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ENERGY PERFORMANCE CONTRACTING IN THE EUROPEAN UNION: CREATING COMMON "MODEL" DEFINITIONS, PROCESSES AND CONTRACTS

Issue Brief

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EXECUTIVE SUMMARY

This paper offers a comparison of definitions, model procurement processes and contract document templates used in energy performance contracting (EPC).* It is intended for policy makers and building efficiency stakeholders at local, regional, national and European Union levels who are interested in EPC as a means to reduce the operating costs and environmental impacts of buildings.

A central theme of this document is that EPC is understood and used differently from one jurisdiction to the next and from one organization to the next. Most policy makers and market practitioners agree that this kind of diversity can create confusion and produce wide variations in the quality of services delivered under energy performance contracts, complicating efforts to track and compare the effectiveness of cost and greenhouse gas reductions across various markets.

Creating **standard European definitions, processes and contract models** for EPC may help to address these issues while catalyzing the European EPC market, which is far from reaching its full potential and which remains underdeveloped in comparison with the United States and, increasingly, advanced developing countries.

In that spirit, this paper examines how EPC is defined by a variety of organizations and suggests common elements for building a standard European definition. It also compares four types of procurement model processes used in Europe and the United States and analyzes the benefits of each model for building owners versus energy service companies (ESCOs). The last part of this paper compares and analyzes three energy performance contract document templates.

* **Energy performance contracting (EPC)** is a proven and internationally-recognized procurement method for reducing the operating costs and environmental impacts of buildings at low risk to property owners. Under a performance contract, an Energy Services Company (ESCO) brings its technical know-how to provide complete turnkey responsibility for a comprehensive set of energy efficiency, water efficiency, operations and maintenance cost efficiency, renewable energy, and/or distributed generation improvement measures. The ESCO manages all aspects of the project from start to finish: building audits, detailed design and engineering, business case analysis, installation, commissioning, and ongoing performance measurement and verification. Importantly, the ESCO assumes performance risk for the project in the form of a long-term financial guarantee to ensure that the projected energy, water, and operational cost savings materialize and are preserved over time.

We hope the information and analysis contained in these pages can be of use for policy makers and other stakeholders who hope to maximize the contribution of the buildings sector to the 20% by 2020 greenhouse gas reduction target set by European Union leaders in December 2008.

INTRODUCTION AND PURPOSE

Energy performance contracting (EPC) or energy savings performance contracting (ESPC) is a proven, scalable, and internationally-recognized procurement method for reducing the operating costs and environmental impacts of buildings at low risk to property owners. EPC is widely considered a cost effective means for reducing the energy and CO_2 intensity of buildings, considered responsible for 40% of global energy use and CO_2 emissions.

In the European Union (EU), EPC has been in use since the 1980s. However, due to generally low levels of awareness, confusion regarding its definition, and other documented barriers,[1] the EPC market remains under-developed in most EU countries in comparison with the United States and other markets.

This is a concern for EU and national climate policy makers, who have committed to reducing EU greenhouse gas emissions 20% by 2020 (and who have repeatedly identified efficiency improvements in the buildings sector as a cost saving, job creating mechanism for achieving those emissions reductions).[2] For example, the partners of the EU-funded Eurocontract project point to "an urgent need for common parameters for the handling of EPC with a view to procurement and budgetary issues. This encompasses also a common standpoint on definitions."[3]

Given this context and following requests by EU policy makers and stakeholders, this paper aims to provide some clarity about what EPC is, how it works, and how creating common models could lessen the confusion for building owners. It is intended for an audience that has basic familiarity with the concept of EPC but wishes to explore the issue in greater depth.

[1] Please see the Institute for Building Efficiency (2010) "Energy Performance Contracting in the European Union: Introduction, Barriers and Prospects" for an introduction to performance contracting accompanied by an overview of some of the most common barriers found in the European Union.

[2] See for example the European Union's 200 billion euro economic recovery package, launched in 2008, which identifies the buildings sector as critical for achieving job growth and emissions reductions simultaneously: http://europa.eu/rapid/pressReleasesAction.do?reference=IP/08/1771

[3] Berliner Energieagentur GmbH (2008) "Eurocontract Overview: Outlook and Recommendations."

CONTENTS AND SCOPE

Uncertainty, lack of knowledge and/or confusion is common around the:

1. **Definitions** of EPC and related terms like energy service company (ESCO);
2. **Processes** used for developing and procuring EPC projects; and
3. **Contract** provisions and terms used in EPC.

This paper deals with each of these issues in turn. It first provides, with the help of Annex I, an overview of the main EPC definitions currently in use in the EU and beyond, highlighting common elements that can help practitioners develop standardized definitions. Subsequently, four "model" procurement processes developed to accelerate EPC throughout the world are outlined and compared. Finally, three model contract templates created to drive standardization are compared, providing an overview of the main features and differences of each.

DEFINING ENERGY PERFORMANCE CONTRACTING

Toward a Universal Definition for the European Union?

There is no one commonly accepted definition for EPC. Annex I provides a non-exhaustive list of some of the definitions of "EPC," "energy service company" (or "ESCO"), and related terms, illustrating how definitions can vary considerably from one organization to the next. While definitions can and perhaps should differ slightly to account for regional differences and approaches, variations that are too pronounced can be a potential source of confusion for market actors and policy makers, and can undermine the quality of EPC services.

The purpose of this section is not to propose or promote a single definition for EPC. Rather it is to point out that there are certain elements common to most existing EPC definitions, notably:

- EPC improves building energy efficiency;
- EPC reduces operating costs;
- Upfront investments for EPC are recuperated over time through cost savings; and
- Structured project financing (optional) can eliminate need for upfront investment by the owner, while allowing the ESCO to fund construction works and recognize revenue in a timely fashion.

In addition, the following elements are frequently included within EPC definitions:

- The energy service company (ESCO) assumes performance risk for the project during construction and the guaranteed savings period;
- The ESCO provides a "turnkey" service, meaning it covers all aspects of a project, from initial audit to installment and monitoring; and
- Rigorous measurement and verification of performance (savings) is conducted by the ESCO using methodologies specified by international protocols.

Taken together, these elements can provide policy makers and other stakeholders with the initial building blocks for elaborating a comprehensive definition of EPC, one that offers market actors greater clarity and a common set of principles for assessing the quality of EPC services.

According to circumstances, such a definition may also include or be accompanied by further information about the mechanics, types, scope and other aspects of EPC, as outlined in the sections below.

Performance Risk

The contractor – usually an ESCO – assumes the performance risk for the project based on contractually agreed cost savings generated by a marked decrease of the building's consumption of energy (electricity and gas), water, operational labor, and other resources.

In most cases, guaranteed CO_2 reductions are not included in the contract. However CO_2 emissions reductions can be calculated based on the building's lower energy use.

The performance risk provision generally works according to one of the following two scenarios:

Shared Savings or Energy Efficiency Services Agreement

The building owner[4] and the ESCO or a third-party special purpose ownership and financing company agree to share the sums accrued through energy and other operational cost savings. The division of savings is contractually determined. In many cases, the ESCO will benefit from a higher percentage of savings in the first years of the contract in order to recuperate its investments in installed equipment. The building owner thus benefits from increased savings over time.

Guaranteed Savings

In this scenario the ESCO guarantees to the building owner that the efficiency improvements will lead to a certain percentage of energy savings over the lifetime of the contract. Details are, once again, contractually determined on a case-by-case basis, but in all cases the ESCO is obliged pay the owner for any shortfall in the amount of guaranteed savings. The shortfall – should it occur – is revealed during regular measurement and verification (M&V) of the project's performance.

[4] "Building owners" is an umbrella term and can include private entities such as companies, as well as public entities such as hospital management boards, public school and housing authorities, municipal, regional and national governments, and international and inter-governmental organizations.

Financing Energy Performance Contract Projects

The ESCO's assumption of risk and the associated guarantee provisions open up several attractive options for financing the upfront investment required to undertake the retrofit, for example:

1. Owner financing (the building owner pays);
2. ESCO financing (the energy service company pays and retains asset ownership);
3. Third party financing (a third party financier provides a loan or services agreement and assumes credit risk and risk of non-payment);
4. A third party entity or fund pays for the investment;
5. Governments or utilities provide full or partial funding through grants, loans and/or fiscal incentives; or
6. Some combination of the above.

With the exception of owner financing, all of the other options mean that the building owner is not required to make any significant upfront investments. Rather, the cost of the retrofit project is spread over the financing term[5] so that the project can (essentially) be paid for out of operating budget savings—which result from the guaranteed reduction in the building's energy, water and other operating costs.

[5] Performance contract lifetimes are usually longer than financing terms and usually range between 7-20 years. Currently in Europe, banks prefer financing terms between 3 and 10 years. Financing terms are often – but not necessarily – slightly longer than the simple payback period for the project if it wasn't financed.

Energy Supply versus Energy Performance Contracting

Energy supply contracting (ESC) differs significantly from EPC. In EPC, demand side building efficiency investments are recuperated over time through cost savings. In contrast, energy supply contracting, as the name suggests, refers primarily to the *supply side provision* of heating, cooling, electricity, steam, compressed air, or other forms of useful energy in an efficient manner. In addition, ESC providers such as utilities generally do not assume the kind of project performance risk that is a central feature of EPC.

Despite these demand versus supply side distinctions, the term "energy supply contracting" has been used in some European countries to describe a demand side service that is essentially identical to EPC. In most countries, however, energy supply contracting is commonly understood to apply primarily to efficient supply side energy provision rather than to demand side energy efficiency improvements.

Power Purchase or Energy Services Agreements

That being said, energy performance contracts may include **power purchase agreements** (PPAs) or **energy supply services agreements** (ESAs) whereby the building owner agrees to purchase *all* heat, cooling, and/or electricity output produced from the ESCO- or third-party-owned assets and building improvements at a contractually determined price (fixed or indexed) per unit of output delivered.

PPAs and ESAs are commonly limited to decentralized, on-site renewable energy sources, district heating, and/or co- and tri-generation facilities. Thus, they differ significantly from an **energy supply guarantee** offered by a large energy company, utility or other energy network operator that delivers energy produced by coal, nuclear, large scale renewable, or other centralized sources and makes guarantees of reliability and/or maximum cost.

Defining ESCOs

As Annex I illustrates, there is no single definition for "energy service company," or "ESCO."

However most traditional ESCOs share important features that differentiate them from utilities, energy supply companies, and other entities in at least two ways:

- Their product and service offering is based primarily on demand side energy efficiency rather than on supply side energy delivery, and;
- A significant portion of their business model is based on the assumption of performance risk for equipment installed or services delivered, whether through EPC or other means.

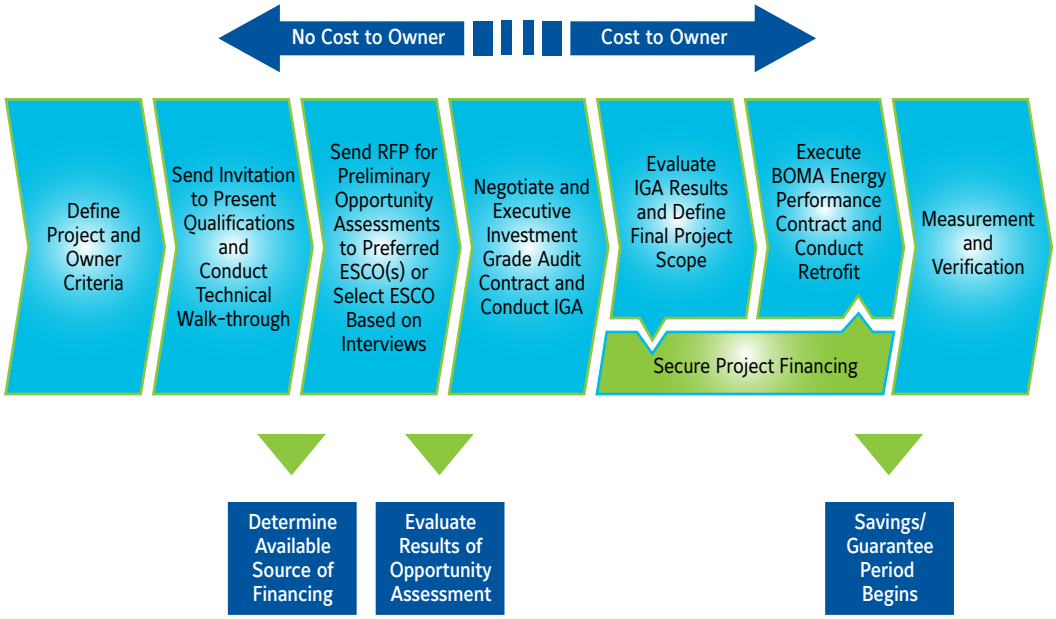
MODEL PROJECT DEVELOPMENT AND PROCUREMENT PROCESSES

In addition to the lack of a common definition for the term "energy performance contracting," another source of confusion is a wide variation in the processes by which building owners work with ESCOs to procure and develop projects. One important step toward enabling growth in use of the EPC model in Europe is to build widespread familiarity with a common process for EPC project development and procurement. As this section will illustrate, divergences in how EPC is defined are reflected in the diverse **model processes** that are promoted for developing, purchasing, and implementing EPC projects.

Building Owners and Managers Association and Clinton Climate Initiative Model

The US Building Owners and Managers Association (BOMA) and the Clinton Climate Initiative (CCI) released a EPC toolkit in 2009 that included a model project development standard. The BOMA/CCI process can be broken down into seven steps.

Figure 1. BOMA/CCI Project Development Process[6]



[6] Building Owners and Managers Association International, Clinton Climate Initiative (2009) "BOMA Energy Performance Contracting (BEPC) Model Program Overview." Available at http://www.boma.org/SiteCollectionDocuments/Org/Docs/About%20BOMA/BEPC/BEPC%20Overview%20020909.pdf

Let us examine each step in turn. The property owner or contracting authority begins by defining project criteria. Competing ESCOs are then invited to present their qualifications and capabilities for pre-selection. Providers who are short-listed are invited to submit more detailed proposals, requiring the completion of a so-called preliminary opportunity assessment, which are helpful as they allow the owner/operator and the ESCO to preliminarily assess project scope, costs and savings so as to enable all parties to obtain appropriate buy-in from key decision makers. Guided by the project goals and criteria established by the owner/operator, these Preliminary Opportunity Assessments are best estimates based on the ESCOs' experience and expertise, but do not have guarantees behind them. The competing ESCOs' proposals are evaluated based on proposed solutions, technical approaches, economic return on investment (ROI), project management and delivery methodology, and past service performance, as well as terms and conditions.

Notably, only one ESCO with the most attractive proposal and qualifications is selected as the prime contractor with whom the building owner goes on to negotiate a project development agreement (PDA). A critical part of such a PDA is an investment grade audit (IGA). While an IGA is costly, it provides critical additional measurement, analysis, opportunity verification, and due diligence. Completion of an IGA thus provides the ESCO with a much greater level of certainty about project costs and expected savings. Under most PDAs (also known as IGA contracts), the owner agrees to pay the cost (as fixed cost or percentage of total project cost) for the ESCO's completion of the IGA in the event that the ESCO proposes a project that meets the owner's defined criteria *and* the owner decides not to proceed with project implementation (a so-called "walk-away fee").

Following completion of the IGA, the ESCO proposes a performance contract with a detailed final scope of work, schedule of payments, forecast of guaranteed energy savings, and measurement and verification plan. Under the BOMA/CCI model process, the ESCO must provide a guaranteed maximum price (GMP) for the recommended project through transparent pricing, including a breakdown of labor cost, material cost, margin, and cost savings for the project by type of measures or even by energy conservation measures. Under CCI's gain sharing provision, any reduction of final project cost below GMP is to be shared between the ESCO and the owner in a negotiated split.

The BOMA model process diagram suggests that the building owner arranges financing following completion of the IGA. However, it is more likely that project financing would be secured when the owner selects an ESCO after the preliminary opportunity assessment phase (e.g., upon owner issuance of a letter of intent), since this is when material costs start to be incurred.

Finally, the building owner must decide whether to proceed with the performance contract with the selected ESCO. Once the contract is signed, work begins and improvement measures are implemented. The "performance phase" begins upon or during project completion, whereby the ESCO provides measurement and verification services to assure savings materialize, generally over a 10-20 year period.

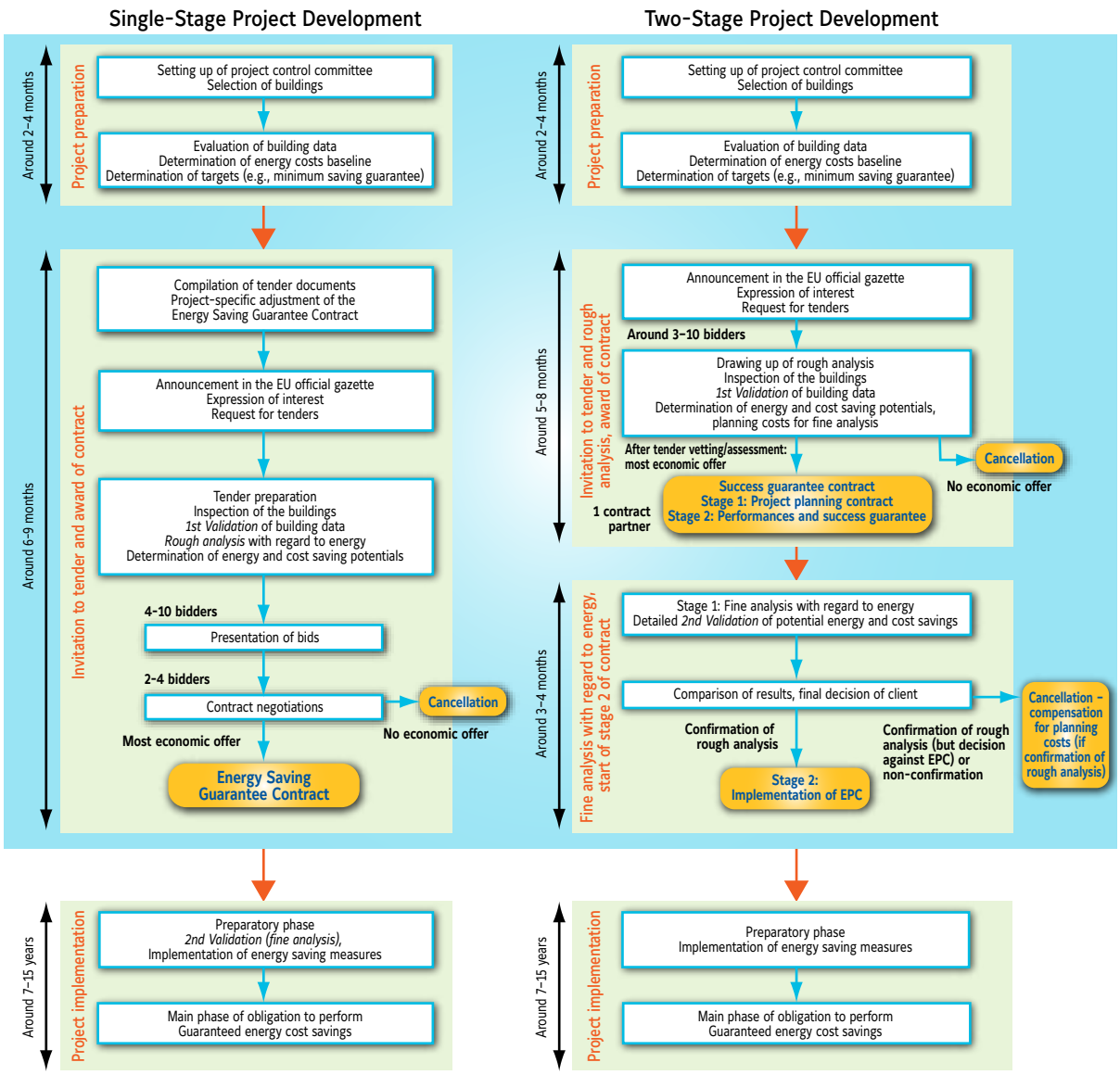
Eurocontract

Eurocontract was an EU-funded project that ran from 2005 until the end of 2007. Its mandate was to accelerate the market for energy services in Europe through promotion and the further development of EPC schemes in Europe including:

- Establishment of a European EPC platform
- Development of innovative Energy Services and financing solutions
- Investigations concerning quality standards and certification for Energy Services
- National work packages with model contract development, pilot projects and other activities

Eurocontract project partners included the Berlin Energy Agency, the Austrian Energy Agency, and several other organizations. The Eurocontract model allows for two different procurement processes: **single-stage** or **two-stage**.[7]

Figure 2. Eurocontract Project Development Models[8]



[7] The single-stage model is based on a PC model and guidelines developed by the Berlin Energy Agency on behalf of the State of Hesse, Germany (the "energy saving guarantee contract"), whereas the two-stage model is based on the "success guarantee contract" developed by DENA, the German Energy Agency.

[8] Intelligent Energy Europe (2008) "Eurocontract EPC Project Development Models and Course of the Negotiation Procedure."

Single-Stage Model

Under the single-stage model, which is common for simple buildings, building owners prepare the project by compiling and evaluating all necessary building data, determining the energy cost baseline of a given reference year, and performing rough analysis of the energy and cost savings potential. The building owners then issue an invitation to tender that forces the prospective contractors to provide an energy savings guarantee based only on the building data prepared by the owner and on a rough analysis (performed by the ESCO). From these, the owner will select bids and negotiate a contract.

The single-stage model requires sufficient detailed upfront preparation work on the part of the building owner to provide all necessary information to the ESCOs. It is intended to result in more competitive bidding among ESCOs and lower costs for the building owner.

Two-Stage Model

This model is generally intended for more complex buildings. The first steps are similar to the single-stage model in that the building owners gather data and assess savings potential. Subsequent steps, however, resemble more closely the BOMA/CCI project development model, which includes a project development agreement and an investment grade audit: the selected ESCO must provide a "fine analysis" to verify the project cost and possible cost savings potential prior to finalizing and executing the performance contract. If the results of the fine analysis confirm the savings potential determined through the rough analysis phase, the property owner can either order project implementation to begin or can decide against implementation. If the work is not ordered, the owner is required to pay the contractor for the fine analysis (based on the costs agreed in the planning contract).

Graz Energy Agency / Berlin Energy Agency / Austrian Energy Agency: *Comprehensive Refurbishment of Buildings with Energy Services*

In addition to their work on the single- and two-stage models as part of the Eurocontract project, the Graz (Austria), Berlin and Austrian energy agencies have also developed models to facilitate the use of EPC not only for improvements of building systems (lighting, temperature controls, cooling/heating systems, etc), but also for **building envelope improvements** (replacement of insulation, windows, etc).

It is noteworthy that the development of such models is complicated by EU public procurement laws, which place limits on the ability of public and private authorities to procure significant construction works, which are often required for building envelope refurbishments, due to the "nature of or risks associated with the delivery of [construction] services."[9] This prevents building owners from negotiating the terms of a building envelope performance contract with bidders in the kind of ongoing, multi-step negotiated procedure that ESCOs prefer, as outlined in the Eurocontract or BOMA/CCI models.

[9] Ibid.

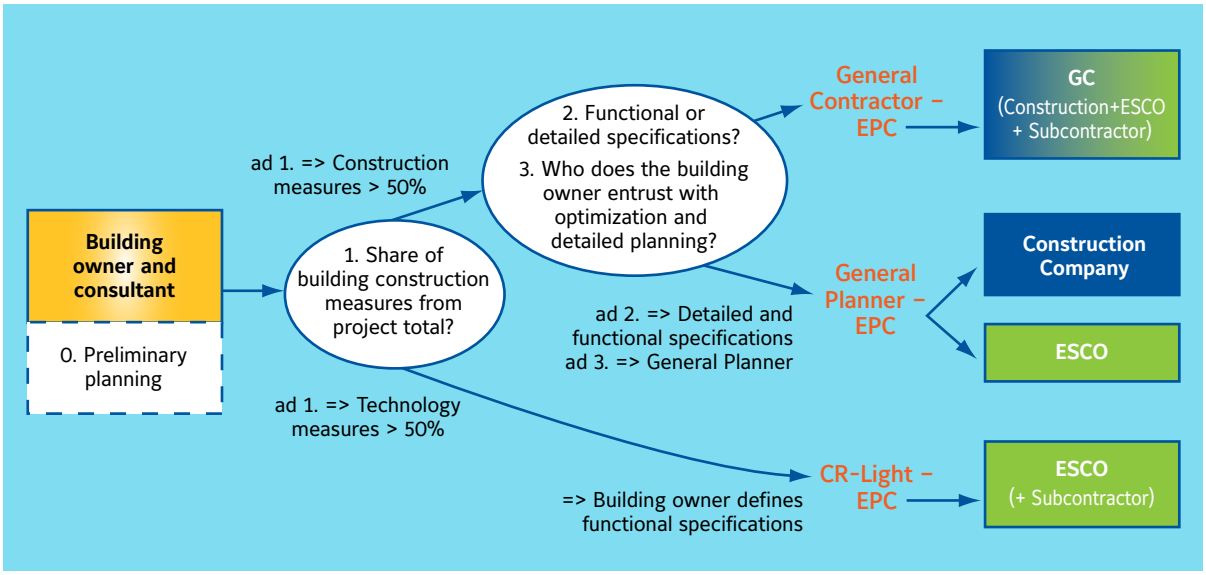
A negotiated procedure is the exception rather than the rule for building envelope works. When this kind of procurement method is used, it is subject to the following perquisites:

- The bidder must be allowed sufficient freedom of scope in formulating a proposal whereby a minimum of 50% of the project cost must be subject to negotiations;
- Tender documents must be formulated as functional specifications defining performance requirements and framework conditions (as opposed to detailed specifications); and
- The negotiated procedure must allow negotiations both for the bidder and the contracting authority.

Historically, typical ESCO projects that consist of a limited number of equipment-specific facility improvement measures are able to meet these requirements. However, as the industry shifts to performing more comprehensive and integrated whole building renovations that achieve deeper levels of energy savings through measures such as building envelope improvements, customers seeking to procure using an EPC may struggle to comply with these laws.

In order to allow flexibility in overcoming this barrier, the three agencies propose three different models known as: "General Contractor (GC)," "General Planner (GP)," and "Comprehensive Retrofit Light EPC (CR-Light)." All three models, outlined in the following flow diagram, meet the procurement obligations for public contracting authorities and can therefore be applied in both the public and private sectors.

Figure 3. Three Models for Incorporating Comprehensive Refurbishments[10]



[10] Ibid.

For projects where construction measures such as the refurbishment of facades, windows, insulation, or passive shading comprise greater than 50% of the total project cost, building owners may use either the GC model or the GP model. Under the GC model, the building owner provides functional specifications (rather than detailed specifications) and all services, including the energy savings guarantee, are contracted to a general contractor.

In comparison, the GP model allows the building owner to specify detailed solutions of the refurbishment measures, and the general planner conducts multiple tenders: one for construction measures on the basis of detailed specifications, and one where typical ESCO projects are tendered with functional specifications.

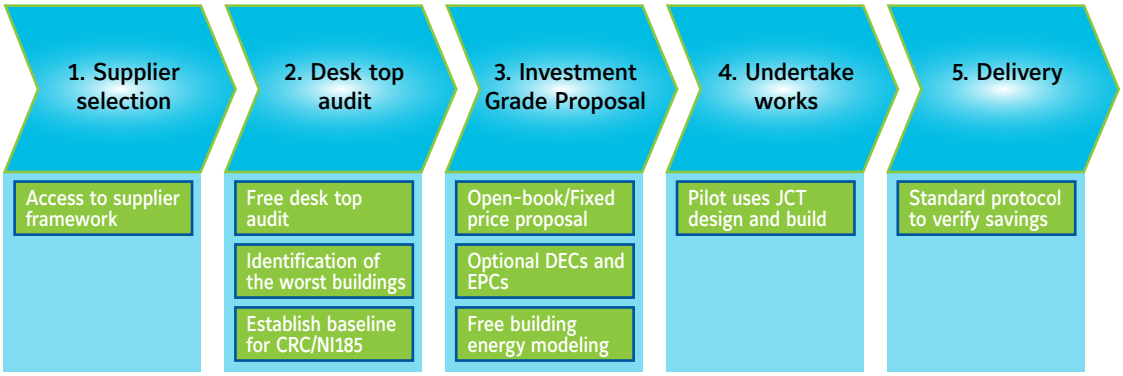
When the cost of construction works is less than 50% of the total project cost, projects can go forward using a standard performance contract awarded directly to an ESCO. Under this "CR-Light" model, the building owner can define detailed specifications for the construction works for the tendering process.

London Development Agency RE:FIT Program

The RE:FIT program (formerly the Building Energy Efficiency Programme, or BEEP) is managed by the London Development Agency (LDA) as part of the Mayor of London's target to reduce the city's CO_2 emissions 60% by 2025. Energy efficiency retrofits are an integral part of RE:FIT, which uses an EPC model process that attempts to "streamline" supplier selection and contracting.

In an attempt to help building owners – in this case, specifically, public sector authorities – the RE:FIT program first establishes a pre-approved pool of ESCOs that have contractually agreed to provide a certain number of pre-defined project deliverables. In other words, before any tendering and bidding starts, the RE:FIT program narrows the field of possible ESCOs and sets a minimum benchmark of services that must be delivered by those ESCOs.

Figure 4. London Development Agency's RE:FIT Process[11]



Building owners, who must prepare a project brief that provides basic building data and indications of desired savings, then run a 'mini-competition' between approved ESCOs. Depending on the preference of building owners, ESCOs may be asked to provide either a desk top audit or a more comprehensive investment grade audit. Once an ESCO has been selected, work is then executed and performance measurement and verification is conducted on an ongoing basis according to the International Performance Measurement & Verification Protocol (please refer to Annex II).

PROCESS COMPARISON

Each of the models presented above has advantages and disadvantages from the perspective of buildings owners and ESCOs. These are examined here in turn.

ESCO Perspective

In general, the BOMA/CCI model process results in the lowest level of risk to the ESCO, because both Eurocontract processes force competing vendors to submit *binding offers* and energy savings calculations based only upon the building owner's data sheets and the owner's or the ESCO's rough analysis.[12] The BOMA process allows for additional due diligence, following the competitive RFP stage, so that ESCOs can better manage risk and can develop projects with more aggressive energy savings guarantees, and thus greater ESCO revenue per project. On the other hand, the Eurocontract model saves the ESCO time by not requiring the presentation of an investment grade audit to the customer.

The BOMA and Eurocontract two-stage models reduce risks for the ESCO because the investment grade audit or fine analysis costs are covered under the contract. More importantly, the opportunity cost risk of undertaking substantial upfront planning and design work is lower because the detailed engineering work is completed only after a single ESCO has been selected by the customer. On the other hand, the one-stage model does lead to faster sales cycles, remuneration, and improved cash flow for ESCOs.

The comprehensive refurbishment models allow ESCOs to grow project size by targeting deeper levels of energy savings and a broader scope. However, if refurbishment costs exceed 50% of total project cost, the ESCO typically loses the opportunity to serve as the prime contractor and interface with the customer. Finally, some ESCOs may express unwillingness to meet the pricing transparency terms set forth in the BOMA/CCI model process.

[11] Simpson-Jones, R. (2010) "Introduction to the Building Energy Efficiency Programme," London Development Agency.

[12] Kuhn, V. (2009) "Summary and Comparison of Different EPC Development Approach Models" Draft paper for Clinton Climate Initiative's discussion with European ESCOs.

Building Owner Perspective

Due to the amount of preparation, analysis, and scope definition that is required of the building owner, the Eurocontract model process is more onerous early on for building owners. However, building owners may benefit from lower costs that result from the competitive bidding process included in both Eurocontract models. On the other hand, using the Eurocontract processes may result in shallower energy savings and an upward pressure on prices because ESCOs lack the certainty provided by investment grade (fine) analysis.

Both the BOMA and Eurocontract models promote strong competition for creative ideas and solutions among vendors, in comparison to other processes being promoted that narrow the competition to as few as two bidders prior to the RFP response phase.[13] While the BOMA model does include some level of pre-selection based on qualifications, the owner can invite as many firms as it chooses to submit proposals, in order to maximize the number of innovative new ideas.

The BOMA/CCI model also results in some attractive benefits for the building owners by requiring transparent pricing with a guaranteed maximum price, and gainsharing of any cost reductions identified later in the project design process. Combining the CCI model with the LDA's RE:FIT (BEEP) Program, building owners will also benefit from lower transaction costs as the result of scale economies.

Building owners will benefit from models that allow for comprehensive refurbishment as part of energy performance contracting. Such building improvement measures are necessary to undertake more integrated, "whole-building" retrofits that result in deeper levels of energy savings at lower cost. If such opportunities are passed up, buildings may become "locked in" to a certain energy performance level. Reaching deeper levels of savings is not cost-effective until the next major wave of infrastructure renewal. Ideally, any model EPC processes should allow for comprehensive "deep" retrofits that include building envelope and/or tenant space improvements.

[13] Legal interpretations suggest such a process does not meet Europe's public procurement requirements.

Toward a Model Procurement Process for the European Union?

As the previous descriptions illustrated, there are some variations in the model processes that have been promoted for building owners to work with ESCOs to develop and procure EPC projects. Practitioners suggest that greater alignment of the processes for EPC project development and procurement would be beneficial for growing the EU market. Developing an EU model process for ESCO selection, procurement, and project development, for example, could help the thousands of building authorities and owners across the EU to navigate the EPC process with greater ease.

It is important to emphasize that any EU standard model process need not come at the expense of regional and local variations. However, such a pan-European standard model process could provide a common framework to simplify purchasing and hasten sales cycles and implementation.

The model project development and procurement processes listed in the previous sections could offer building blocks for an EU model process. But which elements are appropriate for such a model? Clearly, each procurement process differs in the assignment of roles, responsibilities, and risks between building owners and ESCOs. Each process has its own benefits and drawbacks. To help assess the value and applicability of each for building a model process, we propose several guidance questions:

- Who is responsible for the preliminary audit, preparation analysis, and project scope definition?
- Are bidders pre-selected?

- Do ESCOs compete based on proposals or binding offers?
- At what point does the customer select an ESCO and how reversible is that decision?
- Must investment grade audits (fine analysis) be conducted by ESCOs at risk (during competition phase) or under a project development agreement after vendor selection?
- Do building owners provide detailed specifications or functional specifications?
- Does the process allow for comprehensive building envelope refurbishment and "construction works" measures for which the building owner prefers to provide detailed specifications?
- How transparent is pricing?
- Is the ESCO's risk assumption method specified (e.g., guaranteed savings vs. shared savings)?

It is beyond the scope of this paper (and its authoring organization) to recommend the exact set of elements that should be included by policymakers in a model EPC development and procurement process in the EU. However the information contained in this paper could form the basis for discussions between stakeholders – public and private sector building owners, ESCOs and policy makers at various governance levels – that could lead to the development of such a model.

MODEL CONTRACT COMPARISON

In addition to reducing ambiguity in process, building owners and ESCOs could benefit from standardization toward a common model EPC contract document template that could be used and tailored in countries across Europe. Several model contracts have been developed and promoted for the EPC market. As the European Commission considers the promotion of a standard model contract document, it is helpful to understand the differences, advantages, and disadvantages of three model documents that have been created to date throughout the world by the Energy Services Coalition, BOMA/CCI and Eurocontract.

These model contract templates differ in many ways. Table 1 compares how four of the most important provisions are treated by these three models:

1. Payment Processes and Schedules
2. Financing Terms and Requirements
3. Measurement and Verification (M&V)
4. Termination

Table 2 compares additional contract topics, provisions, or clauses that differ across templates.

Table 1. Comparing Model Energy Performance Contract Provisions

Payment Processes, Schedules, Terms and Recourse	
ESC	*Remuneration* · Allows for guaranteed savings or shared savings models. · All materials, labor, design, engineering and related paid up front. · Services including maintenance and monitoring of equipment paid on ongoing basis. *Timing of Payments* · ESCO must commence construction of the project not later than 30 days after execution of contract. · Commencement of the performance guarantee starts on first day of the month after the month of completion of the measures. · Under shared savings model, all realized savings accrue to customer during interim period between start of construction and completion. · Payments to ESCO for construction may be made on a "percentage completed" basis, subject to negotiation. Customer will withhold 10% of each payment until project is complete. · Customer pays ESCO for M&V services annually, the total cost of which must be lower than the guaranteed cost savings. Customer must always be cash flow positive in this contract. · Late payments will accrue interest at one percent per month. *Surplus/Deficit* · In case of deficit (lower realized cost savings than guaranteed), ESCO must make pay the shortfall. Any savings realized beyond the guarantee (surplus) is retained by the customer. · Customer and ESCO may also opt to sign a shared savings agreement whereby savings are divided between the parties. *Allowable Savings Sources* · The following sources of savings will be measured on an ongoing basis: energy use, water use, materials/commodities use, and external labor fees. · The following sources of savings must be negotiated: customer equity cash outlay, deferred maintenance, avoided future capital cost, internal labor. *Term of Performance Guarantee* · Three years of performance guarantees, with customer options for each subsequent year, with contract years ranging from 12–25 years subject to negotiation. *Pricing* · ESCO must provide complete pricing transparency for all materials, labor and services provided, where all costs are shown and a fixed percentage markup applied. The total cost of the project may not be increased, but if less labor and materials than budgeted are needed, the customer can expand the scope of work to true-up to the total cost agreed upon in the contract. *Environmental Incentives* · This contract calls for the ESCO to enter into a demand side management program to sell the avoided energy back to the utility, subsidizing the total cost of the project to the customer.

Table 1. Comparing Model Energy Performance Contract Provisions (continued)

Payment Processes, Schedules, Terms and Recourse	
BOMA/CCI	*Remuneration* · Allows for guaranteed savings or shared savings models. · The total contract sum is the sum of all of the work performed except for Performance Tracking Services, that contract's term for measurement and verification (M&V). The Performance Tracking Services are billed out according to a negotiated schedule. *Timing of Payments* · Option for an incentive fee to be paid to the ESCO for completing the construction early, as well as an option for damages to be collected by customer due to late completion. · ESCO may get paid based upon percentage of work completed, through an escrow account if a third-party financier is used, or ESCO can elect to share the savings during the installation period. · There are two options for use of savings generated during the interim period. One option allows all savings to accrue to the ESCO. The other option shares savings between the two parties. · Customer may retain 10% of payments until the project is 50% complete, and afterwards may retain 5% until final completion. · ESCO may suspend work after 10 days of non-payment following a 30 day window in which customer can pay. *Surplus/Deficit* · Any deficit must be paid to the customer, and any surplus can be used to offset a deficit in the immediate year after, but any surplus that rolls over more than one year accrues to customer. *Allowable Savings Sources* · Energy saved will be measured on an ongoing basis. · Any other types of savings (water, avoided capital cost, labor etc.) may be negotiated by the parties. *Term of Performance Guarantee* · As negotiated. *Pricing* · ESCO must prepare a schedule of values for the cost of work upon which it can add a percentage contractors' fee. In submitting change orders, the ESCO must submit itemized accounting of its actual costs, plus the agreed upon margin to determine the contract adjustment sum. *Environmental Incentives* · Customer has the right to all environmental incentives (grants, rebates, offsets, etc.) that are generated by the project.

Table 1. Comparing Model Energy Performance Contract Provisions (continued)

Payment Processes, Schedules, Terms and Recourse	
Eurocontract	*Remuneration for the ESCO* · Assumes a shared savings agreement between both parties whereby percentage breakdown of the savings is negotiated between the parties. · ESCO is paid a separate percentage savings if performance target is exceeded. *Timing of Payments* · ESCO is paid on a monthly basis a negotiated amount in anticipation of savings achieved. Any additional ESCO claims for payment exceeding the performance guarantee is subject to review and approval by the customer. · ESCO shall also provide collateral equal to 5% of total project cost no later than 30 days after the commencement of the contract. *Surplus/Deficit* · A deficit in savings relative to expected savings shall partially/wholly offset ESCO's fee (fraction of savings). · A surplus is shared between the two parties according to a negotiated percentage breakdown. *Allowable Savings Sources* · ESCO is remunerated for savings calculated upon reductions in either energy consumption and/or power demand, based on contractually agreed upon reference prices: tariff at the end of the baseline year, current tariff, or an assumed tariff escalation schedule. In other words, adjustment calculations are made for changes in energy prices, climate, or building utilization for the settlement period to ensure that only those savings directly attributable to the ESCO's improvement measures enter the performance calculation. *Term of Performance Guarantee* · The start of the performance guarantee shall be determined by mutual agreement of both parties and continue until a negotiated termination date. *Pricing* · Cost transparency is required for equipment to be installed even though fees are based on shared savings model.
Financing Terms and Requirements	
ESC	*Assumes ESCO provides equipment through third-party financier as outlined in a separate lease agreement.* *Customer may also opt to pay any portion of initial project cost up front, remainder funded by third party.* *Provides guidance for altering payment schedule if third-party financing involved.*
BOMA/CCI	*Customer pays for work using either own funds or third-party financing.* *Stipulates that terms of the contract will not take effect until the customer financing is secured, and any necessary escrow accounts are funded.* *Subordinates all liens or security interests to the financing parties, and stipulates that the ESCO must provide those parties with all necessary documentation (i.e., invoices, affidavits, certificates, etc.) also furnished to the customer.*

Table 1. Comparing Model Energy Performance Contract Provisions (continued)

Financing Terms and Requirements	
Eurocontract	*Does not contain any clauses relating to financing since ESCO is responsible for financing energy saving measures and equipment.*
Measurement and Verification (M&V)	
Please also refer to Annex II for an overview of different M&V methodologies.	
ESC	*Baseline Measurement* · Energy bills from the customer 24-36 months prior. · Plus combination of metering, billing analysis, and engineering calculations (including simulation) individually or in combination, subject to negotiation and mutual agreement. · Adjusted on annual basis to control for "prevailing conditions" (weather, billing days, occupancy, usage, etc.) *Ongoing Savings Measurement* · Customer provides energy bills to ESCO every month/quarter/year (schedule negotiated). · Recommends using some combination of the four IPMVP methodologies for ongoing M&V of the performance of retrofits, depending upon the type of retrofit installed and the preference of the parties.
BOMA/CCI	*Baseline Measurement* · Energy use baseline determined based on energy usage pattern over one year, controlled for facility use, weather and other factors. Appropriate algorithm provided in contract. *Ongoing Savings Measurement* · Mix of IPMVP Options A, B and C (see Annex II) may be used to measure the energy savings. The degree to which these different methodologies are used is subject to negotiation.
Eurocontract	*Does not use IPMVP.* *Baseline Measurement* · Baseline calculated by mutual agreement between customer and ESCO relative to a reference calendar year. Energy use of reference year based on net energy price after taxes. Customer assumes risk of tax increases. Energy use calculated differently depending upon fuel type and contract. Certain lump sum supplies (i.e., district heating) and period invoiced supplies (i.e., low-medium voltage electricity) are calculated independent of weather adjustments, and a third category of consumption-invoiced supplies (i.e., natural gas) are adjusted for weather. · Baseline subject to adjustment at the mutual agreement of the parties. *Ongoing Savings Measurement* · Performance guarantee from the ESCO guarantees a savings of a certain amount of Euros below the baseline measurement period settlement period. · Savings are calculated by measuring whole building energy use and adjusting for certain factors over which the ESCO has no control (e.g., changes in calorific value, heating curve), then adjusting for changes in the price of energy, changes in climate, and changes in utilization.

Table 1. Comparing Model Energy Performance Contract Provisions (continued)

Termination	
ESC	*Barring force majeure, neither party has the right to terminate the contract without cause. The contract may be terminated by the relevant parties according the guidelines below:* · Termination by ESCO due to following actions by the customer: – Any payment to ESCO left unpaid for over 30 days after notification by ESCO – Any other failure to live up to terms of contract, if uncured after 30 days – Any false or misleading warranty or representation in this contract – Entrance of the customer into bankruptcy or involuntary assignment due to liquidation · Termination by the customer due to following actions by ESCO: – Violation of Standards of Comfort not resolved after 7 days notice – Any false or misleading warranty or representation in this contract – Failure to install promised equipment by the scheduled date – Any other failure to live up to terms of contract, if uncured after 30 days – Any lien or other encumbrance on equipment not removed after 30 days – Entrance of ESCO into bankruptcy or involuntary assignment due to liquidation – Failure to pay the customer any amount due under this contract
BOMA/CCI	*Termination by Customer* · Customer may terminate if terms in this contract are violated and left uncured for 30 days. · Customer may also terminate the contract for convenience and without cause, for which customer must give 10 days written notice. *Termination by ESCO* · ESCO may terminate contract with 30 days written notice if any payments from the customer are not paid according to payment schedule.
Eurocontract	*Neither party shall have the right to terminate the contract for convenience.* *Both parties have a right to terminate for an "important reason," which may be repeated violations of the terms of the contract regarding "quality" and/or "transparency" criteria that go uncorrected after an "extension of time," or if a warning notice does not elicit a response.* *If one party does terminate legitimately due to the behavior of the other party, terminating party is entitled to damages.*

Other Relevant Clauses

In addition to the four key contract provisions compared across the three model contract documents in the preceding table, there are a number of other clauses of significance that may differ across model EPC contract document templates.

Table 2: Other Relevant Contract Clauses

Aspect	Description
Dispute resolution process	Quality and timelines of work, safety and compliance and other factors may give rise to disagreements between parties. A mutually agreed upon dispute resolution process may be useful for establishing clarity around the timing, location and mediation steps of the dispute resolution processes.
Assignment of tax and compliance responsibility	All parties to the EPC must determine who is responsible for obtaining all permits and pursuing all other compliance measures necessary to perform the retrofit. Additionally, all parties must agree on who will bear the cost of taxes incurred as a result of the project.
Documentation and reporting requirements	Contracts place varying degrees of responsibility on the ESCO to provide documentation of its work. Some examples of differences in expectations around documentation are: degree of detail present in all construction plans and retrofit measures, detail of reports updating customer on progress of construction, ownership and usage rights for all plans, drawings and specifications, reporting requirements to third-parties (i.e., financiers).
Public relations obligation of the ESCO	Some contracts require the ESCO to engage with the customer over a specified period of time in any public relations and marketing efforts that the customer chooses to pursue. This places an added onus on the ESCO, so parties must agree on the extent of this burden.
Warranty	All parties to the contract must agree on the length and terms of the warranty period.
Indemnification	Parties must agree on the extent to which they will indemnify each other against third-party claims relating to safety/injury and the limitation of liability with regard to those claims.
Insurance	All parties must agree on minimum amounts and limits to various types of insurance required by the project.

Recommendations for Strengthening Existing Work on a European Model Contract

Creating a standard, yet customizable, EPC contract template would streamline project development, reduce confusion for building owners, contractors, and financiers, and would generally help to stimulate the building retrofit market in Europe.

The work completed by the Eurocontract consortium made good progress along these lines: he Eurocontract model contract documents provide a foundation for building standard contract structures, provisions, and definitions. However, as illustrated by the contract comparisons presented throughout this section, there are opportunities for improving this model contract document.

First, the contract should be modified to allow for a wider range of financing and ESCO remuneration options from which building owners can select when entering into an energy performance contract. The shared savings model is only one method of amortizing project payments over the lifetime of the guaranteed savings term. The model contract should also allow for the guaranteed energy savings EPC model. Second, the contract model should allow for a broad variety of cost savings streams including other operational cost savings beyond energy savings. Third, it is recommended that measurement and verification be governed by International Performance Measurement and Verification Protocol, a well-known and accepted global standard.

These and any other improvements to the Eurocontract model should of course be made in a way that ensures consistency with a standard project development and procurement process, as described in Section IV, and contract provisions must adhere to the Europe Union's public procurement rules.

CONCLUSIONS

While the EPC market is current very limited at a pan-European level, there is a significant opportunity to catalyze its growth to full potential by creating standard European definitions, processes and contract models for EPC. Industry and policymakers must work together to build awareness of the EPC model and to develop broad familiarity with a generally consistent EPC definition and process across local, regional, national and European Union levels of government.

There are a variety of example "standards" that have been developed around the world for EPC. Eurocontract, in particular, is a useful starting point for promoting such standards across Europe, but the Eurocontract models can be broadened and improved in order to adopt best practices from other EPC models, as highlighted in this paper. There will always be a tension between building owners, ESCOs, and financiers in assuring that risks and interests are properly balanced. Achieving a successful balance is crucial for rapid market growth. Experiences in the United States, Canada, Germany, and other markets suggest that these trade-offs can be successfully managed.

An early and achievable first step in this direction is to agree a common definition for energy performance contracting (EPC) across the EU that includes turn-key project responsibility, assumption of performance risk, measurement and verification by the contractor, and includes a comprehensive set of energy efficiency, water efficiency, operations and maintenance cost efficiency, renewable energy, and/or distributed energy generation improvement measures.

ANNEXES

ANNEX 1: DEFINITIONS OF PERFORMANCE CONTRACTING AND RELATED TERMS

A multitude of definitions exist for common terms used in the energy efficiency services industry. In order to demonstrate some commonalities as well as some sources of conflict or confusion among the various definitions, several are provided here for the following terms: "energy performance contracting," "energy contracting," "energy supply contracting," "energy services company."

Energy Performance Contracting

Berliner Energieagentur GmbH (2008)

An Energy Service Company (ESCO) provides its know-how and takes on the performance risk to ensure that adequate measures are implemented and that the stipulated energy savings are achieved. The investment is refinanced through the savings achieved.

A private specialized energy service company – the so-called contractor – brings their know-how and the necessary financial means into the project. It is his responsibility to ensure adequate investments are made in the buildings and thus to guarantee the energy savings. Both partners share a handout of the cost reductions.

Ecole des Mines de Paris (2002)

Energy performance contracting (EPC) is any mechanism, in which a third party opens opportunities for energy savings in conditions where it is not spontaneous. It ranges from a financing alternative to lower the financial burden for the facility owner to a full outsourcing to reduce the yearly operational costs for energy. The dominant model is a pure service where various components are unbundled and the service company is judged (paid) on each of the unbundled components: economic efficiency in purchasing energy, technical efficiency in continuous audit and maintenance, financial efficiency in planning work on time, technical and economic efficiency in proposing energy saving projects.

European Commission (2006) "Energy Service Directive" (2006/32/EC)

Energy Performance Contracting (EPC): a contractual arrangement between the beneficiary and the provider (normally an ESCO) of an energy efficiency improvement measure, where investments in that measure are paid for in relation to a contractually agreed level of energy efficiency improvement.

Graz Energy Agency (2009)

Energy Performance Contracting (EPC), the focus is on reducing final energy consumption through demand side energy efficiency measures. The scope is extended to the entire building or enterprise including measures such as technical building equipment, user behavior or the building envelope insulation.

ICF International and NAESCO (2007)

Energy Performance Contracting (EPC) is a turnkey service, sometimes compared to design/build construction contracting which provides customers with a comprehensive set of energy efficiency, renewable energy and distributed generation measures and often is accompanied with guarantees that the savings produced by a project will be sufficient to finance the full cost of the project. A typical EPC project is delivered by an Energy Service Company (ESCO) and consists of turnkey service, comprehensive retrofit measures project financing by a third-party financing company, and a project savings guarantee.

International Energy Agency Demand Side Management Programme (2004)

Performance contracting is, in some markets, a well-established mechanism for promoting the installation of energy efficient building equipment and systems. For example, facility owners and energy service contractors use this method to retrofit equipment to save money on building operations. The savings in energy bills due to the installation of this more energy efficient equipment is then shared between the facility owner and the ESCO under the terms of the agreement they entered. In this scenario, the ESCO has taken on the project's performance risk by guaranteeing a specified level of energy savings. Its compensation for this risk is directly tied to achieving savings. The financing for such a project could come from the ESCO, the equipment supplier or a third-party company.

Johnson Controls (2010)

Energy performance contracting (EPC) or energy savings performance contracting (ESPC) is a proven, scalable, and internationally-recognized procurement method for reducing the operating costs and environmental impacts of buildings at low risk to property owners. Under a performance contract, an Energy Services Company (ESCO) brings its technical know-how to provide complete turnkey responsibility for a comprehensive set of energy/water/operational efficiency, renewable energy, and distributed generation building improvement measures, meaning it covers all aspects of the project from start to finish: building audits, detailed design and engineering, business case analysis, installation, commissioning, and performance measurement and verification. Importantly, the ESCO assumes performance risk for the project in the form of a long-term financial guarantee to ensure that the projected energy, water, and operational cost savings materialize and are preserved over time. Regular measurement and verification (M&V) of performance in accordance with international standards allows the building owner and the ESCO to make sure savings are realized and maintained over time. If cost savings are not realized as agreed, the ESCO must pay the difference to the building owner or reduce its service fee accordingly.

Lawrence Berkeley National Lab and NAESCO (2005)

In a performance contract, the Energy Services Company (ESCO) guarantees energy and/or dollar savings for the project and ESCO compensation is therefore linked in some fashion to the performance of the project.

London Development Agency RE:FIT Programme (2010)

The reduction in energy bills and the carbon footprint of buildings is achieved by appointing an energy service company (ESCO) to undertake energy efficiency measures in buildings and to guarantee a set level of energy savings. This offers a financial saving over the period of the arrangement. This transfers the risk of energy savings to be made from improvements onto the ESCO rather than the owner or occupier of the building. This is known as Energy Performance Contracting (EPC).

NAESCO, ACUPCC, CCI (2009)

Energy performance contracting (EPC) is an innovative form of contracting, developed to overcome the major barriers of delivering cost-effective energy efficiency. One of these barriers is the risk to the client that project generated resource savings may not be sufficient to provide an organization's minimum required return on capital. The key distinguishing feature of energy performance contracting is that, unlike traditional construction or services contracting, the ESCO takes on project performance risk to guarantee to the owner a minimum level of resource use reduction. Another distinguishing feature of EPC is that ESCOs provide a turnkey service. The ESCO will be the party responsible for designing, implementing, and measuring the results of an EPC project.

US State of Texas (2010)

An energy savings performance contract (performance contract) allows a political subdivision, public school, public college or university, or state agency to use the guaranteed benefits from enhanced energy or water conservation or usage improvements to pay for same.

World Energy Council (2008)

There are two main models for energy performance contracting: the shared savings model and the guaranteed savings model. Under the first model, the cost savings are shared by the ESCO and the client at a pre-determined percentage for a fixed number of years. In the guaranteed savings model, the ESCO guarantees a certain level of energy savings to the customer: this model has the advantage that interest rates are usually much lower. In contrast, in the shared savings model, the ESCO assumes both the performance and the credit risk.

Energy-Contracting

Graz Energy Agency Ltd (2008)

The physical benefit, utility or good derived from a combination of energy with energy efficient technology and/or with action, which may include the operations, maintenance, and control necessary to deliver the service, which is delivered on the basis of a contract and in normal circumstances has proven to lead to verifiable and measurable or estimable energy efficiency improvement and/or primary energy savings.

Graz Energy Agency (2009)

Energy Contracting is an integrated energy service with outsourcing of risk, interfaces and guarantees to an ESCO. The Energy-Contracting concept shifts the focus away from selling units of final energy (like fuel oil, gas or electricity) toward the desired benefits and services derived from the use of the energy, e.g., the lowest cost of keeping a room warm, air-conditioned or lit.

Energy Supply Contracting

Cofely (2010)

Energy Supply Contracting (also called Energy Contracting) is a service for the owners, administrators and users of residential, commercial, and industrial properties. The contracting provider takes over the planning and construction of energy production and distribution systems or systems for measurement and control technology, as well as the financing and operation of systems and the supply and invoicing of the finished end products, namely heat, refrigeration, electricity and other useful energies. The building owners only pay for the actual energy costs, while the contracting providers bear the costs of investment.

European Commission Joint Research Centre (2005)

Energy supply contracting (delivery contracting) is focused on the supply of a set of energy services (e.g., heating, lighting, motive power, etc.) mainly via outsourcing the energy supply.

Graz Energy Agency (2009)

Energy Supply Contracting (ESC) is the efficient supply of useful energy such as heat, steam or compressed air as contracted and measured in Megawatt hours (MWh) delivered. The business model usually includes purchasing of fuels and is comparable to district heating or cogeneration supply contracts. The scope of energy end-use efficiency measures is usually limited to the energy supply side of the building or enterprise, e.g., the boiler room. It can also be applied to energy supply from renewable sources, e.g., solar ESC.

Energy Services Company

BioSolESCO (2010), citing Paolo Bertoldi & Silvia Rezessy (2005)

An Energy Services Company (ESCO) is a professional business offering customers a wide range of energy services and the opportunity to reduce their energy consumption and related costs...In order to be characterized as an ESCO, it must have some additional features in addition to energy services:

- ESCO guarantees energy savings and/or provision of the same level of energy service at lower cost.
- Renumeration of ESCO is tied to savings achieved,
- ESCO can finance, or assist in arranging finance, for the operation of an energy system by providing a savings guarantee,
- ESCO retains an ongoing operational role in measuring and verifying the savings over the financing term.

European Commission (2006) "Energy Service Directive" (2006/32/EC)

Energy Service Company (ESCO): a natural or legal person that delivers energy services and/or other energy efficiency improvement measures in a user's facility or premises, and accepts some degree of financial risk in so doing. The payment for the services delivered is based (either wholly or in part) on the achievement of energy efficiency improvements and on the meeting of the other agreed performance criteria.

Graz Energy Agency Ltd (2008)

A company that delivers energy-contracting, energy efficiency programmes and other energy efficiency measures in a user's facility, and accepts some degree of technical and sometimes financial risk in so doing. The payment for the services delivered is based (either wholly or in part) on meeting quality performance standards and/or energy efficiency improvements.

NAESCO, ACUPCC, CCI (2009)

An ESCO, or Energy Services Company, that develops, installs, and arranges financing for projects designed to improve the energy efficiency and maintenance costs for facilities over a seven to twenty year time period. ESCOs generally act as project developers for a wide range of tasks and assume the technical and performance risk associated with the project.

Lawrence Berkeley National Lab (2007)

A company that provides energy-efficiency-related and other value-added services and for which performance contracting is a core part of its energy-efficiency services business.

World Energy Council (2008)

ESCOs, Energy Services Companies, offer energy efficiency improvement services including a guarantee of the savings. The remuneration of ESCO is linked to the projects' performance, which means that the ESCO's payment is directly linked to the amount of energy saved. The business model they use, energy performance contracting, helps overcome a number of market barriers. ESCO's usually offer the following services: development and design of energy efficiency projects; installation and maintenance of energy efficient equipment involved; finally, measurement, monitoring and verification of the project's energy savings. Financing for the investment can either be provided by the ESCO from its internal funds or by the customer, or by a third party funding (TPF), in which a financial institution allows a credit either to the ESCO or directly to its client; the loan is then backed by a guarantee for the projected energy or cost savings given by the ESCO.

ANNEX II: MEASUREMENT AND VERIFICATION METHODS

The International Performance Measurement and Verification Protocol (IPMVP)[14] provides an overview of current best practice techniques available for verifying results of energy efficiency, water efficiency, and renewable energy projects in commercial and industrial facilities. IPMVP began in 2001 as a U.S. Department of Energy initiative to develop a protocol that would help determine energy savings from energy-efficiency projects in a consistent and reliable manner. Subsequently, a nonprofit organization, now called the Efficiency Valuation Organization (EVO), was formed to maintain and update existing content and develop new content for the global protocol.

With the exception of Eurocontract, the IPMVP is used almost universally in performance contracts to provide transparency to the customer and assurance that energy and water savings are accurately and fairly counted.

Operational, maintenance and future capital cost avoidance are factored into the overall project benefits and are stipulated separately in performance contracts.

The contract models compared in this paper use one or a combination of four different measurement and verification methodologies as defined by the IPMVP:

Option A – Retrofit Isolation: Key Parameter Measurement

Measures the energy savings only from the portion of the building (or the specific equipment) that has been affected by the improvement. Some parameters may be directly measured and others estimated. For instance, for a lighting retrofit, the power draw of the light may be measured directly, but hours of use might be estimated.

Option B – Retrofit Isolation: All Parameter Measurement

Similar to Option A except there is no estimation. The energy use of all installed energy efficiency measures are measured directly, as in the case of larger pieces of equipment, which may be sub-metered.

Option C – Whole Facility

Energy savings are determined by looking at the energy use of the entire facility or sub-facility level through utility metering. This is compared to the baseline to determine savings of the energy efficiency measures. This may be done when certain energy efficiency measures, like insulation, affect an entire building and cannot be accurately measured on a smaller level.

Option D – Calibrated Simulation

Energy savings are determined through simulation of the energy use of the whole facility or of a sub-facility. The simulation model is calibrated using short-term hourly or monthly utility billing data. Actual energy performance is modeled and compared to the baseline model (e.g., a model of a code compliant building). This option is most commonly used for new construction or major renovation projects with significant "interactive effects" among improvement measures.

[14] Efficiency Valuation Organization (2009) "International Performance Measurement and Verification Protocol: Concepts and Options for Determining Energy and Water Savings." Volume 1. September 2009. EVO 10000 – 1:2009. Available at http://www.evo-world.org/index.php?option=com_content&view=article&id=468

The Institute for Building Efficiency is an initiative of Johnson Controls providing information and analysis of technologies, policies, and practices for efficient, high performance buildings and smart energy systems around the world. The Institute leverages the company's 125 years of global experience providing energy efficient solutions for buildings to support and complement the efforts of nonprofit organizations and industry associations. The Institute focuses on practical solutions that are innovative, cost-effective and scalable.

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