

Making Street Lighting ESCO Projects Work in Practice



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Abstract Enhancing energy efficiency is one of the core EU goals determined by the 2012 Energy Efficiency Directive and thus mandatory for all EU member states. The ways of implementing the Directive's energy consumption targets are set in national plans for energy efficiency. Quality street lighting is a public obligation towards the citizens due to personal and road safety and because of good visibility and urban feeling in populated areas.

Street lighting installations are classified as simple constructions, which make them simpler for implementing energy efficiency-targeted measures. These projects are shorter and cheaper than other energy efficiency projects and thus are considered easier to implement for public authorities. Depending on national regulation of the EU member countries, street lighting projects are contracted under public procurement procedures as energy performance contracts (EPCs). The most important feature of EPCs is that the investments in energy efficiency renovation are repaid from the savings in energy consumption over the contracted period. This simple rule is nevertheless very complicated to implement in practice due to many reasons such as ownership rights on the street lighting infrastructure, insufficient public administration capacity for energy efficiency project implementation, insufficient funds, problems with energy efficiency improvement verification and measurement, complicated regulation on public procurement and/or energy service contracting, fiscal rules, etc.

ESCO financing schemes have been promoted as innovative mechanisms for financing energy efficiency projects throughout the EU. Their popularity originates from the public sector indebtedness and inability to finance improvements in energy efficiency via traditional, budgetary project financing mechanism. ESCOs have been encouraged in the Western Balkans region by the international financial

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institutions and the governments. However, they are still not contracted smoothly in practice. This paper aims to investigate why.

The chapter analyses regulatory and practical issues for energy performance contracting in Croatia with respect to street lighting renovation. The analysis includes, but is not limited to, public procurement and public debt rules. Based on the practical experience in implementing several projects for street lighting renovation, the chapter highlights the possible changes in energy efficiency regulation and practical approach to public authorities to make the ESCO projects in street lighting work better in the future.

Keywords Street lighting • Energy performance contracting • ESCO • Public procurement • Project finance • Croatia

1 Introduction

The EU Energy Efficiency Directive's goal is to achieve energy efficiency target of 20% in primary energy consumption by 2020 (EC 2012a, b). Even though it is primarily directed to public buildings, the street lighting equipment and installations are considered as simple public constructions,¹ which make them good candidates for achieving energy saving measures set in the national energy saving plans of the EU member states. Street lighting has been one of the ten identified sectors for implementing energy efficiency measures at a level of 50% of green public procurement (GPP) by 2010 (EC COM 2008). Street lighting typically accounts for 30–50% of the total electricity consumption of municipalities, 15% of global electricity consumption and 6% of global greenhouse gas emissions (UNEP/GEF 2013). According to the estimates disclosed by the EC, DG Communications Networks, Contents and Technology (2013), there are more than 90 million traditional street-lights in Europe, with more than 75% of installations older than 25 years. Energy efficiency measures in street lighting include replacement of lamps, new control systems for street lighting operation, system optimization, retrofitting the poles, complete replacement of luminaires, etc. Due to obsolete infrastructure, street bulb replacement and street light renovation represent a necessity, and a growing number of public authorities pay attention to environmental and economic benefits of such replacements. Depending on the targeted area, investment costs of street lighting renovation range from a few thousands of euros to several million euros with a project payback period typically of up to 10 years. Solid-state lighting (SSL) technology based on light-emitting diodes (LED) is perceived as the one that can achieve both savings of up to 70% of electricity consumption in lighting and significant savings in maintenance and operation costs, reduce CO₂ emissions and

¹As such they are excluded from the full application of the Energy Performance of Buildings Directive (2010), which is the main regulation prescribing the reduction of energy consumption in buildings.

contribute to road safety, compared to the current old lighting installations (EC, DG Communications Networks, Contents and Technology 2013). Due to rapid development of LED-based technology, their technical qualities may vary significantly, while information provided by manufacturers/suppliers may skilfully hide the required technical specifications set in publicly procured tenders. To help public authorities contract cost-effective street lighting renovation, a technical guidance on street lighting and traffic lights has been available from 2012 (European Commission – DG Environment 2012; Valentová et al. 2012; European Commission 2012a). In addition, 2011 many cities opt for intelligent lighting solutions, such as smart controls for dynamically changing lighting levels in response to different times during the night and specific citizen needs.

Energy performance contracts (EPCs) became a synonym for cost-effective measures in energy efficiency (EE) projects. The Energy Efficiency Directive (2012) defines EPC as “a contractual arrangement between the beneficiary and the provider of an EE improvement measure, verified and monitored during the whole term of the contract, where investments, i.e. work, supply or service, in that measure are paid for in relation to a contractually agreed level of EE improvement or other agreed energy performance criterion, such as financial savings”. The European standard EN 15900:2010 defines EE services as agreed tasks for EE improvement and other agreed performance criteria accomplishment, which include an energy audit (identification and selection of actions) and the implementation plan combined with the measurement and verifications of energy savings. The improvement of EE measures has to be quantified and verified over a contractually defined period of time through contractually agreed methods. Thereby, the EE improvement measures may rely on the substitution or improvement of technology, better use of technology and/or behavioural change. Under an EPC arrangement, an external organisation known as an energy service provider or an energy service company (abbreviated as ESCO) develops, implements and finances an EE project or renewable energy project and uses the stream of its income arising from the cost savings or the renewable energy produced to repay the costs of the project, including its investment costs (Bertoldi and Rezessy 2005). Thus, the three defining characteristics of ESCOs are ESCOs guarantee energy savings and/or provision of the same level of energy service at lower cost; the remuneration of ESCOs is directly tied to the energy savings achieved; and ESCOs can finance or assist in arranging financing for the operation of an energy system by providing a saving guarantee (Bertoldi et al. 2014). The Energy Efficiency Directive (2012) further defines an ESCO as “a natural or legal person who delivers energy services or other EE improvement measures in a final customer’s facility or premises”. According to Bertoldi and Rezessy (2005), ESCOs can provide a range of services including, but not restricted to, energy analysis and audits, energy management, project design and implementation, maintenance and operation, monitoring and evaluation of energy savings, property/facility management, energy and/or equipment supply, provision of service such as heating/cooling or lighting, advice and trainings, etc. Such a broad number of services qualify ESCOs as turnkey service providers in many cases. EPC has been in use since the 1980s in the EU (Mayer et al. 2010).

Still, it has not gain popularity until the launch of the EPC campaign in the EU at national, regional and local levels in 2012. EPC is now accompanied with the 2014–2020 financing framework promoted by the European financial institutions such as EIB, EBRD and CEB and national authorities.

The success of street lighting EE renovation projects depends very much on the national EE policies of the EU member countries. Various *ex ante* and *ex post* EE project implementation grant mechanisms have been designed and available to different types of end-users, including both public and private sector entities. Although the EU policy has been stimulating ESCO market development through various programmes and support measures from the 1990s, many EU member state national markets have not been receptive to such measures so far. Many EU countries have failed in designing adequate grant schemes for EE as well. Thus, the differences between ESCO market developments are great on the common EU territory.

The establishment of the first ESCO in Croatia was funded by the World Bank in 2003.² In the following decade, about ten ESCOs have been set up. Nevertheless, street lighting renovation has until recently been widely neglected (Glavaš et al. 2012). According to the EEA, the public sector is obliged to maintain and reconstruct street lighting in order to reduce energy consumption and CO₂ emissions. It is obliged to analyse electricity consumption in street lighting at least once a year and deliver the data to the national coordination body—Centre for Monitoring Business Activities in the Energy Sector and Investments. The National Action Plan for Green Procurement for the period 2015–2017 (2015) identifies electricity as one of the seven identified sectors for implementing EE measures. It is anticipated that in 2017 the number of “green contracts” will reach 40% of all public contracts.

The goal of this paper is to analyse the energy performance contracting regulation and practice in Croatian municipalities, identify barriers to smoother and more frequent EPC and give recommendations in support of more intensive use of EPC mechanisms that should ultimately result in lower energy consumption and greater satisfaction of street lighting end-users. According to the valid administrative territory split, there are 555 local self-government units in Croatia, divided between 126 smaller or larger cities and 429 municipalities, 20 regional government units (counties) and the city of Zagreb that has a combined status of a city and a county. The fiscal strength of vast majority of public authorities is not sufficient to finance EE projects via traditional project delivery. Public authorities are obligors of public procurement rules, and the EU and national EE regulation give public authorities the leading role in conducting EE-targeted renovation projects.

This paper is organised in five sections. After the introductory part on the importance of street lighting in electricity consumption and defining features of energy performance contracting with the ESCOs, the second part of the chapter deals with the regulatory framework applicable for the street lighting renovation projects in Croatia. The second part of the chapter elaborates street lighting project

²<http://web.worldbank.org/archive/website00978/WEB/OTHER/6737A500.HTM>

renovation in line with the EE laws and rules; the third section explains the impact of fiscal and financing constraints on EE project implementation. The fourth part compares good and bad characteristics of energy performance contracting in street lighting in Croatia. The last part concludes by giving recommendations for smoother realisation of EE contracts in Croatia and in all other countries that may face similar constraints for EE project delivery.

2 Regulatory Framework of EPC

Public authorities (including local and regional self-government) implement energy efficiency projects either by contracting for equipment/work/service delivery with third parties (vendors) or by contracting for the energy service supply. According to the Utilities Act, public authorities have, among other duties, an obligation to ensure proper functioning of street lighting on their administratively determined territory. Although there may be some open issues regarding the ultimate legal ownership over certain parts of street lighting installations between the national electricity company and the local public authorities, the latter exercise economic ownership over the street lighting installations. As such, they are obliged to enable all the necessary permits required for street lighting renovation.

When public authorities contract for equipment/work/service rendering, they directly finance the investment. The process is also known as direct project financing, whereby it does not matter whether they finance the project by their own or borrowed funds. However, if public authorities borrow funds for this purpose, a two-way public tender procedure is required—one for obtaining the lacking funds and the other for contracting for equipment/work/service delivery.

Contracting for energy service is a single public tender procedure in which a contract-awarded energy service company (ESCO) provides energy services and finances the investment under an energy performance contract (EPC). As defined in the Energy Efficiency Act (EEA), an energy service is a service of implementation of an energy efficiency project and other related activities on the basis of an Energy Efficiency Performance Contract (EnPC/EPC), under which the energy service provider (ESCO) guarantees verifiable and measurable improvement of the energy efficiency and/or in savings in energy consumption and/or savings in water consumption to the client after project implementation. The ESCO takes over financing of the investment costs for renovation of street lighting installations, while the public authority pays to the ESCO for the provided energy service. The payments arise from the savings achieved as a result of the investment in EE improvement.

Contracting the energy service is governed by the Public Procurement Act (PPA), the Energy Efficiency Act (EEA)³ and the Regulation on Contracting and

³The Energy Efficiency Act came into force on November 5, 2014, and transposes into the national legal system the Directive 2012/27/EU of October 25, 2012, which supplements the Directive

Implementation of Energy Service in the Public Sector which enjoins a public procurement procedure in case of choosing an EPC.⁴ When contracting for energy service provision in street lighting renovation with ESCOs, public authorities can, as a rule, choose between an open procedure and a restricted procedure. The negotiated procedure and the competitive dialogue are rather an exception which can be exercised in very limited cases.⁵

The public authorities have no freedom of choice of contract award criteria with EPCs, since the EEA prescribes that the only possible award criteria shall be the most economically advantageous bid. It means that the quality of the bid must be judged based on the price (quantitative) as well as on the, by public authority itself set, qualitative criteria. The PPA hereby helps the public authorities by setting out a non-exhaustive list of qualitative criteria which may be chosen, such as the quality of products (service), delivery date, product life expectancy, aesthetic criteria, quality of after-sale service, etc. Such criteria do not need to be of a purely economic nature but, as a whole, must allow in determining the tender that offers the best value for money. The criteria, nevertheless, must be stated in a clear and concise manner that allows all reasonably well-informed and diligent tenderers to interpret them in the same way. The criteria and respective weighting must be indicated in the tender documents. If weighting is not possible for demonstrable reasons, the criteria shall be indicated by descending order of importance. When tenders are being assessed, the award criteria must be applied objectively and uniformly to all tenderers. The principle of transparency requires the disclosure of the existence, scope and relative importance of all the elements which a contracting authority takes into account to determine the most economically advantageous bid. Any subsequent refinement of the contracting authority evaluation methodology to include elements which had not been disclosed before submission of tenders is prohibited, unless they do not alter the criteria, do not affect the preparation of tenders and are non-discriminatory. In other words, contracting authority cannot apply weighting rules or sub-criteria which it has not previously brought to the tenders' attention.

Lots of decisions precede contracting the energy service delivery with an ESCO, such as defining the needs of a public authority for energy services, conducting an annual plan for energy service contracting that has to be submitted to national

2009/125/EZ and the Directive 2010/30/EU. The Energy Efficiency Act replaced the Act on Efficient Use of Energy in Direct Consumption (OJ 152/2008; 55/2012; 101/2013).

⁴Brought in OJ 69/2012 but superseded by the new one in OJ 11/2015.

⁵In very limited cases explicitly listed in the PPA, the public authorities shall have the right to follow a negotiated procedure or a competitive dialogue. These circumstances include (i) no tenders or no suitable tenders have been submitted in response to an open procedure or a restricted procedure, provided that the initial conditions of the contract are not substantially altered, (ii) the nature of a service and risks associated with the service prevent the tenderer to quote a price, (iii) the nature of services is such that the subject matter of a tender cannot be substantiated with sufficient accuracy and (iv) a tender is very complex, making the contracting authority believe that contract award in an open procedure or a restricted procedure is not a feasible option.

authorities not later than by October 1 of the current year for the next year, deciding on whether to contract the energy service via EPC or via traditional project delivery, etc. Once the decision on contracting energy service through EPC is made, the lengthy and demanding procedure of public procurement to choose an ESCO can start. The steps that need to be followed by public authorities from the moment of deciding on implementation of EE measures over choosing the ESCO and concluding the EPC with the ESCO to project implementation and determining the achieved savings thereof via verification and measurement protocol during the contract term are illustrated in Fig. 1. Even when the public authority opts for EPC, it has to run two separate public procurement procedures, unless below the procurement thresholds (HRK 200,000 for services and HRK 500,000 for works). The first one relies on contracting an energy audit service, while the second one refers to the EPC. An energy audit service is a so-called precheck for determining the current

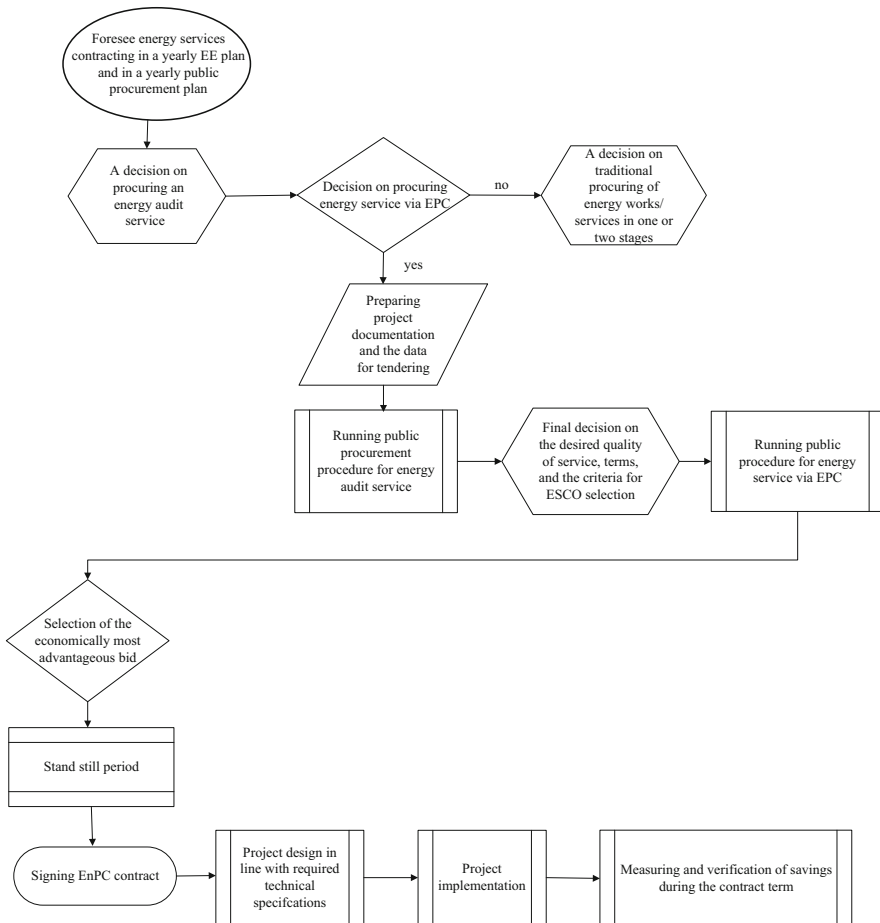


Fig. 1 EPC procedure between a public authority and an ESCO. Source: Authors' illustration

state of street lighting installation and electricity consumption thereof. According to the EEA, an energy audit must be conducted every 5 years. In addition, despite its complexity, the interim steps required for conducting street lighting renovation are considered simpler than for other constructions, as street lighting belongs to simple constructions according to the Law on Construction.

3 Financial Aspects of Energy Performance Contracts

Guaranteed saving energy performance contract in street lighting resembles financial leasing contract in terms of accounting treatment of the street lighting assets. Assets are kept and depreciated in the books of the ESCO until the end of the EPC when they are transferred to the public authority which is its owner all the time. The ESCO finances the investment costs of the street lighting installations up front and recovers its investment over the contract term. The contract term is divided into a project implementation phase and a guaranteed saving phase. In the first phase, the project is implemented, and there is no payment to the ESCO, while in the second phase of the contract, a stream of payments are transferred from public authorities to the ESCO if the guaranteed savings are achieved. The “baseline” scenario determined in the technical part of the project documentation is the starting point for calculating the project savings and thus ESCO’s fee which is earned in instalments during the guaranteed saving phase. Energy consumption and energy costs are compared to those of the reference year to avoid the influence of price fluctuations on the fee size during the guaranteed saving period.

The possibility to contract energy service rendering with an ESCO has provoked a growing interest of indebted Croatian public authorities as the debt incurred for the initial investment cost is kept off-the-public balance sheet during the EPC term. Energy service can be contracted even if public authorities do not have sufficient funds for street lighting renovation as ESCOs facilitate access to commercial financing (Sarkar and Singh 2010). The essence of the transaction is that electricity consumption bills charged regularly to the public authorities for the operation of street lighting do not change. Actually the electricity consumption bills are much lower for the public authority after the application of the EE measures, but the difference between the new amount due and the amount due before the street lighting renovation is a saving surplus used to gradually repay the investment and other costs of energy service provision to the selected ESCO during the guaranteed saving phase of the contract term. The higher the initial investment costs, the longer is the investment payback period, i.e. the longer the contract term with the chosen ESCO.

Croatian regulation recognises guaranteed saving contracts as a variant of EPCs. In such contracts, the ESCO is typically responsible for the entire design, installation and saving performance risks, while the client/public authority is responsible for financing the project. However, high levels of public debt altered the typical allocation of financing risk, common in guaranteed saving contracts in international

practice, as public authorities expect the ESCO to assume financing risk, i.e. credit risk arising from borrowing funds for project realisation. The payment in instalments, by public authorities to ESCOs, is conditional on regularly achieved guaranteed savings which is demonstrated by periodically measured and verified savings. If the savings are not as promised, there is no payment from the public authority, and hence, the entire financing risk remains with the ESCO. The model EPC with guaranteed energy savings goes hand in hand with the third-party financing, in which ESCO bears investment and credit risk; the municipality assumes operational and user behaviour risk, while other risks such as inflation or foreign exchange risk are typically shared between the ESCO and the public authority (Bertoldi et al. 2014).

Grant award for implementing EE projects has become very common in the public sector. Grant is a co-funding instrument in EE investments which is awarded in public calls. The calls for EE grants are typically issued annually for public authorities, and they are either open for a limited period of time, or they are open until the annual cap for supporting investment projects in all sectors is reached. Grants have been offered from the central budget via designated public institutions such as the Environmental Protection and Energy Efficiency Fund or the Croatian Bank for Reconstruction and Development, or they are available via EU programmes (EIB's ELENA, EBRD's WeBSEFF and others). Grant award is, nevertheless, also subject to the expected/proven savings after the implementation of the EE measures. Depending on the regional development of a project location, the Environmental Protection and Energy Efficiency Fund typically approves grants amounting from 40 to 80% of acceptable (justifiable) investment costs. Grant award is also subject to the upper limit of the investment value for street lighting reconstruction, meaning that depending on the specific call, smaller or larger projects can be preferred but also meaning that the same public authorities may turn larger projects into a stream of smaller projects hoping to get grants for their realisation year after year. The grants may be approved regardless of the prevailing financing option (traditional budgetary financing, third-party financing/ESCO or borrowing from commercial banks), or they may be bound to the loans. In the latter case, the amount of grant depends on the type of the borrower the grant programme has been designed for, i.e. public authority or the ESCO.

4 Practical Issues in EPC Implementation

Based on several case studies in EPC implementation performed in Croatia from 2014 to 2016, a number of advantages and barriers are identified and presented in Table 1. They are split according to the specific phases of EE project implementation as well as according to some general observations. The observed advantages and disadvantages are described from a public authority's stance as public authorities are bound by law to implement the EE measures in street lighting.

Table 1 Advantages and disadvantages of EPC from public authorities' view

Project phase	Advantages	Disadvantages
Pretendering phase	<ul style="list-style-type: none"> Public authorities are expected to prepare as many documents as possible in advance, anticipate public needs and define the scope of the project 	<ul style="list-style-type: none"> A rather complicated interference of governing regulatory and by-regulatory acts Timing caused by administrative and fiscal reporting rules
Tender preparation phase	<ul style="list-style-type: none"> Technical assistance funded from the EU/IFIs for preparing tender documentation is available The criteria for evaluating the ESCOs' bids need to be prepared and disclosed in advance 	<ul style="list-style-type: none"> Technical knowledge of public authorities with regard to defining technical scope of the project, preparing tender documents and setting the criteria for tenderer selection is limited Reliance on available grant programmes Long decision-making process by public authorities which raises the transaction costs of project implementation A tendency of public authorities to prefer lower price bids
Tendering phase	<ul style="list-style-type: none"> Transparency of public authorities towards the ESCOs Flexibility to contract whatever type of energy service ranging from design to operation of street lighting Strict fiscal rules are avoided 	<ul style="list-style-type: none"> High administrative requirements towards the tenderers A lengthy process
Project implementation	<ul style="list-style-type: none"> Public authority remains the legal owner of street lighting equipment Public authorities are held responsible for all permits necessary for project implementation Public authorities let ESCO take over major project risks 	<ul style="list-style-type: none"> No shared saving contracting is explicitly allowed, and hence there are no incentives for the energy efficiency greater than the guaranteed ones Shared ownership over street lighting infrastructure between public authorities and utilities complicates complex project implementation Public authorities cannot choose between the preferred financial options

Source: Authors

In a *pretendering phase*, a public authority has to determine the current condition of street lighting by conducting an energy audit check. Based on this report, it has to define public needs and the scope of the project, estimate maximum affordable investment costs of the street lighting renovation and choose between various technical solutions available in the market on the public cost-benefit principle. Fiscal position of public authorities is very important as it influences the preferred financial option and thus the whole tendering procedure via traditional

or project-based financing. The mixture of governing laws and by-laws for EE is substantial, ranging from EE acts, over budgetary acts, to construction laws and ownership laws. The list of the applicable laws includes, but is not limited to:

- EPC-related regulatory framework which includes Energy Efficiency Act (OJ 127/14), Environment Protection and Energy Efficiency Act (OJ 107/03), by-law on contracting for and execution of energy service in public sector (OJ 69/12), by-law on methodology for calculating and defining a framework energy saving goal in immediate consumption (OJ 40/10) and by-law on methodology for monitoring, measurement and verification of energy savings in immediate consumption (OJ 77/12)
- Laws related to procurement of energy service: Public Procurement Act (OJ 90/11, 83/13, 143/13), by-law on drafting and handling of public tender documentation and tenders (OJ 10/12) and by-law on supervision over execution of Public Procurement Act (OJ 10/12)
- Fiscal rules: Budget Act (OJ 87/2008, 136/2012, 15/2015), State Budget Execution Act adopted in the beginning of each year (see, for instance, OJ 26/2016), Law on Fiscal Responsibility (OJ 139/2010, OJ 19/2014), economic and fiscal policy guidelines adopted for a 3-year period and by-law on the procedure for borrowing and issuing of guarantees and approvals of local and regional self-government (OJ 55/2009, 139/2010)
- Other related regulations such as Ownership Act, Utilities Act, Public-Private Partnership Act, etc.

In terms of ESCO market development, timing of public authorities' decision on EE renovation is very important. Substantial time can pass from the decision to implement the project with an ESCO as an EPC to announcing the tender in the market. Although the preparatory process of the tender is complex and time-consuming, it is, at the same time, a good experience for the public authorities as ultimate owners of the project, because it makes them aware of many aspects of project implementation and spares them time and effort during the project implementation phase. Nevertheless, public authorities are severely constrained with administrative and fiscal rules that influence project timing. If a public authority has not identified its intention to run the public procurement for energy audit until October 1 of the current year and if it cannot reallocate funds from other budgetary revenue items in the next year for such purpose, the investment into better energy service is postponed for a full calendar year. Public procurement plans are just a reflection of financial plans that need to be prepared by the public authorities and submitted to the Ministry of Finance by September 15 of the current year for the next year. Public authorities' plans include revenues and receipts presented by type, expenditures and expenses for a 3-year period, an explanation of the financial plan proposal and a development plan. Project timing may be influenced by the final decision on available grant programme award. However, the fact that public authorities applied for a grant does not necessarily postpone tender announcement as the intention of financing a part of the project costs needs just to be disclosed clearly in tender documentation together with the amount of expected funding from

grant. The latter is subject to public authority judgement as it depends on the number and quality of all projects nominated for grant funding as well as on the total available public funds for grant payment.

Tender preparation phase is the most demanding one for public authorities. This is because the public authorities must prepare and publish an EPC as part of tender documentation. Often they lack sufficient technical expertise in preparing the tender documents for procurement of the energy service and thus heavily rely on energy audits and pre-assessments of the condition of street lighting infrastructure on their area. The overall decision-making process is slow with public authorities, which is not a sole characteristic of engaging into street lighting projects but in other investment projects as well. Public authorities often “wait for somebody” to decide on something related to the tender announcement or “wait for something” such as the decision on grant availability for the designated project to determine the maximum investment cost in tender announcement. However, the technical assistance from the EU-/IFI-funded programmes is available to all interested public authorities. The financial (quantitative) and nonfinancial (qualitative) criteria for tenderer’s scoring and selection need to be prepared by public authorities in advance. However, since the value of public procurement is all-cost inclusive, the value of investment turns out to be pretty high in most cases, prolonging the project payback period. Hence, the public authorities put the highest weight to price criterion. This criterion can be both favourable and unfavourable for public authorities. The former case occurs when the price criterion relies on the whole economic lifetime of the street lighting usage (total cost of ownership approach), while the latter case occurs when the price is calculated only based on the criterion of investment payback period.

Tendering process may be very lengthy, especially if there are tenderers who appeal the final decision on ESCO selection before the State Commission for Supervision of Public Procurement Procedures. The tender process lasts 6–8 months on average. The probability for lengthening the tendering process increases proportionally with the poorly defined tender requirements. Hence, the time spent on tender preparation may be well repaid in later stages of the project contracting and implementation. It is especially true for the draft version of the EPC contract that is disclosed within the tender documentation. The general tenderer exclusion and selection criteria in public procurement often prevent the tenderers from bidding. The sense for both market demand and supply is crucial in determining the criteria for ESCO selection. For example, if there have not been any contracted ESCO projects in EE in the near past, then the range of acceptable EE projects in the reference list has to be broadened to include the similar in scope EE projects that have been realised in the market. An advantage of contracting the energy service with the ESCO is the flexibility of the public authorities to choose whatever type and scope of energy service, ranging from project design to control of operation and maintenance of renovated installations. The public authorities often exclude maintenance and operation from the energy service provision as they have long-term maintenance contracts with local vendors and as they like controlling street lighting operations themselves. Regarding fiscal constraints, it has to be noted that the total debt and debt securities issued by public authorities at all levels of government are

consolidated into the national public debt. For this reason, the central government imposed restrictions on debt issuance to local public authorities. The State Budget Execution Act, enacted on a yearly basis, discloses the total amount of the public debt at the end of the budget year, as it gives the guidelines for the maximum amount of the new debt that can be issued during the current fiscal year. A local or regional government can make long-term borrowings only for an investment financed from its own budget and approved by its representative body with a prior consent of the Minister of Finance (for investments of up to 10 million HRK, i.e. about 1.4 million euro) or with the consent of the central government (for investments of more than 10 million HRK). All borrowings and debt securities issued cannot exceed a maximum additional debt limit. The total annual liability of a local and regional self-government unit can amount to 20% of its revenues realised in the year preceding the year when the self-government unit makes borrowings. An additional limitation sets a cap for all self-government units' borrowings to a maximum 3% of all budgetary revenues realised by all self-government units in 2015 for the 2016 fiscal year (this amount typically varies between 2 and 3% depending on the fiscal year in question). According to the State Budget Execution Act, the limitation on self-governments' borrowings does not apply for projects cofinanced from the EU funds, for energy efficiency projects and for projects performed by the self-government units in the areas of special government concern. Public authorities can issue performance guarantees based on the received advances in money or assets for infrastructure projects conducted according to the joint venture on concession principles. However, promissory notes, often required by the vendors in contracts concluded with public authorities, create future obligations for the state budget and can be issued only after the approval of the Ministry of Finance.

Project implementation phase is the longest one, especially for big street lighting renovation projects. Public authorities let the ESCO bear major project implementation and financial risk while staying the ultimate legal owners of the project. Operational risk is taken by the public authorities, while other risks that may influence the size of payments and external risks that are not controlled by either contracting party are most frequently a shared responsibility. The energy performance contract obliges the public authority to obtain all the necessary permits for project implementation; hence, there are no excuses for project delay thereof. The Croatian legislation does not account for shared saving contracts, meaning that additional savings over the guaranteed ones are not valued and cannot be used for ESCO company selection. Another significant drawback is the inability of the public authorities to influence the preferred financial option(s) of the ESCO, even if such financial option(s) benefit(s) the public authorities. It often happens that the public authorities want to obtain the grant that would decrease the project costs, but the ESCO may be more prone to financing the project with its own funds as it is irrelevant to them whom the stream of payments comes from (public authorities or grant-awarding public institutions). Shared ownership over street lighting infrastructure between public authorities and utilities in charge for certain infrastructure installations may not be an obstacle in street bulb renovation but can be an issue in complex renovations of street lighting installations.

5 Conclusion

This paper gives an overview of regular and practical issues in implementing energy efficiency-targeted renovation projects in street lighting. It combines regulatory and financial approach which is very difficult to find in available literature on energy performance contracting. While regulation on implementing EPC is very comprehensive, it is yet scattered between various regulations and by-laws ranging from construction legislation over public procurement to energy laws and fiscal rules. Public authorities are, despite available technical assistance provided by EU institutions, very much left on their own to achieve demanding energy consumption reduction requirements. Public authorities need to define technical characteristics of street lighting equipment and adjust them to available budget and end-user needs. Most of them do not understand the essence of ESCO model contracting and have concerns on disobeying numerous fiscal restrictions imposed by the central government on a regular basis. There is no generic EPC contract template with a preapproved content by the governing ministries for energy and finance, which public authorities can use for the contracting and achieving their energy efficiency goals. Time-consuming public tender preparation and tendering process as well as availability of grants to fund EE projects make public authorities postpone the EE investments and wait for (central government's) grant availability. Meanwhile, old street lighting infrastructure installations do not fulfil public needs. Last but not the least, private sector is reluctant to participate in public bidding process as they find public procurement rules too rigid and too complex for a possible earning margin they can achieve if selected in the tender procedure.

In a nutshell, a lot of effort has to be invested by public stakeholders to promote EPC contracting to public authorities and simplify the procedure required for EPC contracting for the benefit of both public authorities and the private sector.

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