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Best Practice Guidelines for Using Energy Performance Contracts To Improve Government Buildings

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Abstract

This document is a product of IEA ECBCS Annex 46, Subtask C. The objective of Subtask C of Annex 46, *Holistic Assessment Tool-Kit on Energy Efficient Retrofit Measures for Government Buildings*, was to develop best practice guidelines for innovative energy performance contracts (EPCs). Accordingly, this document analyzes the use of EPCs to implement energy efficiency upgrades in government buildings. It presents information on the methods used to put EPCs in place at government facilities, and the building systems commonly addressed. The document also provides recommendations on the conditions necessary for successful government EPC programs. These recommendations constitute the best practice guidelines based on the experiences of government EPC programs in five countries: the United States, Canada, Germany, Finland, and Denmark.

Contents

List of Acronyms

Acronym	Spellout
AFCESA	Air Force Civil Engineering Support Agency in the United States
BEA	Berlin Energy Agency in Germany
BGB	Bürgerliche Gesetz Buch in Germany
Dena	Deutsche Energie-Agentur
DESC	Defense Energy Support Center in the U.S. Deparment of Defense
DOE	Department of Energy in the United States
DSM	Demand side management
E+O&M	Energy plus operating and maintenance
ECBCS	Energy Conservation in Buildings and Community Systems
ECM	Energy conservation measure
EPC	Energy performance contract
ESCO	Energy service company
ESP	Energy service provider
ESPC	Energy savings performance contract
FBI	Federal Buildings Initiative in Canada
FEMP	Federal Energy Management Program in the U.S. DOE
IDIQ	Indefinite deliver, indefinite quantity
IEA	International Energy Agency
IPMVP	International Performance Measurement and Verification Protocol
M&V	Measurement and verification
NFESC	Naval Facilities Engineering Support Center in the U.S. Department of Defense
NGO	Non-governmental organization
NPV	Net present value
O&M	Operation and maintenance
PF	Project facilitator in the U.S. DOE FEMP
UESC	Utility energy service contract

1 Introduction

Historically, the majority of energy efficiency projects in government buildings have been carried out using funds provided by government itself. Since the ultimate source of the government's funding is usually tax appropriations, such projects are often referred to as "appropriations funded." The site uses the funding to award subcontracts to one or more firms to design, install, and commission the equipment. Site personnel are then responsible for the operation and maintenance of the installed equipment throughout its useful life.

Appropriations continue to provide an important source of funding, but a growing number of governments worldwide are using energy performance contracting to upgrade the energy efficiency of their buildings. An energy performance contract (EPC, also called an energy savings performance contract, or ESPC) is a financing technique that uses cost savings from reduced energy consumption to repay the cost of installing energy conservation measures. Normally offered by Energy Service Companies (ESCOs), this financing technique allows the benefits of energy savings to be captured up front. EPCs require no capital expenditures on the part of the government, since the costs of the energy improvements are borne by the performance contractor and paid back out of the energy savings. A key feature of an EPC is that the ESCO guarantees the level of cost and/or energy savings and periodically demonstrates to building managers that the savings are being delivered, through the measurement and verification (M&V) process. The contract may also require the ESCO to operate and maintain the equipment it installs.

This document provides background information on the characteristics of EPCs and presents some best practice guidelines for using them to implement energy efficiency projects in government buildings. It is based on the experiences of five countries – Canada and the United States in North America, and Denmark, Finland, and Germany in the European Union – that participated in Subtask C of the International Energy Agency's Annex 46, established under the Implementing Agreement on Energy Conservation in Buildings and Community Systems (ECBCS). The function of ECBCS is to undertake research and provide an international focus for building energy efficiency.

The intended audience for this document includes government building managers and energy managers planning to implement energy performance contracts in the buildings for which they are responsible, and government officials who wish to improve existing energy performance contracting programs or put new programs in place.

2 Energy Performance Contracts

2.1 Definition

Energy performance contracts vary in their details to some degree among the countries participating in Annex 46, but in the broadest sense, an EPC can be defined as a partnership between a customer and an ESCO. * The ESCO conducts a comprehensive energy audit and identifies improvements that will reduce operating costs at the customer's facility. In consultation with the customer, the ESCO designs a project that meets the customer's needs. Using financing secured by the ESCO or by the customer, the ESCO installs the improvements and guarantees the savings over the term of the contract. The ESCO is then paid from the savings that result from the project.

Energy performance contracting provides a means for government organizations to implement energy improvements in their facilities to reduce operating costs, energy and water consumption and costs, and greenhouse gas emissions without any front-end capital investment and with limited risk to the government.

Figure 1 shows the effect an EPC has on operating expenses. Before the contract, a building owner pays a certain amount for utilities and maintenance. The ESCO designs and installs a project that reduces the utility and maintenance costs, resulting in a savings. For the duration of the contract, most (or all) of these savings is paid to the ESCO to operate and maintain the equipment, and to pay the financing. Operational costs are the same or lower than they were before the EPC. Finally, when the contract is completed, all savings accrue to the site.

While governments use a variety of contracting structures, the main distinction is in how performance and financing risks are allocated between the government and the ESCO. The Summary Report from IEA DSM Task X (2003) listed four basic types of contracts:

1. Contracts in which the ESCO offers the financing and provides a savings guarantee, meaning the ESCO bears both the financial and the performance risk
2. Contracts in which the ESCO takes the performance risk, and the customer is responsible for the financing
3. First out contracts, where all energy cost savings are used to pay interest and amortization of the loans until full repayment
4. Contracts for energy management in which the ESCO is paid to provide an energy service such as space heating or lighting, "chauffage" (heating) contracts.

Contracts in which the ESCO provides both the financing and the savings guarantee (most of the EPCs in the participating countries) usually pay all or most of the guaranteed savings to the ESCO. This is because any retention of savings by the government extends the time required to repay the financing, thereby raising interest costs.

* In the U.S. Federal government, a distinction is made between EPC contracts awarded to ESCOs and those awarded to utility companies. The former are called "ESPCs" and the latter "Utility Energy Service Contracts" (UESCs). The main difference from the perspective of the government site is that in UESC, repayment is made through the site utility bill, whereas in ESPC payments are made directly to the ESCO. For the purposes of this report, both are considered to be EPCs.

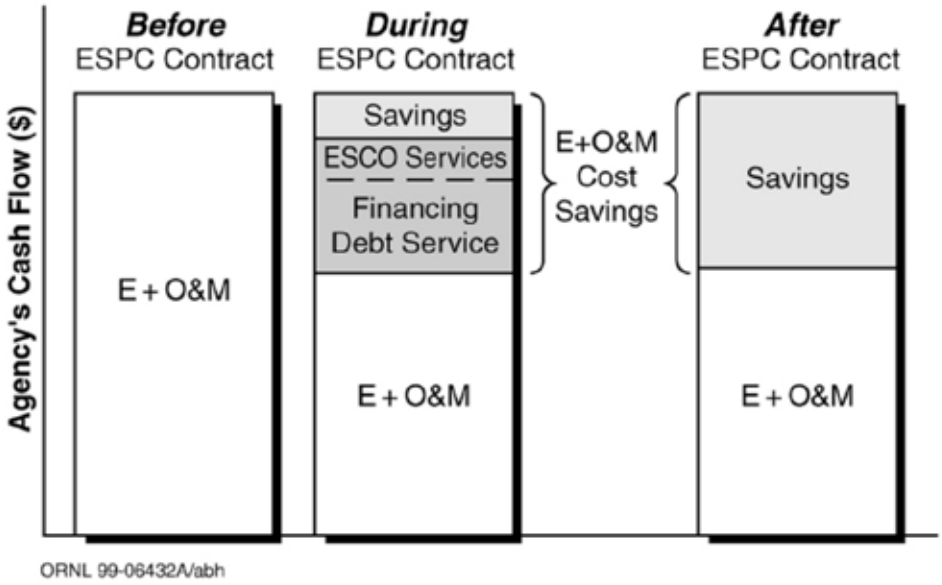

Figure 1. How an EPC affects the operating expenses for a building.

2.2 ESPCs in the Annex Member Countries

The governments of countries participating in Annex 46 use EPCs to varying degrees. In Canada, the Federal Buildings Initiative (FBI) has helped facilitate over 85 retrofit projects, attracting $320 million in private sector investments. In 2006, EPCs were responsible for about $375 million in private investment at U.S. Federal government sites (U.S. Department of Energy 2006). An additional $1 billion per year is thought to be invested in state, municipal, and institutional buildings in the United States (Hopper et al. 2005).

Governments in Denmark and Finland do not use EPCs to great extent. Christensen and Sundman did identify 10 energy service companies doing business in Denmark (2007 p 7). Much of their work is in the private sector though there is mention of ESPCs for:

- district heating
- municipal street lighting
- airports
- hospitals
- offices
- housing
- public institutions
- and Danish municipalities (Christensen and Sundman 2007, p 10).

The use of “savings guarantees” is not widespread in Denmark nor is project financing a part of most ESPCs. “Several Danish ESCOs are trying to replace [the current paradigm for ESPCs] with a model in which the ESCO owns the plant/buildings in the contract period” (Christensen and Sondman 2007, p 23). As a general rule, ESCOs in Denmark bear the risks associated with the installed equipment while the customer assumes the risks associated with operating the equipment. Contract terms in Denmark need to ad-

dress every conceivable variable affecting system operation and energy cost savings and must ensure that the risks associated with each are explicitly divided between the ESCO and the client (Christensen and Sundman 2007 p 26).

The use of EPCs in Germany is known to be widespread, although Germany does not maintain statistics on EPC use. Energy performance contracts in Germany have taken several different forms since they were first established around 1990. These have included: (1) operation contracting, (2) supply contracting, (3) energy saving guarantee contracting, (4) performance contracting, (5) energy saving partnerships, and (6) creating "building pools" combining buildings with smaller energy saving potential with buildings with large potential to create a single profitable energy saving contract (Schmidt 2010 p 4).

ESPCs have not been used in Finland to the same degree that they have in Canada, Germany, and the United States for a number of reasons. Extensive use of energy audits, funded in part by the government, and the "Voluntary Energy Conservation (Efficiency) Agreements" identified many ECMs with paybacks of less than 2 years. Over two-thirds of these projects in public buildings have been implemented internally by the public agencies (Motiva 2009 p 6). In a sense, this has resulted in improvements capturing the "low hanging fruit" leaving only ECMs that are difficult to implement successfully through an ESPC. ESPCs have been used profitably for energy savings in high investment energy efficiency improvements in industrial processes, such as heat recovery during air compression (Motiva 2009 p 7). Finland, unlike other participating countries, estimates energy savings at the process level instead of by estimating reductions in annual energy consumption for an entire building (Motiva 2009 p 7).

Finland also perceives that most ESPCs in Canada, Germany, and the United States are incorporated as part of general renovations of public buildings (Motiva 2009 p 4). Energy efficiency improvements in public buildings in Finland have not been coupled to general renovations and thus are more expensive to implement and less attractive to ESPs.

3 Motivations for Using EPCs for Government Facilities

EPCs and appropriations are used by government for the same purpose: to upgrade equipment in buildings to reduce energy and water use, pollutant emissions and operating costs, and improve the working environment. A primary reason for using EPC as opposed to appropriations is that the government or government agency has insufficient appropriations available to fund all of the improvements that are necessary in its buildings. With appropriations, governments typically set up a process to allocate the available funding, establish selection criteria, and require facility managers to submit applications. This process increases the length of time managers must wait to receive funding. Depending on the amount of funding available, facilities may have to apply multiple times before funding is finally received. In the meantime, inefficient equipment continues to operate, consuming more energy than it would if it were replaced. In contrast, where robust EPC markets exist, a viable project of sufficient size can be initiated by an ESCO in a much shorter period of time.

Even when appropriations funding is available, government sites often lack the expertise required to identify all of the energy savings opportunities that exist in their buildings. Another advantage of EPCs is that the ESCO uses its experience to design a comprehensive project that captures all of the savings that can be feasibly achieved.

Government facilities may also lack the personnel to operate and maintain new equipment. ESCOs can provide these services on equipment installed under an energy performance contract. The fact that these services are provided at a fixed price (or at a price that increases by a fixed percentage each year) facilitates planning and budgeting. In addition, the M&V process can be viewed as a form of continuous commissioning, ensuring that the equipment continues to operate with high efficiency throughout its useful life.

Of course, since EPCs are financed using private capital, they incur interest charges that are not present when using appropriated funds. It has been shown however (Hughes and Shonder 2003) that EPC projects often have lower life cycle costs than appropriations-funded projects, especially when appropriated funds are scarce and sites must wait long periods of time to receive them. In any case, because EPCs require no up-front capital, and have no impact on operating budgets, they are life-cycle cost-effective by definition.

4 Most Common Energy Conservation Measures (ECMs)

The energy efficiency measures included in EPCs in government buildings were quite similar in the participating countries. These included:

- lighting systems
- HVAC systems
- improvements to the building envelope
- central heating/cooling plant measures
- comprehensive operator training
- employee awareness programs
- variable speed drives for motors
- water efficiency measures
- energy management control systems
- cogeneration
- integrated systems
- fuel conversions
- recommissioning.

In addition, Finland has implemented successful projects incorporating heat recovery while Germany has had projects in peak load management and hot water supply (Schmidt 2010 p 6).

Many countries are now using EPCs to promote the use of renewable energy in government buildings. For example, the new ESPCs awarded by DOE FEMP (awarded in December 2008) require ESCOs to investigate the use of renewables in each project.

5 Implementation Process

While there are some differences in the way governments put EPCs into place, most projects proceed through five well-defined phases: (1) Project Planning, (2) ESCO Selection, (3) Audit and Project Development, (4) Construction, and (5) Performance. The following sections describe the activities that take place in each phase. Governments have acted to provide agencies and municipalities with assistance through some or all five phases of this process. “Canada and the United States have identified and made available project facilitators with technical and ESPC experience who can help an agency review and assess proposals. Germany has created a network of quasi-public and non-governmental procurement agents that assist public agencies throughout the procurement process” (Singh et al. 2010, p 101–102).

5.1 Phase 1 – Project Planning

In Phase 1, a government agency (the potential customer) explores opportunities for energy savings at the site and a feasible ESPC project. Germany has found that only sites with energy bills of 100,000 €/annum are viable candidates for energy performance contracting because of the legal “overhead” (Schmidt 2010 p 4). Small sites may need to be “bundled” together to form an economically viable project. An important step in Phase 1 is the establishment of a Project Team. The Team should consist of all key personnel responsible for the management and operation of the facility. It should also include representatives from the physical plant, procurement, human resources, engineering, and legal departments.

An energy audit is frequently used in preparing requests for proposals and in preparing proposals. Canada and the United States have energy audit templates that include sample forms, worksheets, and graphs that can be used for data collection. They also frequently use “representative” energy audits for projects with many buildings or for a bundle of similar government buildings (Singh et al. 2010, p 78). Some countries such as Finland provide funding for an initial energy audit that establishes the site’s needs (Motiva 2009, p 5). Canada sometimes compensates all of the ESP bidders for some or all of the costs of detailed energy audits (Singh et al. 2010, p 79).

Germany recognizes four distinct levels of energy audits as in energy saving performance contracting:

1. Level 0: Selection of site(s) for energy assessments
2. Level I: A qualitative analysis consisting primarily of a walk-through and review of existing documents and utility records
3. Level II: A quantitative analysis using calculated energy savings and cursory analysis of partial instrumentation measurements over a period of 2 to 6 months verifying all of the crucial assumptions in the project proposal
4. Level III: Continuous commissioning, performance measurement and verification assessment; fully instrumented including diagnostic measurement (Schmidt 2010, p 11).

How requests for proposals are written and bid frequently depends on the laws and regulations that govern ESPCs and on distinctions between “goods,” “works,” and “ser-

vices." "Germany generally uses works contracts (referred to as "VOB") for Federal properties, but in other jurisdictions uses service contracts (called "VOC")" (Singh et al. 2010, p 82). Germany also uses minimum energy savings as a means of defining projects (Singh et al. 2010, p 85). Many Canadian public ESPCs use the "first-out" method in which the ESPC takes 100% of the savings until it recovers its investment with fees to encourage greater EPSC competition in the bidding (Singh et al. 2010, p 86).

Christensen's observations about the early negotiations and client relations with the ESCO at the outset of an ESPC are broadly relevant in all of the member countries:

> It is essential that the customer and the ESCO agree on the progress of the contract – the customer has the ability to back out from [participation] in several places in the project's first phase, and only when there is an agreement on implementation of the [contract that] the actual project is started. If the framework for the negotiation process is not defined from the beginning misunderstandings can quickly arise (and consequently mistrust) between the ESCO and the customer might occur. And the cooperation between the two sides may be particularly vulnerable when [EPCs are] … relatively new and unknown commodity[ies] (Christensen and Sundman 2007, p 26).

5.2 Phase 2 – ESCO Selection

If the potential for a project exists, an ESCO is selected. In some countries, ESCOs tender offers based on the energy audit, and one offer is selected; in others, an ESCO is chosen based on other criteria, and the selected ESCO performs the initial audit. In either case, the selected ESCO develops a preliminary assessment that includes a description of proposed energy conservation measures and estimates of energy and cost savings. The agency reviews the preliminary assessment and decides whether or not to proceed.

The prevailing goal in RFP evaluations should be the overall best value to the client agency. "Canada and the U.S. [NYSERDA] use a weighted average of multiple cost criteria" to evaluate the value to the client while Germany relies more on a single financial parameter such as net present value (NPV). Germany uses a metric incorporating energy cost savings, operating costs, the value of the investment at the end of the contract, and the ESP's share of the energy cost savings (Singh et al. 2010, p 98). In order to ensure the best value for the agency, Germany also requires the client agency to compare energy service provider (ESP) bids with the traditional project implementation process (Singh et al. 2010, p 101).

5.3 Phase 3 – Investment-Grade Audit and Project Development

If the preliminary assessment is acceptable, the agency transmits a letter confirming its intention to award a contract to the ESCO. Canada, Germany, and the United States require the ESCO to perform an investment-grade audit and submit a report that describes the basis for the project's contractually guaranteed savings (Singh et al. 2010, p 89).

The Project Team reviews the report and submits its comments to the ESCO. Based on these comments and further negotiation, the ESCO develops a final proposal. This is a fixed-price proposal for installation of the energy conservation measures (ECMs) and

(usually) provision of ongoing services such as M&V of savings and operation and maintenance (O&M) of the new equipment.

5.4 Phase 4 – Construction

Phase 4 entails construction, commissioning, and agency acceptance of the completed project.

5.5 Phase 5 – Performance Period

The performance period begins after the agency formally accepts the completed project. During the performance period, the agency pays the ESCO from the savings that are generated by the ECMs. The ESCO uses this payment to repay the lender and to fund the performance-period services called for by the contract. M&V of savings is required, and, at least once a year, the ESCO produces an M&V report detailing the results of the activities carried out to estimate the savings being delivered by the installed equipment. If the savings do not meet the guarantees, the agency can withhold payments to the ESCO up to the level of the shortfall, and the ESCO is required to remedy any performance problems.

6 EPC Best Practices

Governmental EPC programs in the participating countries evolved over time to meet the unique requirements of each country. Nevertheless, a number of common elements were found to lead to success in the use of EPC for improving the efficiency of government buildings. This section discusses these common best practices.

6.1 Policy and Legal Framework

A fundamental requirement for the successful use of EPC in government buildings is the existence of a policy and legal framework to support it. In the countries participating in Annex 46, specific legislation was required before government agencies were permitted to enter into energy performance contracts with private companies.

Government agencies required legal authority to obligate funds far beyond their normal 12 month budget cycle and also to use funds authorized for operating expenses (i.e., energy) to pay for equipment (e.g., chillers, boilers, lighting systems). Action was required at state, provincial, and even municipal levels before ESPCs could be used. For example, Canada's Treasury Board Secretariat's contracting policy authorized Federal departments to use private-sector funding to finance energy improvements in their facilities in the early 1990s. In Germany, the Bügerliche Gesetz Buch (BGB) is the legal basis of all supply contracts under German law and AVBFernWärmeV governs general conditions for supplying district heating. The Germany Ministry of Economics has also issued two modifications pertaining to ESPCs (20 July 1980 BGB1. I. S. 742 and 19 January 1989 BGB1 I. S. 112) (Schmidt 2010, p 6). Additionally, every state in Germany has implemented some type of enabling legislation to permit EPCs.

The Danish government passed legislation referred to as the "Danish Energy-Saving Agreement" that provides the legal basis of ESPCs in Denmark (Christensen and Sundman 2007, p 30).

The use of energy savings performance contracts by the U.S. Federal government was authorized in the 1986 amendments to the National Energy Conservation Policy Act of 1978, which was further amended by the Energy Policy Act of 1992. The policy framework was provided in the Final Rule on ESPC (10 CFR 436) promulgated by DOE FEMP.

Addressing energy performance contracting on the Federal level, as did Canada and the United States, resulted in consistent procurement practices throughout the countries making it easier for ESCOs to work. Germany, on the other hand, focused on local and state levels first (out of respect for state and municipal government autonomy and considerations). This resulted in public procurement practices that vary between states and even between municipalities and has made it necessary for ESCOs to be familiar with a greater number of laws and regulations to operate across jurisdictional areas (Singh, et al. 2010).

At a minimum, the policy framework necessary for successful use of government EPC includes definitions of important EPC-related terms as they are understood in the par-

ticular country; a description of the types of EPC contracts that are permitted; and a listing of the rules that govern the use of EPC contracts in government buildings. Other information, such as a description of the implementation process, may be included as well.

Also, note that directives encouraging the use of EPC have been as important as the legislation permitting their use. Performance contracting is a new way of doing business for government facility managers. Positive reinforcement from legislators and higher levels of government was key to the eventual acceptance of the concept. An example is the European Parliament Directive on energy end-use efficiency and energy services (2006/32/EC). The Directive recognizes the responsibility of the public sector to set an example for energy efficiency and encourages the development of a market for energy services and the delivery of energy efficiency programs and measures to end users. In the United States, a series of Executive Orders imposed energy reduction targets on Federal government agencies (Executive Order 13123[*]).

6.2 Pre-Negotiated/Model Contracts

EPCs are complex agreements. Governments with successful EPC programs have either pre-negotiated many of the standard terms and conditions or provide model contracts that individual sites can tailor to their needs.

Umbrella contracts are legal vehicles that eliminate the need to reinvent the wheel each time a new contract is awarded, thereby reducing project development time and effort. Umbrella contracts pre-qualify ESCOs so there is no need to issue requests for qualification for each individual EPC.

The concept of an umbrella contract means that the contract is pre-awarded. To implement a particular project, an individual government agency or site writes a task order against the master contract. The task order automatically binds the ESCO to the standard terms and conditions that pertain in the master contract. Any site specific conditions are included in a separate document that is included with the final proposal.

Umbrella contracts are obviously applicable only where a central organization can award contracts that can be used by its subsidiary parts. However, model contracts issued by centers of expertise at any level can fulfill much the same purpose —providing a contract template that has been vetted by experts invested in the customer's best interests. This is the approach taken by Canada's Federal Buildings Initiative (FBI). FBI also maintains a list of pre-qualified energy service companies (ESCOs) that can bid on Federal retrofit projects.

The U.S. Federal government has taken the umbrella contracting approach, awarding indefinite-delivery, indefinite-quantity (IDIQ) contracts to groups of qualified ESCOs. Ex-

[*] "Agencies shall maximize their use of available alternative financing contracting mechanisms, including Energy-Savings Performance Contracts and utility energy-efficiency service contracts, when life-cycle cost-effective, to reduce energy use and cost in their facilities and operations. Energy-Savings Performance Contracts, which are authorized under the National Energy Conservation Policy Act, as modified by the Energy Policy Act of 1992, and utility energy-efficiency service contracts provide significant opportunities for making Federal facilities more energy efficient at no net cost to taxpayers."

amples of umbrella contracts are also seen in Denmark* (Christensen and Sundman 2007, p 27). Although U.s. Federal agencies had the authority to implement ESPCs beginning in the 1980s, before the advent of the IDIQ contracts in 1998, annual awards averaged less that $25 million per year. Since 1998, that average has grown to more than $300 million per year, with 90% of EPC project investment made using IDIQ contracts. IDIQ contracts have been issued by DOE FEMP, the U.S. Army Corps of Engineers, the U.S. Air Force, and other agencies. Many U.S. states have placed IDIQ ESPCs that are available to state and local agencies. While expediting the contracting process, IDIQs "can create barriers to market entry for new ESPs by locking up all contracts to the selected firms for a fairly long period (often 5 to 7 years in the United States)" (Singh et al. 2010).

Canada circumvents some of the aspects of IDIQ contracts by employing "open book" contracting where the ESP negotiates with the government client on remuneration rates and then shops around for the best subcontractors to provide the services. Contracts can stipulate processes for selecting subcontractors to simulate competition and foster development of new ESP companies (Singh et al. 2010).

ESPCs exist in many different forms. Stuttgart, Germany uses "public internal performance contracting" where a unit within a public agency acts as the ESP and provides technical and financial services and receives payment through internal budget transfers (Singh et al. 2010). Germany also uses energy supply contracting where a public agency contracts for an energy service, such as heating or lighting, and selects a provider strictly on the basis of cost per unit service (Singh et al. 2010). Procurement agents are used in both the United States and Germany where a non-governmental organization helps government agencies write RFPs on a fee-for-service basis and assists them through the contracting process (Singh et al. 2010).

Deutsche Energie-Agentur (Dena) and other organizations in Germany offer standard contracts that can be used to reduce procurement costs and make small ESPCs financially viable (Schmidt 2010, p 7):

> "The Energy Saving Guarantee Contract developed in cooperation with the State of Hesse in the 'Hessian Guidelines for the Contracting in State Buildings' ensures the highest possible degree of reliability. It takes all the specific details of the project into account and legally guarantees the clients interests" (Schmidt 2010, p 9).

Dena provides comprehensive information (in German) for municipal administrations interested in ESPCs.

The IEE project EUROCONTRACT is a resource of current information regarding ESPC in Europe offering examples of best practices, model contracts, and country specific information (Schmidt 2010, p 15). Berliner Energie Agentur is the coordinator of EUROCONTRACT.

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* Christensen and Sundman use the phrase "umbrella contracts" with regard to ESPCs in Denmark in the same manner as it is used with the other annex participants, but they also include the sense of multiple buildings where other countries use "bundling" and project "pools."

"Project bundling" is used across jurisdictions to create incentives for successful ESPCs. Government agencies generally are not allowed to retain money saved through ECMs, but the larger entities that fund them are. School districts in the United States, for example, have used "bundling" to reduce utility costs through ESPCs where individual schools had low interest in taking on responsibilities that saved the district money, but did not benefit themselves directly (Singh et al. 2010). Finland perceives a need to expand their own definition of energy performance contracting to include "pool contracts" that bundle multiple buildings into a single contract (Motiva 2009, p 1). Germany refers to similar project bundling as "building pools" (Schmidt 2010, p 8).

6.3 Training and Assistance

An EPC is often described as a partnership between the customer and the ESCO, but it must be admitted that in some cases the partnership is an unequal one. EPCs involve a wide array of technical, financial, legal, and energy-related issues. ESCOs are large organizations with personnel experienced in all aspects of the EPC implementation process. The government customer on the other hand may be a small organization such as a school district with little or no technical staff. Larger sites such as military bases may have access to technical expertise, but little experience with EPCs. For this reason, most governments that have had success with ESPC provide some means for customers to access technical and contracting assistance.

In Canada, such assistance is provided by FBI, which offers the following services:

- opportunity assessments and facilitation services
- advice and consultation on environmental assessments, project planning, tendering, awarding of contracts, staff training and project monitoring
- assistance in customizing the model performance contracting documents
- an on-line list of pre-qualified ESCOs that can bid on Federal retrofit projects
- consultation with ESCOs and Federal organizations on evolving policy and operational issues
- customized approaches to training and workshops through reliable industry contacts.

Canada-Quebec and Germany have relied on assistance and guidance from non-governmental organizations (NGOs) and associations and from contracting agents (Singh et al. 2010, p 117).

Some of the same services are provided in Finland by Motiva, a state-owned company promoting energy efficiency and renewable energy sources. Motiva acts as a link between ESCOs and their potential clients by developing contracting models and tools, and marketing the EPC concept.

Deutsche Energie-Agentur– the German Energy Agency – provides some assistance with EPC contracts in that country. In addition, the Berlin Energy Agency (BEA) has been very active in facilitating EPCs in Germany. BEA is a leading energy consultancy – partly owned by the government of Berlin – which organizes retrofits for large government and commercial buildings through EPC. Typically BEA will bring together a number of buildings – from 4 to as many as 400 – and pool them together into a single EPC project. BEA is able to offer its services for free as a result of joint funding from the state and district municipal governments. In addition, Schmidt reports that many German states also provide technical assistance and grants or other financing options for facilities that wish to undertake using an ESCO (Schmidt 2010, p 7).

The role of the project facilitator in the U.S. DOE's ESPC program – administered by FEMP – provides another model for delivering this assistance. FEMP project facilitators (PFs) are objective, expert consultants for technical, financial, and contractual issues who help to optimize the financial value of ESPC projects.

PFs reduce the time required to implement projects and minimize the use of agency resources by helping to assemble the right team and providing education and dedicated assistance to reduce agency workload. They enhance communication with routine conference calls and by facilitating key meetings. They also have the experience to guide agencies to the best resources and practices and ensure that agency partnerships with ESCOs are balanced. DOE FEMP now requires the use of a project facilitator in all projects awarded under its IDIQ ESPCs.

In addition to its pool of project facilitators, FEMP offers training for U.S. Federal customers in all phases of the ESPC process, from initial negotiation through the implementation phase, and in specialized topics such as pricing and financing and M&V. FEMP also provides standards and reference documents on related topics.

Other U.S. contract centers provide assistance to the users of their contracts as well.[*]

6.4 Competition

Competition between firms tends to drive down prices in any market, and EPC is no exception. Governments have used competition in various ways to increase the value of their EPCs. In EPCs implemented through Canada's FBI, for example, the first step in the process is an opportunity assessment, which provides an inventory of energy-using equipment, a basic analysis of energy records and energy consumption patterns and a set of recommended measures to improve efficiency. This becomes the basis for a request for proposals that is sent to firms on the qualified ESCO list. Interested ESCOs submit bids, which are subsequently evaluated by the site project team. While price is not the only factor in selecting the winning bid, competition provides a powerful incentive for ESCOs to reduce prices to make their bid as attractive as possible.

In the United States, DOE FEMP successfully used competition to reduce interest rates in its ESPC program. As the program was originally implemented, FEMP provided minimal guidance to the ESCOs on financing selection. In 2004, FEMP modified the ESPC contracts to standardize the information the ESCOs were expected to provide to potential financiers. The contract changes also required the ESCOs to seek offers from multiple investors. As a result, finance premiums, which had averaged about 240 basis points above like-term Treasury securities, dropped to an average of 120 basis points.

Another method of introducing competition is to require ESCOs to compete their construction subcontracts on EPC projects. Some ESCOs compete their subcontractors voluntarily, realizing that this provides best value for the customer.

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[*] The U.S. Air Force's AFCESA organization provides technical and contracting expertise to users of the Air Force regional ESPC contracts, as well as to Air Force sites that use other ESPC contracting vehicles such as the DOE ESPCs. The U.S. Army Engineering and Support Center provides similar services to users of its contracts. The Navy's ESPC Team at Naval Facilities Engineering Support Center (NFESC) assists users of ESPC vehicles with an array of services similar to those provided by other organizations.

6.5 Measurement and Verification

Guaranteed savings with well-defined requirements for M&V of savings is another key to the success of government EPCs. Since the meaning of "performance" in a performance contract is the delivery of savings, M&V is one of the most important activities associated with implementing an EPC.

In an EPC, savings are determined by comparing energy use and costs before and after the installation of energy conservation measures. While the concept appears simple enough, the development of real-world M&V agreements is not trivial. To minimize risks and M&V costs, it is important to establish reasonable savings expectations before ECM or system installation. ESCOs may overestimate customer savings by relying on overly optimistic energy savings calculations. For this reason, government agencies usually attempt to reach consensus with ESCOs on realistic energy savings estimates before issuing approval to proceed with installation. This approach establishes reasonable expectations up front that reduce the likelihood of a payment dispute following installation.

A primary reference for M&V used in all of the countries that participated in Annex 46 is the International Performance Measurement and Verification Protocol (IPMVP). The M&V techniques included in the IPMVP are based on four general approaches to assessing savings. The approaches, or "Options," are designed to cover the spectrum of project complexity:

- Option A: Energy savings are based on a partial measurement of energy use of the equipment affected by the ECM in the ESPC in isolation from the balance of the building; some parameters in the ECM are stipulated by the parties and not measured.
- Option B: Energy savings of an ECM at the equipment level are based on full measurement, no stipulations as in Option A.
- Option C: Energy savings are determined from utility meters or sub-meters to assess the energy performance of the entire building.
- Option D: Energy savings resulting from the ESPC are determined using computer simulations.

(DOE/GO-102002-1554, 2002, p 23). For many projects, savings may be verified with a minimum of measurement and at a minimum cost. Other projects call for a more rigorous approach to M&V. In general, the more rigorous the verification requirements, the more expensive the verification process will be.

Factors affecting the development of an M&V plan for an EPC project include:

- Number of energy measures implemented
- Size and complexity of energy conservation measures
- Interactions between energy conservation measures
- How risk is allocated between the owner and the contractor in a performance contract.

Some organizations have developed their own interpretation of the IPMVP Guidelines. DOE FEMP for example has developed its own guidelines for Federal ESPC projects, based on IPMVP. DOE FEMP provides numerous other documents to assist U.S. Federal agencies in the development and evaluation of M&V plans.

ESPCs under U.S. Federal Energy Management Program generally stipulate energy prices based on an agreed escalation rate and the public client bears the risk if rates rise faster than stipulated (Singh et al. 2010, p 121). German ESPCs typically guarantee the

minimum level of energy cost savings, generally as a percentage of total energy costs based on established guidelines (Singh et al. 2010, p 120).

6.6 Quality Assurance During Project Performance Period

One of the motivations for encouraging the use of ESPCs at government facilities is that facility personnel often lack the expertise required to develop comprehensive efficiency upgrade projects. The ESCO provides this expertise, ensuring that the project delivers as much savings as is feasible. During the performance period of the contract the ESCO guarantees the savings, but in many cases, facility personnel also lack the expertise necessary to understand the methods used to measure and verify those savings and to assess the ESCO's verification reports. In the United States, this problem is compounded by the long contract terms that result from low energy prices: over the life of the ESPC, site personnel who were involved in the implementation phase of the project move on to other positions, and their replacements are not as familiar with the conservation measures and M&V techniques.

Governments have addressed this issue in a number of different ways. "Public agencies in Canada and the United States typically lack the capacity to perform M&V" themselves "and the ESPs thus have been responsible for it" (Singh et al. 2010, p 122). Germany recognizes M&V as one of the most important activities in implementing an ESPC. For larger projects they recommend installation of additional instrumentation including submetering , temperatures, operating times, etc., preferably on an hourly basis. They also recommend detailed energy modeling of the project site(s) (Schmidt 2010, p 14).

In the U.S. Federal government, for example, some larger contracting organizations provide independent reviews of annual M&V reports[*]. Also in the United States, FEMP has begun providing life-of-contract support for ESPCs implemented under its contract. The objective of the support is to ensure that personnel responsible for key functions relating to the oversight of each ESPC contract are contacted on a regular basis to identify any changes in personnel that may require training or related support necessary to ensure competent contract oversight.[†]

If necessary, FEMP can also direct the site to other DOE resources that can assist in resolving any performance issues that may have arisen.

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[*] An example is the Defense Energy Support Center (DESC). DESC does not have its own umbrella ESPC contract, but rather provides contracting support for ESPC projects at U.S. Department of Defense facilities that are implemented using other umbrella contracts such as those offered by FEMP and the Army Corps of Engineers. In addition to contracting officers, DESC's staff includes experts in M&V who, for each project the organization awards, review the annual M&V reports throughout the entire performance period.

[†] At a minimum, sites are contacted before and after the ESCO's annual M&V site visit. The purpose of the initial call is, first of all, to determine whether there have been any personnel changes among key project staff. If so, new personnel are advised of the schedule for training in ESPC performance period management. They are also sent copies of current FEMP guidance on M&V witnessing, M&V report review, and related topics. This wat, FEMP ensures that site personnel are aware of the schedule for the ESCO's M&V activities, that individuals have been assigned to witness the ESCO's M&V activities, and that the witnesses have received training and/or have access to current FEMP guidance. On a follow-up call after the ESCO's visit, FEMP ensures that the ESCO made the site visit, that the M&V report was received on schedule, and that the individuals assigned to review the report have access to important project documentation (e.g., the M&V plan) and current FEMP guidance on report review.

Other governments handle performance period issues in a different manner. In Finland, Motiva provides some assistance with M&V in the performance period. In the United States, some state and local governments have used third parties to perform M&V of savings.

6.7 Continuous Program Improvement

Finally, the experiences of several countries have shown that attention to continuous improvement is vital to the success of EPC programs. Managers of these programs must periodically assess all aspects of project implementation and performance to ensure that the program itself and the individual projects are meeting the needs of building owners and the objectives of the government.

Government EPCs involve the participation of individuals from various agencies that only rarely communicate with one another. Providing a forum for those individuals to meet and discuss their experiences with EPCs is one way to develop ideas for continuous improvement. In the United States, EPC program officials and representatives from Federal agencies that use EPC contracts to upgrade their buildings participate in the Federal ESPC Steering Committee. Among the objectives of this committee are to:

- share experiences learned during practical application of ESPC
- develop similar procedural mechanisms to implement projects
- identify barriers to more efficient and effective application of ESPC authority and develop consensus on procedural changes to overcome those barriers
- review current policies, regulations, and procedures for the implementation of ESPC in light of practical application, and develop recommended changes that could improve the effectiveness, efficiency, and results of the program
- Review ESPC implementation in the light of practical applications, changing conditions and constraints, and recommend potential legislative changes where no procedural changes will result in significant program improvement.

Similar roles may also be served by ESCO trade associations in other countries (Vine 2005).

In addition to Steering Committee meetings, DOE FEMP has begun to hold public forums to allow one-on-one meetings between the agencies, ESCOs, and FEMP staff to answer more specific questions and provide insight about how the ESPC program works. To provide focus for the meeting, each forum is devoted to a specific theme such as financing, measurement, and verification and performance period administration.

7 Conclusions

Energy performance contracts are one method for governments to use in upgrading the efficiency of their buildings. EPCs have a number of advantages over traditional methods of funding such upgrades. First of all, they require no up-front capital on the part of government. Improvements are financed using the cost savings that result from the improvements themselves. Governments with budget constraints that do not allow all necessary building efficiency improvements to be funded can use EPC to obtain private financing, which is repaid over time by the resulting cost savings.

EPCs allow government to tap into not only private sector financing, but private sector experience as well. The energy service companies that develop EPC projects generally have more experience than the managers of government buildings in the development and implementation of energy efficiency projects. ESCOs use this experience to design comprehensive projects that make it easier for government agencies and individual sites to meet energy reduction targets. In countries with less mature EPC markets, such as Denmark, “it is a great advantage to be able to produce references for similar [ESCO] projects in other countries” (Christensen and Sundman 2007, p 23).

The performance guarantees inherent in EPCs can be thought of as a form of continuous commissioning which ensures that the equipment installed under EPC is continues to operate with high efficiency throughout the term of the EPC contract. Government sites with insufficient maintenance personnel and/or maintenance budgets can use EPC to ensure that savings are delivered. ESCO maintenance of the equipment can also be included in the EPC and paid out of the energy cost savings.

Since they include finance charges, governments will pay more to install equipment using an EPC than they would to install the same equipment using conventional appropriations funding. For this reason, if a site has sufficient funding available for a project, that funding should be used preferentially over an EPC. However, if appropriations funding is uncertain and/or will require a significant length of time to obtain then EPC should be considered. Given the time value of money and the cost of operating inefficient equipment during the delay, EPCs often have lower life cycle costs than appropriations-funded projects. Competition among firms is one way to reduce the cost of EPCs to governments.

To be used successfully by governments, EPCs require the appropriate legal and policy framework that establish the conditions under which they can be used at government sites. Nevertheless, EPCs represent a new way of doing business for governments, and building managers and other officials are generally unfamiliar with them. For this reason, directives encouraging the use of EPC are often as important as the legislation permitting their use.

EPCs are complex, long-term agreements, and government agencies often require assistance in setting them up. Governments with successful EPC programs provide some degree of assistance to agencies in putting EPC contracts in place for their buildings. Umbrella contracts awarded to qualified ESCOs, with pre-negotiated standard terms and conditions are one way of reducing the time required to negotiate an EPC. Another me-

thod is to develop model contracts that are tailored to the needs of individual projects. Both methods have been used successfully.

Governments with successful EPC programs usually provide contracting assistance through a central organization. Examples include DOE FEMP in the United States, the Federal Buildings Initiative in Canada, Motiva in Finland and the Deutsche Energie-Agentur (dena) in Germany. These organizations offer training in EPC-related topics such as pricing and financing and measurement and verification. In the United States, DOE FEMP assigns a Project Facilitator to each project to assist the site in all aspects of the project development process. In Canada and Finland, the central organizations provide assistance with the energy audit used to establish project potential.

Measurement and verification of savings is a key aspect of EPC in ensuring that savings are being delivered. Successful EPC projects include requirements for annual (or sometimes more frequent) reports from the ESCO that establish the level of savings being delivered. Since the ESCO guarantees the level of savings, the amount of any shortfall can be withheld from payment. An international standard such as the IPMVP should be used to develop M&V plans.

Because EPCs have long durations, personnel changes at government sites can leave gaps in knowledge about the contract: the particular equipment installed, the techniques used to measure the savings, and the site's responsibility for review of annual savings reports. For this reason, governments should consider making periodic contact with managers at EPC sites to ensure that personnel responsible for administering the EPC during the performance period are aware of their responsibilities and have access to the latest training and recommendations.

Finally, it is recommended that managers of government EPC programs periodically take stock of all aspects of the program to ensure that it and the individual projects awarded through it continue to meet the needs of building owners and the objectives of the government. Annual or semi-annual meetings of EPC stakeholders — including program managers, energy officials from major government agencies, facility managers, technical support staff, and ESCOs — should be used to identify problem areas and solicit ideas for improvement.

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