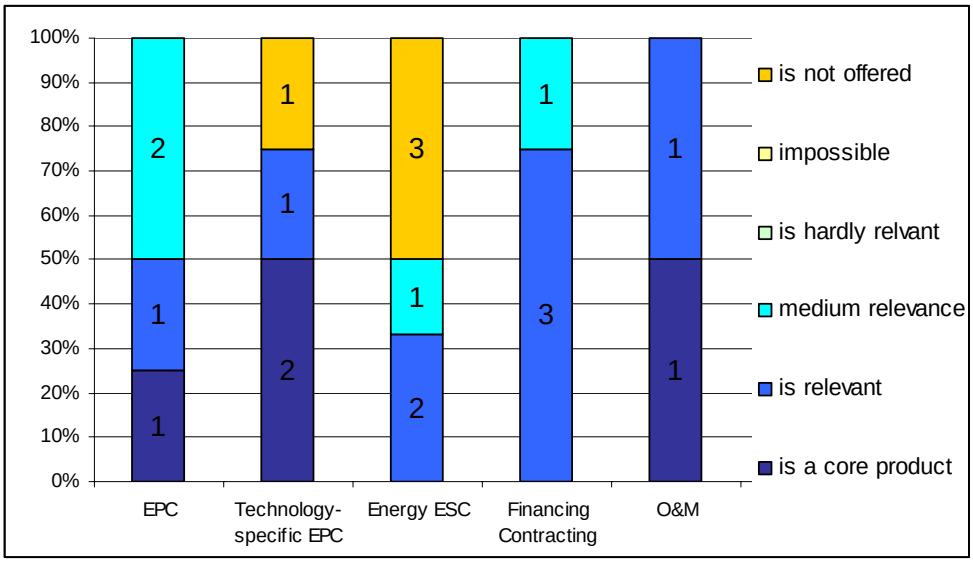

Figure 10 Energy services offered by ESCO

The ESCOs are public sector oriented. Municipalities and their schools, hospitals and other public units are perceived as the key clients in ESCOs business. However one of interviewed companies declared that tertiary sector creates most of its ESCO related revenues. Nevertheless it should be changed this year because the public sector has started a "PPP campaign"..

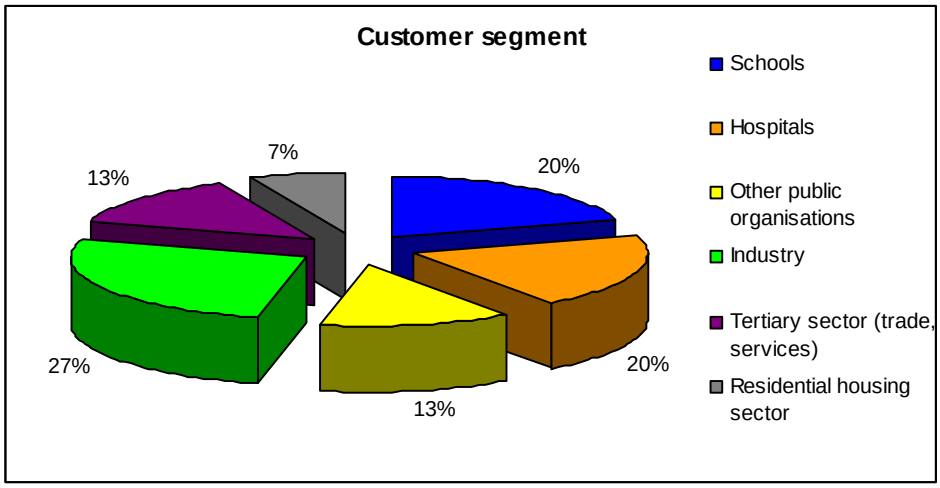

Figure 11 Customer segments in the field of EPC served by ESCO.

ESCOs are estimating the EPC market between € 5 – 25 million. The discrepancies are related to the size of questioned companies.

7. CURRENT TRENDS IN THE EPC MARKET (TASK 3.1.5)

As in the nearest perspective the public support shall be shifted from subsidies towards returnable aid (loans) the phrase that 'the "ESCO formula" shall be considered' appears in official documents in Poland. „ESCO formula" as an idea is very trendy and wide spreading but it still is unclear whether there will be decisions made that the ESCOs will be able to apply for financing directly or the stress on cost-effectiveness will lead to the support in form a kind of revolving fund for ESCOs' clients. Usually for the implementation of EPC a PPP agreement is negotiated and prepared (several new public procurements has been announced). It takes a lot of time (even more than a year) but the public partner:

- can independently apply and receive a subsidy and,
- may use the ESA95 manual on government deficit and debt provisions to exclude its liabilities related to an EPC agreement from the statistical reports of the public debt.

Whatever new will be created, the main barrier is developed by the fears and concerns of lower level officials of implementing new ideas into life. That is to be removed.

All but one ESCO are public sector oriented, and they notice improvement in the market conditions. The municipalities start to create specialized internal units monitoring or managing energy issues or to employ "city engineers" who shall deal with EE problems. The PPP mechanism for thermal modernization has been tested in Silesia and is a proof that EPC can be successfully implemented. The ESCOs share the belief in fast development of the market

7.1 Conclusions

There may be a unique opportunity for development an EPC market in Poland. The declaration from ESCOs, high rank officials are very promising. The forecast suggest that this segment is at its turn-point and long lasting upward trend shall start at any time. The problems are in "details" minor ones. Nevertheless unless those details are solved, the limitations related with the interpretation of the public debt indicators are not cleared the development will be hindered. The awareness among Clients must be widespread and the belief that it can be done showed through effective demonstration.

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ANNEX 1 RESULTS OF THE SURVEY AMONG POTENTIAL BENEFICIERIES

Only three filled in questionnaires from clients. All have been completed after either personal meeting or phone conversations. Due to limited participation of ESCOs Clients', the multi-answer possibilities method used in this survey the results have limited meaning

. Figures below present opinions of ESCOs Clients (the potential beneficiaries).

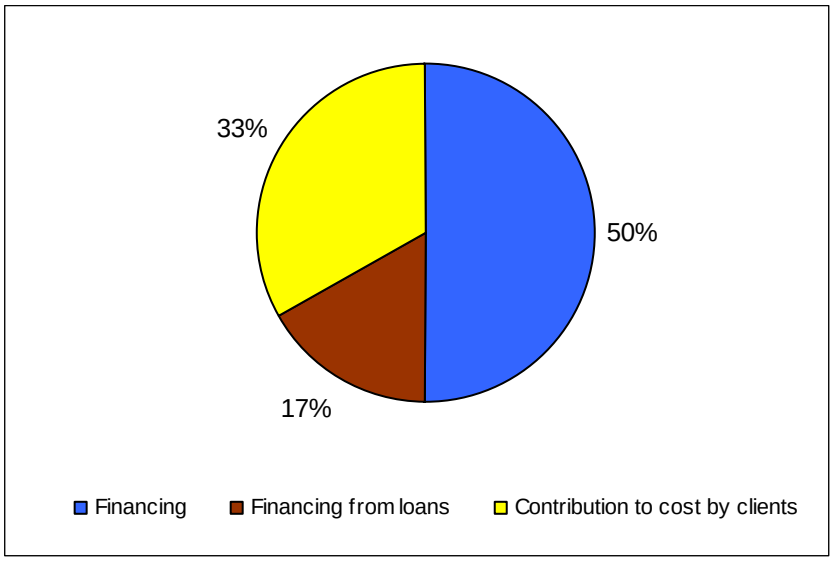

Figure 12 Kind of financing offered by ESCOs in the EPC projects

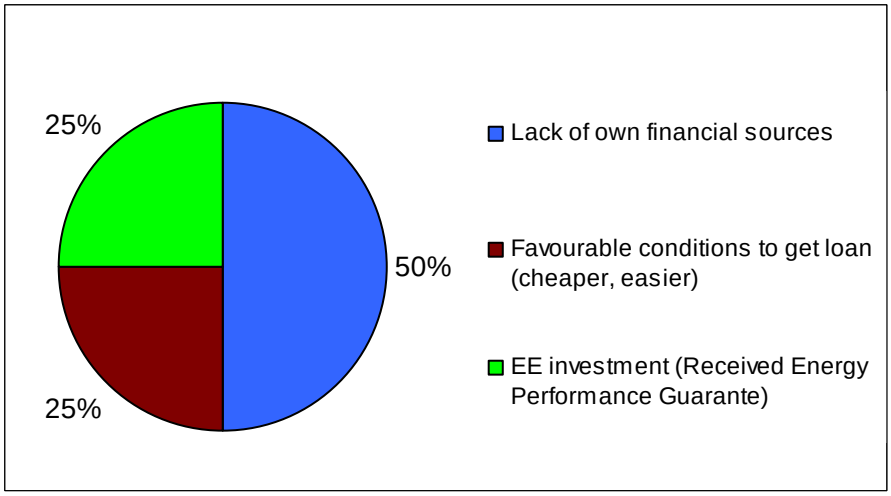

Figure 13 Reasons, why Clients decided to include elements of EPC in contracts

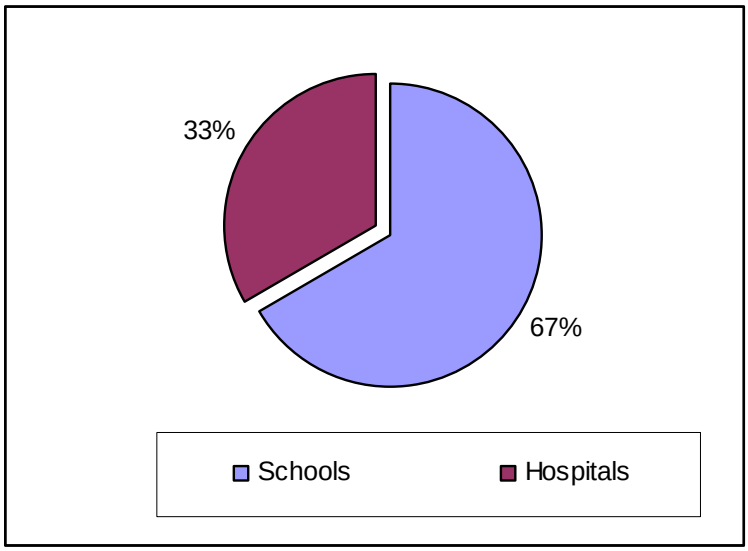

Figure 14 Clients by sector.