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Assessing Framework Conditions for Energy Service Companies

in Developing and Emerging Countries
Guideline

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Summary

Energy efficiency is an issue that is gaining importance worldwide due to the role it plays in the areas of resource conservation, providing access to energy for all - especially in developing countries - and combating climate change. The potential for improving energy efficiency remains largely untapped, particularly in developing and emerging countries. The reasons and barriers are diverse, stemming from the policy environment (e.g. focus on rapid economic growth), the energy sector itself (e.g. low energy prices), socio-cultural aspects, financing problems and a lack of information and know-how.

Under certain conditions, energy contracting models by energy service companies (ESCos) can open up solutions for a number of obstacles in the way of energy efficiency projects. Amongst others, these opportunities may encompass access to financing, minimisation of project cycle cost across capex and opex budgets, comprehensive planning and optimisation across various technical disciplines and trades or performance and operation guarantees for an entire project cycle. In this regard, energy services can be seen as a 'delivery mechanism' for energy efficiency and (renewable) supply projects.

In many industrialised countries, energy service models have been developed for this purpose and positive outcomes have been realised on the market. Two well-established models include energy supply contracting (ESC) - aiming at the supply of efficient, decentralised use energy - and energy performance contracting (EPC), in which the costs of implementing energy efficiency measures are recouped through guaranteed energy cost savings. These models exist in numerous variations, each adapted to local conditions. The Integrated Energy-Contracting (IEC) model is an innovative 'delivery mechanism' that combines energy efficiency and (renewable) supply projects.

Experience has shown that successful energy service market development is often driven by the client side (e.g. from public institutions) through pre-structuring energy service projects and opening them to the market for ESCos to bid on. The role played by an independent market and project facilitators serving as mediators between ESCos and their (potential) clients has proved to be of great value in enabling potential clients. The facilitator approach also ensures a fair and level playing field for competition among ESCos. When establishing energy service models in emerging and developing countries, the experience gathered in industrialised nations can be useful as a source of project ideas. However, customised solutions must either be designed to correspond with local conditions or be developed from the ground up. Ideas and approaches for pilot projects are best developed when project hypotheses are tested with local conditions in mind. It is advisable to take a structured analytical approach that addresses the following points:

- potential customers (who would commission an ESCo?)
- potential ESCos (is there anyone who could perform this task?)
- general conditions (which preconditions do customers and ESCos require?)
- cost-effectiveness and financing (which financial resources are needed, how can they be procured and from whom?)

Initial plans to implement ESCo models should be kept simple in order to build confidence for such approaches and reduce unrealistic expectations in local markets. In this respect, models involving low levels of investment, or none at all, would be suitable as a first step for developing and emerging countries. These could, for instance, be based on 'EPC light' (effectively amounting to external energy management) or energy operations contracting. Service models requiring substantial investment, such as ESC and complex EPC, need longer contract terms and thus place greater demands upon statutory and other preconditions, thereby harbouring greater risks.

By sorting out a suitable selection of pilot projects and providing targeted support for robust and sustainable ESCo market development, German development cooperation can, first and foremost, promote economic development and the creation of skilled jobs while also contributing to climate protection and energy resource conservation.

1 Introduction

Relevance of energy efficiency and energy services in developing and emerging countries

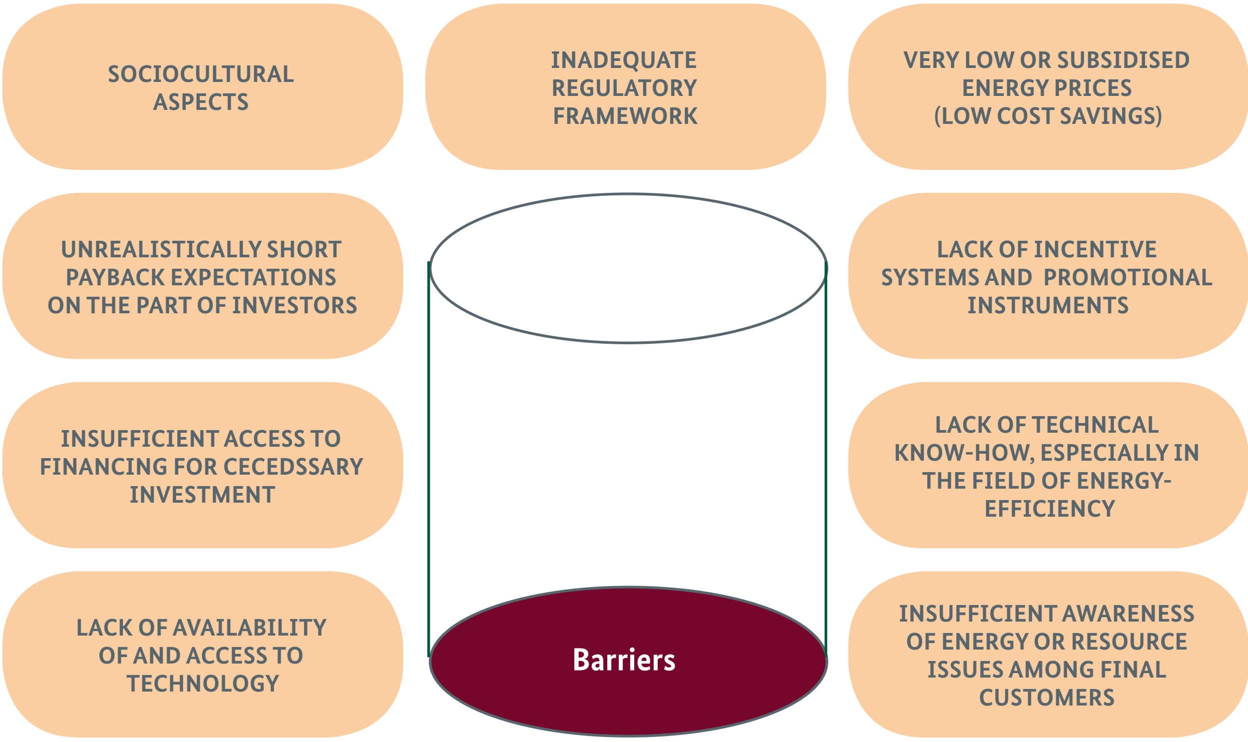
Energy efficiency is an issue that is gaining importance worldwide due to its role in resource conservation, access to energy for all - especially in developing countries - and, not least, in contributing to the reduction of CO_2 emissions, needed in order to stabilise the global climate.

The International Energy Agency (IEA) has come to the conclusion that a relatively conservative 'New Policies Scenario' (based on policy commitments and plans already announced) would not suffice in limiting global warming to 2°C by 2100. This goal, it says, would require an ambitious '450 Scenario' (for 450 ppm CO_{2e}), involving additional reductions in annual emissions by approximately 2.5 Gt CO_2 as early as 2020 and 14.8 Gt CO_2 by 2035 [IEA 2011]. Around **72% of CO_2 savings in 2020 would need to be delivered by energy efficiency measures**. This includes the energy production and distribution side as well as the final consumption side (comprising the majority of measures). Only around a quarter of all CO_2 emission reductions in this scenario would need to be achieved by the USA and the EU; the remainder would largely fall on emerging and developing countries [IEA 2010]. This calls for extensive investment in energy efficiency and low-carbon energy supply – the IEA anticipates a global total amounting to USD 15.2 trillion by 2035 (gross investment - in addition to the New Policies Scenario - in the energy supply, transport, buildings and industrial sectors according to the 450 Scenario, i.e. without taking account of energy cost savings achieved). Of that total, energy efficiency measures in buildings account for USD 4.1 trillion (of which around half would be in non-OECD+ countries)[1] and the industrial sector accounts for about USD 1.1 trillion. Within these sectors, USD 2.7 trillion would be anticipated for efficiency measures designed to reduce electricity consumption [IEA 2011]. Thus, the realisation of **energy efficiency measures in buildings and in industrial companies** must make a major contribution towards limiting climate change.

Energy efficiency measures make economic sense in many cases due to the relating energy cost savings. They also often increase comfort and convenience (e.g. in better insulated buildings) and substantially contribute to energy supply security (e.g. ensuring uninterrupted production processes in a company). Despite the numerous benefits, people often do not recognise or take advantage of opportunities to improve energy efficiency. Figure 1 presents the possible **barriers** from the perspective of energy users, depending upon the individual prevailing conditions.

1 Non-OECD+ countries: comprises all countries that are not OECD or EU member states.

Figure 1: Barriers for the implementation of energy efficiency measures



Under certain conditions, **Energy Service Companies (ESCos)** can help overcome individual barriers. The business models and energy services offered by these companies depend greatly upon specific national, and even local, conditions (e.g. legal frameworks, energy prices, building ownership structures, etc.) and therefore vary greatly from country to country. While numerous industrialised countries (such as Germany and the USA) already benefit from several decades of experience with ESCos and ESCo markets, these are only just beginning to be established in most developing and emerging countries. If ESCo markets are to be success in such countries, energy services need to be specifically tailored to local conditions and target groups. This requires careful analysis of the complex conditions, savings potentials and potential barriers.

Who is this guideline for?

The present guideline paper on ESCos in developing and emerging countries (hereafter 'guideline') addresses all parties concerned with the planning and implementation of development cooperation projects and programmes relating to energy efficiency, especially those who wish to lay the groundwork for energy services.

Purpose

The purpose of this guideline is twofold:

- to impart a basic understanding of energy services and their potential variations, particularly with regard to implementing energy efficiency measures involving capital investment, and
- to provide a **structure for developing ideas and analysing potential** for energy services (mainly those involving investment) for a specific country, guided by numerous practical examples and points of departure for developing project ideas.

Structure

The guideline is organised into three parts, exploring the following questions:

- What are energy services?
- How can energy service arrangements particularly suited to a given country be identified and developed?
- Which framework conditions are relevant to energy services?

2 What are energy services?

2.1 Terminology

The terms ‘energy service’, ‘energy service provider’, and ‘energy service company’ (ESCo) are already in widespread use around the globe. However, they are often used in narrowly defined ways for specific, regionally disparate services, which often leads to a misunderstanding. The present guideline paper uses a very broad, inclusive understanding of the concept in order to illustrate the diversity of existing energy service options and promote the development of customised and novel models. The definitions established by the European Union (EU) in its Directive on Energy End-Use Efficiency and Energy Services (Energy Services Directive) [EU 2006] are well suited for this purpose:

‘Energy service’: 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.

‘Energy service company’ (ESCo): a natural person or legal entity 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.

2.2 Differentiation of Energy Services Providers and their Services

In the ESCo industry as well as in the respective literature, a wide variety of definitions are in use, reflecting the varying interests among the broad spectrum of involved stakeholders. However, for the purpose of clarification and structuring, it is helpful to classify different groups of service providers based on their services (without any intention to place a value on them). We propose a distinction between three main groups of service providers:

1. **Consultancy (service) providers** such as energy auditors, planning engineers, certified Measurement & Verification Personnel (CMVPs), accountants, lawyers and others who basically provide advice. The consultant risks are typically limited to professional indemnity insurance, while project performance risks remain with

the client. Payments for consultancy services are commonly agreed upon based on their inputs (hourly rates or a lump sum); sometimes consultants also utilise performance based components (share of savings achieved) in their remuneration.

2. **Technology suppliers of energy efficiency hardware** (e.g. efficiency technologies like re-lighting, CHP and solar components or systems) or **software** (e.g. for energy accounting or management) and their **related operation and maintenance services** (e.g. servicing of burners, technology maintenance services or software updates). They all supply individual components of energy efficiency projects and are paid for supplying these components, though typically not for their performance or outputs. The supplier risks are typically limited to product warranties and vendor liabilities while project performance risks remain with the client.

3. **ESCos** who provide **performance based Energy-Contracting** (also labeled as **ESCo** or **Energy Efficiency Services).** The two basic business models are: Energy Supply Contracting (ESC), which delivers units of use energy measured in MWh, and Energy Performance Contracting (EPC), which provides energy savings measured in comparison to a previous energy cost baseline. For both models, the ESCo's remuneration depends on the respective outputs of the services provided and not on the inputs consumed (like fuels or person-hours), thus introducing an intrinsic interest for the ESCo to increase efficiency of the technologies deployed and to reduce final energy demand and related emissions.

All three groups of service providers are needed in order to develop an ESCo industry. At the same time, their role in the value-added chain and scope of service, their degrees of risk acceptance and business models and remuneration schemes notably vary. By distinguishing between these groups of service providers, the analyses and recommendations can be much better targeted.

In many studies and statistics, these groups are brought together, which may lead to rather unspecific findings and recommendations. In terms of reporting – such as in National Energy Efficiency Action Plans (NEEAPs) or ESCo registers – figures are not very meaningful when they do not distinguish among the groups of service providers proposed above. There is otherwise a risk of having high registration numbers of so-called ESCos which do not at all correspond to the number of EPC projects implemented or the number of offers a request for proposals (RFP) for an ESCo project induces.

The different categories of services also reflect various client preferences as to purchasing individual components of an energy efficiency project (e.g. separate planning, construction, maintenance contracts) or to outsourcing a comprehensive package to a service provider.

Last but not least, this differentiation allows us to delimit 'real', performance-based services, which include estimates of technical and economic risks by an ESCo, from standard, non-performance based services.

By way of illustration: An energy consultant who only conducts energy audits or provides energy advice for a fixed fee (without assuming any risk) is not an ESCo according to the definition above. In contrast, however, an 'energy caretaker' receiving a results-based fee (such as a building caretaker focussed on energy efficiency issues) can indeed be regarded as a simple energy service provider. ESCos are able to harness far greater energy efficiency potential; along with system operations, they plan and implement investment measures and facilitate access to financing. The ESCo mechanism itself is very flexible, so deciding who will provide financing should be made according to which party (client, ESCo or a financial institute) can provide the best financing conditions. In reality, a mixture of differing financing sources is often a good solution, also with regard to risk sharing. The present guideline document focuses on these more complex energy services.

NOTE

In Germany, the term *'Contracting'* is used as a catch-all for (many) different energy services. In English, however, 'contracting' (without stating the specific form, such as energy performance contracting) is not commonly used in this sense. The German word *'Contracting'* should therefore be translated into English as 'energy services' or 'ESCo services'. Sometimes, an ESCo is understood in the narrower sense as being a provider of very specific energy services, such as energy supply contracting or energy performance contracting. When discussing the technicalities of energy services and ESCos, it is therefore important to first establish a shared understanding of the terminology used if misunderstandings are to be avoided.

Table 1 lists several helpful directives, standards and other sources relating to energy services.

2.3 Energy service models

The principal types of energy service model are (see DIN 8930-5 [DIN 2003])

- energy supply contracting (ESC),
- energy performance contracting (EPC),
- energy operations contracting (EOC),
- third-party financing.

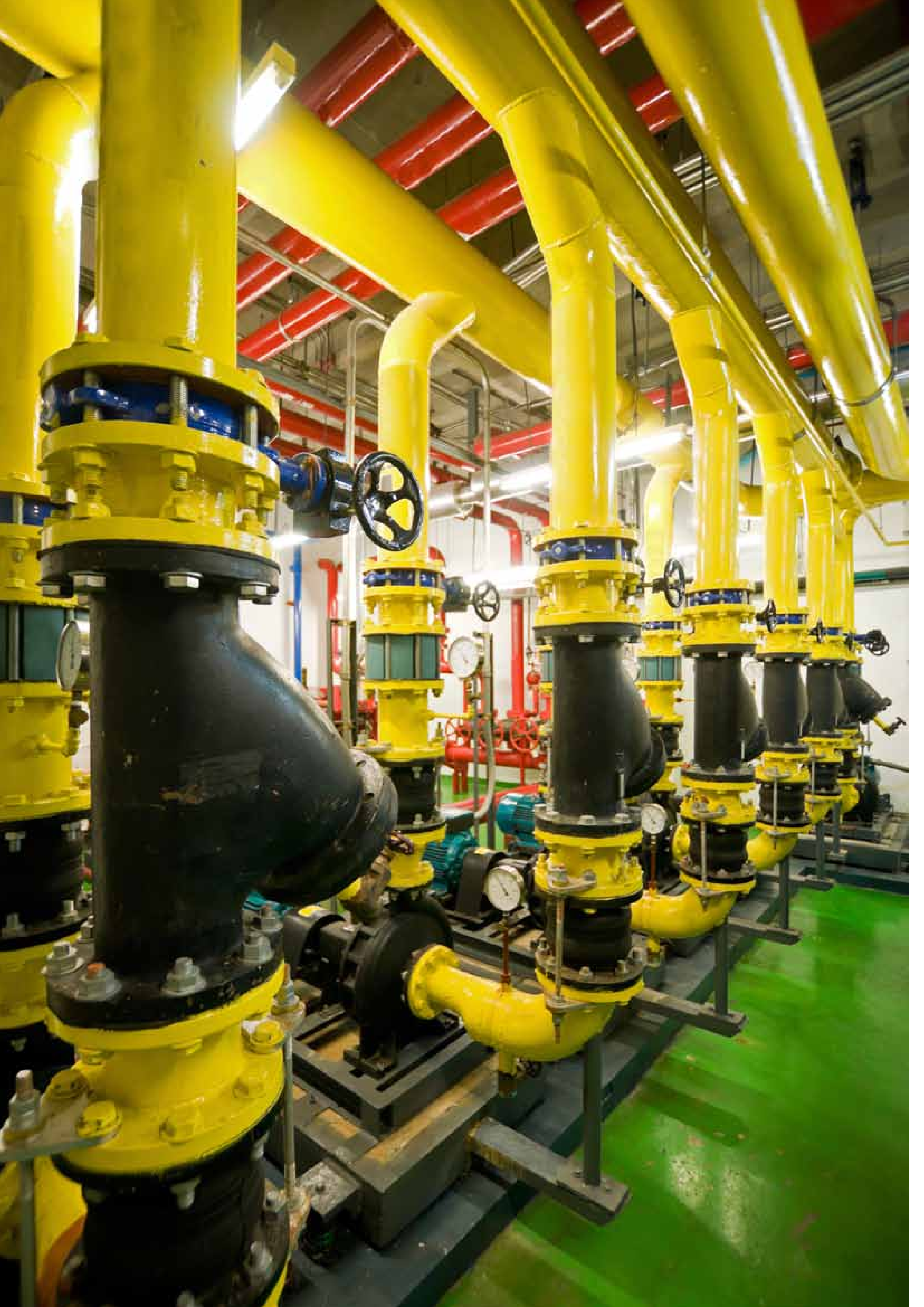
Table 2 gives a summary overview of the four above-mentioned energy service models. The subsequent Sections 2.3.1 to 2.3.6 present the key characteristics of these models in more detail and discuss options for designing novel variants. For energy service provisions to succeed, it is essential to adapt models to specific local circumstances; this is especially crucial in emerging and developing countries.

2.3.1 Energy supply contracting (ESC)

The main participants involved in an ESC arrangement are the ESCo, the customer and a financing institution. The ESCo supplies the customer or the tenant directly with **use energy** such as heating, cooling, light, electricity, steam or compressed air and charges the customer for the quantity (e.g. in kWh). For this purpose, the ESCo converts primary energy (e.g. gas received from a gas supplier) into the specifically required use energy, doing this directly on the basis of customer use of pre-installed **decentralised energy supply systems** (e.g. a small-scale cogeneration unit). In order to finance these installations, the ESCo raises funds on the capital market via banks. One way of supplying security for the loan in Germany is to officially register a

SOURCE	WHAT IS IT ABOUT?
EU 2006/32/EC Directive on Energy End-Use Efficiency and Energy Services (Energy Services Directive)	Commitment by the EU member states to improve energy efficiency, using the promotion of energy services as one tool among others.
DIN EN 15900 Standard on Energy Efficiency Services	Definitions, essential requirements and examples of energy efficiency service measures. (Note: DIN EN 15900 defines the concept of 'energy efficiency service (EES)' instead of 'energy services'. While the definition is very similar, EESs tend to rather be a subset of the energy services as defined in the present guideline document. The term 'energy efficiency service' is, as yet, less widespread than 'energy service' and is therefore not used further here.)
DIN 8930 Part 5 Contracting	Definitions and fields of application of key types of ESCo services.
DIN EN ISO 50001:2011-12 Energy management systems – requirements with guideline for use	Requirements for energy management systems, with guideline for use and for organisational options for establishing systems and procedures designed to improve energy efficiency .
VDMA 24198 Performance contracting	Terminology, types of performance and procedures in energy performance contracting.
IEA DSM Task XVI: Definition of performance based energy services and source for innovative ESCo models like Integrated Energy Contracting	Energy contracting – also labelled as ESCo or Energy Services – is a comprehensive energy service concept for executing energy efficiency and renewable projects in buildings or production facilities according to minimised project cycle cost. An Energy Service Company (ESCo) typically acts as a general contractor and implements a customised efficiency service package (consisting of design, building, (co-)financing, operation & maintenance, optimisation, fuel purchases, user motivation). As key features, the ESCo's remuneration is performance based; it bears the commercial as well as the technical implementation and operation risks and guarantees the outcome and all incidental cost of the services for the duration of the project.

Table 1: Directives and standards relating to energy services



TERM	Energy supply contracting (ESC)	Energy performance contracting (EPC)
	Alternatively [Bert 2010, WB 2010]: ■ supply contracting ■ facility contracting ■ useful energy supply ■ chauffage ■ delivery contracting (DC) ■ contract energy management (CEM)	Alternatively: ■ performance contracting ■ energy savings performance contracting (ESPC)
BRIEF CHARACTERI-SATION	ESCo supplies use energy – such as heat, electricity or cooling – to customers	ESCo is responsible, across all branches of constructi **building service systems** and for systems operation i **not supply energy.** ESCo commits by contract to identifying and tapping recouping the requisite investments needed from the **teeing the savings result** over the entire contract ter
SERVICES REN-DERED BY ESCO	■ Use energy supply (e.g. heating, cooling, electricity, steam, compressed air) ■ Primary energy purchasing (e.g. gas) ■ Energy supply planning ■ System construction ■ Financing	■ Calculation of savings potential, possibly also data ■ Planning energy savings measures, designing energ ■ Implementing energy-saving measures ■ Financing ■ If appropriate, systems operation ■ Maintenance
CONTRACT TERM	Long-term (approximately 10-15 years)	Normally long-term (8-15 years) for optimisation me of construction and maintenance; for EPC involving l light'), short-term contracts (2-3 years) are also possi
REMUNERATION	Use-based charge for energy supplied, e.g. €X/kWh	**Results-based** annual payment to ESCo **(contracting** commences **as a proportion of the energy cost savin** e.g. €X/year.
MEASURES (EXAMPLES)	New, replacement and/or supplementary investments for individual energy supply facilities, e.g. ■ Efficient heating boilers ■ Small-scale combined heat and power (CHP) units ■ Photovoltaic systems ■ Solar thermal installations ■ Refrigerating units (e.g. absorption-type, compression-type) ■ Systems for heat and cold supply (local district heat networks, pumps, control systems, etc.) ■ Lighting systems	■ Retrofit and efficiency investments for all types of □ Energy-saving lighting □ Efficient heating systems (heating boilers, CHP □ Refrigeration □ Air-conditioning □ Building energy management systems □ If appropriate, building refurbishment (roof insu □ Heat recovery ■ Optimisation of the operation of (existing) installa ■ Additional measures such as user motivation and t
OWNERSHIP ARRANGEMENTS	■ Throughout the duration of the contract, installed facilities are owned by ESCo or are leased by it. Normally, the rooms in which they are installed (e.g. boiler room) are rented or leased by the ESCo in order to build the facilities. ■ When the contract terminates, installations are either dismantled or can be purchased by the customer.	■ Facilities installed within the context of the measu of the customer from commencement of the cont provided the investment and financing).
CUSTOMER BENEFITS	■ The planning, building, operation and maintenance of technical facilities is done by one source, a specialists, and not by the customer. ■ Transparent price development (price escalation clause), which may also lead to a lower price for use energy. ■ Security of supply through efficient energy supply systems within the customer's own premises (e.g. emergency power supply, uninterruptible power supply if the grid is unstable and presents a risk of outages). ■ No customer investment required ■ Building owner or customer is relieved of key planning and operational tasks.	■ The planning, building and maintenance of technic a specialists and not the customer. ■ Guaranteed energy cost savings for the entire cont ■ Usually no customer investment required (but pos ■ Building owner or customer is relieved of key plan ■ Increase in value, productivity and comfort/conver ■ Economic and technical risks largely transferred to ■ Planning certainty is provided by steady level of no due to constant level for contracting fee.

Table 2: Overview of four energy service models

	Energy operations contracting (EOC)	**Third-party financing (TPF)**
	Alternatively: ■ technical facility management ■ operations contracting	Alternatively: ■ equipment leasing
on and maintenance, for **optimising** n existing buildings. The ESCo **does** the available savings potential, to e energy cost savings and to **guaran-** m.	ESCo delivers **technical services** to ensure safe, economic, environmentally sound and **efficient operation** of systems and equipment.	ESCo **provides a distinct technical facility or system** to ensure safe, economic, environmentally sound and efficient operation.
collection gy facilities	■ Systems operation ■ Maintenance ■ Primary energy purchasing ■ Use energy supply	■ Planning energy saving measures, designing energy facilities ■ Implementing energy saving measures or energy installations ■ Financing
asures encompassing all branches ow levels of investment (e.g. 'EPC ble.	Variable	Medium to long-term, similar to ESC and EPC
fee) assessed when the contract **gs that are to be achieved,**	If there is no use energy supply, then outlay-based remuneration (e.g. €X/month), possibly supplemented by a results-based bonus. If there is use energy supply, remuneration is as in ESC, i.e. use-based charge for energy supplied, e.g. €X/kWh.	Remuneration consists of a charge for provision of the system/equipment [DIN 2003], e.g. €X/month.
energy uses, e.g. units, pumps, control systems, etc.) ılation, window replacement) tions, including maintenance raining	■ Optimised operation of new or existing installations ■ Regular maintenance of technical installations such as boilers ■ Energy carrier (input/output) monitoring	■ Planning, financing and building technical systems that are distinct and clearly defined, such as lighting or heat recovery systems.
res are normally the property ract onwards (even if the ESCo has	■ Facilities are owned by the customers.	■ Installed facilities are owned by the ESCo during the contract term. ■ Upon termination of the contract, facilities either automatically pass into customer ownership or can be purchased by customer.
cal facilities is done by one source, ract term. sible). ning and operational tasks. nience in a building (or facility). ESCo. on-variable costs over the long term	■ Transparent price development (price escalation clause), which may also lead to a lower price for use energy. ■ Operation and maintenance of technical systems by specialists. ■ Building owner or customer is relieved of key planning and operational tasks. ■ Increase in productivity and comfort/convenience in a building (or installation).	■ No customer investment required. ■ Planning and building by specialists. ■ Building owner or client is relieved of key planning tasks.

limited easement on the facility. Energy savings normally result from an optimal supply mix including various sorts of use energy, e.g. via combined heat and power (CHP) units or combined power, heat and cooling generation systems (trigeneration). Energy savings are not a fixed object within the contract – they generally arise by way of the utilisation of modern energy installations. On account of the long-term contract duration, with corresponding standing and energy charges, the ESCo can recoup its investment, freeing customers of their own investment. The standing charge covers the non-variable costs (e.g. cost of servicing loans, personnel costs, etc.), while the energy charge covers the ESCo's variable costs (e.g. energy costs, etc.). The main differences between this and use energy supply by a traditional energy supplier (e.g. a municipally owned utility providing district heat and electricity) are, firstly, that decentralised, customised facilities are installed (and thereby also emergency power supplies) for the customer, and, secondly, the long-term duration of the contract. Figure 2 gives a simplified illustration of the ESC principle.

NOTE

In principle, due to the long-term price agreements, the ESCo has a strong incentive to make the use energy supply extremely efficient. Nonetheless, ESC through an ESCo is not necessarily more energy efficient than traditional central supply by an energy utility company, but depends greatly upon the individual conditions. For example: a modern, central CHP plant feeding into a high-quality local district heat network can, under certain conditions, supply heat in a more energy-efficient manner than an efficient heating boiler fitted in the basement of a residential building. The large plant is able to balance variations in consumption since it has a greater number of connected consumers and can thus continue to run optimally at all times, while this is often not possible for an ESCo operating an heating boiler with only one consumer.

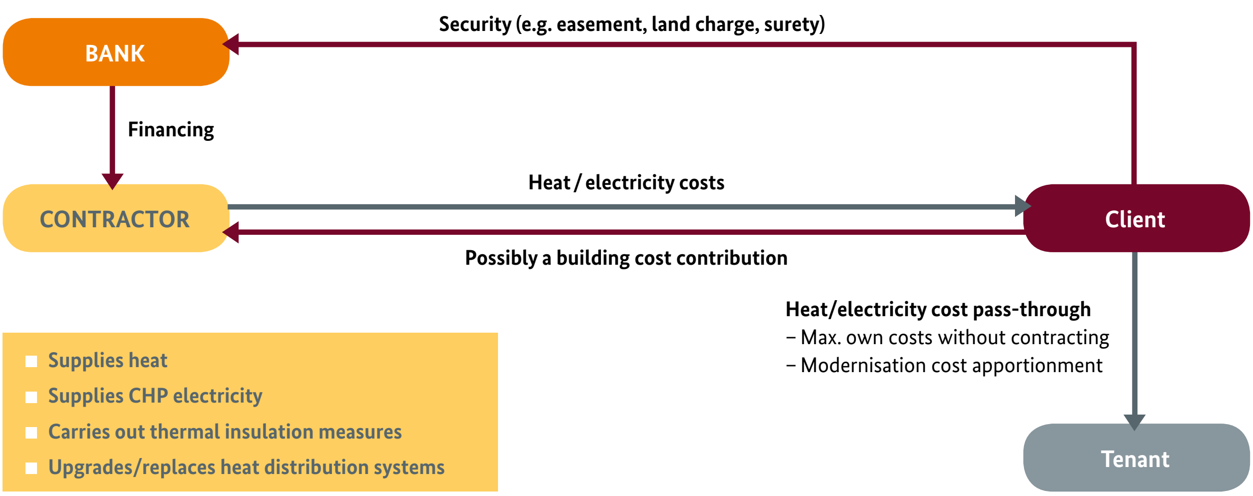


Figure 2: Schematic of energy supply contracting (ESC)

2.3.1.1 Remuneration arrangements

The customer pays a fee to the ESCo for the energy supplied. This is typically composed of a basic cost component for financing the investment (capacity charge or standing charge, covering all the ESCo's non-variable costs, plus a profit margin) and a consumption-based cost component (energy charge, covering all variable or consumption-related costs, plus a profit margin). Both components are linked to relevant price indexes by means of price escalation formulas. Before a call for tenders is issued (e.g. for heat supply), the customer normally stipulates the structure of the price escalation formulas in question in the tender documents. For the capacity price CP (price for keeping one kW_{th} available) a typical formula would be:

$$CP = CP_0 \cdot \left(FixCO + VCGI \cdot \frac{CGI}{CGI_0} + VLCI \cdot \frac{LCI}{LCI_0} \right)$$

in which CGI is the capital goods index and LCI is the labour cost index. The 0 subscript designates the baseline value of the parameter at a reference time stipulated in the tender documents. The ESCo can now determine the percentage weighting factors FixCP (non-variable proportion of the capacity charge), VCGI (investment-related proportion) and VLCI (labour-cost related proportion). The sum of these three is 1 or 100%. The ESCo agrees on the variable indexes to be used with the customer. In Germany, reference is usually made to the publications of the Federal Statistical Office.

An analogous procedure is used for the energy charge, with a price escalation formula in which the weighting factors for relevant energy carrier indexes (e.g. gas, wood, oil) or other indexes are determined by the ESCo. Price escalation formulas must either be adjusted according to the energy carrier used or developed individually.

This approach has two benefits: it ensures maximum price transparency for the customer while also mitigating energy price risks for the ESCo, being that the latter has the option of raising its prices. The intervals at which prices are adjusted are stipulated in the energy service contract. This is generally done annually or quarterly.

In addition to the aspect of price transparency, ESCos can often offer use energy prices that are lower than the costs incurred were customers to generate use energy themselves. This is usually due to the combined – and therefore efficient – supply of several forms of use energy, e.g. heat or energy from an ESCo's CHP plant instead of separate procurement of gas from another supplier for heat production in a boiler and additional procurement of electricity from another supplier. Further price benefits can result for customers for the following reasons:

- the ESCo pays lower interest rates on borrowings for investments than the customer would (e.g. to install a photovoltaic system);
- the ESCo is granted more favourable purchasing terms for primary energy (e.g. natural gas) by the primary energy supplier, because it purchases larger quantities;
- the ESCo has better utilisation of operating personnel and thus lower costs, as it manages several installations.

Case study: Energy supply contracting in Guangdong, China

In Guangdong province, an ESCo currently supplies steam to a large pharmaceutical company. Before this arrangement started, steam was produced in four steam boilers running on heavy oil. The ESCo now deploys two biomass-fired fluidised-bed boilers. The heavy oil boilers remain available as a back-up system in order to ensure uninterrupted steam production during maintenance of the biomass boilers. The investment costs were EUR 4.5 million; of this, approximately 80% was financed by borrowing from a bank, while around EUR 850,000 came from the ESCo's equity capital. The ESCo's services comprise of planning, financing, building and implementing the project and system operation. The ESCo's investment costs will be recouped over a contract term of 10 years. The contract stipulates a final energy price of around EUR 22/tonne steam. Billing is monthly, and the customer is obliged to make the payments to the ESCo by the 10th of each month at the latest. In the event of a delay in payment, the customer must pay an additional penalty interest on arrears amounting to at least 1% of the contractual payment for each day of arrears under the terms of the contract.

Source: GIZ China & National Development and Reform Commission of the People´s Republic of China (NDRC)

2.3.1.2 Contract variants

In many industrialised countries, it has proven useful to apply standard contract wording, as this creates trust among the parties needed for such long-term contracts. Nonetheless, individual adjustments are often made in order to accommodate specific customer wishes. This section briefly explains a number of aspects related to individual contract adjustments. Energy supply contracting can be used for both existing buildings and for new construction projects. The installations falling under the energy service arrangement (e.g. boilers, CHP units, photovoltaic systems) can either be planned and installed by the ESCo or they can be taken over from existing stock. How existing installations (or their components) are to be dealt with (e.g. continued use, replacement, etc.) must therefore be taken into account within the contract on a case-by-case basis. This also presents the question of ownership during the contract term and after its termination. The following forms of ownership transfer are conceivable:

- The installation is owned by the ESCo during the contract term, and when the contract ends, it is either removed or is purchased by the customer through a one-off payment in the amount of the asset value. This is the normal case for ESC arrangements in Germany.
- The ESCo owns the installation during the contract term. A proportional extra charge, calculated according to the anticipated residual value of the installation, is made in addition to the capacity charge or standing charge. At the end of the contract term, the installation becomes the property of the customer.

NOTE

This variant amounts to a financing scheme and may therefore not be permissible for public-sector institutions.

'Bundling' buildings to form a pool is a further important aspect. Here, the contract precisely stipulates which buildings are assigned to a pool and how the individual pools and building types are to be supplied.

Case study: Energy supply contracting in Yunnan, China

In Yunnan province, electricity is generated from the waste heat of a sintering plant under the terms of an ESCo arrangement. The ESCo has financed a steam turbine for electricity generation with an installed capacity of 7.5 MW_{el} as well as the components for saturated-steam production from various waste heat sources in the sintering process. This further comprises of a water treatment system, an extinguishing system, a high and low-voltage power distribution system, and an automatic control system for the entire installation. Investment costs amount to EUR 6.2 million, of which EUR 3.7 million were financed through external financing. After deducting on-site power consumption and system losses, the system generates 49 GWh of electricity annually with around 7,200 operation hours. The ESCo assumes all project risks, and the installation is refinanced by means of a contractually agreed upon payment amounting to around EUR t 0.05/kWh_{el}. As the normal electricity price for the company would have otherwise been substantially higher, it immediately profited from the project. The contract term is 66 months, including the construction period. Beside system operation and regular system optimisation, the agreed upon services also include maintaining close contact between the ESCo and the client company. Once the contract terminates, the installations will become the property of the customer. One of the company's key motivations for implementing the project was the immediate reduction in energy costs.

Source: GIZ China & National Development and Reform Commission of the People´s Republic of China (NDRC)

2.3.2 Energy performance contracting (EPC)

In an energy performance contracting (EPC) arrangement, the ESCo is responsible for **optimising building services systems and system operations in existing buildings across all branches of construction and maintenance.** However, the ESCo **does not supply use energy**, meaning that the customer continues to procure gas and electricity, e.g. from an energy supply company. The main service provided by the ESCo is a guaranteed level of savings over a defined period of time.

The ESCo contractually commits to identifying and tapping available savings potentials, covering the requisite investment from energy cost savings and guaranteeing **savings results for the entire contract term**. The guaranteed energy cost savings are the basis for calculating a constant annual remuneration to the ESCo – the **contract-**

ing fee. This sum is normally lower than the sum of guaranteed savings (and is thus typically a budgetary benefit for the customer). In addition to refinancing the investment cost of the implemented measures within the contract period, this fee also contains a profit margin for the ESCo. Figure 3 shows a simplified schematic of the EPC principle.

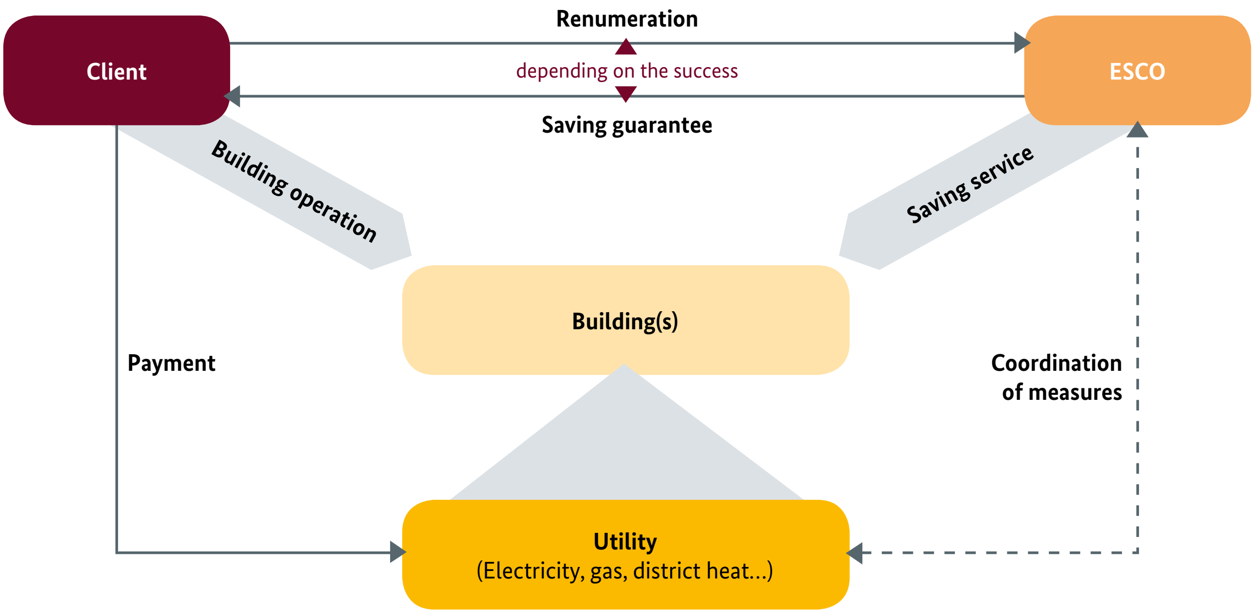


Figure 3: Schematic diagram of energy performance contracting (EPC)

NOTE

The abbreviation EPC for energy performance contracting should not be confused with EPC used as an abbreviation for 'engineering procurement and construction'.

2.3.2.1 Remuneration arrangements

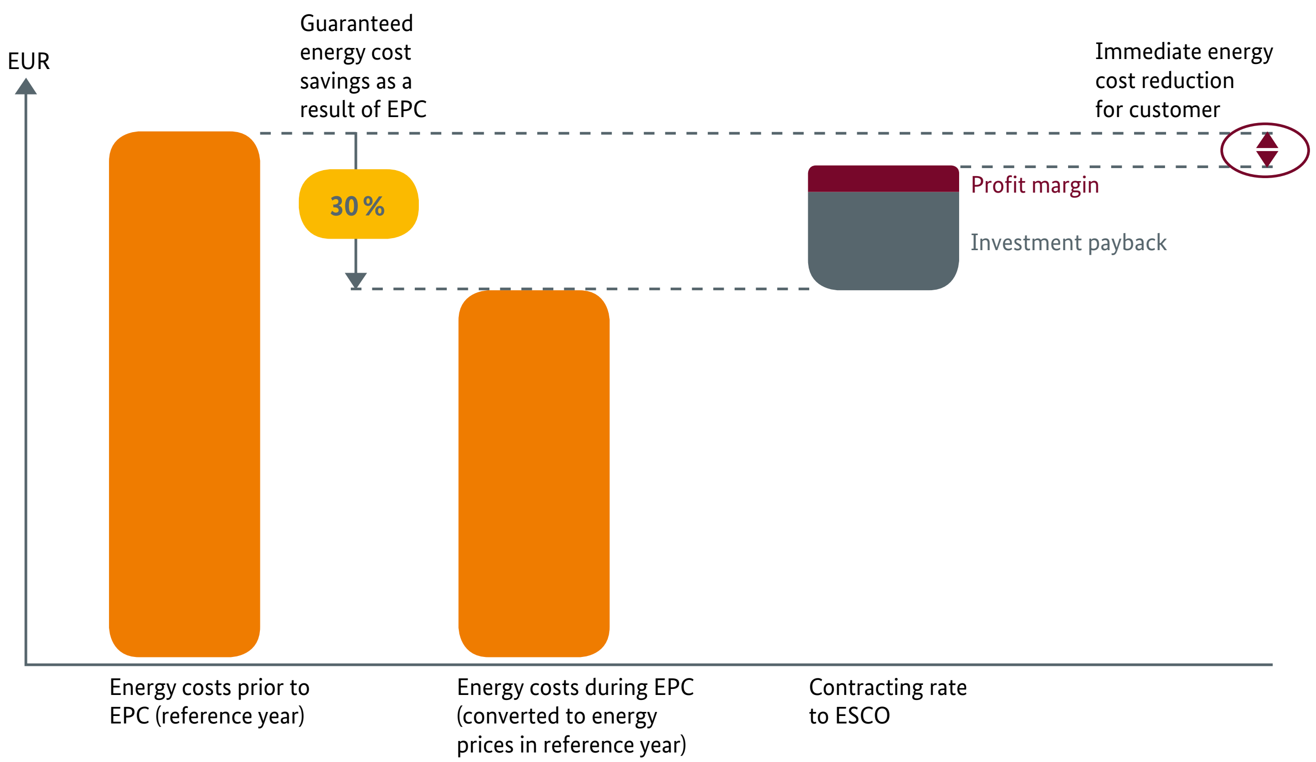
At the heart of energy performance contracting is remuneration based on the energy cost savings achieved. Before a tender is made, an **energy cost baseline** is determined for the building (or building pool) or facility. This can, for example, be based on the energy consumption in the previous calendar year, prior to the EPC measure (the reference year). This is normally compared to the consumption levels of the two preceding years (in order to eliminate extreme climatic influences, usage fluctuations, etc.). In addition, consumption data is climate adjusted on the basis of mild or hot days.
If the supplier's energy billing was based on reliable, actual (metered) consumption measurements in the past, these can be used to determine the baseline and for future EPC billing. The International Performance Measuring and Verification Protocol (PMVP) presents alternative approaches. Finally, in order to determine an energy cost

baseline, the energy prices paid by the customer at a set date (such as 31 December of the reference year) are applied to the adjusted energy consumption of the reference year.

Proceeding from the energy cost baseline, the ESCo **guarantees** an annual **energy cost savings** (in EUR, calculated with the energy prices of the reference year) to the customer over the entire contract period, e.g. 30% of the baseline. A fixed proportion of these guaranteed savings (e.g. 80%) is set as the **contracting fee**, which the ESCo receives from the client to finance the investment, maintain the installations and attain a profit margin. The remaining proportion benefits the customer, reducing budgeted costs. As the ESCo does not supply use energy, the customer must continue to procure energy (e.g. gas and electricity) from an energy supplier and settle accounts with that company. Figure 4 illustrates the relationship between the contracting fee and energy costs.

Rising energy prices have no influence upon the EPC contract with the ESCo (no price escalation formula is in place). Increases are, however, reflected in the bills received by the customer from the energy supplier. Due to the fact that only the energy cost baseline (with customer energy prices of the reference year) is used in the EPC contract, the **annual contracting fee remains constant** throughout the entire contract term. The customer receives the full savings benefit from the installed systems only once the contract terminates. Figure 5 illustrates this case in a 10-year EPC contract.

Figure 4: Contracting fee and energy costs in EPC arrangements (potential structure)

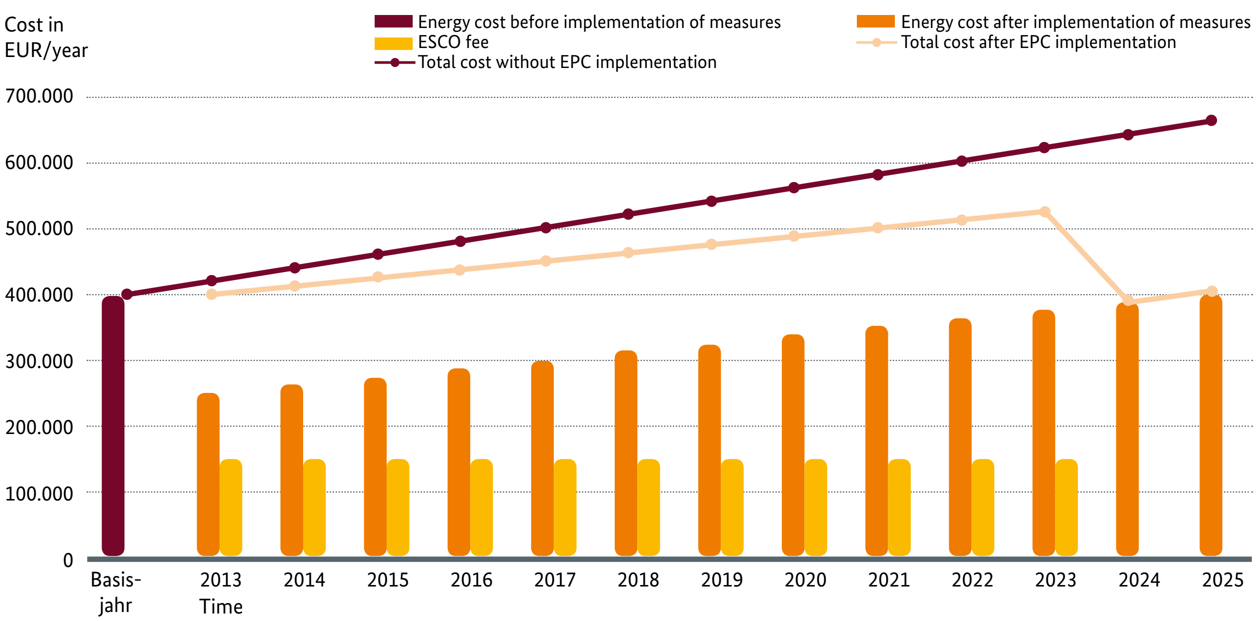


In order to verify the annual energy savings, incurred energy consumption costs are converted into the reference year basis and then compared to the baseline during EPC bill audits. For the sake of ensuring this comparability, energy supply bills received by the client need to be adjusted for the following factors:

- deviations from the reference year in climatic conditions;
- changes in energy prices compared to the reference year (energy bills received by the customer must always be converted into the energy prices of the reference year);
- changes in building/facility usage compared to the reference year (insofar as these have caused energy consumption changes).

The adjusted energy cost savings applicable to the contract be determined and the energy cost baseline compared to adjusted annual energy costs only once these factors have been considered. This process can be supported by a neutral facilitator or consultant.
If the difference between the adjusted energy cost savings and the guaranteed savings is zero, the ESCo is exactly within the performance parameters of its contract. If the difference is greater than zero, contract over-performance sets in (savings are greater than guaranteed); in this case, the extra savings can be shared among the ESCo and the client. If the difference is **negative**, **the ESCo has not achieved its savings goal and must reimburse the customer with the resulting difference**.
If **energy prices rise**, the energy cost savings for the customer delivered by the EPC increase (same quantity of energy saved, multiplied by increasing energy price). This delivers **additional budgetary benefit for the customer; the ESCo, however, does not profit**. Under the EPC contract, all energy savings are only calculated with the energy prices of the reference year, as described above.

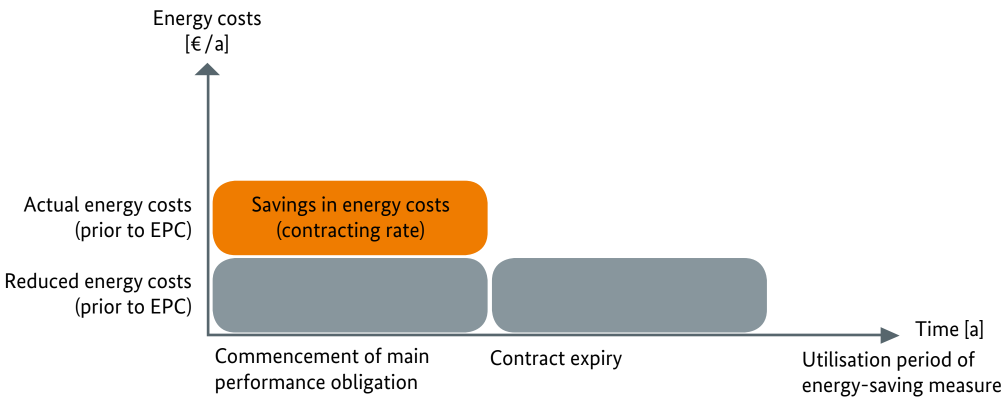
Figure 5: Energy costs and contracting fee under an EPC contract [HLF 2012]



There are two ways in which the client **shares in profits** generated by energy cost savings: ‘fixed-term’ EPC and ‘shared savings’ EPC.

- **Fixed-term EPC**
  In a fixed-term EPC arrangement, the ESCo receives the anticipated energy cost savings throughout the entire period of its main performance obligation. The client thus pays the ESCo a contracting fee, equivalent to the total saved energy costs. The ESCo uses this fee to cover all of its expenditures, notably the investment costs incurred, including a suitable interest margin. The contract period can thus be reduced to the ‘pure’ payback period of the energy-savings measures, which is shorter than in a shared savings arrangement. The fixed-term EPC option is typically used in the private sector.

Figure 6: Fixed-term EPC



Case study: Fixed-term EPC in China

In Hubei province, an EPC arrangement was used to fit an aluminium plant with state-of-the-art electric control systems.
The ESCo installed energy management and control software (including fuzzy control software) in the company. These intelligent systems control the electric drives of ventilators, water pumps, air compressors, etc. in a highly efficient manner. The EPC contract stipulates minimum energy savings rates for the various technical components. The following energy savings have been realised:

Component	Power uptake before optimisation	Power uptake after optimisation	Savings
Water pumps	1,065 kW	585 kW	45%
Dust collection fans	1,855 kW	575 kW	69%
Cooling fans	275 kW	140 kW	50%

Total investment amounts to just under EUR 900,000, which is financed by the ESCo’s equity capital. The investment is refinanced through a fixed contracting fee. The fee also contains a profit margin for the ESCo. The core business of the ESCo is introducing energy management systems in industrial companies.

Source: GIZ China & National Development and Reform Commission of the People´s Republic of China (NDRC)

- **Shared savings EPC**
  Under a shared savings EPC arrangement, the client participates in the energy cost savings from the start of the main performance obligation period. The level of a client's share in cost savings must be stipulated in the contract. Typically, a client's profit share is between 10% and 20% of the savings achieved. Profit-sharing from the start results in shared savings EPC contracts having longer periods than a fixed-term arrangement, being that the annual contracting fee available to the ESCo for refinancing investment costs is lower. The benefit is that the customer's budgeted costs are directly reduced during the main performance obligation period of the savings guarantee agreement.

  In Germany, the shared savings model has proven particularly popular. The tender documents for EPC measures in the public sector stipulate a fixed contract period (e.g. 10 years). ESCos base their tenders on the energy-savings measures to be conducted, the return on capital and the ongoing expenditure that results from this fixed term. The scope of measures carried out depends on the fixed contract term, as a longer duration makes refinancing measures with longer payback periods possible (such as those involving building refurbishment). The key parameters of a tender (savings guarantee, immediate energy cost reduction for the client, scope of measure, level of investment) thus depend upon the contract term.

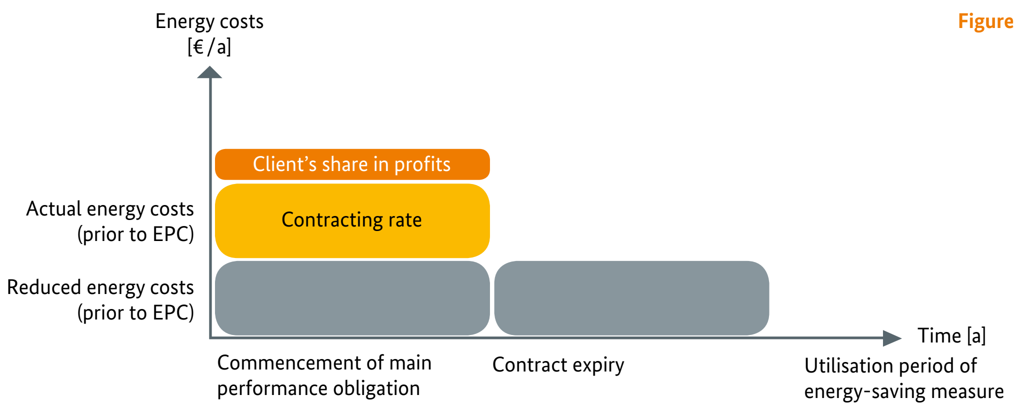


Figure 7: Shared savings EPC

NOTE

Contractually agreed upon one-off payments at the beginning (e.g. investment or building cost contributions) or at the end of the contract term (redemption sum) are also possible. With this solution, higher investment costs do not necessarily lead to permanently high contracting fees.

2.3.2.2 Contract variants

In connection with EPC, a distinction is often made between **'shared savings'** and **'guaranteed savings'** contract models. While both forms are based on a savings guarantee, there is a difference in the financing structure. 'Shared savings' is a participation model as described above in which the ESCo makes the investment and provides financing. 'Guaranteed savings' is a variant in which the ESCo provides a savings guarantee for the measures realised, whereas the client makes the investment and finances it. The contracting fee must then only refinance planning, operation and the like, but not the initial investment; the fee is thus accordingly lower. See Section 2.5 on financing variants.

In EPC, the ESCo may also perform system operation management tasks, or restrict its activities to essential maintenance work. The decision on the extent to which system operation remains a responsibility of the client depends greatly upon the client's personnel resources and on their confidence in the ESCo's ability to achieve savings targets. In industrial facilities, the question of responsibility distribution among the ESCo and client can be a major barrier. Systems are usually housed within core processes of the company, and the company generally does not wish these to be accessible to third parties (ESCos). As a result, ESCos are usually not commissioned.

In classic EPC arrangements, the energy costs saved generally do not suffice for paying back extensive refurbishment of existing buildings, such as replacing windows or installing insulation (unacceptably long contract terms would otherwise be necessary). In industrialised countries, this is largely due to high labour costs, which account for a larger proportion of the expense of refurbishment measures than material costs. This situation may not apply in all developing or emerging countries, and should therefore be assessed in each individual case.

There are also novel variants of EPC models. These are briefly presented in the following [HLF 2012]:

EPC plus

'EPC plus' is a term applied to arrangements in which the EPC model is expanded to **include the refurbishment** of buildings or building components in order to achieve greater savings (e.g. window replacement, improved insulation). Here, refurbishment measures are defined by the client as mandatory, with corresponding planning specifications. As the payback periods of refurbishment are often significantly longer – more than 20 years for some individual measures – it is usually necessary for the client to contribute to construction costs (one-off or annually). Construction cost contribution depends upon the scale of the refurbishment measures required (proportion of structural construction work in overall investment). The provision of a savings guarantee by the ESCo is a key element, as in classic EPC. However, due to the combination of building refurbishment with system retrofit and optimisation, guaranteed savings are substantially higher (30-50%).

Case study: EPC for multi-family housing in Latvia

Around 60% of the Latvian population lives in multi-family buildings, most of which were erected in large housing developments in the 1970s and 1980s. As in many former Soviet satellite states, formerly state-owned housing has almost completely been transferred into the private ownership of occupants over the past 20 years. However, since no effective decision-making structures with regard to maintenance and caretaking have been established, the condition of these buildings is often relatively poor. Moreover, their energy performance standard is very low: average energy consumption for space heating is around 180-220 kWh/(m^2*a).

RENESCo, a private-sector energy service company, has successfully been implementing energy services in the multi-family building sector since 2009. Taking EPC as its basic business model, it has comprehensively improved the energy performance of residential buildings by carrying out measures involving the building envelope (e.g. insulation, windows), making it possible to reduce the space heat requirement to less than 70 kWh/(m^2*a). This is achieved by combining extensive European Union structural fund resources (meeting 50% of the costs) with arrangements under which energy cost savings are recouped over contract terms of 10 to 20 years. RENESCo guarantees that the energy costs after implementation will remain at the same level as before, and utilises actual savings to recoup its investment. A key aspect is the higher guaranteed level of occupant comfort (indoor air temperatures, hot water temperatures), which is the real value of the energy service for many owners.

In this setting, the absence of a decision-making structure among the many individual owners within a single building presents a major challenge to ESCo activities. A further barrier is that the owners often represent lower income groups, who are highly risk-averse since they have little previous experience with financing arrangements. This situation has been resolved in Latvia as follows: using a series of information events or joint on-site visits, the housing owners are informed about the EPC option. If basic agreement is reached with the occupants (i.e. 66% of the occupants approve of EPC), a building owners association is established and a chairperson is elected as representative. RENESCo then concludes an energy service contract with this building owners association.

To ensure that the savings goal is actually achieved, RENESCo closely supervises the refurbishment work and thus ensures that construction work is carried out to a high standard. This has proven to be a key benefit compared to conventional refurbishment schemes that lack a similar incentive system.

Source: RENESCO, EKODOMA

EPC light
In 'EPC light,' energy consumption savings are achieved exclusively by means of measures involving low levels of investment or none at all. Such arrangements amount to **external energy management coupled with a savings guarantee**. The contract durations are only 2 to 3 years, as no investment payback is needed. The contractor guarantees the level of savings to be achieved through system optimisation, energy management or the achievement of a certain level of consumption. ESCo payment is result-based, in a manner similar to classic EPC.

This model is particularly suited for clients lacking human resource capacity for sustainable energy management. It is also suited to buildings for which classic EPC is not an option (e.g. due to size, uncertain building utilisation over the long EPC term, lack of current requirement for investment, etc.).

Because no investments are made, contracting costs for potential customers can be kept low. This makes EPC light a particularly interesting model in developing and emerging countries.

In EPC light, the contractor performs the following services:
- initial survey of technical systems (only if required);
- regular consultation with users on changes in building use, and provision of user training to match circumstances as appropriate;
- continuous, active optimisation of heating and air-conditioning system control, and documentation for each building or facility in an operating manual;
- reporting maintenance needs where found;
- meter monitoring, consumption analysis, energy bill auditing;
- recording building usage changes that impact consumption;
- semi-annual energy reports;
- one-off creation of a critical point analysis for a specific building or facility, with investment proposals (mini-audits) if necessary.

Case study: EPC light in Germany

In 2010, twelve schools – one youth centre and one cultural institution in the Pankow district of Berlin – concluded a two-year EPC light contract (an external energy management arrangement with savings guarantee) with a facility management company.
The goal of this pilot project is to reduce the energy consumption of the schools and administrative buildings by means of effective energy management and technical system optimisation. In contrast to conventional energy performance contracting, EPC light does not involve any capital investment. The energy savings are achieved through system optimisation, energy management and by keeping consumption below a certain level.
In order to achieve this goal, the teaching staff, students, participating youth and cultural institution staff received advice on how energy can be saved through modified user behaviour alone. The ESCo also performs further services: optimising the heating and air-conditioning control systems, compiling semi-annual energy reports, monitoring meters, conducting consumption analyses and auditing energy bills.

Energy costs in 2010 (baseline)	882,714 EUR/year
Guaranteed savings	90,037 EUR/year
Guaranteed savings (relative to the baseline)	10.2%
Payment to ESCo	44,118 EUR/year
Payment to ESCo (relative to savings)	49.0%
CO_2 emissions reduction	3.973 t/year

Source: Berlin Energy Agency

Technology-specific EPC
Normally a holistic approach is taken in EPC to optimise systems, i.e. the customer does not make technology-specific stipulations regarding the way in which energy savings are to be achieved. However, stipulations are, in principle, possible and make sense for cases in which the customer intentionally wishes to concentrate on certain energy applications (such as lighting). This may result from the customer wishing ESCo activities to be limited in scope or affect only certain parts of the organisation (as in industrial companies that do not wish to give external service providers full insight into and access to production facilities). In such a case, an ESCo may be commissioned to perform only measures designed to optimise air conditioning, control systems or lighting systems.

Lighting is a sector in which this approach is frequently taken. Many lighting systems in buildings owned by public authorities, industrial companies and businesses no longer meet current technical standards or do not comply with current rules and regulations; the same applies to many municipally-owned street and open-space lighting systems. Apart from supply contracting arrangements (lighting contracting), EPC schemes can also be used to upgrade lighting systems. While the basic principle is similar to classic EPC, it is less complex due to limited application to certain technical installations.

Manufacturers of efficient technologies are now offering technology-specific EPC increasingly often. This broadens their service portfolio, opens up new fields of business and customer groups, and can boost overall product sales. The contracting customer, in turn, benefits from high quality technologies, as the manufacturer is directly responsible and therefore does not use low-quality price-cutting products.

Case study: Technology-specific EPC for water pumps in Jordan

The Water Authority of Jordan (WAJ) is the country's largest electricity consumer, accounting for around 15% of total electricity production. Due to given hydraulic conditions, fresh water from the Jordan valley needs to be pumped to the cities through an elevation gradient of 1,400 metres. Technical inefficiency in water pump operation has led to high electricity consumption. This is not only a major cost factor for WAJ but also the source of substantial carbon emissions, as Jordan's electricity is generated almost exclusively from fossil fuels. GIZ's Improvement of Energy Efficiency (IEE) project is working with the private sector to develop an innovative contracting model for improved energy efficiency in Jordan's water sector.

A pilot project involving German water pump manufacturer WILO has developed an EPC model for water pumps and has tested it in a pumping station in Ebquoreyeh. With this model, WILO acted as an ESCo, performing all tasks from planning, implementation and operation through to financing. As a result of this project, the pumping station now consumes 30% less energy, delivering annual energy cost savings of approximately EUR 110,000 and emissions savings in the order of 1,100 t CO_2/year.

The pilot project has also led to improvements in the specifications applied by WAJ in its procurement process for water pumps. These now prescribe higher levels of quality, thus taking account of the economic benefits delivered across the entire lifecycle of the pumps.

The successful outcomes of the pilot project are now to be replicated country-wide and further private sector commitment is to be sought.

Source: GIZ Jordan

2.3.3 The Integrated Energy-Contracting Model for combining savings and (renewable) supply

The Integrated Energy Contracting (IEC) model is an innovative 'delivery mechanism' for combinations of energy efficiency and renewable energy projects. IEC is not intended to be a replacement for existing business models but as an additional product approach to help spread energy efficiency and renewable energy initiatives into new market sectors and smaller projects. The three core ideas of IEC are:

1. Combination of energy efficiency measures at any point in the facility (building and/or production plant) and energy supply in a single service package following the 'energy efficiency first' paradigm.
2. A flexible, pragmatic and case-by-case approach to measurement and verification (M&V) of energy efficiency measures.
3. Avoidance of any incentive for the ESCo to deliver more energy than needed.

The IEC model was developed based on experiences with the existing energy contracting (EC) basic business models EPC and ESC. Both of these models have their strengths. EPC is a proven and effective framework for driving comprehensive energy savings, particularly in large facilities. ESC has a larger market volume (at least in most European ESCo markets) and has been successful in penetrating a variety end-use markets and improving energy efficiency on the supply side, even for much smaller projects.
On the other hand, these two models also have limitations. ESC has, in practice, hardly moved 'out of the boiler room' to include energy efficiency improvements that reduce demand, and, indeed, it is not able to wholly exclude incentives for an ESCo to sell more energy. EPC is restricted to projects with very high energy cost baselines (usually above EUR 100,000) and requires relatively complex M&V methods which are only affordable in rather large projects. IEC proposes ways to overcome these limitations.
The IEC business model builds upon the relatively widespread and robust ESC model. Compared to ESC, IEC expands its scope to include energy efficiency measures for the entire facility in the areas of building technologies (e.g. controls, HVAC, lighting), building envelope, and user behaviour. To avoid incentives for supply surplus energy, the energy price is fixed at the profit-neutral marginal price. The business model is summarised in the figure below.

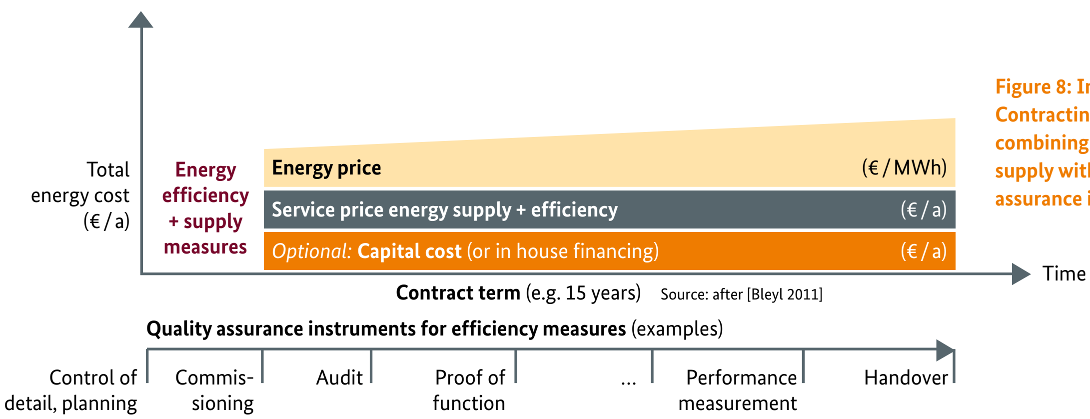


Figure 8: Integrated Energy-Contracting business model for combining energy efficiency and supply with examples of quality assurance instruments

Compared to EPC, IEC promotes simplified M&V methodologies. Particularly for smaller projects, calculated verifications are proposed in combination with quality assurance instruments (QAIs), which result in flat-rate charges for the energy efficiency measures. For larger projects and M&V budgets, a fully IPMVP-compatible M&V regime can be applied in order to verify savings. For the energy supply portion of the energy service package, megawatt hours delivered from boilers, solar systems or heat-recovery installations are metered and billed directly.

With these features, IEC provides a framework for performance-based energy efficiency projects in various market segments, especially useful for finding economically viable solutions for smaller project volumes. (Source after [Bleyl 2011][2])

Case study: Integrated Energy-Contracting for Austrian Military

After having successfully implemented a 500 kW_{elt} biogas plant on its 270 hectare military airfield in Zeltweg through an ESC model in 2004, the Austrian military has recently outsourced the energetic refurbishment of one of its military training grounds to an ESCo for a 15 year contract term.
The technical scope of services encompasses comprehensive energy conservation measures (building technologies, building shell and user motivation) for heat, electricity, water and replacement of the existing 2 MW oil fired boilers with a 2 boiler wood chip system.
The energy services business model applied is an Integrated Energy-Contracting scheme with a modular scope of services. The wood chips are supplied by the local military forestry department, thus increasing the local value-added chain.
In the European-wide call for proposals, Proenergy was identified as the best bidder. The negotiated procedure allowed a combination of competition for best solutions and lowest prices.

Energy cost baseline	EUR 300,000 per year
Biomass supply investments	EUR 990,000
Energy efficiency investments	EUR 370,000
NPV of future energy cost savings cash flow	EUR 280,000
CO_2 emissions reduction	67%, equivalent to 600 t/year

The heat energy supply costs from the biomass installation, including capital cost, are even slightly below the heat energy cost baseline.

Source: Energetic Solutions 2013

2 Bleyl, Jan W. Conservation First! The New Integrated Energy-Contracting Model to Combine Energy Efficiency and Renewable Supply in Large Buildings and Industry in ECEEE Summer Studies, paper ID 1-485, Belambra Presqu'île de Giens, France June 2011

2.3.4 Energy Operations Contracting (EOC)

In energy operations contracting – also known as technical facility management –, the key aspect is the optimised operation of existing or new energy systems. While system operation remains the responsibility of the customer, under conventional maintenance and service contracts, in this model, the contractor also performs system operation. Remuneration for contractor services is normally similar to that of energy supply contracting (ESC), but with substantially lower standing charges (see Section 2.3.1.1.).

Contract terms can either be very short, running for one to two years, or longer. Often, when more comprehensive plant refurbishments become necessary, a technical facility management agreement is converted into an energy supply contracting arrangement [NRW 2012].

2.3.5 Third-party financing (TPF)

Third-party financing – also known as equipment leasing – is a form of contracting that is not yet in widespread use. In contrast to the other contracting models, the client continues to operate the systems in this approach. The service package essentially comprises of planning, financing and constructing plant equipment that can be clearly defined and demarcated such as lighting or heat recovery systems. The charges paid to the contractor are usually fixed, and their level – as in leasing – depends upon the contract term and the volume of investment [NRW 2012].

Case study: Equipment leasing in China

In Shanxi province, extensive energy efficiency measures have been implemented in a coal preparation plant by means of a third-party financing arrangement. The project involves introducing an energy management system, installing measurement equipment for recording and monitoring electrical parameters, installing medium and low-voltage frequency converters and installing reactive power compensators.
Three parties are collaborating on the project: the first is a plant engineering company that acts as the general contractor, providing an integrated solution for measure implementation including energy auditing, concept planning, plant supply and installation, engineering support and staff training. A general contractor also makes savings guarantees. A financial institution provides the requisite capital in the form of financial leasing for the installations. For the duration of the three-year contract term, a bank is in possession of the installations, and the coal processing company pays a leasing rate to the bank. After deduction of debt service and profits, the bank passes the remaining sums through to the plant engineering company. The total investment costs amount to around EUR 410,000.

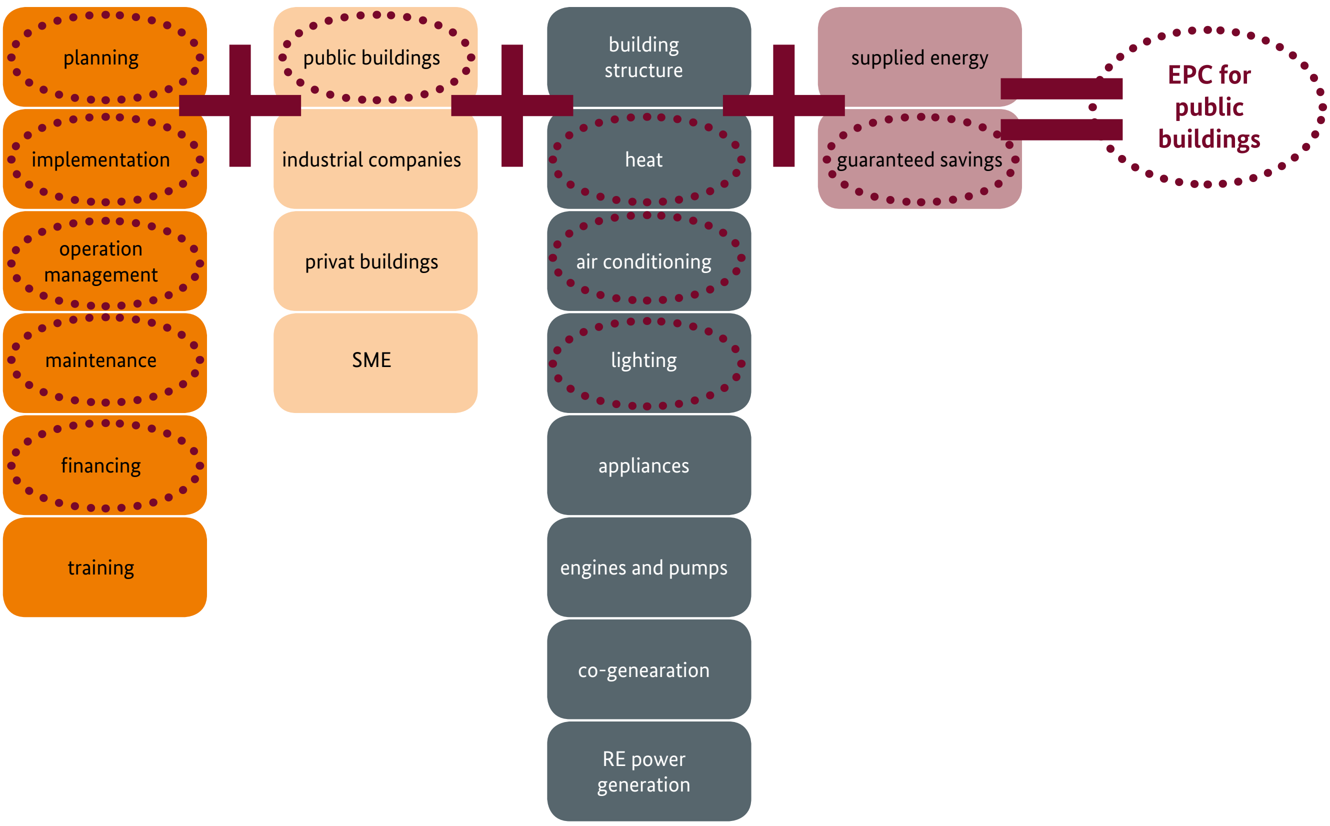
Source: GIZ China & National Development and Reform Commission of the People's Republic of China (NDRC)

2.3.6 Putting together further energy service models

The examples set out in Sections 2.3.1 to 2.3.5 encompass energy service models that have become established in recent years, especially in industrialised countries such as Germany, the USA and France. These models are by no means to be understood as uniform standards – they differ in many details according to customer sector and region. Energy services need to be **customised for local conditions**. This is all the more imperative in emerging and developing countries. The examples set out above should therefore be understood as a toolbox of ideas, not as patent recipes that can be transferred directly.

Figure 9 demonstrates approaches to putting together new variants: modular energy service packages can be compiled using elements from different categories: value chain of energy services, target group and technology sector. The example presented here is an EPC model for public buildings. The services involved in this example are planning, implementation, maintenance and financing for public buildings, offered specifically to realise energy efficiency measures in the technology sectors of heating (e.g. using a small-scale CHP unit), ventilation and cooling (e.g. using a combined heating, cooling and power generation system) and lighting (e.g. using LED systems). Since public buildings often have operating personnel of their own, this example of an EPC model does not involve operational services.

Figure 9: Putting together modular energy service packages. Example: EPC arrangement for public buildings (following Figure in [E7 2010])



2.4 Possible energy service company types (ESCos)

Just as there are many variants and interpretations of the concept of energy services, the range of potential forms of ESCos (for a definition see Section 2.1) is highly diverse. The following lists a few examples:

- **Energy suppliers**: For these, energy supply contracting models are the logical option, as they are similar to classic energy supply and require comparable know-how. At first glance, EPC, with its typical focus on building services engineering, refurbishment, etc. would not seem to match the business model of an energy supplier. However, this can in fact be a lucrative expansion along the value chain. In a liberalised energy market, it can become possible to increase customer loyalty and, for instance, to follow up with energy supplies in addition to EPC services in this manner. EPC thus becomes a second line of value creation for the energy supplier. What makes EPC even more attractive is that it gives the supplier opportunities to engage in targeted demand side management. It may thus become possible to maintain a lower level of generating plant capacity to meet demand, or to better match load curves with the available generating capacities. This aspect can be particularly relevant in emerging countries that are experiencing strong economic growth in situations where the installed generating capacity of an energy supplier can no longer meet demand and there is a risk of power outages.

- **Technology manufacturers**: For the manufacturers of energy efficient technologies and equipment, energy services can be a valuable marketing route by which to increase turnover and customer loyalty. Siemens, Honeywell, Wilo and Johnson Controls are firms taking this route. They usually offer energy services through specialised subsidiaries, sometimes even with their own financial institutions (e.g. Siemens). Here, too, energy services supply a second line of value creation for the companies. If an ESCo's profit margin is unattractive in a given competitive situation, it can be compensated for by its profit margin on components and plants.

- **Planning consultancies, energy agencies, etc.**: These companies have specific know-how relating to the planning and, in some cases, also to the operation of installations. By outsourcing to other service providers, they are able to offer complete energy service packages (e.g. the Berlin Energy Agency).

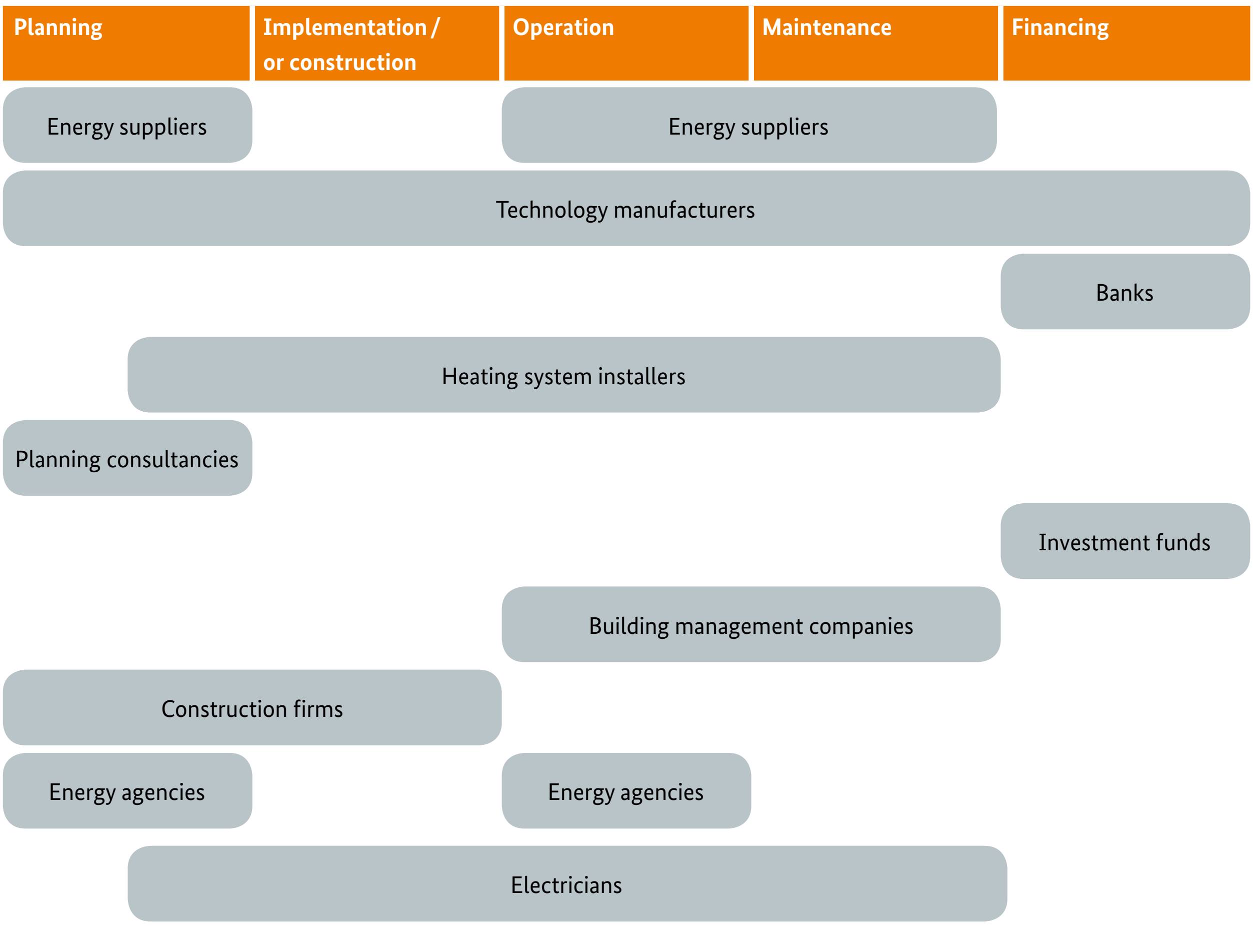
- **Finance institutions, investment funds**: These normally act as contract partners for ESCos, such as in a forfaiting model (sale of an ESCo's future receivables to a bank in order to finance the investment see Section 2.5). However, they can also act as ESCos themselves by outsourcing those services that lie outside of their core business. This line of business can also be interesting for investment funds (e.g. SUSI Partners's planned Energy Efficiency Infrastructure Fund, see Links section).

- **Building management companies**: Energy services are a logical complement to building management, and are partly integrated within facility management (e.g. Hochtief in Germany).

- **Heating system installers, electricians, construction firms, etc.**: These often act as subcontractors for larger ESCos, and a gradual expansion of the services they offer can turn them into ESCos. As these are mostly small and medium-sized companies, possible claims made under guarantees for technical installations can have a negative impact and may raise the business risk for these firms to an unsustainable level.

In principle, all companies and institutions that have expertise in the value chain of energy efficiency realisation (planning, implementation/construction, operation, financing, maintenance) can offer energy services as ESCos. By outsourcing components to subcontractors, they can expand their core services and provide complete packages to customers. Figure 10 illustrates various possible providers of energy services and their core services in the ESCo value chain. We would remind readers here of the definition of an ESCo (see Section 2.1) and note again that mere consultancy by energy auditors does not fall under this definition.

Figure 10: Examples of possible providers of energy services and their core competences in the ESCo value chain



Both private and public ownership of ESCos is possible, as are mixed forms as public private partnerships. In order to implement energy efficiency measures in public buildings or district heat networks, a state-owned ESCo may be an appropriate option (such as ESCo-Rivne in Ukraine [WB 2010]). State-owned 'super-ESCos' that conclude energy service contracts with public-sector customers, while subcontracting the actual projects to external service providers, are a further option (such as FEDESCo in Belgium, or NYPA in New York, USA) [WB 2010].

Figure 10 lists a number of key advantages and drawbacks of public and private ESCos.

Figure 11: Advantages and drawbacks of public and private ESCos

	Public ESCOs	Private ESCOs
Advantages	+ Uncomplicated award of constracts by public customers + Centralised ESCOs permit rapid scaling (super-ESCOs) + Financing generally simpler thanks to good credit ratings	+ Competition promotes innovation and the development of new sercice models and leads to low prices for customers
Drawbacks	– Risk of monopoly structures emerging that impede further market development	– Award of contracts by public customers can be complex – Market development may be a lengthy process (many competitors need competece building) – Investment funding is difficult for small companies

Case study: State ESCO in China

The State Grid Corporation of China (SGCC) is the world's largest grid operator, with more than one billion customers. The new demand-side management directive adopted in the context of the 12th Five-Year Plan obliges SGCC to engage in energy conservation. Electricity deliveries must be reduced by 0.3% each year, primarily through energy efficiency measures. ESCos are one of various tools being deployed to achieve this goal. SGCC's provincial branches have established their own ESCo divisions at the local level, which offer energy services to their customers. The aim is to expand the range of services offered by the corporation and to contribute to energy conservation. GIZ is advising SGCC on how to develop sustainable ESCo business models. Being a state corporation, SGCC can provide extensive guarantees so that project financing – often such a difficult aspect of ESCo business – proves unproblematic. The technical cooperation project titled 'Energy Policy and Energy Efficiency' is training experts and decision-makers, while also refining project ideas and promoting technology cooperation.

Source: GIZ China & State Grid Corporation of China (SGCC)

2.5 Financing energy services

Energy service models often involve extensive investment in energy efficient technologies and installations on the customer or user side. Energy services that involve investment generally deliver much greater energy cost savings than services involving no investment (such as energy operations contracting), in which the savings are used to pay back the investment.

Three ways of financing energy services can be distinguished:

- **Customer financing** (see Figure 12a)
  The customer provides the financing (and is thus also responsible for the accounting) for all necessary investments, usually by borrowing from a bank. The ESCo performs only services involving no investment (such as planning, implementation, operation) and is remunerated for these by the customer.
  This is the type of financing used in '**guaranteed savings**' EPC arrangements (see Section 2.3.2 on EPC). Here, the ESCo guarantees the outcome of investment in energy efficiency measures (e.g. a certain level of efficiency improvement, energy cost reduction, etc.) in the EPC contract. As long as attainment of this target is regularly verified, the ESCo receives a constant remuneration over the contract term (or a share in profits in the event of over-performance). If the goal is not attained, the ESCo must cover the customer's borrowing costs until this is remedied.
  Direct customer financing is always recommendable if the customer has better access to favourable financing options. This aspect is often a problem for small ESCos that do not have a large balance sheet total, such as companies that were originally pure planning consultancies.

- **ESCo financing** (see Figure 12b)
  The ESCo provides the financing (and is thus also responsible for the accounting) for all necessary investment, normally by borrowing from a bank. The customer pays a fee to the ESCo for the services rendered and for investment payback.
  This type of financing is often used in both **energy supply contracting (ESC)** and classic **shared savings EPC** arrangements (see Sections 1.1.1 and 2.3.2).

- **Forfaiting** (see Figure 12c)
  This financing model is a variant of classic ESCo financing (see above) and is used primarily in **shared savings EPC** arrangements. Forfaiting refers to the sale of future receivables for financing institutions. The ESCo cedes a proportion of its receivables from the customer (equivalent to the financing proportion of the future contracting fee) to the lender in exchange for upfront investment by the lender.
  In signing a 'notice and acknowledgement of assignment', the customer acknowledges the continued payment obligations to the financial institutions, regardless of any disputes between the customer and ESCo. The ESCo thus receives only part of the contracting fee from the customer, the remainder going directly to the bank.

Of course mixed forms of these models are also conceivable, such as one in which the customer provides part of the investment itself and the ESCo finances a further part, be it through borrowing or forfaiting.

Further important sources of supplementary financing include state grants (such as construction cost grants from structural funds) or loans with favourable terms from development banks.

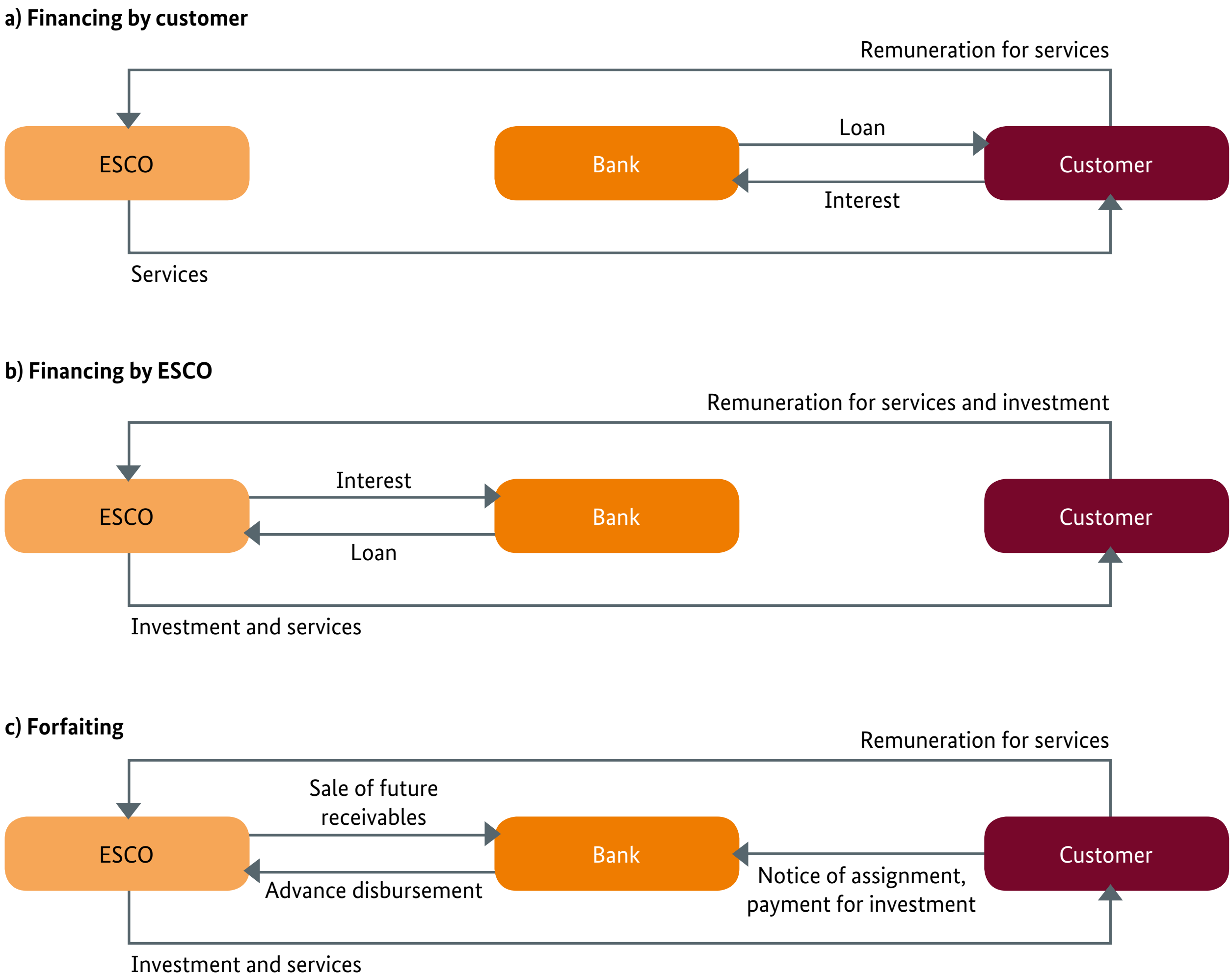
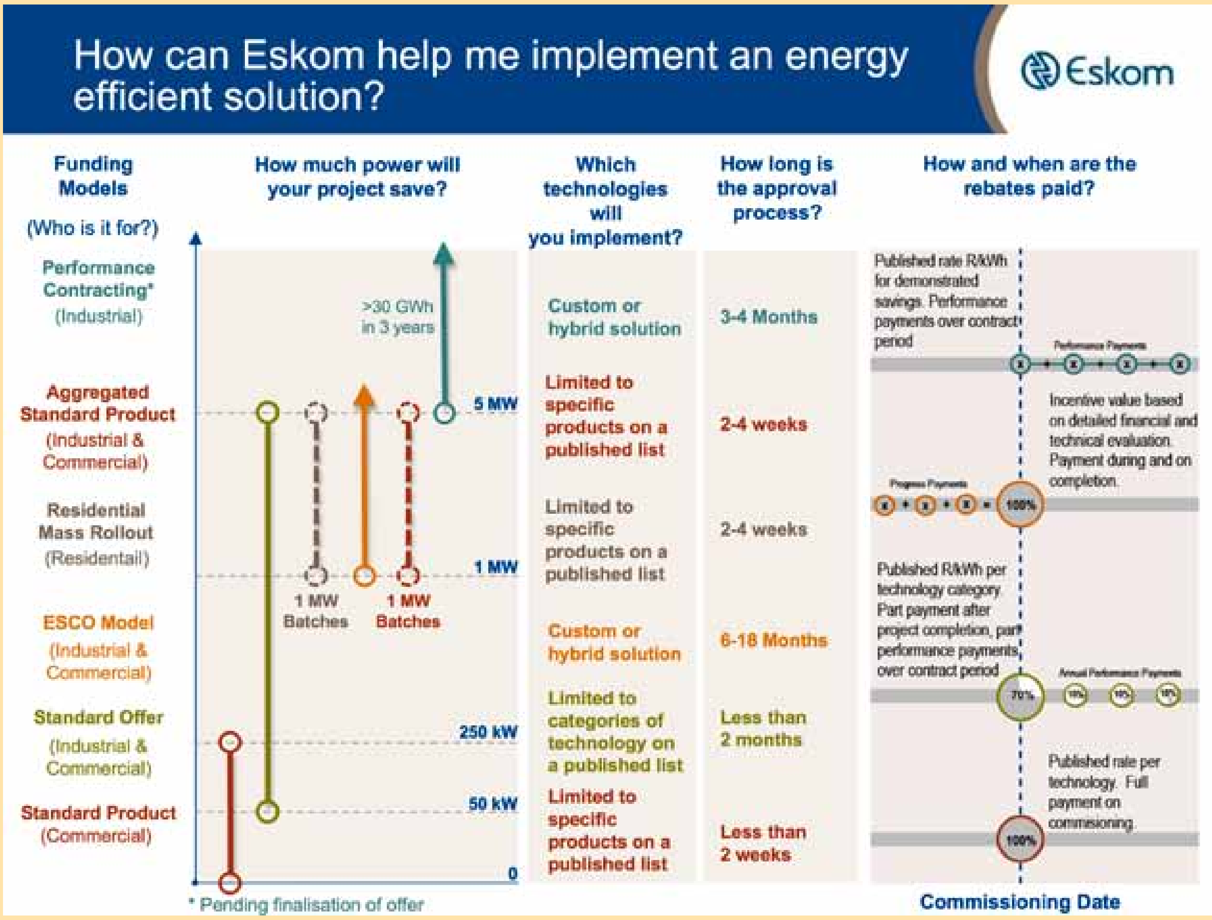


Figure 12: Financing variants for energy services

Case study: ESKOM IDM Programme: Financing of 'Negawatthours' in South Africa

ESKOM, the South African state-owned national utility is operating a comprehensive integrated demand management programme to reduce load and consumption. A variety of funding models for measured and verified savings delivered are offered and packaged as either standardised ('standard products' or 'standard offers') or project specific/customised (ESCo and EPC models) solutions. IDM aims at different end-use sectors such as commercial, industrial and residential. The programme is summarised in the following figure:

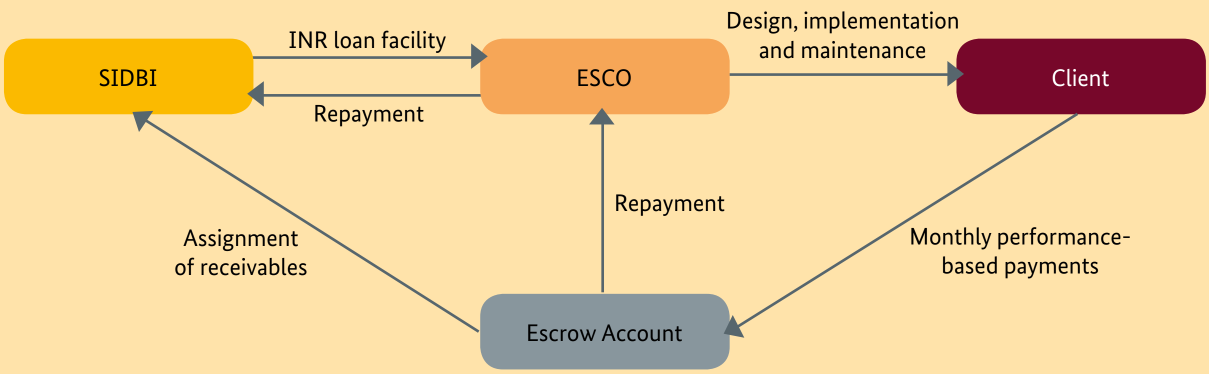


The remuneration scheme consists of payments for load and energy savings. For example, in March 2013, the 'Standard Offer' program paid R5.25m/MW and 42cent/kWh saved.
Despite some criticisms of high administrative burdens and market distortion, the IDM financing scheme appears to be a very interesting financing instrument for energy service providers to sell electricity savings.

Source: ESKOM IDM program 2013

Case study: Cash-flow based financing product for ESCos in India

SIDBI, the Small Industries Development Bank of India (www.sidbi.com), is introducing an innovative finance product to cater to the needs of ESCos in the framework of a KfW energy efficiency credit line. With the credit line, SIDBI is providing a revolving loan limit product to ESCos. As per this arrangement, each individual project is assessed by SIDBI and approved for financing under the revolving limit. On approval of the individual project, 75% of the project costs are disbursed in order to enable commissioning of the project. All receivables of the ESCo are escrowed to a designated account and repayments are scheduled to match the cash-flow to the ESCo.



The key benefits are:

Availability of finance which otherwise is not available through a traditional mode of financing (e.g. working capital loan).

The financing and repayments are matched to the actual cash flows and an adequate grace period is offered to the customer.

No further hypothecation of equipment installed at ESCo client facilities.

ESCo clients can scale up operations since availability of finance for the projects is addressed.

ESCo clients save on finance costs.

Promotion of energy efficiency in industry.

Source: KfW 2013

3 'Facilitators': a missing link for enabling clients and creating a 'demand pull'

3.1 Introduction - the client matters

Successful, performance-based energy service market development was often driven by the client side, e.g. from public institutions by structuring energy service projects and putting them out for ESCos to bid on. As a matter of fact, these processes were frequently enabled by so called 'facilitators' which acted as intermediaries between ESCos and their (potential) clients. Based on these experiences, which are shared by an increasing number of stakeholders including ESCos themselves, market development for energy services requires increased focus on the customer side of the market. Last but not least, market development in a (largely) unregulated environment is ultimately determined by decisions by (potential) client to buy or not to buy.

By their very nature, energy contracting models constitute a significant degree of complexity: they offer solutions for an entire project or life cycle, including design, building, operation & maintenance, optimisation, measurement, verification and disposal. They likewise integrate various technical trades as well as economic, financial, organisational and legal aspects of a project into a single customised energy service package or contract.

This integrated and multidimensional approach to performance-based energy contracting presents solutions for a number of obstacles in the way of energy efficiency projects, ones that are not achievable through standard planning instruments or procurement practices. These opportunities encompass minimisation of project cycle costs across the borders of capex and opex budgets, comprehensive planning and optimisation among various technical disciplines and trades, and performance and operation guarantees for an entire project cycle. In this regard, energy services can be seen as a 'delivery mechanism' for energy efficiency and (renewable) supply projects.

This comprehensive approach has extensive implications and requirements for all parties involved and may particularly be a challenge for the client side. The need for change in comparison to established, standard procedures – which only address individual parts of the project life cycle – concerns a variety of areas along the project life cycle. Examples include: developing and structuring of interdisciplinary projects across technical trades and departments, economic appraisal in terms of life cycle evaluations, multi-year financing arrangements across different capex and opex budgets, non-standard procurement procedures, contractual design of long-term energy service agreements, and measurement and verification of the savings achieved.

From a client perspective in particular (but also for consultants and aspiring ESCos), these requirements often constitute substantial obstacles and challenges towards comprehensive energy service projects and, thereby, energy contracting market development. Solving most of the above issues requires special know-how and expertise, which is not often readily available in public institutions or within most private sectors undertakings. Many clients will need support to enable them to overcome the obstacles and challenges outlined above.

3.2 The role of 'Facilitators'

One solution is for the so called 'Facilitators', who mostly act on behalf of a client, to play and important and enabling role – something they have successfully done in European and other energy contracting markets. The facilitators' role is to consult the client (and sometimes the ESCo) and provide the specific know-how and experience needed in order to surmount the specific requirements for energy services outlined above. Additional facilitator activities may encompass feasibility studies, selection of an energy service business models (e.g. ESC, EPC or IEC), structuring of financing from internal and external sources or subsidies, preparing tender documents, evaluating ESCo proposals, and quality assurance and M&V on behalf of the client. The following figure gives an overview of the role of project facilitators as enablers for clients and as intermediaries between the demand and supply sides of energy service markets.

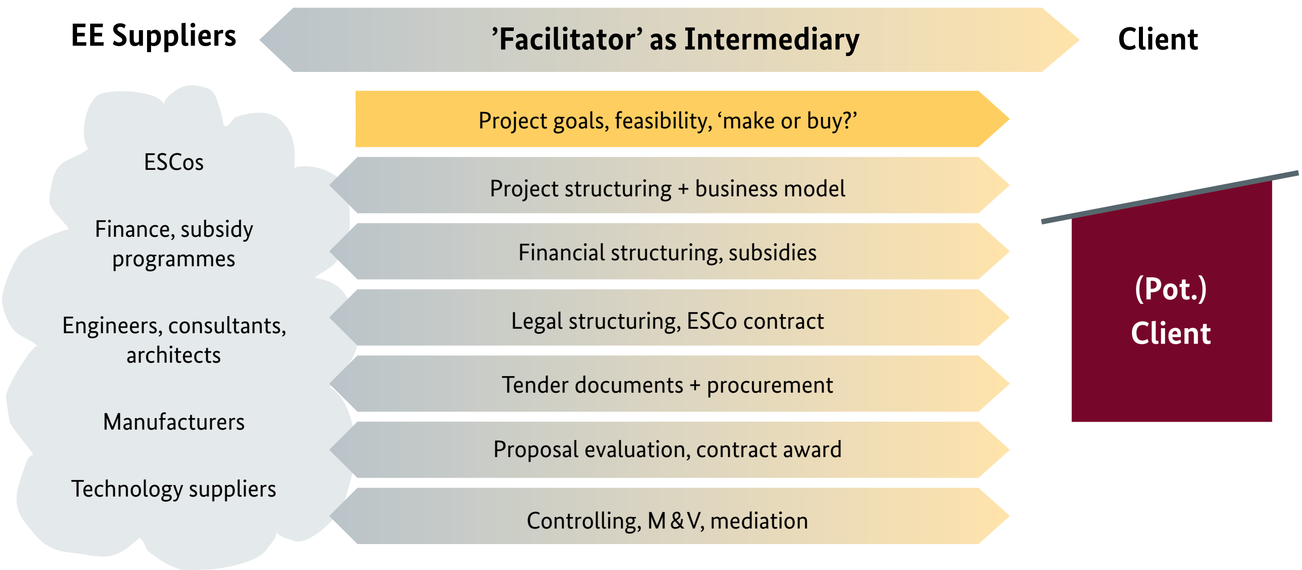


Figure 13: "Facilitators" as intermediaries to enable (potential) clients [Bleyl et al. 2013]

Besides enabling project development, another important advantage of the buyer-led approach is that it fosters competition among the supply side for particular projects. Furthermore, the facilitator approach provides a fair and level playing field for competition between ESCos, other EE suppliers and also financiers.
Another facilitator role is to serve as an intermediary between client and ESCo '(corporate) cultures', interests and expectations in different phases of the project cycle. This mediation may encompass guidance to ESCos on client needs and requirements (either for specific projects or more generally), information and exchange about innovative energy services model developments, and cooperation opportunities. Clients expectations towards ESCos and energy service models sometimes require a 'reality check' in order to not overburden the model. Mediation may be needed to find consensus on how to adapt energy cost baselines to changes in utilisation of a building or a plant. Facilitators can also provide independent advice on how to solve billing or M&V disagreements.

3.3 Facilitation cost

Facilitation costs are up-front investments for project development and help create a level playing field for competition. In principle, they are comparable to other up-front planning costs such as fees for architects, engineers or other consultants. Typical facilitation costs in the more developed project facilitation markets of Austria, Germany and Sweden are around 3% of EE investment costs on average. When comparing these costs to typical planning fees for engineers of between 10 and 15% of the investment cost, the facilitation cost figures are notably lower by an average of about half. Experienced clients and facilitators have often mentioned that the advantages achieved with regard to prices and quality greatly outweigh the initial facilitation cost through an intensive (but fair) competition between suppliers.

However, at least initially, facilitation costs have to be borne by the clients. This up-front investment often constitutes an obstacle for market development and requires the attention of policy makers in regards to opportunities to support market development. Facilitation costs also appear to have only little correlation with project sizes, which means their percentage value decreases in larger projects. On the other hand, this means that facilitation costs for smaller investment projects can be prohibitively high.

3.4 Limitations of the Facilitator approach

However, despite the opportunities that the facilitator approach can create, some obstacles to EE can only be solved through legislative or regulatory changes, namely budgetary household regulations and respective accounting rules (e.g. for 'ring-fencing of savings'). These would need to permit the signing and administrative implementation of long-term ESCo contracts in national, provincial and municipal public households as well as in private undertakings. Another prominent example in which legislative intervention is needed relates to the differing incentives between landlords and tenants in the residential and commercial building sector.

But even the best facilitator cannot be successful if a client organisation is not enabled to meet the requirements and become supportive/executive and knowledgeable for comprehensive energy contracting projects. Organisational change processes are sometimes required, though this may represent new territory for most energy efficiency professionals. A key task is to enable the members of the client organization to define their new role as client representatives and supervisors in 'energy savings partnership' projects.

The facilitator approach will need to be multiplied if the market is to develop from individual projects, led by highly motivated individuals, to mass roll-outs for comprehensive refurbishment portfolios in order to provide more significant contributions of EE and energy policy goals. (Source after [Bleyl et.al 2013][3])

3 Bleyl et.al. ESCo market development: A role for Facilitators to play in ECEEE Summer Studies, paper ID 3-472-13, Belambra Presqu'île de Giens, France June 2013

4 Analytical approach to identifying energy service models particularly suited to a given country

This section presents an analytical structure that can be used to identify energy service models particularly suited to a given emerging or developing country. The purpose is to exclude less suitable variants from the outset, while at the same time recognising possible barriers to implementation early on. Building upon such initial appraisals, it may then be possible to conduct detailed feasibility analyses and/or pilot projects in a targeted manner.

The starting point of the appraisal is an initial **hypothesis** concerning potential customers for energy services and the suppliers who might theoretically be in a position to provide such services. This hypothesis (which initially does not need to be fully established or proven) can be formulated as follows:

- In Indonesia, if industrial parks act as ESCos and provide energy supply contracting for industrial firms, a sustainable ESCo market could be developed.

- In Mongolia, if plumbers and fitters, acting as ESCos, provide 'EPC light' services involving low levels of investment for public institutions such as hospitals, a sustainable ESCo market could be developed.

The hypothesis must now be subjected to a **structured analysis;** the flowchart in Figure 14 illustrates the procedure. The **relevant preconditions** that may facilitate or prevent the success of energy services are explored in a sequence of steps. The following basic classes of conditions are distinguished:

- customer potential
- service provider (ESCo) potential
- general setting
- costs and financing

Section 5 examines these four classes of conditions in depth.

The conditions must always be analysed **in terms of the initially formulated hypothesis** in order to generate questions and answers that are as specific as possible. If the hypotheses appears plausible under the conditions, feasibility studies and pilot projects can be developed in a further step in order to test and trial the energy services.

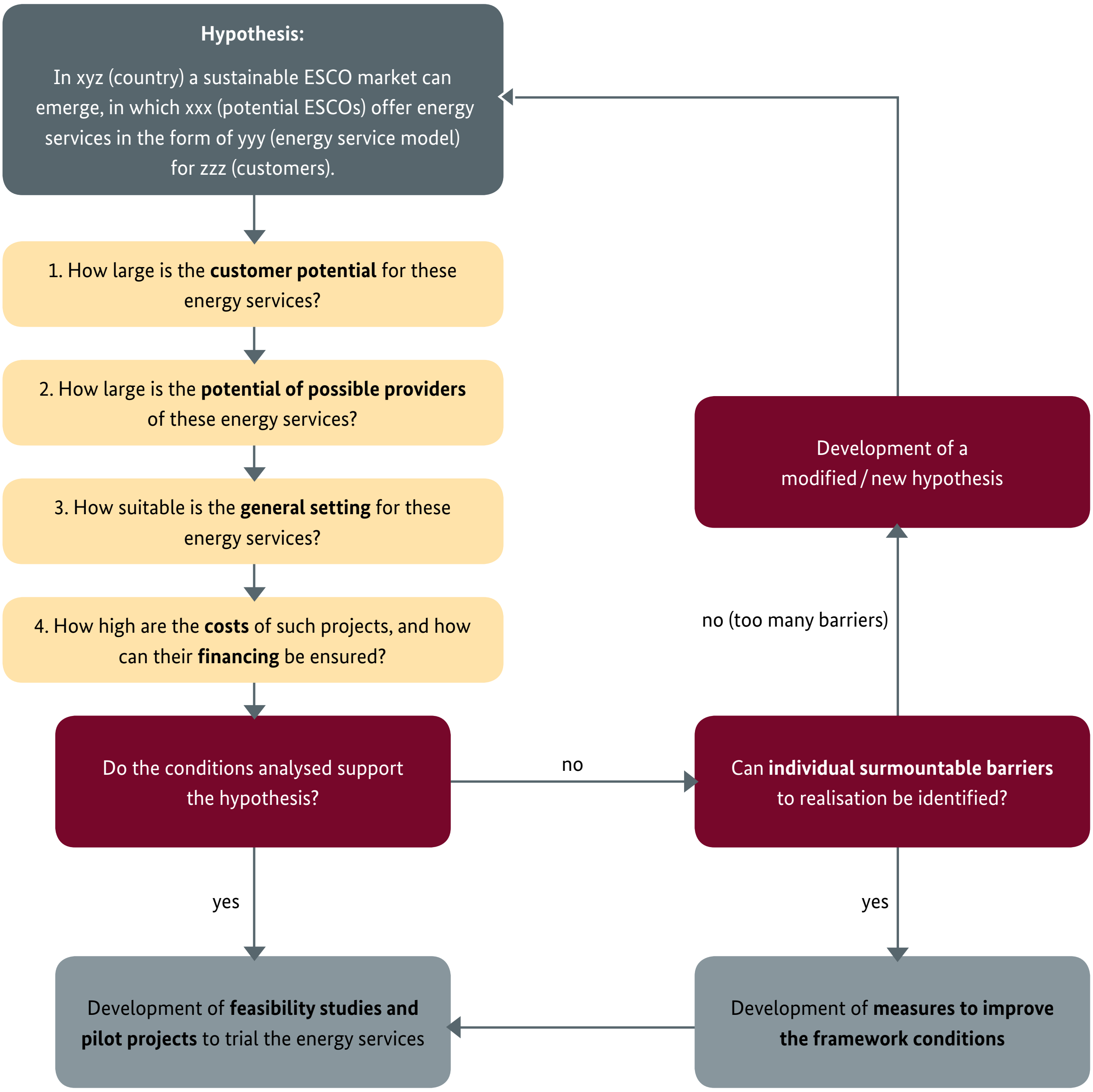


Figure 14: Procedure for the structured analysis of the potential of energy service models

If the analysis shows that the preconditions are unfavourable for or even run counter to the hypothesis, there are two possible ways to proceed:

1. Identification of points of mismatch between the proposed hypothesis and the preconditions has possibly **revealed individual surmountable barriers** to the realisation of a sustainable ESCo market. Instead of seeking alternative market development approaches, the ways in which these barriers can be surmounted (e.g. by helping to create a supportive statutory framework, building the capacity of potential providers of energy services, etc.) must first be approached.

2. The **hypothesis was not completely correct and must therefore be modified or improved**. Is the selected target group for energy services not suitable? Does the possible provider not have the necessary capabilities to act as an ESCo? After modifying the hypothesis – i.e. formulating it with other potential customers or ESCos – a structured analysis would again be performed from the beginning.

Section 5 examines the various preconditions in greater depth in order to expand on the analytical structure presented briefly here.

5 Settings and conditions relevant to energy service provisions

The previous section presented an analytical structure for the preconditions that need to be taken into account when identifying or developing energy services suitable for emerging and developing countries. Not all of these conditions are necessarily relevant or need addressing for every type of energy service. It is helpful, however, if a hypothesis, an approach or a project idea for a specific energy service variant is examined in light of this set of conditions and refined accordingly. The present section provides further guidelines for structuring the process – though this is not a mandatory list of specifications. The following issues are addressed:

- How suitable is the general setting?
- How large is the customer potential?
- How great is the potential for possible providers of energy services (ESCos)?
- How well is the cost-effectiveness of energy service projects and their financing assured?

NOTE

In order to arrive at concrete conclusions and identify specific barriers where they exist, the preconditions presented in this structural guideline should always be examined with reference to a specific case (or hypothesis).

5.1 How large is the customer potential?

Energy services can essentially be applied in all areas of society where energy consumption levels are significant and where resources and know-how in the field of efficient energy management are scarce. This may be the case in:

- **residential buildings** (particularly for large buildings with several dozen units);
- **industrial companies** (particularly for small and medium-sized manufacturing companies with limited resources for efficient energy management);
- **public institutions** (e.g. hospitals, administrative buildings, schools, day care centres, town halls, tax offices, youth and senior citizen facilities, libraries, sports facilities, swimming pools, colleges, universities, prisons, police stations, fire stations, army barracks, cultural facilities);
- **service sector** (e.g. office buildings, banks, supermarkets, shopping malls, hotels)

In order to define possible target groups and analyse them in more detail, several aspects need to be appraised: the real potential for energy efficiency measures, the interest in or willingness to outsource energy services, and the suitability of decision-making structures on the customer side.

5.1.1 How great is the realisable potential for energy efficiency measures?

Beside the purely **technical potentials** for extensive energy efficiency measures, based, for instance, on the condition of installations and buildings, two further questions are of key relevance: the **relative level of energy costs** and the **importance of security of energy supply, occupant comfort** and other qualitative criteria for potential customers. These two points critically determine the **motivation or pressure to act** on the part of the customer in deploying energy services and thus the real **realisable potential** of energy efficiency measures.

- **How large of a market volume can be expected from the potential customer segment (technical potential)?**
  The analysis outlined in the following relates to energy performance contracting. However, it is applicable to other energy services in a similar form as well. In order to assess the total potential of a customer group, the first step is to identify widespread building types or installation types used by these customers. An audit carried out in a representative building or installation (or an initial extrapolation) can identify past energy consumption and savings potential per installation or building (e.g. expressed in MWh/year). Combined with data on the overall number of buildings or installations in a region or country, the total savings potential within the given customer segment of the market can then be determined. The next step is to calculate the annual cost savings based on relevant energy costs, both for individual installations/buildings and for the entire customer segment of the market.

- **How important are energy costs to the potential customers (share of energy costs in overall costs)?**
  If energy costs make up only a small proportion of a potential customer's overall costs, the motivation to address energy efficiency issues for cost reasons will be very low. By way of illustration: in Germany, industrial companies are considered energy-intensive if their energy costs exceed around 10-15% of turnover (e.g. companies in the metal-processing industries). If efficiency measures reduce these costs by approximately 20-30%, the cost savings amount to 2-4% of turnover. Most companies, however, have much lower energy costs, with the result that many view the potential savings as too low and therefore do not carry out such measures.

  If the priority given to energy costs is very low in the potential target group, it may be necessary to adjust the appraisal of the present market volume downwards (see previous point); the currently realisable potential is then lower than the technical potential for energy services.

- **What role do security of energy supply, improved occupant comfort and other criteria play?**
  Besides the purely monetary benefits of energy savings, the following points can also be of interest for potential customers and thus positively influence the realisable market potential of energy services in a given customer segment:

  - **Security of energy supply**
    This argument is a key criterion for hospitals or specialised industrial companies. For example: installing a small-scale CHP unit within a building can guarantee emergency power supply as well as improve the efficiency of supply. Installing such a unit by way of an energy service arrangement (EPC or ESC) therefore delivers significant added value above and beyond the actual efficiency improvement.

  - **Improved occupant comfort**
    A new heating system, modern lighting or improved insulation significantly improve the comfort of building occupants. The guarantee that indoor air temperatures will be maintained at a constant level is one aspect that makes energy service models highly attractive.

  - **Increased productivity and value**
    The above-mentioned qualitative benefits (increased occupant comfort and security of supply) can translate directly into measurable productivity improvements of facilities and increased value of buildings.

  - **Reduced workload**
    For many potential customers, the assumption of maintenance and operational tasks by an external service provider at low cost (financed by energy savings) is an attractive option for reducing their own workload. The resources freed up to focus on other tasks can have a greater value to a customer than the actual energy cost savings.

5.1.2 How suitable are the decision-making structures among potential customers?

Energy services involving a large volume of investment are realised as long-term contracts in order to permit payback via efficiency gains. Such contracts require clear decision-making structures and designated customer contacts:

- **How clearly are decision-making powers and processes defined among potential customers?**
  In order to conclude long-term energy service contracts, it is essential to clarify who is empowered to make such decisions and through which procedures. This can present a major challenge in larger organisations (such as state institutions) or in places where ownership structures are fragmented (e.g. individual apartment owners in large multi-family buildings; see EPC for multi-family housing in Latvia in Section 2.3.2.2).

Case study: Public contract award procedures in Romania

In Romania, the law governing the awarding of public contracts made long-term EPC contracts for public institutions unattractive and difficult to realise until 2011. This was due to a lack of agreement between the finance ministry and the contract awarding authority ANRMAP on the approval of a suitable procedure for awarding EPC contracts. The underlying dispute concerned a new approach to EPC contract awarding procedures which, in contrast to previous procedures, subjects EPC to a **functional** assessment. Here, only the desired function (energy cost savings) is put out for tender, not the specific measures needed to achieve the goal. In contrast to conventional public contract awarding procedures, requiring feasibility studies for certain technical solutions in EPC arrangements impede the overall project. Firstly, it excludes a range of other technical solutions and, secondly, it consumes additional financial resources. This mandatory requirement to produce a feasibility study, combined with the lack of procedural approval by the state, has made institutions executing public sector projects reluctant to put EPC out for tender. Following agreement among the dissenting institutions in late 2010, the path for EPC appears to have opened up: the approach is now to conclude a concession agreement that no longer requires a costly non-functional feasibility study, replacing this with a simple opportunity study.

Source: Berlin Energy Agency, study for German Federal Environment Agency UBA

- **What is the level of willingness or authority to make longer-term decisions?**
  Particularly in public institutions, budget regulations can act as a barrier to energy services. This is because investments under energy savings guarantee contracts are ultimately financed by savings in the administrative budget (for maintenance of sites and buildings, and for energy purchase costs), and not from the capital budget. Only once budgetary rules allow for appraisal of savings in both budgets in their entirety do decision makers have an incentive to conclude energy service contracts.

  In the industrial sector, the requirement to have short payback periods (2-3 years) is often a barrier to longer-term contracts. Here, work needs to be done to urge changes in corporate management payment mechanisms (longer-term assessment horizons instead of individual business years).

5.2 How great is the potential of possible energy service providers (ESCos)?

Energy services can be provided by a great diversity of company types (see Section 2.4). The following questions may help to appraise the capacities of the proposed providers:

5.2.1 How large is the ESCo potential of existing companies?

In order to build a sustainable, organically developing ESCo market, it is important to integrate suitable existing companies into this development process. The following questions may assist in the analysis of suitable company types:

- **To what extent is energy efficiency know-how available in the field of building services engineering?**
  Competence in this field is particularly advantageous for EPC, especially in the fields of:
  - lighting,
  - heating,
  - ventilation and air-conditioning,
  - building insulation, glazing, etc. (only for extensive building refurbishments).

  As set out in Section 2.4, companies need not perform all tasks in the value chain themselves, but should be able to provide key services in the fields of planning, implementation, construction, operation, maintenance and financing.

- **To what extent is energy efficiency know-how available in the field of energy technology?**
  This expertise is particularly advantageous for energy supply contracting (ESC), such as with regard to combined heating, cooling and power systems, optimising energy supply for industrial processes, installing photovoltaic systems, etc. Companies need not perform all the tasks in the value chain themselves, but should be able to provide key competences in the fields of planning, implementation or construction, operation, maintenance and financing (see Section 2.4).

- **How good is the general reputation of and confidence in these companies?**
  High reputation and customer confidence are essential for ESCos to be able to conclude long-term contracts with potential customers. For instance, potential customers may have little confidence in a formerly monopolistic energy supplier. Such a supplier could have poorer prospects for success than a provider of energy services.

- **How extensive is the available experience with long-term, major projects?**
  Energy service contracts are often major, long-term projects and therefore require structured project management. If the proposed companies have little experience with such projects, they should initially be considered for less comprehensive projects or energy service contract models.

NOTE

It is recommendable that newly established ESCos start with smaller projects involving lower levels of investment, gradually advancing to the provision of more complex energy services. The learning curve is very steep for German ESCos, too.

- **How can an ESCo finance projects?**
  ESCos generally need to borrow capital in order to finance projects. The ESCo's ability to raise the necessary funds on the market for the sake of implementing measures for the customer is decisive. Access of this kind is usually lacking in developing and emerging countries; bank staff have little or no experience with ESCos and energy efficiency, and high risk surcharges may apply to interest rates on loans. As a result, this aspect is one of the largest barriers. See Section 5.4.3.

5.2.2 How supportive is the wider setting for ESCos?

The following issues are relevant for the sustainable expansion of an ESCo market that is still at an early development stage:

- **What provisions for initial and later training are available?**
  For ESCos to be able to recruit qualified staff, initial training and continuing professional development provisions in the field of energy efficiency must be available or be created, e.g. through universities, chambers of commerce, industry associations, etc.

- **What level of support/promotion for business start-ups is available?**
  The development of an ESCo market presents opportunities both for business start-ups and for partitioning parts of a company in order to start a new enterprise. Government funding and assistance for start-up entrepreneurs and for ESCos helps to boost this dynamic. Unnecessary barriers should be identified, followed by targeted action to remove them (such as unnecessarily high transaction costs for entries on the commercial register). Further useful promotion instruments include:
  - services and training to impart know-how (e.g. on project financing);
  - certification of ESCos (e.g. ESCo quality label);
  - an official ESCo register;
  - ESCo platforms or trade fairs;
  - promoting technology cooperation between German ESCos and those in developing and emerging countries.

- **How well are relevant companies organised?**
  Every type of company benefits from the representation of its interests – ESCos are no exception. This can be done via chambers of commerce or through special ESCo associations such as NAESCo in the USA and eu.ESCo in Europe. It is important that such organisations are not only self-serving. They should therefore have relatively low priority, particularly when a market is beginning to develop, unless they make active contributions to know-how transfers or other benefits.

5.3 How supportive are the general framework conditions?

5.3.1 How reliable is the statutory framework and what degree of legal certainty is given?

Energy service contracts involving capital investment often require long contract terms in order to achieve investment payback. They therefore necessitate both trust among the contract partners and a robust statutory framework with corresponding legal certainty. The following aspects can be relevant depending upon the energy service model:

- **Property law with regard to energy services**: who owns the installations during and after the service period?

- **Security of ownership during the contract term**: what happens if customers refuse to give ESCo staff access to technical installations or consider the installation to be their property?

- **Law of warranty and law of contracts with regard to long-term service contracts**: who is liable in the event of insolvency (of the customer or of the ESCo)?

- **Broader energy sector setting**: which administrative conditions apply to the licensing and operation of private energy-generating plant?

The question of **legal certainty** – i.e. the extent to which laws are enforced by the state and infringements are prosecuted – is a fundamental issue in this context.

5.3.2 Does the socio-cultural setting provide a supportive business environment for energy service contracts?

Socio-cultural circumstances are often underestimated. However, in emerging and developing countries, they often differ from those in industrialised countries and must be kept in mind in efforts to develop a sustainable ESCo market. The following questions may be helpful to guide analysis:

- **How widespread is the use of service companies?**
  This question should be posed with particular regard to the envisaged customer group. If, for instance, it is not common for public institutions to award contracts for consultancy or other services to external service providers, it will be more difficult to raise interest in energy service arrangements among this potential customer group.

- **How reliable are business practices?**
  Professional business behaviour and reliability are important to long-term service contracts: arrangements and agreements (e.g. on response times in the event of plant failure) should be recorded in writing and complied with reliably by **both** partners in order to avoid jeopardising long-term mutual trust and the contract purpose. Under certain conditions, close cooperation and strong trust between customer and ESCo (regular meetings and talks, strong social networking) can **supplement or even replace contractual safeguards** to a certain extent. In this regard, it is important to fully understand the local cultural circumstances in developing and emerging countries and to make use of these, and also to part with business practices that would be typical in industrialised countries when necessary.

  A further key aspect apart from the reliability of the service provider is the **payment behaviour of the customer**. If, for instance, it is a widespread practice among the envisaged customer group to pay electricity bills with great delay or even to ignore them completely, this market segment will not be very attractive to ESCos.

- **What is the situation with regard to preventing/combating corruption?**
  Corruption (e.g. in the awarding of contracts by public clients) is a disadvantage for individual companies. Such market distortions can be particularly problematic during the development phase of an ESCo market. It is therefore recommendable to analyse a potential energy service model and the envisaged target market with regard to susceptibility to corruption and its possible impacts. It may be possible to establish countermeasures, such as transparent tendering procedures in the public sector, into the service model at the development stage. However, consideration should be given to ruling out an energy service model if the risks resulting from corruption are deemed to be too high.

5.3.3 How supportive are the energy and climate policy conditions?

In countries with a full-fledged body of regulations governing energy and climate policy, there are many conditions that may be supportive for energy services (yet may also increase the administrative workload and the resulting transaction costs; see Section 5.4.1.) The following questions should be examined:

- **Do government targets or strategies for climate, emissions or energy exist?**
  Energy services can potentially make an important contribution to attaining targets of this kind; working with government institutions locally can harness this potential. It may also be possible to customise energy services specifically so as to help attain targets in a particular industrial sector.

  National energy and climate strategies can stipulate the establishment and promotion of energy service markets. However, once they have been adopted, implementing these strategies is often a very slow process. Nonetheless, the enshrinement of such goals at the national level can be helpful in removing barriers to cooperation with governments.

- **To what extent do prescriptions and prohibitions, stipulations, incentives, support schemes, etc. in relation to energy efficiency exist?**
  Analysing this question can make it much easier to focus on suitable customer segments for energy services. Support schemes and mandatory provisions clarify, on the one hand, the political priorities chosen by a country to promote defined market segments; they may also rule out ideas for projects that would otherwise be viable. For instance, it may be the declared political will to impede or promote certain primary energy sources or technologies (in Germany, for instance, small-scale CHP units are explicitly promoted). Furthermore, Germany has secondary legislation on conserving energy in buildings (Energy Saving Regulation, EnEV) which sets clear energy standards for new construction and for refurbishment of existing buildings.

  Thus, a possible question to pose is: Who is obliged to comply with strict statutory provisions but lacks the necessary know-how or financial resources?

  Statutory provisions and support schemes should be taken into account in a targeted manner when developing potential energy services.

- **To what extent do institutions with explicit responsibility for energy consumption or for improving energy efficiency exist?**
  These can, for instance, be specialised departments in ministries or separate institutions (e.g. the Bureau of Energy Efficiency (BEE) in India; the Federal Energy Efficiency Office (BfEE) and German Energy Agency (dena) in Germany). These institutions should be involved in deliberations on energy service projects in order to avoid uncoordinated duplication of efforts in a targeted manner. If such responsibilities do not yet exist, establishing them or founding a responsible institution may be a starting point for GIZ projects. Market catalysts or facilitators acting as private companies or public-private partnerships also provide interesting starting points for establishing energy services (such as the Berlin Energy Agency).

5.3.4 Energy sector context

The level of **final energy prices** and their future development has major relevance to a functioning energy service market. As ESCos generally finance their activities directly from energy savings or energy supplies, very low energy prices for potential customers lead to low revenues for ESCos and thus may make business prospects unattractive.

NOTE

In EPC, circumstances are conceivable in which low energy prices are balanced by an extremely high savings potential combined with low investment and operating costs.

The **availability of primary energy sources and technical infrastructure** (supply networks) is also very important (especially for energy supply contracting and similar models).

The existing **market structure** is a further important aspect, i.e. whether there is a (more or less) liberalised energy supply market or at least access to supply networks for ESCos.

The following questions should be analysed in terms of the hypothesis initially chosen:

- **How high is the present final energy price level?**
  When answering this question, it is important to focus on the envisaged customer group(s), the energy carriers relevant to them (electricity, gas, coal, wood, etc.), and the associated final energy prices. As Figure 15 illustrates, for the example of the electricity price for industrial and residential customers, major differences can exist; these result from varying prices set by the energy suppliers and from varying tax and levy fees.

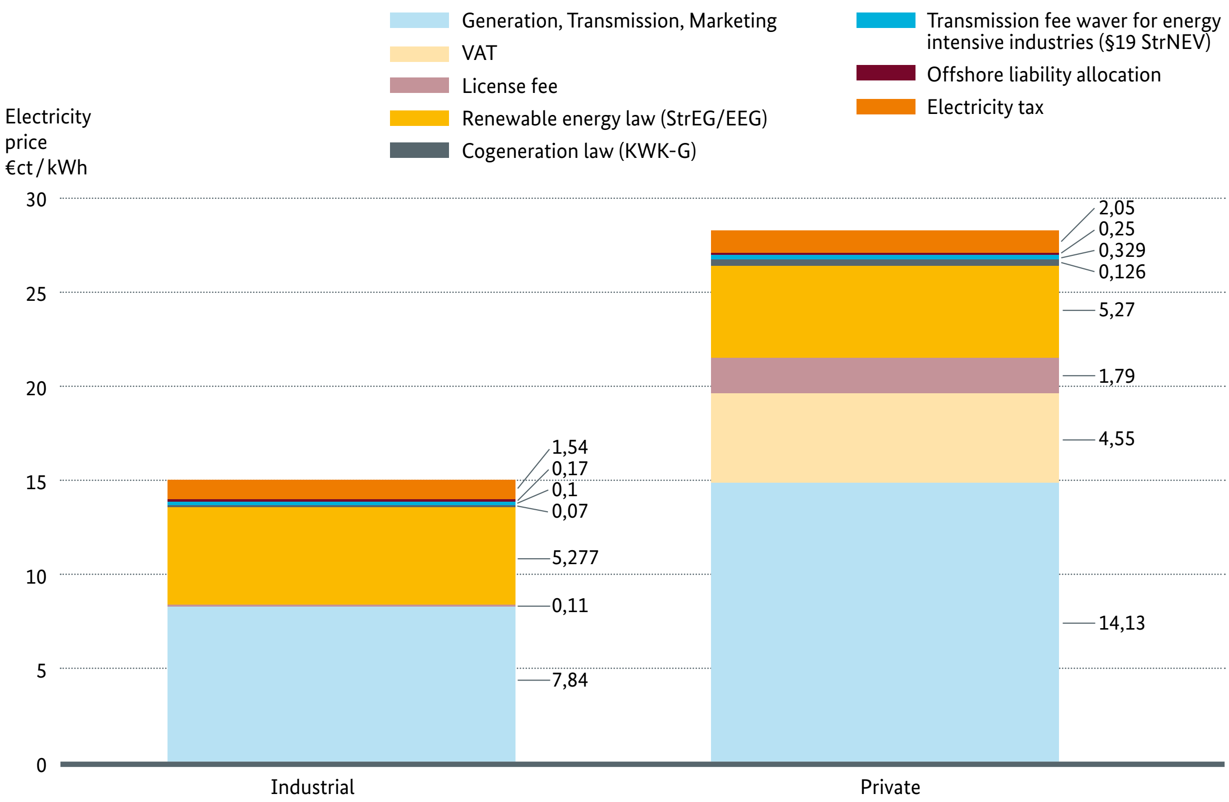


Figure 15: Average electricity costs in Germany. Status: January 2013 (Source: BDEW)

NOTE

Prices for electricity and other energy sources for heat production can vary greatly within a given country, both from region to region and among customer types.

Some emerging and developing countries subsidise final energy prices for certain target groups (e.g. electricity and district heat in parts of Russia for private consumers) so that they are below the actual production or procurement costs. If final energy costs are too low, payback on investments in energy services is not possible over a fixed period if the local energy prices are taken as baseline. It then becomes impossible to establish a sustainable ESCo market. The economics of an energy service model must be analysed in detail for specific projects (e.g. in the course of a feasibility study). The economic feasibility calculation of potential measures is key.

Case study: Subsidised energy prices in Russia

In Russia, the energy prices for private households are often below the break-even point for the supply companies, and are therefore highly subsidised by means of various government and regional instruments. There are 60 price regions for electricity, with prices ranging between RUB 1.69/kWh (Siberia) and RUB 4.49/kWh (Far East), i.e. between about EUR 0.04 and 0.11/kWh (2009 data). This makes it virtually impossible to recoup investments in energy efficiency measures over acceptable periods. Energy services such as EPC that involve capital outlay are thus difficult (or impossible) to realise.

A further problem is that energy costs are usually not coupled to actual consumption levels but are assessed on the basis of building floor space. For many building owners, no incentives exist to save energy (costs). This greatly hampers the implementation of energy services in the residential building sector, including variants such as ‘EPC light’, which involve no or low levels of investment.

Source: Berlin Energy Agency (study for the IFC/World Bank)

- **How favourable is the future trend in energy prices?**
  High or rising energy prices are conducive to the development of a robust ESCo market. In connection to this, a planned removal of energy price subsidies for certain customer target groups can create a promising outlook for ESCos.

  Furthermore, the development of new capacity markets can also present additional opportunities for new ESCo models (e.g. for supply contracting). In a capacity market, it is not the consumed amounts of energy that are traded, but the (short-term) provision of supply capacity in order to unclog bottlenecks. As power bottlenecks are a widespread problem in many developing and emerging countries, this aspect could gain greater importance in future.

- **What is the state of availability of required primary energy sources and technical infrastructure (supply networks)?**
  For energy supply models in particular, the availability of primary energy carriers (e.g. gas, coal) and technical infrastructure is highly important (electricity grid for feed-in, gas network or coal suppliers for primary energy supply, etc.).

  Mongolia is a case in point: as its gas supply system does not cover the entire country, it is simply not viable to implement ESC on the basis of distributed, gas-fired small-scale CHP units. Other challenges arise in the country when considering alternative available energy sources: there are rich lignite deposits, but the technology for distributed, compact CHP units has not yet been established for this energy carrier. Here, pilot projects would first need to be conducted in order to remove specific technological barriers before ESCo business models could be established.

  Great dependence upon individual energy sources susceptible to supply bottlenecks clearly harbours, beside the outage risk, a higher risk in relation to price stability and volatility.

- **How liberalised is the energy market?**
  This question is particularly relevant in the context of energy supply contracting. In order for an ESCo to balance any energy surpluses produced under an ESC arrangement, the option of feeding these into supply networks (e.g. into the public power grid when cogeneration plants are operated) is advantageous. This does not necessarily presuppose a fully liberalised energy market with independent energy suppliers. However, suitable opportunities for ESCos to connect to grids would be highly beneficial. To that end, it would be necessary to define feed-in rules, mandatory connection rules, connection processes, etc.

Case study: Electricity costs in Mongolia

Mongolia is currently experiencing strong economic growth driven by a boom in the mining sector. Between 2000 and 2004, GDP rose by 5% annually and by around 9% annually since 2005, albeit with a brief dip in 2009 as a result of the global financial crisis. Final energy consumption also rose by approximately 9% per year from 2005 to 2008, and is anticipated to rise by about 4% annually in future. This has been caused both by the mining boom and the country's increasing urbanisation. Electricity supply is based largely on coal-fired cogeneration plants; their installed capacity (823 MW) will very soon reach its limits. Grid overload and blackouts are possible consequences, should electricity imports from Russia be unavailable during peak-load periods.

Final energy prices – such as for electricity at approximately USD 0.04-0.11/kWh for businesses and USD 0.03-0.06/kWh for private consumers – are still highly subsidised and thus very low. However, according to a parliamentary decision, these subsidies are to be reduced to a point at which the final energy prices for electricity are at least at cost-recovery levels by 2013.

The country has considerable coal deposits. The government is therefore likely to rely on constructing new coal-fired power plants to expand electricity-generation capacity, as this technology allows for power generation at low costs. The construction of these new generating capacities, however, will take a further 3-5 years, at the least.

There is, at present, no ESCO market in Mongolia. In order to reduce the burden on the strained generating capacities, the state energy authority now aims to work with GIZ to evaluate its options.

Source: GIZ Mongolia, 'On a path towards an energy efficiency policy' framework – the case of Mongolia', eceee 2011 Summer Study

5.4 How well are the cost-effectiveness of energy service projects and their financing assured?

Energy services must be **economically viable for both ESCos and their customers**. For the ESCos, the contracting remuneration received (together with any additional state grants) must cover the costs incurred over the entire project duration, plus an acceptable profit margin. For the customer, the sum of the contracting remuneration and all additional costs incurred (e.g. for project development; and energy costs paid to energy suppliers in EPC arrangements) must be commensurate with the service rendered, i.e. normally lower than the costs for an alternative solution (such as realising the same package of measures themselves, or implementing no energy efficiency measures at all). Furthermore, the initial investment required must be **financeable**, either by the ESCos themselves or their customers, through credit lines or by other means. The following three points shall therefore now briefly be examined:

- project costs,
- project revenues/contract remunerations,
- financing options.

5.4.1 How high are the project costs?

In simplified terms, the costs of an energy service project can be considered in three blocks:

- **How high are the project development costs?**
  Project development costs comprise all costs incurred before realising an ESCo project, i.e. before the actual investment in and implementation of energy efficiency measures. These costs are borne by both the customers and the ESCos. Since it is usually mandatory to put services out for tender in the public sector, the costs incurred by public-sector customers are generally greater than those for private-sector customers: for the latter, the ESCo bears the bulk of project development costs through its sales development activities. Table 3 compiles several typical cost items incurred by customers and ESCos during the project development phase of energy service projects.

  Many of the costs arising at this stage are **transaction costs**, i.e. the costs incurred to inform all participants, carry out internal decision-making processes, engage in public approval procedures, procure legal or technical advice, and so forth. Transaction costs are particularly high for pilot projects and may often deter potential customers from realising a project (or in fact make such a project uneconomical). If projects have replicable or standardisable processes, transaction costs can be minimised across a series of projects, thus improving their cost effectiveness.

Possible development costs of energy service projects	For the customer	For the ESCo
Communication and visits for (cold) customer acquisition		✓
Communication during project, involving all participants and decision-makers	✓	
Collecting data (building/facility utilisation data, energy costs) and selecting buildings or installations	✓ (in the public sector)	✓ (in the private sector)
Baseline definition	✓ (in the public sector)	✓ (in the private sector)
During tendering procedure: preparation of necessary documentation, issuing call for tenders and evaluating bids	✓	
Preparation of bids		✓
Contract negotiation and conclusion	✓	✓
Checking of contracts by lawyer, if required	✓	✓
Communication and negotiation with financing institutions	(✓)	✓

Table 3: Typical cost items incurred by customers and ESCos during the development phase of energy service projects

- **How high are the investment costs?**
  Depending on the contract model, either the ESCo or the customer will bear the investment costs of energy efficiency measures, and apportions these to the remuneration established by the contract for investment payback. They comprise of the costs for the technology or systems to be installed, and the associated planning and installation/construction costs. All of these cost items are country-specific and can even vary from region to region (especially personnel costs). Technology costs may also include customs duties. Furthermore, reinvestment costs need to be taken into account if the contract term is longer than the service life of the installed plant and components.

- **How high are the recurrent costs?**
  The recurrent costs incurred by an ESCo for an energy service contract typically include:
  - operation and maintenance costs for installations (including personnel costs)
  - primary energy purchasing (in energy supply contracting and energy operations contracting)
  - insurance
  - interest on borrowed capital (debt service)
  - taxes
  - administrative costs
  - waste-disposal costs
  - mark-ups to buffer risks

  Care needs to be taken so that **country-specific** costs are considered for all items.

5.4.2 How high are the realisable contracting remunerations?

The contracting remuneration for an ESCo is essentially capped by the level of energy costs relevant to the customer that would need to be paid for supplies purchased from the previous energy supplier. The ESCo will normally not be able to demand more per unit of energy supplied (ESC) or saved (EPC); if it were to do so, the customer would not enter into an energy service contract. The customer is only willing to pay a premium if, in return, an extra benefit is provided (such as emergency power supply or supply guarantees) and this benefit is offered at a lower cost than alternative realisation or implementation of a similar solution by the customer itself. To provide a real incentive to enter into a contract, the contracting remuneration must be significantly below this 'natural' cap.

5.4.3 How accessible are favourable financing options?

As set out in Section 2.5, there is, in principle, a whole array of options that the ESCo and/or customer can use to finance energy efficiency investments. These can include:

- **reduced-interest loans** by local or international (development) banks, cooperative ventures with financing institutions
- **grant funding** from the state or from international (development) organisations, e.g. for each kWh saved
- **forfaiting** future contracting payments (see Section 2.5)

In order to develop a sustainable ESCo market in an emerging or developing country, a stable finance and banking sector capable of providing financing options such as credit lines and forfaiting arrangements should exist.

Grant funding is a bonus; if the government does not make this available, partner countries or international organisations may possibly fill the gap. It is always worth examining whether grant programmes that are not specifically focussed on energy efficiency may be used as a source of funding. These may be structural development funds, labour market promotion programmes and the like.

International banks and funds with relevant grant programmes include:
- World Bank (IBRD, IFC, etc.)
- European Investment Bank (EIB)
- European Bank for Reconstruction and Development (EBRD)
- KfW (DEG, Entwicklungsbank, etc.)

Under certain circumstances, **emissions trading** (the sale of emissions allowances or the generation of CDM/JI certificates) may also be helpful to finance energy efficiency measures or new energy installations. Potential additional revenue from the sale of CO_2 certificates can make it easier for ESCos or customers to recoup investments. If, however, CO_2 certificate prices are low (below EUR 10-15/t CO_2), this supplementary source of finance has little relevance. It is also important to bear in mind that before such funds can be generated, a post-Kyoto agreement on this point must be established by the international community, and the conditions for submitting JI/CDM projects for approval must also be met (project characteristics, application procedures, etc.).

Useful links

- **ChangeBest:** http://www.changebest.eu
  The ChangeBest website: a project funded by the European Union under its Intelligent Energy Europe (IEE) programme. ChangeBest is concerned with developing new energy service models. The site provides the ChangeBest Guide, a manual for strategic product development.

- **European Energy Service Initiative (EESI):** http://www.european-energy-service-initiative.net
  Website of the EESI project, which is funded by the European Union under its IEE programme, with a focus on further developing EPC in Europe. The website provides a toolbox containing standard documents for EPC, market reports and examples of best practice from numerous countries.

- **Guideline of the German state of Hessen for energy performance contracting in public buildings** *(Leitfaden Energiespar-Contracting in öffentlichen Liegenschaften (Hessen-Leitfaden)):* http://www.energieland.hessen.de/dynasite.cfm?dssid=467&dsmid=17450#dstitle_96106
  Only available in German, this is the standard reference on EPC in Germany. Updated in 2012, the guideline provides new contract models, case studies and many standard documents.

- **Competence centre for contracting in buildings** *(Kompetenzzentrum Contracting für Gebäude):* http://www.kompetenzzentrum-contracting.de/
  Only available in German, this is the website for the competence centre for contracting, maintained by the German Energy Agency (dena). The site provides numerous links as well as standard documents at a charge.

- **eu.ESCO:** http://www.eu-esco.org/
  Website of the European Association of Energy Service Companies.

- **EVO:** http://www.evo-world.org
  Provider of the International Performance Measurement and Verification Protocol (IPMVP).

- **IEA DSM Task XVI:** http://www.ieadsm.org => Task XVI
  International Energy Agency's Demand Side Management Implementing Agreement: Task XVI "Competitive Energy Services (Energy-Contracting, ESCo Services)" brings together experts on Energy-Contracting from countries around the world, who join forces to advance ESCo models and markets.

- **SUSI Partners:**
  http://www.susi-partners.ch/focus-areas/energy-efficiency-infrastructure
  Financial service provider currently developing a specialised energy efficiency fund.

- **IEA Task 16:**
  http://www.ieadsm.org/ViewTask.aspx?ID=16&Task=16&Sort=0
  Website of the IEA Demand Side Management Task 16 – Competitive Energy Services (Energy Contracting, ESCo Services)

- **ESKOM IDM Programme, Financing of 'Negawatthours' in South Africa:**
  www.eskomidm.co.za/
  ESKOM, the South African state-owned national utility is operating a comprehensive integrated demand management programme to reduce load and consumption.

- **Cash-flow based financing product for ESCos in India:** www.sidbi.com
  The Small Industries Development Bank of India (SIDBI), is introducing an innovative finance product to cater to the needs of ESCos in the framework of a KfW energy efficiency credit line.

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Abbreviations

BEE	Bureau of Energy Efficiency
BfEE	Federal Energy Efficiency Office
CDM	Clean Development Mechanism
CGI	Capital Goods Index
CHP	Combined heat and power
CMVP	Certified Measurement & Verification Personnel
CP	Capacity price
DEG	Deutsche Investitions- und Entwicklungsgesellschaft
DSM	Demand Side Management
EBRD	European Bank for Reconstruction and Development
EC	Energy contracting
EE	Energy Efficiency
EEG	Erneuebare Energie Gesetz Renewable Energy law
EES	Energy Efficiency service
EESI	European Energy Service Initiative
EIB	European Investment Bank
EnEV	Energy saving Regulation
EOC	Energy operation contracting
EPC	Energy performance contracting
ESC	Energy supply contracting
ESCo	Energy service company
EU	European Union
HVAC	Heating, ventilation and air conditioning
IAE	International Energy Agency
IBRD	International Bank for Reconstruction and Development
IDM	Integrated Demand Management
IEC	Integrated energy contracting
IEC	Integrated Energy Contracting
IEE	Improvement Energy Efficiency
IEE	Intelligent Energy Europe
IFC	International Finance Corporation
IPMVP	International Performance Measurement and Verification Protocol
JI	Joint Implementation
KWK-G	Coogeneration law Kraft-Wärme-Kopplung Gesetz
LCI	Labour cost index
M&V	Measurement and Verification
NDRC	National Development and Reform Commission
NEEAP	National Energy Efficiency Action Plan
PMVP	Performance Measuring and Verification Protocol
QAIs	Quality assurance instruments
RFP	Request for proposal
SGCC	State Grid Corporation of China
SIDBI	Small Industries Development Bank of India
SME	Small and Medium Enterprises
TPF	Third-party financing
WAJ	Water Authority of Jordan

Guiding Questionnaire for ESCo Country Assessment

28 November 2012

Quick Considerations	Comments / Questions
Do studies or preliminary research already exist in relation to an ESCO market?	
Are there any examples of past or present engagement or experience similar to the hypothesis (in the target country or elsewhere)?	

1. How large is the potential customer base for energy services?	
1.1 … in the industrial sector?	
1.1.1 What are the customer characteristics?	
1.1.1.1 Which sector should be addressed?	
1.1.1.2 How large is the market volume of the potential customer segment?	
1.1.2 How large is the achievable potential for energy efficiency measures?	
1.1.2.1 How large is the market volume of the potential customer segment?	
1.1.2.2 How important are energy costs to the potential customers (percentage of energy costs in relation to total costs)?	
1.1.2.3 What is the importance/status of energy supply security (e.g. reduced blackouts)?	
1.1.2.4 What sort of customer acquisition boundaries exist for potential ESCOs?	
1.1.3 How compatible are decision-making structures of potential customers?	
1.1.3.1 How transparent are decision-making processes and authorities in regards to potential customers?	
1.1.3.2 What degree of willingness exists for outsourcing and cooperation with third parties?	
1.1.3.3 What degree of willingness and capability exists for long-term decision-making?	
1.2 … in the public sector?	
1.2.1 How large is the achievable potential for energy efficiency measures?	
1.2.1.1 How large is the market volume of the potential customer segment?	
1.2.1.2 How important are energy costs to the potential customers (percentage of energy costs in relation to total costs)?	
1.2.1.3 What is the degree of importance of energy supply security and increased comfort (e.g. reduced blackouts)?	
1.2.2 How compatible are the decision-making structures of potential customers?	
1.2.2.1 How transparent are decision-making processes and authorities in regards to potential customers?	

1.2.2.2 What degree of willingness and capabilities exists for long-term decision-making?	
1.3 ... in the service sector (banks, shopping malls, etc.)?	
1.3.1 How large is the achievable potential for energy efficiency measures?	
1.3.1.1 How large is the market volume of the potential customer segment?	
1.3.1.2 How important are energy costs to the potential customers (percentage of energy costs in relation to total costs)?	
1.3.1.3 What is the degree of importance of energy supply security and increased comfort (e.g. reduced blackouts)?	
1.3.2 How compatible are the decision-making structures of potential customers?	
1.3.2.1 How transparent are decision-making processes and authorities in regards to potential customers?	
1.3.2.2 What degree of willingness and capabilities exists for long-term decision-making?	
1.4 ... in the residential building sector?	
1.4.1 How large is the achievable potential for energy efficiency measures?	
1.4.1.1 How large is the market volume of the potential customer segment?	
1.4.1.2 How important are energy costs to the potential customers (percentage of energy costs in relation to total costs)?	
1.4.1.3 What is the degree of importance of energy supply security and increased comfort (e.g. reduced blackouts)?	
1.4.2 How compatible are the decision-making structures of potential customers?	
1.4.2.1 How transparent are decision-making processes and authorities in regards to potential customers?	
1.4.2.2 What degree of willingness and capabilities exists for long-term decision-making?	
2. What are the opportunities for possible energy service suppliers (ESCOs)?	
2.1 What is the scope of ESCO potential of existing enterprises?	
2.1.1 ... among energy suppliers?	
2.1.1.1 How much knowledge about energy efficiency in the area of building technology (e.g. lighting) does currently exist?	
2.1.1.2 How much knowledge about energy efficiency in the area of energy technology (e.g. CHP) does currently exist?	
2.1.1.3 What is the public reputability of these enterprises; how much confidence are they awarded?	
2.1.1.4 How comprehensive are the general experiences that these enterprises have had with larger, long-term projects?	

2.1.2 … among technology suppliers?	
2.1.2.1 How much knowledge about energy efficiency in the area of building technology (e.g. lighting) does currently exist?	
2.1.2.2 How much knowledge about energy efficiency in the area of energy technology (e.g. CHP) does currently exist?	
2.1.2.3 What is the public reputability of these enterprises; how much confidence are they awarded?	
2.1.2.4 How comprehensive are the general experiences that these enterprises have had with larger, long-term projects?	
2.1.3 … among smaller engineering companies, maintenance companies, and the like?	
2.1.3.1 How much knowledge about energy efficiency in the area of building technology (e.g. lighting) does currently exist?	
2.1.3.2 How much knowledge about energy efficiency in the area of energy technology (e.g. CHP) does currently exist?	
2.1.3.3 What is the public reputability of these enterprises; how much confidence are they awarded?	
2.1.3.4 How comprehensive are the general experiences that these enterprises have had with larger, long-term projects?	
2.1.4 … among public institutions?	
2.1.4.1 How much knowledge about energy efficiency in the area of building technology (e.g. lighting) does currently exist?	
2.1.4.2 How much knowledge about energy efficiency in the area of energy technology (e.g. CHP) does currently exist?	
2.1.4.3 What is the public reputability of these enterprises; how much confidence are they awarded?	
2.1.4.4 How comprehensive are the general experiences that these enterprises have had with larger, long-term projects?	
2.1.5 … among industrial parks?	
2.1.5.1 How much knowledge about energy efficiency in the area of construction technology (e.g. lighting) does currently exist?	
2.1.5.2 How much knowledge about energy efficiency in the area of energy technology/supplier technologies (e.g. CHP, steam generation) does currently exist?	
2.1.5.3 To what extent are the necessary facilities and technical equipment available?	
2.1.5.4 How much experience exists in relation to energy accounting, contract management, etc.?	
2.1.5.5 What is the public reputability of these enterprises; how much confidence are they awarded?	
2.1.5.6 How comprehensive are the general experiences that these enterprises have had with larger, long-term projects?	

2.1.5.7 What sort of customer acquisition boundaries exist for potential ESCOs?	
2.1.5.8 What are the possibilities for cooperation in the area of energy services (e.g. with other industrial parks)?	
2.1.5.9 What degree of interest exists among industrial parks in expanding their service portfolio?	
2.2 How amenable are the conditions to the establishment of ESCO enterprises?	
2.2.1 How much competition exists among industrial parks in relation to customer acquisition? How important would differentiation through ESCO services be?	
2.2.2 What opportunities exist for education and profession training in the area of energy efficiency (universities, chambers of commerce, etc.)?	
2.2.3 What are the support/finance structures for the founding of new enterprises?	
2.2.4 How well are the relevant enterprises organised (business associations, chambers of commerce, etc.)?	
3. To what degree are general pre-conditions met?	
3.1 How dependable are the legal structures and protections?	
3.1.1 How well have legal structures that would be relevant for energy services been regulated?	
3.1.1.1 How well regulated are ownership rights in industrial parks (Who do facilities belong to? What happens when a customer exits an industrial park?)? What implications do they have for ownership of ESCO services?	
3.1.1.2 How dependable are guarantee and contract rights in relation to long-term service contracts (e.g. bankruptcy liability)?	
3.1.1.3 Do energy supply contracts exist? How are they structured and regulated?	
3.1.1.4 What other legal conditions exit, such as administrative pre-conditions for approvals and the operation of private energy generation facilities? What is the process for gaining permissions?	
3.1.2 How well are laws carried out by the state?	
3.1.2.1 To what extent are breeches of contract and the like actually punished by legal institutions?	
3.1.2.2 How are disagreements (e.g. between industrial parks and industrial enterprises) resolved?	
3.1.2.3 How does communication between official institutions and industrial parks flow?	

3.2 How commercially enabling is the business culture for energy services?	
3.2.1 How extensive is the utilisation of energy service companies?	
3.2.2 How dependable are business practices (e.g. contract fulfilment)?	
3.2.3 What is the status of corruption avoidance and reduction?	
3.3 How supportive are the conditions in relation to energy policies and climate policies?	
3.3.1 Do federal goals exist for climate, emissions and energy?	
3.3.2 What regulations (orders or bans) exist in reference to energy efficiency?	
3.3.3 To what extent do economic incentives (e.g. taxes, fees, subsidies, grants) exist for energy efficiency measures and what sorts would be feasible?	
3.3.4 Are there any institutions with explicit authority in regards to energy consumption and the improvement of energy efficiency?	
3.4 How compatible are the conditions relating to the energy sector?	
3.4.1 What is the level of current prices for end energy?	
3.4.1.1 How high is the electricity price?	
3.4.1.2 How high are the prices for end users in relation to energy sources that are generally utilised for heat generation (heaters, industrial processes, etc.) or cooling (air conditioners, refrigeration, etc.)?	
3.4.2 What is the forecast for future energy price development?	
3.4.2.1 What is the probability of energy demand steadily rising in the future (i.e. via continued economic growth)?	
3.4.2.2 What is the likelihood that electricity and heat supply generation will prove insufficient?	
3.4.2.3 How probable is it that governmental measures will cause energy prices to rise (i.e. via reduction of existing subsidies or increased taxes)?	
3.4.3 What is the current availability of needed primary energy sources and the status technical infrastructure (supply networks)?	
3.4.4 To what degree is the energy market liberalised?	
3.4.4.1 To what extent can businesses feed energy into the supply network?	
4 How well are the economic efficiency and the financing of energy service projects guaranteed?	
4.1 How high are the project costs?	
4.1.1. How high are project development costs?	
4.1.1.1 How high are the transaction costs (e.g. legal advisement)?	
4.1.1.2 How complex/comprehensive are the bureaucratic processes (e.g. approvals)?	
4.1.2 ... investment costs?	
4.1.2.1 How high are the technological costs (e.g. import duties)?	
4.1.2.2 How high are the labour costs for facility construction?	

4.1.3 ... operational cost?	
4.2 How much compensation is achievable with contracting?	
4.3 How easy is it to access inexpensive financing options?	
4.3.1 ... for potential customers?	
4.3.1.1 To what extent do potential customers have their own sufficient funds or securities?	
4.3.1.2 Are there any special financial instruments or credit lines for energy efficiency measures (nation or international)?	
4.3.1.3 How easily can governmental, international or other external financing sources be accessed?	
4.3.2 ... for ESCOs?	
4.3.2.1 To what extent do ESCOs themselves possess sufficient funds or securities?	
4.3.2.2 Are there any special financial instruments or credit lines for energy efficiency measures (nation or international)?	
4.3.2.3 How easily can governmental, international or other external financing sources be accessed?	

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