



Intelligent Road and Street lighting in Europe (E-Street)
EIE/05/157/SI2.419662

Status quo on Street Lighting Contracting in Europe short study

Berliner Energieagentur GmbH
July 2006
(on behalf of the Investitionsbank Schleswig-Holstein)



The sole responsibility for the content of this reports lies with the authors. It does not necessarily reflect the opinion of the European Communities. The European Commission is not responsible for any use that may be made of the information contained therein.

Contents

1. Summary	3
2. Introduction	3
3. Examples	6
3.1 Street lighting Contracting projects.....	6
3.2 Contracting projects with measures on building lighting	10
4. Market analysis.....	10
4.1 Introduction	10
4.2 Germany	12
4.3 Austria.....	13
4.4 Czech market potential	13
5. Frame conditions	14
5.1 Introduction.....	14
5.2 Lighting Contracting.....	15
5.3 Light supply Contracting	15
5.4 Performance Contracting	16
5.5 Frame conditions in countries with developed Contracting markets	16
5.6 Frame conditions, market overview other European countries.....	17
6. Conclusions	20
Annex: List with European street lighting Contracting projects	22

1. Summary

Investments to improve the uptake of energy efficient lighting are among the most cost effective and practical energy efficiency measures and offer the EU one of the most immediate and effective opportunities to increase the security and reliability of energy supply. The new **Directive on energy end-use efficiency and energy services in EU** (Energy Service Directive ESD) aims to stimulate the final energy efficiency, the programmes and measures of energy efficiency. The ESD will stimulate and facilitate cost-effective investment in energy efficiency of different sectors like buildings and lighting.

The public owners of street lighting systems have the duty to keep the systems in order to ensure road safety and to fulfil the other functions of public lighting. The lack of public budget has led to a stagnation of investment in energy efficiency of the public street lighting, now there is a critical situation with regard to high operating costs and large refurbishment necessities without public funding possibilities. There is a “drive” towards cost reductions and outsourcing of these services, and such Public-Private-Partnership (PPP) models like Contracting and especially Performance Contracting can be successful tools to save energy costs and guarantee quality standards and maintenance of the street light systems. The study gives an overview on the two basic forms of Contracting with the focus on Performance Contracting (EPC). It includes short descriptions of examples projects with different Contracting models of street lighting in the study. Such examples can support municipal decision makers to start with such projects and will help to develop the ESCO market in Europe.

In the total lighting sector there is a large energy saving potential, the EU could save 4.3 billion euro in running costs through energy efficient lighting each year. In Germany 9.125 Mio. lighting points illuminate the public streets of the 14,000 municipalities. The study summarizes the results of market analysis for some example countries.

Besides the existing saving potential the development of the ESCO market including the clearance of obstacles of frame conditions and the providing of standards and model contracts are crucial for the implementation of Contracting solutions for street lighting in the European countries. The study describes the key issues, barriers and obstacles in general for the main Contracting models, the frame conditions in countries with developed Contracting markets and for most of the other European countries.

Finally the needs to develop new standards with the implementation of new technical specifications and norms, of more efforts regarding the convincing of the public owners of street lighting, transfer of know-how and dissemination of information and experiences are summarized. For countries with a low level of ESCO market development and experiences in this field it is suggested to start with capacity building measures and first easy pilot projects for street lighting Contracting.

2. Introduction

The new **Directive on energy end-use efficiency and energy services in EU** (Energy Service Directive) aims to stimulate the final energy efficiency, the programmes and measures of energy efficiency. The objective is that of increasing the efficiency in the final uses of energy by means of operational measures. One of them is the development of the energy service market for energy efficiency to be integrated in the national energy market. The Directive achieves its aims by providing a series of regulations for the promotion of the *energy service market* and the *market of measures for energy efficiency* in those sectors of final uses of energy. The Directive sets an energy saving target that member states will have to fulfil as requirement in order to measure the progress obtained in energy efficiency and to create an adequate level of energy services demand. It provides also an energy saving

This project is co-funded by the European Community

target for the public sector, together with the obligation for member states to ensure to the customers the offer of energy services by companies for energy supply and/or retail. The Directive will stimulate and facilitate cost-effective investment in energy efficiency and will foster the development of ESCOs by requiring member states to remove barriers to ESCOs and Third Party Financing (TPF).

The new Directive will support the development of existing large energy efficiency potential in such important sectors like buildings and lighting, to reach such goals like greenhouse gas emission reduction and saving of energy resources. Besides other sectors there is a large need in investment in energy efficiency of the public street lighting, and TPF is a powerful tool to get such investment without additional public investment. In this connection some existing and widely-used standard models from the building sector can be used or must be adapted for street lighting environment.

Street lighting systems are normally owned and operated by public bodies like street authorities, municipalities and special public owners of sites. There is a "drive" towards cost reductions and outsourcing of these services and such Public-Private-Partnership (PPP) models like Contracting and especially Performance Contracting can be successful tools to save energy costs and guarantee quality standards and maintenance of the street light systems.

Street lighting Contracting generally means **operating and financing procedures for the provision of specific energy services** for owners of the street lighting systems. It may also contain the cost effective delivery of electricity (and in some cases also gas) for the owner of the system. There are also models with combination of using Renewable Energy Sources (RES) and/or integration of replacement measures of existing components/systems, energy metering and billing, Life Cycle Cost Assessment (LCCA) as well as interfaces with other customer services.

These procedures aim at cost effective energy supply and/or saving of energy and cutting costs by modernising and optimising necessary functions of system automation installations. Thus, Contracting is not just a financing instrument, but also includes essential elements of operation optimisation and management up to user motivation.

Differentiation of Public Private Partnership models

Third Party Financing (TPF) as a kind of Public Private Partnership is a well introduced tool to finance energy efficiency measures in buildings and other facilities. Especially Performance Contracting has become an instrument to realise relevant CO₂ emission reductions. Considering the specific limits, the different Third Party Financing concepts from Operation Contracting and Performance Contracting offer relevant advantages for an efficient management and refurbishment of public street lighting systems as well as the possibility to reduce operation costs.

From the customer's perspective, a Contracting project can be financed in one of three fundamental ways (1) through self-financing, (2) debt financing, or (3) third party financing. Also the ESCO has again these three fundamental ways to finance a project in which it engages. The may also use its own funds to finance the investment, which should ultimately be self-financing (in some cases with a subsidy for expensive investment measures by the building/street lighting owner), or use debt or third party financing.

The main distinguishing feature of Contracting is, that the service company obliged under the contract bears the risk (or major parts of the risk) of the street lighting and installation management with regard to energy and thus, of course, at the same time is given the chance to gain its own appropriate profit if the intended improvement in efficiency is actually achieved. The task undertaken is characterised by a more or less high degree of multidisciplinaryity.

Basic models

Although in recent years the most varied models have emerged, a basic structure can still be determined which has led to the following widely recognised classification. Depending on the system approach or aim of Contracting, the following two basic forms can be distinguished:

- **Energy Supply Contracting** (also called Facility Contracting or Energy Delivery Contracting/delivery of useful energy) - EDC
- **Energy Performance Contracting** (also called Energy Saving Contracting) – EPC.

Both of these basic models and especially the EDC are widely-used in several building sectors, but also in several combinations and variants e.g. for the lighting sectors. The services in the field of energy services in the lighting environment offered by different companies range from project development, over operation, “light supply”, servicing and maintenance, up to complete reconstruction and financing.

Thereby, it can be differentiated between pure service models, in which the lighting **remains in the ownership of the municipality, a complete transfer of the system to the private company** or rather a **combination of both models**.

In the lighting sector basically **three different models** of Contracting can be differentiated:

- Lighting Contracting (operation or facility Contracting)
- Light supply Contracting (supply Contracting)
- Performance Contracting

	Lighting Contracting	Light Contracting (Light supply Contracting)	Performance Contracting (Energy saving Contracting)
Applica-tion	Refurbishment of the lighting devices	Renewal, replacement and /or supplementing investments of the lighting system and additionally the operation of the lighting	Energy saving measures
Services	Financing (optional), Planning of the refurbishment, Installation and maintenance	Financing (optional), Planning of the refurbishment, Installation and maintenance, Additionally: Whole operation of the lighting points including purchasing of the energy	Financing, Planning, Installation, maintenance and support of specific energy saving measures
Finan-cing	Contracting rate as remuneration for the services	All costs for the supplied light (Contracting rate with basis and working price)	Contracting rate as remuneration for the energy and operating cost savings achieved
remarks	For single refurbishment measures including maintenance	For total refurbishment/complex solutions including operation, can be combined with leasing/buying model	For more complex solutions with high saving potential; not so widely used (often combined model with subsidies of the lighting owner for refurbishment measures)
Type of Con-tracting	Facility Contracting	Supply Contracting	Performance Contracting

3. Examples

3.1 *Street lighting Contracting projects*

Example: Free Hanseatic City of Bremen (Light Supply Contracting, combined with a sale model)

A complete sale of the public lighting system to a private service company with an acquisition of maintenance, refurbishment and electricity supply for 20 years was resolved recently by the Free Hanseatic City of Bremen. The public lighting of the Free Hanseatic City of Bremen covers about 59.000 lamps. The Free Hanseatic City of Bremen decided in June 2004 to improve energy efficiency and traffic security by additional passages within the new contract for light supply Contracting. With the year 2005 the new contractor started to operate the lighting points of Bremen. The contract runs 20 years to 2024 and commits the contractor:

- To reduce the power density from today's 3.52 kWh/km to 3.31 kWh/km which results in a connected power reduction from 5,300 kW to 5,000 kW
- To substitute 10 % of the total luminaries by new efficient and insect protecting lamps until 2010, which will mostly be based on the technology of energy saving lamps, this will result in 2,500 new lamps
- To invest at least 1 Million €/year into the system
- To optimise energy saving switching mechanism by half night switches and voltage lowering

The contractor planned to refurbish the remaining 8.000 lamps during the contract period until 2024. It is also planned to replace all mercury vapour lamps (about 10.500) to more efficient lamps with luminescent material.

Example: City of Prague (Light Supply Contracting)

The City of Prague was in trouble with efficiency of administration and maintenance of public lighting as well as with investment. For this reasons Prague decided to pass on the responsibility for the public lighting via PPP methodology to the private company ELTODO - CITELUM on the basis of public tender for the years 1999 - 2013.

Total savings in public lighting in Prague was achieved via miscellaneous technical and organizational measures:

- Installation of sealed luminaires with high IP (ingress protection of light active part of luminaire 65 and higher)
- Replacement inefficient insulated distribution cables and lines
- Correct design and operation of lighting systems according to the standards
- Using discharge lamps with higher luminous efficacy
- Uniform power loading of phases of power distribution
- Elimination of unauthorized power take – offs
- Installation of the devices for reduction of luminous flux in night time with reduced traffic flow such as lighting power control units located in power supply or specially equipped ballasts
- Optimization of maintenance
- Consistent register of the acquisitions via information systems

The PPP model is a Light Supply Contracting combined with a leasing model with following essentials:

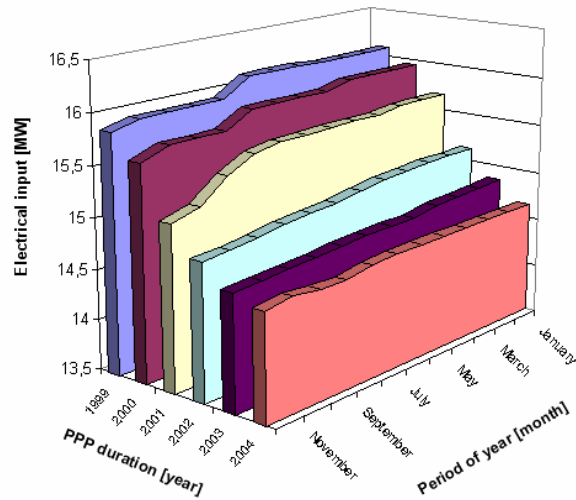
- Long – term Contracting relation between the ESCO (ELTODO - CITELUM) and city of Prague (15 years, 1999-2013). ESCO provides administration, maintenance, operation of public lighting (and town clocks) and purchasing of electrical energy.
- ESCO makes investments in renovation of devices of public lighting network (renewing of at least 30% of the devices during first 5 years of contract).
- Periodical exchange of light sources by the ESCO.
- Remuneration of the ESCO services via a Contracting rate (sum of negotiated working price for operating, managing, maintenance services including energy consumption costs and basic price per lighting point for whole activities) by municipal authority.
- Devices of public lighting network remain in property of municipal authority, but are leased to the ESCO for a yearly leasing rate.
- Municipal authority provides controlling activity.

According to the basic document for maintaining of public lighting in Prague “Conception of the renewal of the public lighting 1999 – 2013” is running replacement of the luminaires and more than 90 % of the luminaires were replaced during the first seven years of the contract. Planned replacements in the number of the units or in the length of the cables as well as real replacements are shown in the table below. Total number of the luminaires in the Prague is 136 690 on the date 31.12.2005. Total electrical input of public lighting network was reduced from 16 MW before 1999 to 14,5 MW at the end of 2004. The real functionality of lighting systems is in any case keeping higher than 99,2 %. Public lighting network consists of lighting systems and devices connected to public lighting network, such as lighting traffic signs, traffic lights, bus stations, informative and advertising facilities and etc.

Performance of the conception for the years 1999 - 2013					
Device	Total number [unit, m]	Planned replacement		Total real replacement (31.12.2005)	
		Replacement [unit,m]	Replacement [%]	Replacement [unit,m]	Replacement [%]
Luminaires	136 690	109 352	80	124 966	91
Armature	123 881	37 164	30	47 677	38
Poles	110 765	20 824	19	23 762	21
Pole case	110 765	20 824	19	23 762	21
Painting of the poles	110 765	56 771	51	66 800	60
Discharge lamps	136 690	136 690	100	283 250	207
Cable	6 168 900	302 276	5	758 317	12
Switch boards	1 376	160	12	264	19

The year - long consumption of electrical energy in public lighting network has been declining about 7 GWh during the first six years of PPP. Replacement of the luminaires have played key role for reduction of electrical energy consumption in the process of public lighting reconstruction. Monitoring of electrical input for single months of PPP duration is shown on the figure below.

Evolution of total power requirement of public lighting network in Prague (MW)



Evolution of total power requirement of public lighting network in Prague (MW) 1999 – 2004

Example: management of the public street lighting of Berlin (Lighting Contracting/management)

The company AT.LUX got 2000 a contract for the maintenance of the 185.000 lamps of the public street lighting system from the city of Berlin, the service fee was about 10 Mio. €/year. There were an extension of the contract, and since end of 2003 the new Stadtlicht GmbH (subsidiary of Dutch company Nuon and German utility Stadtwerke Leipzig) is responsible for the maintenance of all 185.000 electric and additional the 44.000 gas operated lamps. Although there were additional quality standards agreed, the contract model is not sufficient to fulfil all requirements of the city with regard to increasing refurbishment necessities in the street lighting system, especially under the public budget shortages. Therefore the city is searching for a new PPP-model, the tender for the consulting services was in 2005. After the final decision for a model the city will award a new contract.

Example: management of the traffic lights in Berlin (Lighting Contracting)

The company Nuon Stadtlicht GmbH got a contract for the modernisation and maintenance of all 2.000 traffic lights in Berlin. The contractor is responsible for the comprehensive refurbishment and the operation of the system, first measure is the changing of 618 oldest traffic lights to modern LED lights. The contract duration is 10 years, the city will pay the total amount of 126 Mio. € for the services to the contractor. Before this contract the city had to pay yearly at least 10 Mio. € for maintenance and 2,6 Mio. € for new traffic lights, now the saving of operation costs (and the public budget) are 10,5 Mio. € for the whole contract duration.

Example: municipality of Gunkirchen, Austria (Performance Contracting)¹

Gunkirchen started in the year 2003 an EPC project, with the aim to renovate the street lighting installations in the whole community area and to save costs and energy with this action. The EPC contract between client and the ESCO EWWAG was signed in August 2003 for a duration of 10 years.

¹ Summary from "Catalogue of best practices of energy efficiency services in 8 European countries", September 2005, IEE project PU-Benefits

This project is co-funded by the European Community

With the exchange and renovation of pillars, the implementation of new lighting control devices and the enlargement of the street lighting energy savings of 24.615 kWh per year and a reduction of the energy costs of 3.200 Euros per year are guaranteed. Also a reduction of 7,4 tons per year carbon dioxide is guaranteed. The total investment amounts 138.930,58 Euros. A financial support of 3.603,70 Euros from the regional government was given to the municipality with the condition to use this money for refunding.

The municipality wanted to reduce failures in the street lighting and in combination with that to reduce the grievances of the citizens. This should also be reached with the implementation of the best available technology. In the contract was also fixed that the maintenance of the street lighting has to be done by the ESCO which causes less work in administration, maintenance and operation for the municipality.

As results of the project, the municipality of Gunskirchen mentions that all the guarantees of the contract were fulfilled: all the pillars were exchanged or renovated and the new lighting control devices were implemented. An effect of the third party financing project is that the lighting will be reduced during night time by reducing the lighting power by special lighting monitoring devices. This reduces costs and saves energy.

The functionality of the street lighting was generally improved with this project and failures are now very seldom.

Example: municipality Gerasdorf, Austria (Performance Contracting)

The company Ökoplan GmbH performed comprehensive measurements and audit measures and developed the following measurement catalogue:

- renewing of lamps
- increasing of the intervals between the pylons
- re-fitting of meters
- adjustment control of voltage

The saving prognosis was 22.238 €/year for electricity costs and 9.084 €/year for maintenance cost. The contractor Ökoplan got the order for the Performance Contracting and is getting the remuneration for the services from the real savings over the contract duration of 9,2 years.

Example: municipality Schärding, Austria (Lighting Contracting)

The public street lighting was refurbished in 2002 and financed via a Contracting model. The total investment was 223.500 €. The following savings are guaranteed by the contractor: a saving of 30 % of the electricity costs per year and the reduction of the electricity consumption from 228.278 kWh to 140.728 kWh per year.

Example: municipality of Tukums, Latvia (Lighting Contracting)

In June 2002 a tender, addressed to ESCOs, has been announced for implementing an efficient street lighting system in Tukums. At the end of September 2002 the selected ESCO and Tukums Council have signed a conception agreement for the duration of 10 years. During this period ESCO will implement the project and then operation and management.

The main measures undertaken by the ESCO in order to achieve and guarantee the savings were

- Change of luminaries in 21 km of main streets
- Change of luminaries in all inner and small streets
- New street lighting system in 2,7km of main streets.
- Change of distribution panels.

Accordingly 845 light points have been replaced.

This project is co-funded by the European Community

Total project costs for efficient lighting project in Tukums amount 395.000 € (Financing model: subsidy from Tukums Council: 127.000 € as bank loan, contribution from ESCO: 268.000 €, of which 136.000 € loan from LEIF – Latvian Environmental Investment fund, and 132.000 € private bank loan).

The estimated savings are 630.000 kWh/a (about 37.000 € in 2002) and 365 t CO₂ reduction/a.

3.2 Contracting projects with measures on building lighting

Example: Penitentiary Tegel/Berlin (Performance Contracting for a building complex, additional refurbishment of tracing illumination)

The contract for the Energy Saving Partnership between penitentiary Tegel and MVV Siemens Building Technologies GmbH & Co. OHG was signed on April 28, 2004. The project has been developed and managed by the Berlin Energy Agency. On basis of an energy cost baseline of 1.8 million Euro the contractor guarantee:

- to save 33 % energy costs over a contract period of 12 years which correspond to 162,000 Euro per year
- to reduce the CO₂ emissions about 4,700 tons per year
- the refurbishment measures and the modernisation of the energy systems runs from the heating system to tracing illumination/outside lighting system

Example: municipality of Neunkirchen-Seelscheid, Germany (Performance Contracting of lighting systems in public buildings)

In cooperation with the energy agency NRW the municipality Neunkirchen-Seelscheid managed to realise the urgently necessary refurbishment of the lighting via Contracting first for a small gymnasium of the secondary school and then for further real estates as coliseum, primary schools, the secondary school, the aquarena indoor swimming pool and a kindergarten. Since the conclusion of the contracts spanning ten years with the company Eurolux AG the old lighting has been removed by the contractor and was replaced by luminaires which conform to the best available technology. This improvement could be approached without any financial costs for the municipal budget.

New in this project is the integral claim of the “saving” by the municipality Neunkirchen-Seelscheid. Thus, not only pure monetary aspects are in the focus, but also environmental aspects and business management reasons. So the costs referring to the total economic lifetime of the goods are considered and evaluated.

The lighting concept focus has been laid on the installation of modern best available technology. For example the connection power in the secondary school Neunkirchen could be reduced about more than the triple from 61.5 Kilowatt to 18.13 Kilowatt. The energy costs such as for the lighting in the multipurpose gymnasium Neunkirchen could be reduced about 10,000 Euro per year.

The lighting refurbishment has achieved an yearly reduction of 590,000 kWh. With this effort the CO₂ equivalent emission could be reduced about nearly 400 tons per year. Neunkirchen-Seelscheid is GreenLight partner since 2003

4. Market analysis

4.1 Introduction

For lamps, the potential savings are striking; the EU could save **4.3 billion euro in running costs through energy efficient lighting each year**, this equates to the output of **12**

medium sized power plants or 28 megatons of CO₂ or more than 50 million barrels of oil annually!

Investments to improve the uptake of energy efficient lighting are among the most cost effective and practical energy efficiency measures and offer the EU one of the most immediate and effective opportunities to increase the security and reliability of energy supply. New energy efficient lamps can **reduce energy consumption by as much as 80%** and can **last between 5 and 30 times longer** than conventional equivalents.

Moreover, energy-efficient alternatives are available for all main lighting application areas, with close to **70-80% of the market devoted to ‘professional’ applications** (e.g. street lighting, offices industry and restaurants and shops) and **20-30 % to domestic applications**.²

Besides the existing saving potential the development of the ESCO market is crucial for the implementation of Contracting solutions in the European countries. The draft of a report reviews and analyses the development and the current status of ESCO industries in the EU and the New Accession Countries (NACs)³. The report illustrates, that there can be a classification of the countries with regard to the intensity of ESCO activities and development of ESCO market into 3 leagues: the premium league (Germany, Austria, for some issues also United Kingdom, France, Hungary), the second league (Spain, Sweden, Czech republic, Italy) and the third league (all other European countries).

Other investigations of public bodies knowledge and usage of different types of Energy Service contracts in eight EU member states had the following results as summary:⁴

- Germany, Austria, United Kingdom: good or relatively good usage and knowledge (in some cases local/regionalised)
- Finland, Italy, Sweden: some usage, relatively good or some knowledge
- France, Spain: non or very limited usage, some or very limited knowledge

EPC is commonly used in Germany, Austria, Finland, Sweden, United Kingdom and less commonly used in Italy.

These more general investigations regarding intensity of ESCO market, usage and knowledge of different types of Energy Service contracts show some different results. After evaluation of the country reports from other EU-projects (see chapter 5.6) it can be summarized: Germany and Austria are in the “premium league” for EPC. On a lower level are at first Finland, United Kingdom, Sweden, Italy and the Czech Republic (in France there are legal requirements with four kinds of contract models which can’t be compared with the EPC model, there shall be a new EPC model developed in the frame of the project EUROCONTRACT).

It can be assumed, that some of these countries (especially Austria, Germany) are also in the “premium league” for Energy Services in the street lighting environment. They have large market potential (especially the larger countries with high population and number of municipalities) and experiences in Energy Services. But the list is incomplete because such European countries with most experiences in the field of Energy Services for street lighting are missing like the Netherlands and Norway.

The following sub-chapters give short information regarding the market potential and development for some example countries.

² “Doing more with less by getting Europe’s lighting right”, The ELC Response to the Commission’s Green Paper on Energy Efficiency, December 2005

³ ESCO-report, draft document of the EC Joint Research Centre, 2005

⁴ Summary from “Country specific legal framework for public bodies concerning Energy efficiency Services”, September 2005, IEE project PU-Benefits

This project is co-funded by the European Community

4.2 Germany

Market potential

In Germany in total 9.125 Mio. lighting points illuminate the public streets of the 14.000 municipalities. These are on average 111 lighting points per 1,000 citizens. In Germany more than 4,000 Mio. kWh are used for street illumination every year, which is about 7 % of the municipal electricity consumption. This consumption alone costs the municipalities about 500 Mio. € in total and 4 € per capita and year. These electricity costs are caused by out-dated technology and are accompanied by a high amount of maintenance and fault clearance. Including this effort the operating costs raise to yearly 720 Mio. €, which results in operating costs about 6 € per year and capita. Whereas the operating costs without personal costs range between 6.90 € for smaller municipalities (< 5,000 inhabitants) and 9.90 € for cities with more than 500,000 inhabitants, the operating costs including staff costs achieve the range of 7.10€ and 12.10 € per capita and year or rather the range of 57 € and 97 € per lighting point and year. The cost structure of the public street lighting in Germany is the following:

- 54 % energy costs
- 34 % maintenance costs
- 12 % staff costs

Success story Contracting

In the beginning and middle of the 90s, only very few Energy Performance Contracting (EPC) projects were initiated by a few selected ESCOs, mostly through “**informal**” EPC. There were no standard contracts, there was no public procurement and no transparency regarding the detailed contract agreements in the building sector and also in the sector of public lighting. Hence, there was no real publicity about the projects, although there were some technically properly designed concepts and energy saving investments programmes.

There was a young and growing market of **Energy Supply Contracting**, meaning a simpler case of energy services, focussing on heat supply (combined with electricity supply in case of micro CHP) for buildings and electricity/other media for some other cases. Potential clients as owners of the facilities and buildings were hesitating to approach the EPC offers made by the few existing contractors for EPC in the market. They did not know whether offers were **trustworthy**, whether submitted contracts were **legally reliable**, they were not sure what the real **value of the contract** was. Transparency, procedural and contractual security and the economic evaluation of EPC offers were (and still are) the main barriers for the EPC market.

At the beginning of 1995, the EPC model **Energy Saving Partnership (ESP)** was developed and implemented in public buildings of Berlin with the aim of reaching ambitious objectives for climate protection and reducing energy costs in the face of a tight budgetary position. Now the market for Energy Services in Germany is a standard market with standard procedures and tools for several building sectors, but it is also still in development for the lighting sector. With TPF-solutions in the building sector (90 % of that Delivery Contracting and Operation Management Contracting, remaining shares mainly Energy Performance Contracting) a lot of projects are realized. It can be assumed, that these percentage figures are similar for the street lighting environment.

The market is characterised by more than 80,000 concluded Contracting contracts, but most of these are for the building sector. Under the 500 existing vendors for Energy Contracting services there are about two thirds Energy Service Companies (ESCO's) and utilities. It can

be assumed, that only max. 1 - 2 % of the contracts are for street lighting Contracting projects and between 2 – 3 % are for the more popular building lighting Contracting projects. General the Energy Services for street lighting is offered in different contract models by the utilities and specialized ESCOs. The market will be further developed in the near future, more and new ESCOs will be active on the German street lighting market, also from other countries.

4.3 Austria

Stage of the market

Since 1997 Energy Performance Contracting (EPC) became an often used tool to optimise and modernise federal and municipal buildings in Austria. Since then, more than 1.000 buildings have been energy-optimised with this tool. Most of these contracts are still active and successful. Besides the building sector there are also more and more Contracting projects for street lighting systems of Austrian municipalities.

The quality of projects, which were developed together with independent Energy agencies and consultants and under ideas and price competition is high, there exist several securing tools (standardised contracts, a standardised project development, quality labels for ESCOs (Thermoprofit) and ESCO services (eco-label) for the building sector and proved Contracting model examples for the street lighting sector (mostly from the ESCO side).

Market actors present

The Austrian ESCO market includes 30 to 50 ESCOs offering EPC services. However, just about 5 ESCOs cover about 70 to 80 % of all EPC-contracts in the building sector. Branches and outsourced parts of utilities are mostly the bidders for street lighting Contracting projects. Since the EPC market is still only in the developmental stage, these companies are still building up their capacity.

4.4 Czech market potential

Public lighting in the Czech republic counts approximately 1.2 million installed luminaires and the consumption of electrical energy reaches about 600 GWh per year. The electrical energy consumption costs the municipalities about 30 Mio € per year. The calculation procedure of the price for electrical energy in public lighting is based on the special rate called C 62d – Special rate for lighting of public areas.

Majority of lighting systems were built before the year 1990. The system of public lighting was energetic over-designed at this time. Cost-savings measures have been provided since 1994 nevertheless the number of lighting points has been increasing since that time. The aim is to implement of such types of lighting technology, which can carry out the norms and reduce average consumption of a lighting point. That is provided by operating public lighting via PPP methodology by ESCOs. Main ESCO player on the market operates in 200 towns and municipalities at the moment. Total number of lighting points amounts more than 190,000 in such PPP projects.

5. Frame conditions

5.1 Introduction

In most of the EU member countries there exist legal obligations to improve the energy efficiency of the public sector. In some countries and regions like Upper Austria there is a legal obligation for energy accounting for municipalities, and programmes support the implementation of Contracting in the municipalities. In Germany there exist a national sustainability strategy since 2002, one important issue is the dissemination of Contracting and especially EPC in Federal owned buildings/sites. Such programmes and strategies contain also measures for the public lighting or street lighting sector – or can extended to the lighting sector.

Besides such basic legal duties like the duty of the owner of the streets to ensure road safety (in Germany based on section 823 of the Civil Code) there are a lot of **technical norms and standards** to consider. The outdoor lighting is processed in national/international technical standards (concerning both lighting and electrical requirements) and in national laws (concerning properties).

Despite the fact that new energy efficiency standards are being implemented in all EU member and EU associated countries, there are still different standards in force by EU countries (e.g. for Germany the new DIN EN 13201 and parts of DIN 5044 (Road Traffic), DIN 67523 (Pedestrian Crossing), DIN 67524 (Tunnels), DIN 67528 (Parking areas). European standards and norms will be developed as common basis, the CIE is elaborating the new TC 4-44 “management and maintenance of road lighting”, a draft is under discussion. The final publishing shall be in summer 2007.

Regarding the implementation and realisation of Contracting projects there are some general issues to consider. Contracting is a win-win model for both partners, but it needs a good preparation and partnership collaboration on the basis of adequate and proven contract models like the Hesse model contract for EPC projects in the building sector. There are some of the following general barriers for using of Contracting models especially in the municipal sector, which are also universalised for the street lighting sector:

- New, largely unknown instrument
- Lack of confidence in the model
- Lack of motivation
- Administrative hurdles
- Lack of necessary know-how (mostly on the side of building owners)
- Increased organizational efforts (e.g. for data collection, baseline calculation)
- Lack of optimized offers (high efforts/transaction costs for the bidder)
- Legal and regulatory uncertainties in some fields (e.g. public budget and municipal law, questions regarding securities and ownership)

Additional barriers for public lighting improvement were analysed in the frame of the EnLight-project. A following summary (abstract) can be found on the project webpage⁵:

The major barriers, why innovative outdoor lighting energy saving concepts have not been developed to the same extend as in the field of indoor lighting are:

- Lack of promotion of best practise examples

⁵ www.eu-enlight.org

- Proof of energy savings and subsequently cost reductions through new outdoor lighting concepts
- Lack of appropriate cost/benefit analysis and planning instruments for outdoor lighting
- Lack of appropriate resources in city administrations to elaborate and implement energy saving measures to improved outdoor lighting concepts”

The public owner of the street lighting has to follow the public procurement rules for awarding Contracting services, he has to organize a competition of the bidders to find the most economic solution. Besides the tender and awarding procedure the public owner has to make an assessment of the economy of the several offers in comparison with solution in own direction. There might be some uncertainties regarding the use of the procurement rules, the economic assessment methods etc., and frame conditions in the European countries are different.

Before that will be outlined for some countries, the typical key barriers and issues for the main Contracting models shall be described.

5.2 Lighting Contracting

This Contracting form is a simple model, if there is a proper contract between client and ESCO for such services like single refurbishment measures including maintenance key barriers shouldn't exist. The most typical barriers are **human**. Street lighting owners and administrators (in most cases municipal staff) lack know-how and understanding of energy services. The operational staff which needs to be directly involved in the preparation and implementation of an Contracting project is very often afraid of outsourcing, which is perceived as a threat of losing job and position. Other barriers could be such issues like the price adjustment for the performed services with regard to changing conditions (salaries, material prices etc.), no clear definition of interfaces with regard to the maintenance of parts or the whole systems, the scope of maintenance measures and the risk sharing.

If the ESCO is assuming the financing of the modernisation measures, it needs a subsidy for the most expensive measures on the part of the client to prevent too long contract duration with extraordinary high Contracting rates. The public client has to observe the **public budget legislation rules**, e.g. the approval and budgeting necessities before the contract can come into force.

5.3 Light supply Contracting

Light supply Contracting is more complex than Lighting Contracting, most of the typical barriers are similar. But it is not such a complex model like EPC, the contract model and risk structure is easier. Critical features of the contract are the realistic definition of the energy demand for the street lighting by the client (with forecast of the future traffic necessities), the exact definition of delivery borders or interfaces and the price adaptation formulas. Main obstacles could be especially problems of re-financing of necessary expensive modernisation measures and renewing of parts of the systems, in some cases necessary after first contract period, additional wishes by the client etc.

All costs for the supplied light, that means for the services refurbishment, operation, maintenance, purchasing of energy and in most cases financing of the project must be covered by the Contracting rate with basis and working price. Critical issues are especially price adjustment rules, ownership of the street lighting system/new installed parts of the system. The public client has to observe the **public budget legislation rules**.

5.4 Performance Contracting

There are **minor technical barriers**, such as difficulties in putting the necessary solid data basis. It is indispensable, that the public owner of street lighting – very often assisted by energy agencies or consulting companies – prepares the basic data on the system (energy consumption and costs, status of the system). In practice, this is a time consuming process.

Legal barriers, such as the provision of a secure and fair contract basis and the definition of the procurement scheme for a functional description of targets and services, are usually of minor importance for projects in the public building sector of countries with a developed EPC market, too, since the necessary model contracts and standards have been already developed and need usually only adaptation to the concrete project conditions. Additionally, the EU directives referring to public tendering give enough flexibility related to the characteristics of EPC projects. Now it is necessary to adapt the standards for EPC in buildings to the street lighting sector necessities.

Besides there are some differences in the legal framework for the public sector of different countries, e.g. the rules regarding the ownership on the energy efficiency equipment after installation by the ESCO, the commitment for comparison with own direction before the contract conclusion and opportunities and conditions to implement such financing instruments like forfeiting in a Contracting project.

In general there are **financial** and **economical barriers** based in the following aspects:

- Some energy efficiency measures (e.g. retrofitting the whole lighting system) need comparably long contracts or need an additional budget.
- Some municipalities want to be more flexible and do not want to fix contracts with a duration of more than 5 years.
- In some countries the public sector has a low credit rating by private banks with risk of stopping payments for the ESCO – in this case, access to cheap credits for a comparably high investment by the ESCO becomes difficult
- In other countries like Germany and Austria the public sector has a high credit rating, they can get low interest rates for Energy Efficiency investments – and for ESCOs it is difficult to underbid these rates.

Besides the most typical barriers are also **human** (see above). A general mistrust in a third party can be observed frequently with such typical questions like:

- Why should they know something which I do not know by myself?
- Are long-term contracts a risk for the building owner?
- Does the purchasing of energy management services mean staff reduction?

5.5 Frame conditions in countries with developed Contracting markets

Financing

Financing by third parties is not a problem in Germany, Austria and other developed Contracting markets with banks which are experienced in TPF. ESCO's have to provide the concept for the planned Contracting project together with feasibility investigations with rough and/or fine analysis of street lighting data and saving potential, energy efficiency measures and economic calculations with different assumptions (sensitivity analysis).

Standards and frame contract models were developed from some actors like energy agencies and ESCOs, but a general standard like the Hesse Energy Saving Guarantee Contract for public buildings⁶ is needed for EPC for street lighting.

⁶ “Contracting guidelines for public buildings”, Hesse Environmental Ministry, 2003
This project is co-funded by the European Community

In connection with financing of EPC the ESCO for himself as financing institution may take into account the aspects of capital procurement, securities, accounting and tax effects. If tools like forfeiting are used, the % of the total contract value for which this is used has to be balanced (i.e. 70 % of basis remuneration) and properly linked to securities to offer the benefits of using such ways. These issues must be considered in the model contract.

Admissibility with regard to budget law

For **EDC** and also for Lighting Contracting and Light supply Contracting there don't exist real obstacles, contracts of such kind are "transactions of day-to-day administration" (e.g. in Germany).

EPC as type of financing is **admissible pursuant to budget law** in Germany (and also in Austria). It is rated by the supreme municipal supervisory authority as a "transaction resembling loan", because the alternative of internal financing by municipal loans, regardless of the profitability of the energy saving measures financed through them, means borrowing. **As profitable measures** energy saving guaranteed contracts or adequate saving contracts are **not** counted under the **credit limit** which some municipalities have **already reached**.

Public Procurement

Lighting Contracting contains mainly construction services, the price (value of the contract) can be estimated, the services are being given by the client. Therefore the procurement rules for construction works and the open or restricted tender procedure must be used. **Light supply contracting** contains in most of the cases the main service light supply. Because the price (value of the contract) can be estimated, the procurement rules for services and the open or restricted tender procedure must be used.

EPC projects need mixed contracts with a combination of works and services, in most cases the main part are the services. In such cases the procurement rules for services must be used, in other cases the procurement rules for construction works. The negotiation procedure is allowed, because there is only a functional description of the services by the public owner as client/orderer (and not the estimation of the price) possible in the frame of tender.

5.6 Frame conditions, market overview other European countries⁷

Sweden

Sweden has an immature and relatively conservative market with a history of less successful EPC projects, but also a striving and emerging market mainly driven by foreign companies.

The main obstacles for developing the market for EPC are today the limited know how and experiences within the public and private real estate sector, causing the ESCO companies, difficulties in convincing the customers and explaining the contractual benefits. The difficulties is only partially connected to legal issues such as public procurement and accounting rules etc., the main problem in Sweden, is the insufficient experience and lack of credible and highly visible reference cases, preventing a wider development.

There are no energy efficiency standards of norms for municipalities on public lighting and no obligation for local authorities to meet energy efficiency public lighting standards.

Examples of other barriers are lack of finances, lack of time, calculating with too short payback time and limited technical progress within the lighting area, besides there exist also informational and technical barriers.

France

⁷ abstracts from SAVE project "Clearcontract" (see country reports under www.clearcontract.net), IEE projects "EUROCONTRACT" (see market development under www.eurocontract.net), EnLight (see foot note 5) and "PU-Benefits" (see foot note 4, www.pubenefits.org)

This project is co-funded by the European Community

The main legal barrier arises from the fact that it is not possible to conclude a global contract covering the works, the services (operation and maintenance) and the funding. Article 10 of the Code of Public Contracts allows, however, a single contract to be concluded which covers both works and the provision of services, in which case the contract must show separately the respective prices of works and operation or maintenance. The remuneration of operating or maintenance services must never contribute to the payment for works. Furthermore, the payment for works cannot be deferred. Funding can be done by leasing by means of a separate item. An EPC is therefore legally possible on condition that the funding arrangement is covered by a separate item, which further complicates a type of approach that is already complex.

Greece

The core ESCO business, via the implementation of EPC, has not yet deployed, neither in the public nor in the private sector despite the objective conditions of the local energy market that would favour the wide outsourcing of energy saving projects under a guarantee of performance and of service quality.

Main reasons for the above situation are 1) the lack of a positive institutional environment for the support of initiation and viability of commercial operation of ESCOs, 2) the absence of a clear and helpful procurement, contractual and administrative procedure for the selection, control and repayment of the integrated energy service provided by an ESCO on the principle of contract negotiation procedures and competitive dialogue with the client, and 3) the absence or weak application of energy management procedures which would otherwise promote the interconnection of activities of on-site expert personnel with top decision makers as well as the involvement of external contractors-suppliers for efficient facility management, including EPC.

United Kingdom

Currently, UK local authorities do not have express planning powers to stimulate commercial energy efficiency in use. There are currently 12 registered ESCO's, operating within varying aspects of the energy industry.

There are some key barrier issues for local authorities to use Contracting services, e.g. lack of a legal framework for local authority participation in ESCOs and regional/ local authority structural differences hence responsibilities.

Hence it is currently very limited experience of Energy Performance Contracting (EPC) in the UK. The term EPC is not used, and the concept is poorly understood, and so it is often difficult to determine from published information whether a contract is in fact EPC or not. There has been considerable experience of energy delivery Contracting, particularly relating to CHP installations in the health and commercial sectors. This experience has been mixed, resulting in a certain amount of caution in the market, particularly in the health sector.

Finland

In Finland the ESCO procedure is considered, more or less, as a tool for the implementation of energy saving measures identified and reported in the energy auditing reports. A lot of energy audits have been carried out in Finland during the past ten years in different client categories linked to the voluntary Energy Conservation Agreements. ESCO business has been growing in Finland but not to the extent that was expected, even though the state gives financial support to the ESCO investment projects. The reasons for that are e.g. lack of knowledge, slowness in adapting new methods. Even more obstacles, real or imagined, have been noticed to prevent a more rapid expansion of the Energy Performance Contracting and ESCO procedures.

Most of the ESCO projects implemented so far have been individual energy conservation measures in building technologies or process industry. Some EPC agreements have integrated several saving measures but they have been a minority among all the ESCO projects.

Norway

In Norway the EPC market is immature, even if there have been sporadic cases of EPC or similar projects the last fifteen years. The municipalities of Fredrikstad and Hvaler have about ten years of experience as clients. Different companies have since 1990 offered different versions of “energy saving with guaranteed results”, but the market response has not been overwhelming.

3 municipalities went in 2003 – 2004 (as probably the first in Norway) through a public procurement procedure on EPC, and are now in the implementation phase. One additional municipality also has signed an energy performance contract.

Today there are too few contractors and too little demand to constitute an effective EPC market. The procurement, contracts and implementation is very heterogenous and partly unprofessional from both sides. There is a need for development of guidelines and standards to secure quality projects, as well as a need for more training and active marketing of the EPC concept.

Czech Republic

There are some obstacles for developing the market for EPC, e.g. the limited know-how and experiences within the public and private real estate sector, although such actors like the Energy Agency SEVEN have supported the development and implementation of several EPC pilot projects.

Predominantly some financial and motivation barriers could occur on the Czech market which could prevent the expansion of new technologies for saving operating and maintenance costs. First of all, initial investment costs, investment costs return and operating price of these technologies are significant factors. Supervisors of public lighting network has to solve still essential problems and application of hi-tech technologies is not first rate matter. Also current maintenance systems are functional and their complexity has reduced operational costs in the past. One of the problems is conservatism on the side of energy providers having their own policy in the field of public lighting networks.

Slovakia

Slovakia has a general **legal framework** for the energy sector, but this focuses largely on supply-side issues. Very little attention has been paid to demand side and energy savings issues. The knowledge base concerning commercial financing through bank loans, leasing, and obligation bonds is higher, but municipalities still lack experience in project financing and alternative financing (i.e. EPC).

There are also **technical barriers**, that means the lack of technical background by public lighting owners, operators and investors with regard to

- Preparation of proposals and projects for implementation
- Preparation of audits and feasibility studies
- Negotiation skills with potential investors
- Preparation of business plans
- Cost benefit analysis – analysis of energy savings
- Preparation of tendering procedure and definition of technical selection criteria

Institutional barriers concern the implementation of energy policy and the management of energy programmes by public or even private institutions.

The main **informational barriers** are:

- Lack of targeted information on savings from new available technologies
- Lack of information among users about consumption and energy costs
- Lack of information on the availability and reliability of energy efficiency technologies
- Lack of awareness of additional benefits of public lighting reconstruction projects
- Lack of information on available funding opportunities (at national and European levels)

CEEC in general

The market for ESCOs and TPF services is on a low developed level in most of the CEEC (Central and East European Countries), the general barriers for using of Contracting models especially in the municipal sector (and in this connection also for the street lighting sector) are similar like from the introduction (chapter 5.1) and from the example Slovakia.

The improvement of frame conditions must be supported with the following main focus:

- **Financing sector** (better conditions for energy efficiency projects with TPF; e.g. longer duration of the credits; fair risk sharing between ESCO, bank, better credit rating)
- **Public procurement** (possibilities to invite TPF partner with its financing into the tender for contract; general possibility to use negotiation procedure for EPC projects)
- **Public budget and municipal law** (municipalities should get allowances for TPF projects also if the total annual debts representing due to instalments to the contracted and/or guaranteed loans exceeds limits of the total income; municipalities/public institutions should can benefit from savings of funds for energy and water costs, there budget for this budget item shouldn't be reduced in the following year, because the energy cost savings must be used for payment of the Contracting rates to ESCO)
- **Capacity building** (improvement of knowledge, implementation of efficiency programmes, Know-how-transfer and training programmes, adaptation of standards and model contracts, providing technical assistance)

6. Conclusions

The public owners of street lighting systems have the duty to keep the systems in order to ensure road safety and to fulfil the other functions of public lighting. Because of increasing energy prices, restrictions of the public budgets and necessities of modernization and refurbishment there is a “drive” towards cost reductions and outsourcing of these services, and such Public-Private-Partnership (PPP) models like Contracting and especially Performance Contracting can be successful tools to save energy costs and guarantee quality standards and maintenance of the street light systems.

In the lighting sector there is a large energy saving potential, the EU could save 4.3 billion euro in running costs through energy efficient lighting each year. In Germany in total 9.125 Mio. lighting points illuminate the public streets of the 14,000 municipalities.

Besides the existing saving potential the development of the ESCO market including the clearance of obstacles of frame conditions and the providing of standards and model contracts are crucial for the implementation of Contracting solutions in the European countries.

Germany and Austria are growing markets for Energy Services and are pioneers for developing the European market for Contracting and especially EPC in the building sectors. But important parts of potential for Energy services and increasing energy efficiency in the street lighting sector are only partial opened until now. Therefore the efforts for developing new standards with implementation of new technical specifications and norms, the convincing of the public owners of street lighting, transfer of Know-how and dissemination of information and experiences should be intensified. The experiences and adapted standards from the "pioneer countries" including the Netherlands should disseminated to the other European countries, best practice examples will support the development of ESCO market for street lighting in such countries.

Energy agencies, other experts and mediators can support the public owners in the decision process to start with project preparation for street lighting Contracting projects EPC and during preparation and implementation phase. For such countries with low level of ESCO market development and experiences in this field like the CEEC it is necessary to start with capacity building measures and first easy pilot projects for street lighting contracting, e.g. using of Lighting Contracting model.

Annex: List with European street lighting Contracting projects

No	Project	Country	Contact for information
1	Gunskirchen	Austria	Oberösterreichischer Energiesparverband www.esv.or.at
2	Traun	- " -	- " -
3	Kematen/Krems	- " -	- " -
4	Bad Schallerbach	- " -	- " -
5	Schärding	- " -	- " -
6	Scharnstein	- " -	- " -
7	Rohrbach	- " -	- " -
8	Freistadt	- " -	- " -
9	Bad Goisern	- " -	- " -
10	Gerasdorf	- " -	Ökoplan GmbH www.oekoplan.at
11	Sitzenberg-Reidling	- " -	- " -
12	Rum	- " -	- " -
13	Absdorf	- " -	- " -
14	Hainburg	- " -	- " -
15	St. Koloman	- " -	www.stkoloman.at
16	Tukums	Latvia	www.ekodoma.lv
18	Bremen	Germany	www.swb-gruppe.de
19	Berlin	- " -	www.nuon- stadlicht.de
20	Prague	Czech Republic	www.eltodo.cz