



D4.10 - EPC Basics and Financing

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WHY EPC?



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ENERGY EFFICIENCY

Energy Efficiency (EE)



A way of managing and restraining the growth in energy consumption.

Something is seen as more energy efficient if it delivers more services for the same energy inputs, or the same services for less energy input.

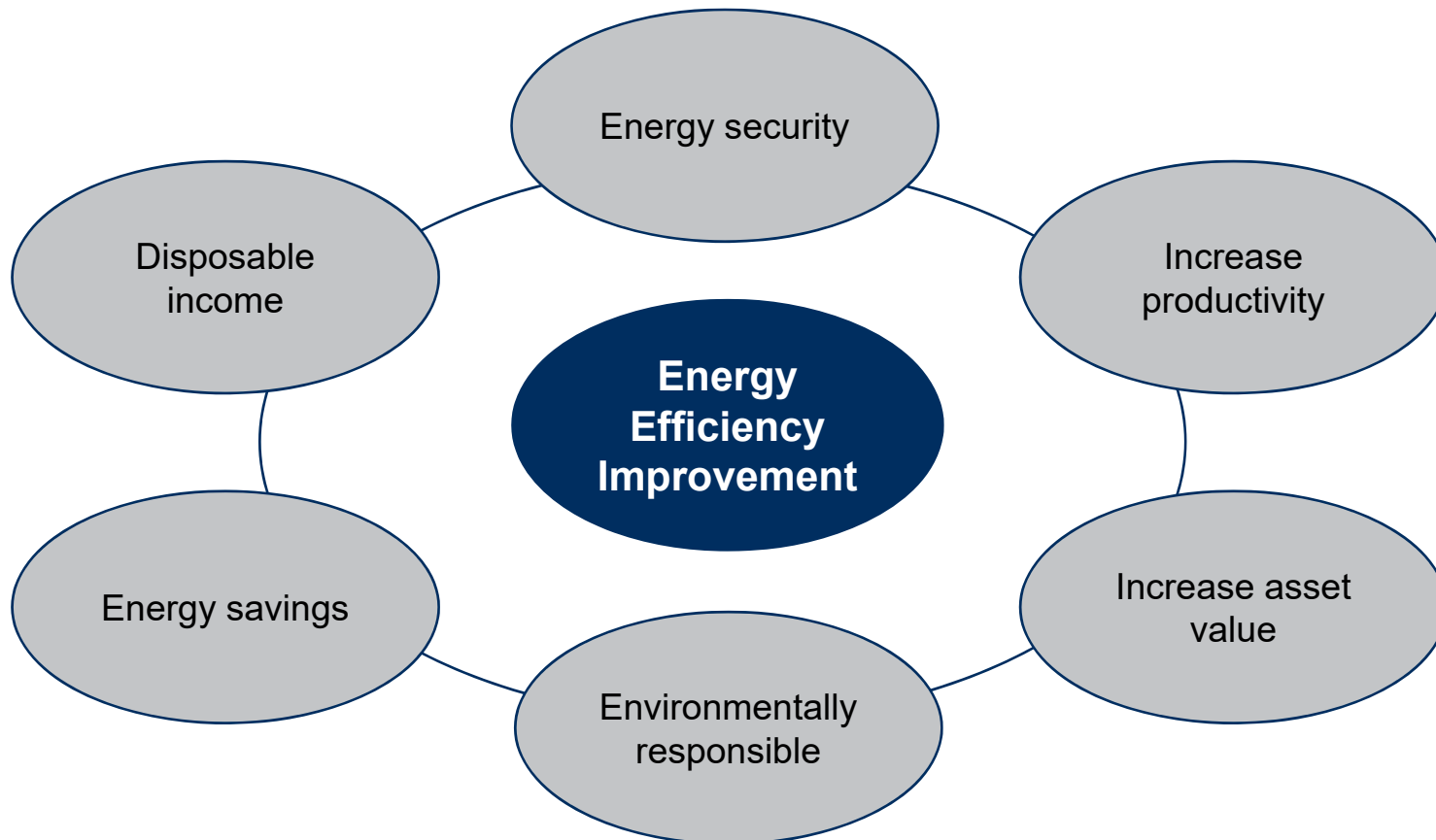
Energy Efficiency Improvements (EEI) offer many advantages to customers, such as:

- **Energy security:** e.g., when renewable energies are installed they offer energy independence
- **Energy savings:** due to the reduction obtained through efficiency
- **Increase asset value**
- **Disposable income, obtained from new savings**
- **Increase productivity**
- **Environmentally responsible**

Source: International Energy Agency (IEA)

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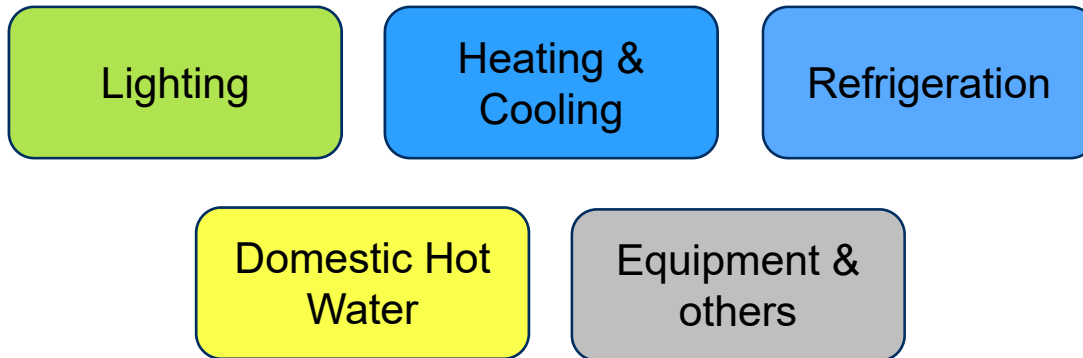
ENERGY EFFICIENCY



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ENERGY EFFICIENCY

Energy Efficiency and EPC projects use different measures to improve conditions on tertiary sector facilities. Most common are:



Some of the measures that are implemented on each of these categories are:



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ENERGY EFFICIENCY

Lighting

- Substitution of incandescent lamps with CFL or LED
- Occupancy and presence detectors in bathrooms and corridors
- Photocell to dim luminous flux based on natural light

Heating & Cooling

- Substitution of boiler burner, low efficiency heat pumps, windows, etc.
- Installation of high temperature cooling, variable frequency drives, curtains, etc.
- Improvement of thermal insulation of roofs, facade, etc.

Refrigeration

- Substitution of appliances with more efficient ones
- Installation of temperature detectors
- Proper insulation of doors and others

Domestic Hot Water

- Substitution of conventional boilers
- Heat recovery systems in chillers
- Solar thermal panels

Equipment & others

- Substitution of hydraulic motors in elevators
- Substitution of conventional appliances
- Installation of RES

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ENERGY EFFICIENCY

Depending of the type of measure and type of facility where these are being implemented, there will be different levels of energy savings.

Average savings for each type of measure

| Segment / Measure | Retail | Hospitality | Education | Health | Offices |
|----------------------|--------|-------------|-----------|--------|---------|
| Lighting | 5-40% | 26-50% | 20-65% | 40-60% | 40-70% |
| Heating and Cooling | 20-60% | 17-46% | 10-40% | 15-35% | 10-40% |
| Refrigeration | 5-30% | 10-30% | - | 10-20% | - |
| Domestic Hot Water | - | 15-52% | - | 10-50% | 5-20% |
| Equipment and others | 1-2% | 5-10% | 15-30% | - | 5-15% |

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Energy Performance Contracts (EPC)

Energy Performance Contracts are contractual arrangements between the beneficiary and the provider of an energy efficiency improvement measure, verified and monitored during the whole term of the contract, where investments (work, supply, service, etc.) are paid for in relation to contractually agreed level of energy efficiency improvement or other agreed energy efficiency criterion, such as financial savings.

Generally long term contractual agreement

EPCs are structured around the desired outcome, such as energy savings and/or equipment renewal.

EPC Providers: mix of service providers, contractors and product suppliers

Energy performance guarantees can be incorporated into contracts.

More than just financing mechanisms

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EPC

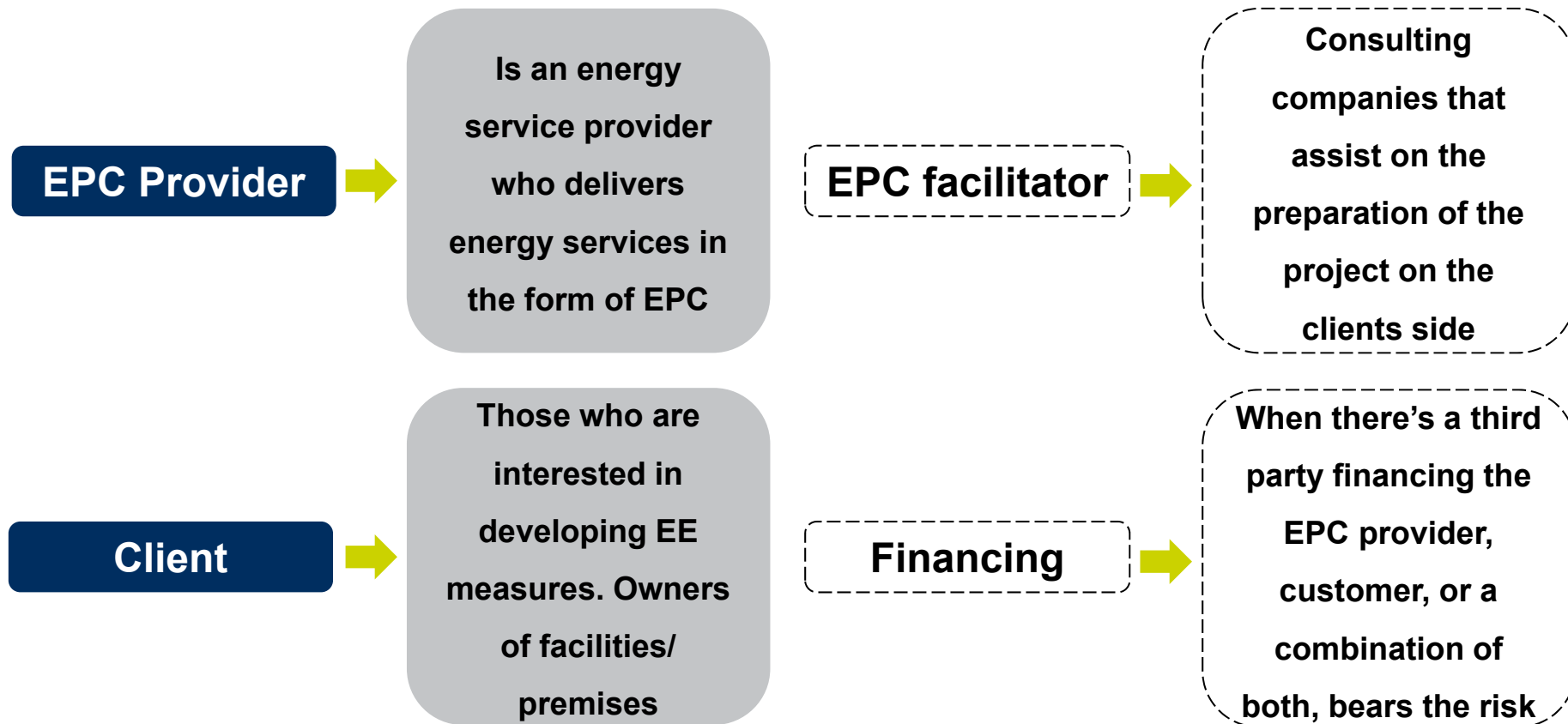


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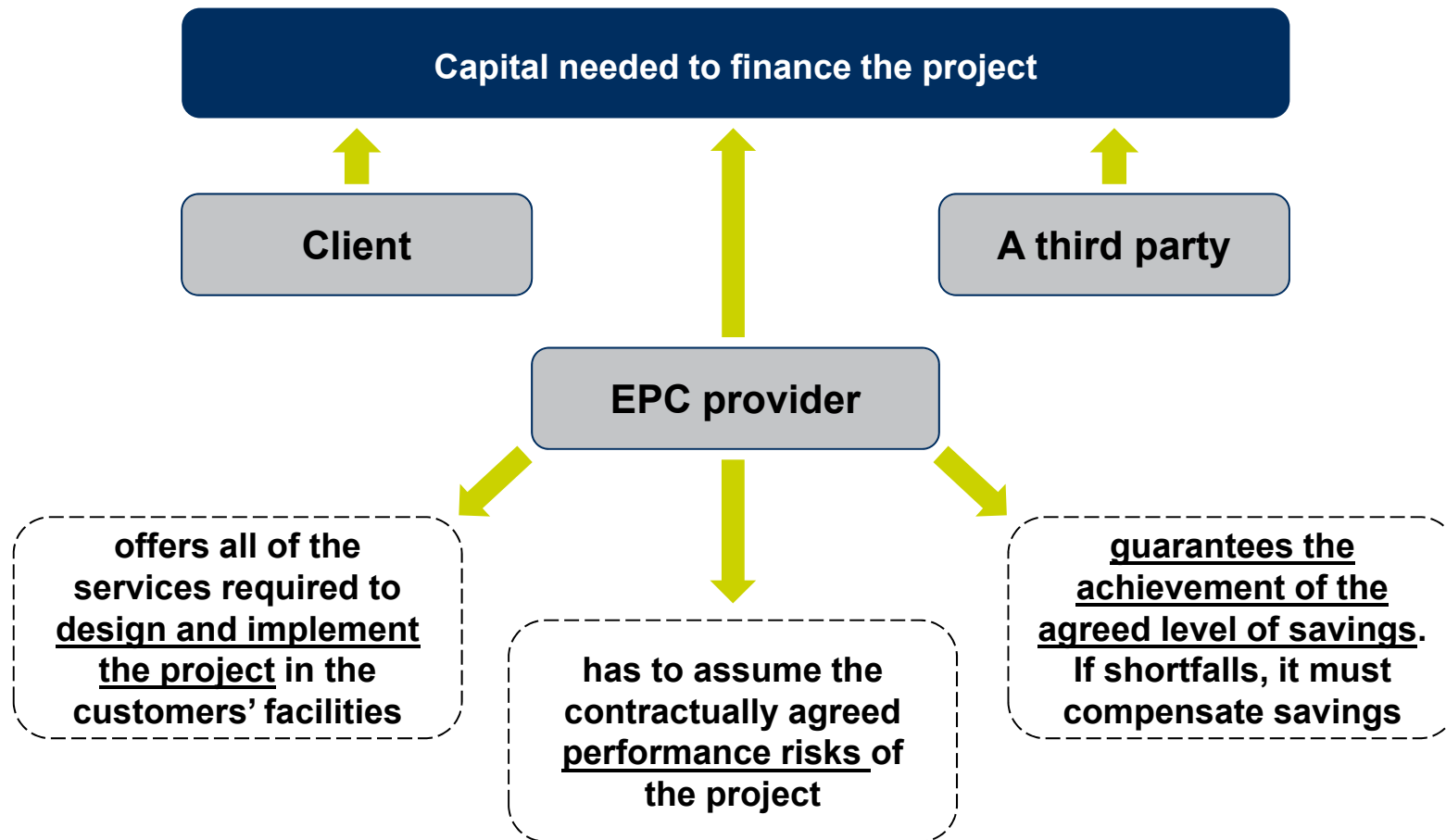
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WHY EPC?



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MAIN CHARACTERISTICS



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MAIN CHARACTERISTICS
TYPICAL EPC PROJECT

The Key Feature

Energy efficiency investments are repaid from energy savings and related financial savings.

Turnkey service

The ESCO provides all of the services required to design and implement a comprehensive project at the customer facility, from the initial energy audit to long-term Measurement and Verification (M&V) of project savings

No need for up-front capital

Energy efficiency investments are repaid directly from energy savings, so there is no need for up-front capital on the customer's side

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MAIN CHARACTERISTICS

TYPICAL EPC PROJECT

The Key Feature

Energy efficiency investments are repaid from energy savings and related financial savings.

Risks for customers minimized

The ESCO assumes the contractually agreed performance risks of the project

Guaranteed savings

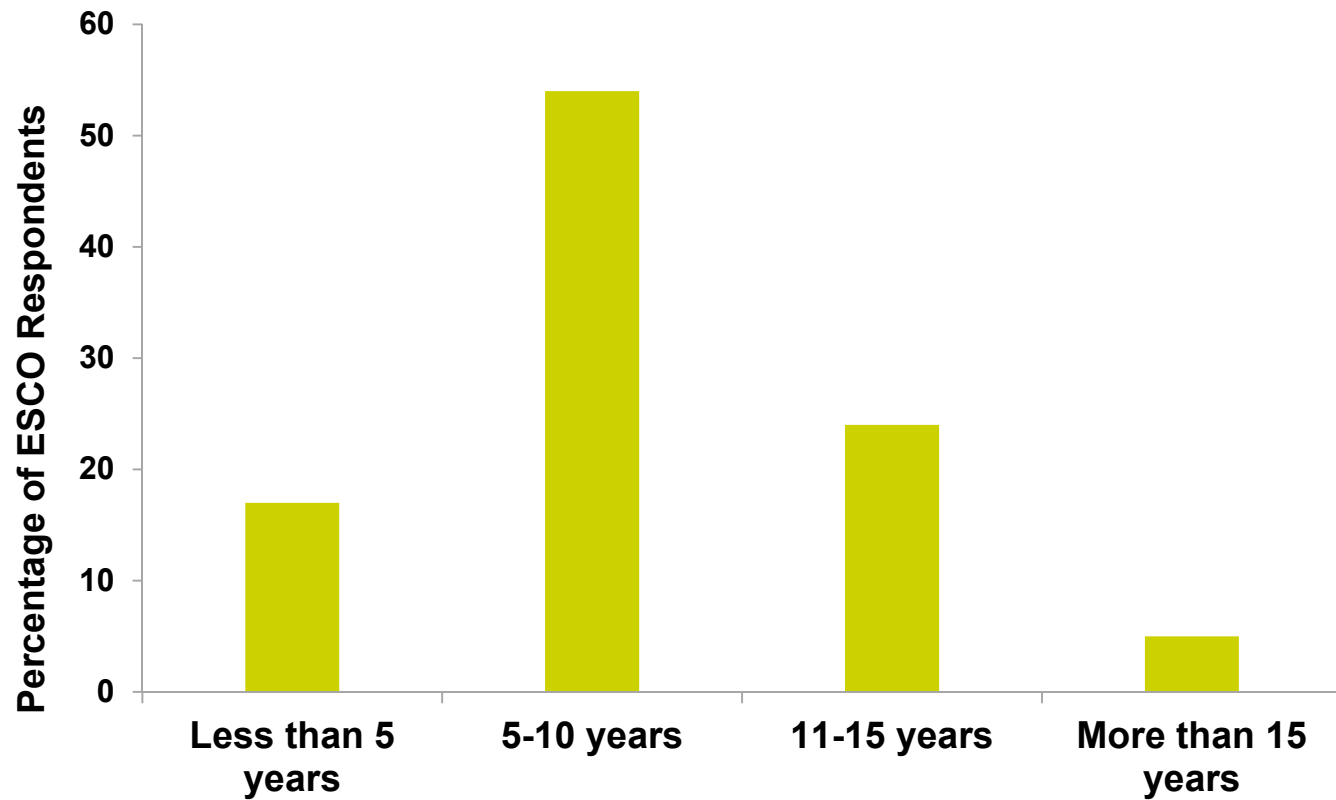
The ESCO guarantees the achievement of the contractually agreed level of savings and is obliged to compensate savings shortfalls.

Support in finding financing

The capital to finance the EPC project can either be supplied out of the Client's own funds, by the EPC provider or by a third party. Provision of financing by the EPC provider is an option, not a necessary part of the EPC project.

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MAIN CHARACTERISTICS TYPICAL LENGTH OF THE PROJECT

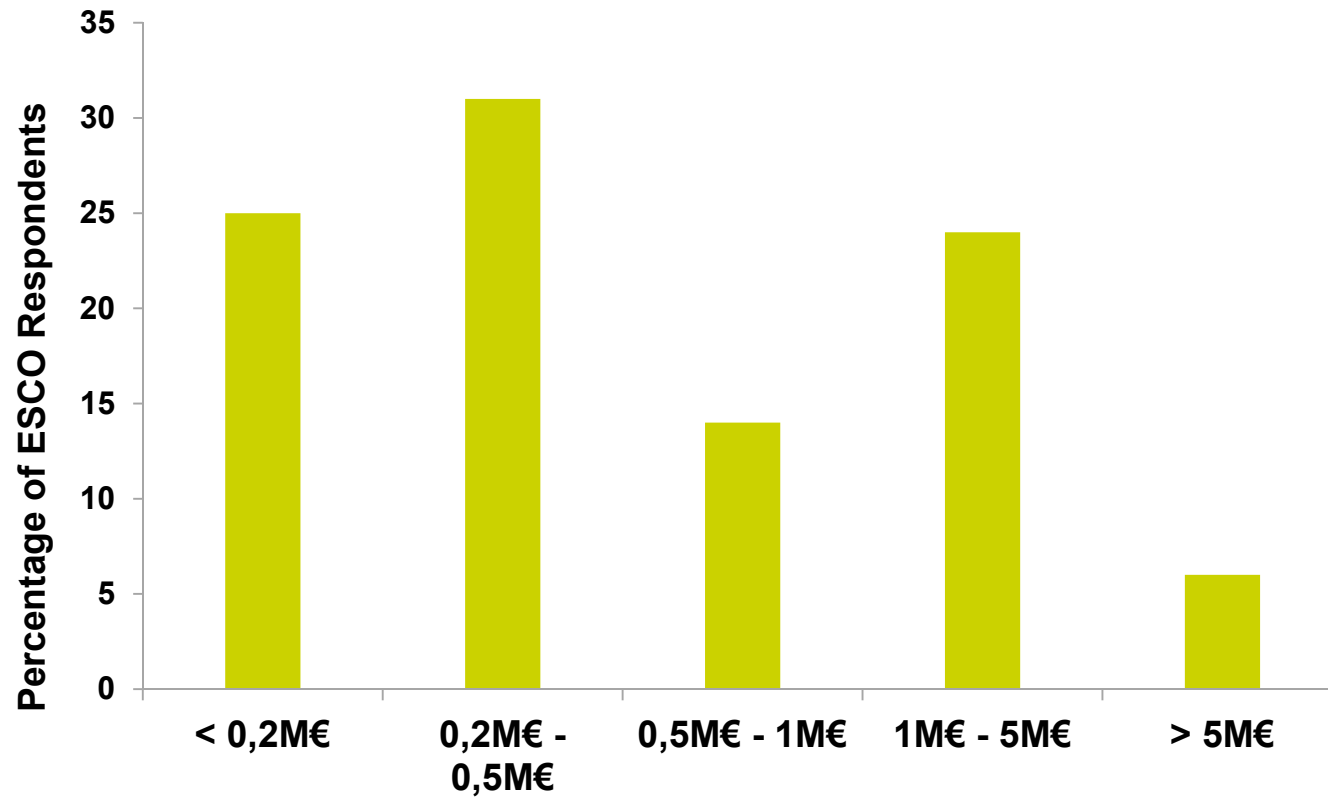


Source: Transparens, 2013

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MAIN CHARACTERISTICS

MOST COMMON INVESTMENT OUTLAY FOR EPC PROJECTS

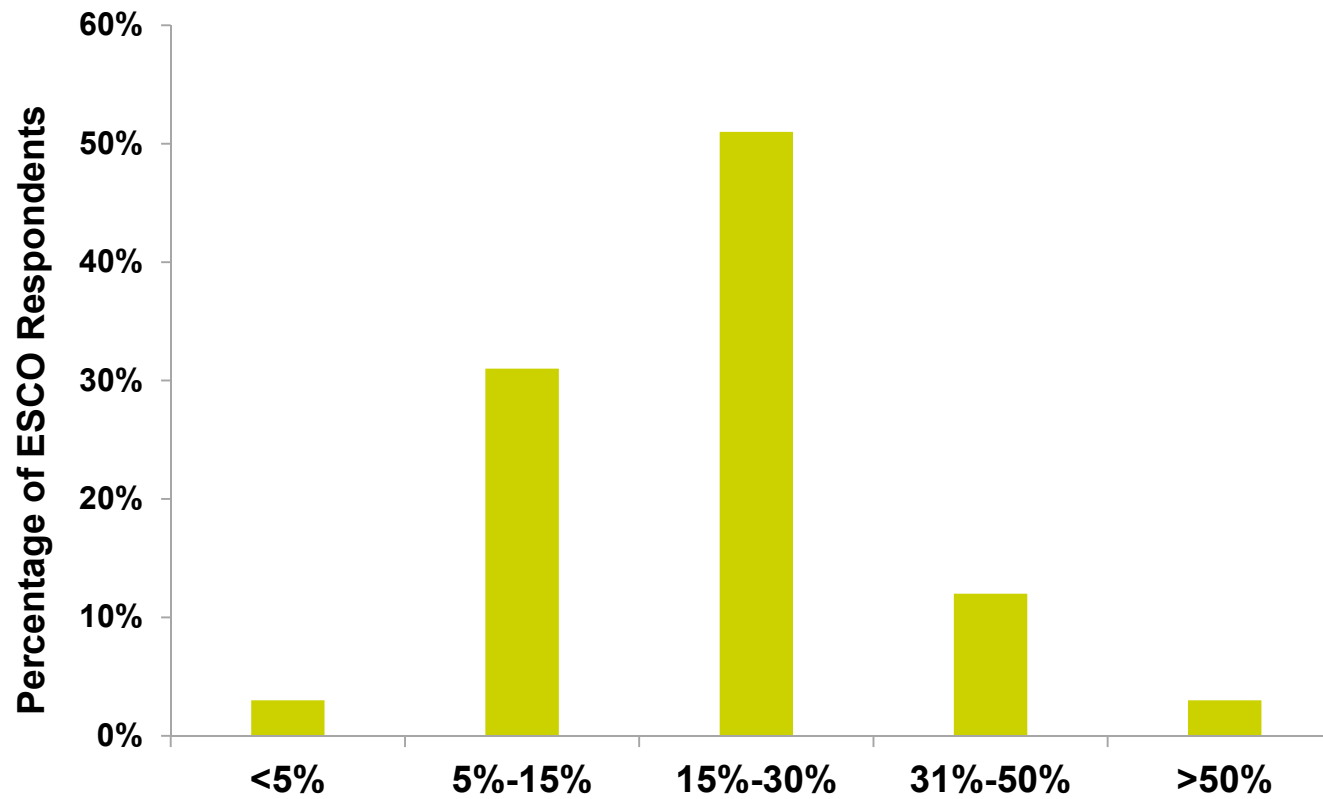


Source: Transparens, 2013

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MAIN CHARACTERISTICS

TYPICAL ENERGY SAVINGS ACHIEVED

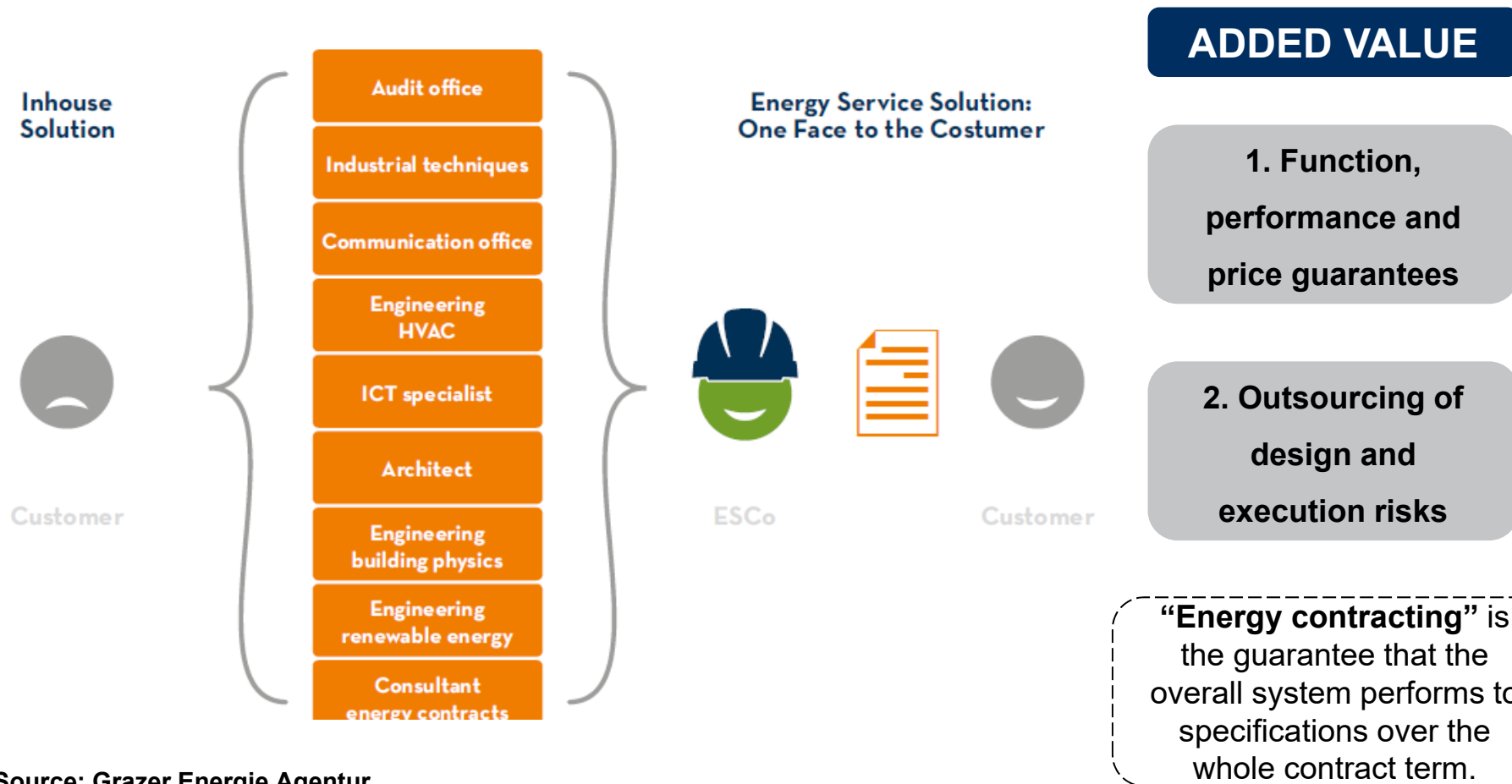


Source: Transparens, 2013

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MAIN CHARACTERISTICS

ADDED VALUED COMPARED TO IN-HOUSE SOLUTIONS

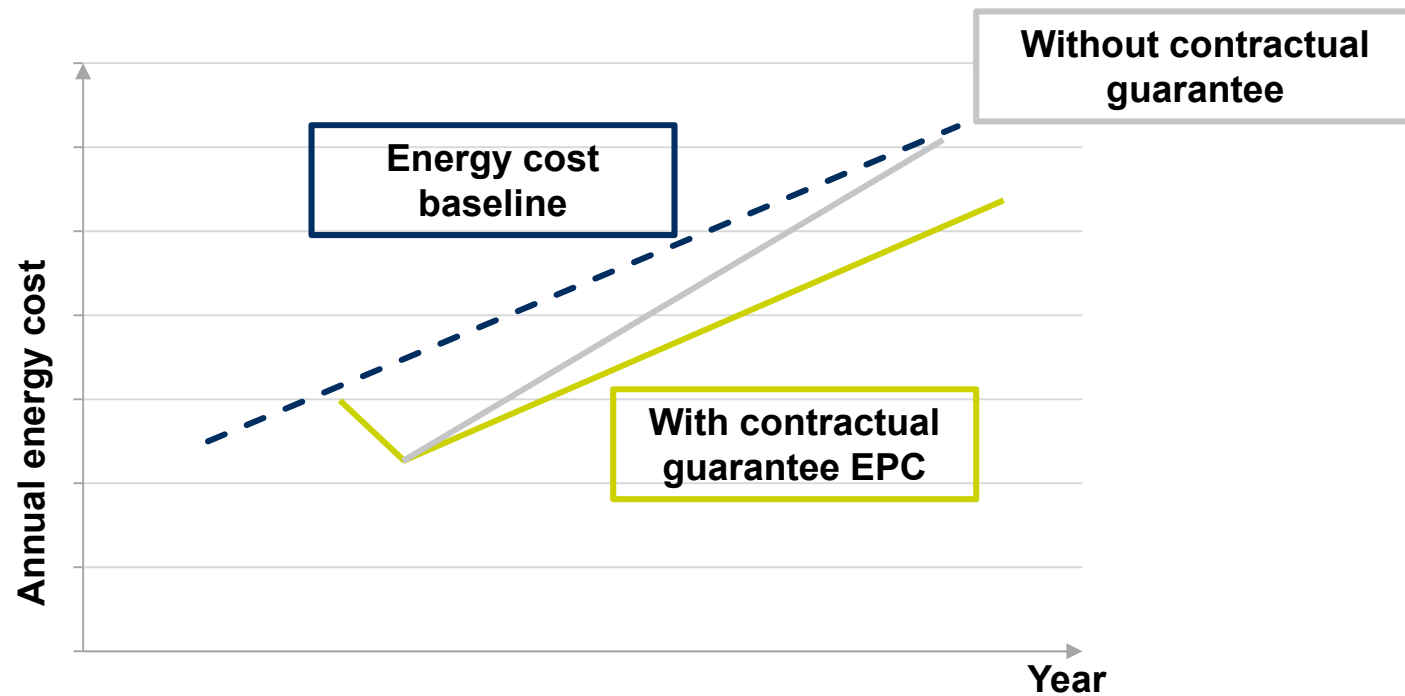


Source: Grazer Energie Agentur

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MAIN CHARACTERISTICS

NO-REBOUND EFFECT



Expected Energy Savings (Engineering Estimate)

=

Realized Energy Saving

Source: Grazer Energie Agentur

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 MAIN CHARACTERISTICS
 COMPARISON EPC VS IN-HOUSE

| ADVANTAGE / DISADVANTAGE | EPC | IN HOUSE SOLUTIONS |
|--|--|--|
| Savings Guarantee | ESCO guarantees under EPC contract energy savings | No guaranteed savings |
| Maximizing Energy Savings | ESCO is highly motivated to maximize energy savings | Threat of rebound effect |
| Technical Risks | ESCO | Client |
| Technical Responsibilities for New Systems | ESCO over whole contract duration | Warranty of external planners for 2 years. After warranty, client responsible. |
| Financial Risk | ESCO | Client |
| Financial Costs | | Could be lower, provided client has a budget or low-interest financing |
| Comfort Levels | Energy optimization at defined comfort levels | Full flexibility of comfort levels |
| Planning Process | Co-ordinated by ESCO | Co-ordinated by client and external planners |
| Rebound Effects | ESCO is highly motivated to avoid all possible rebound effects | Usually increase of energy consumption after implementation |

Source: Grazier Energie Agentur

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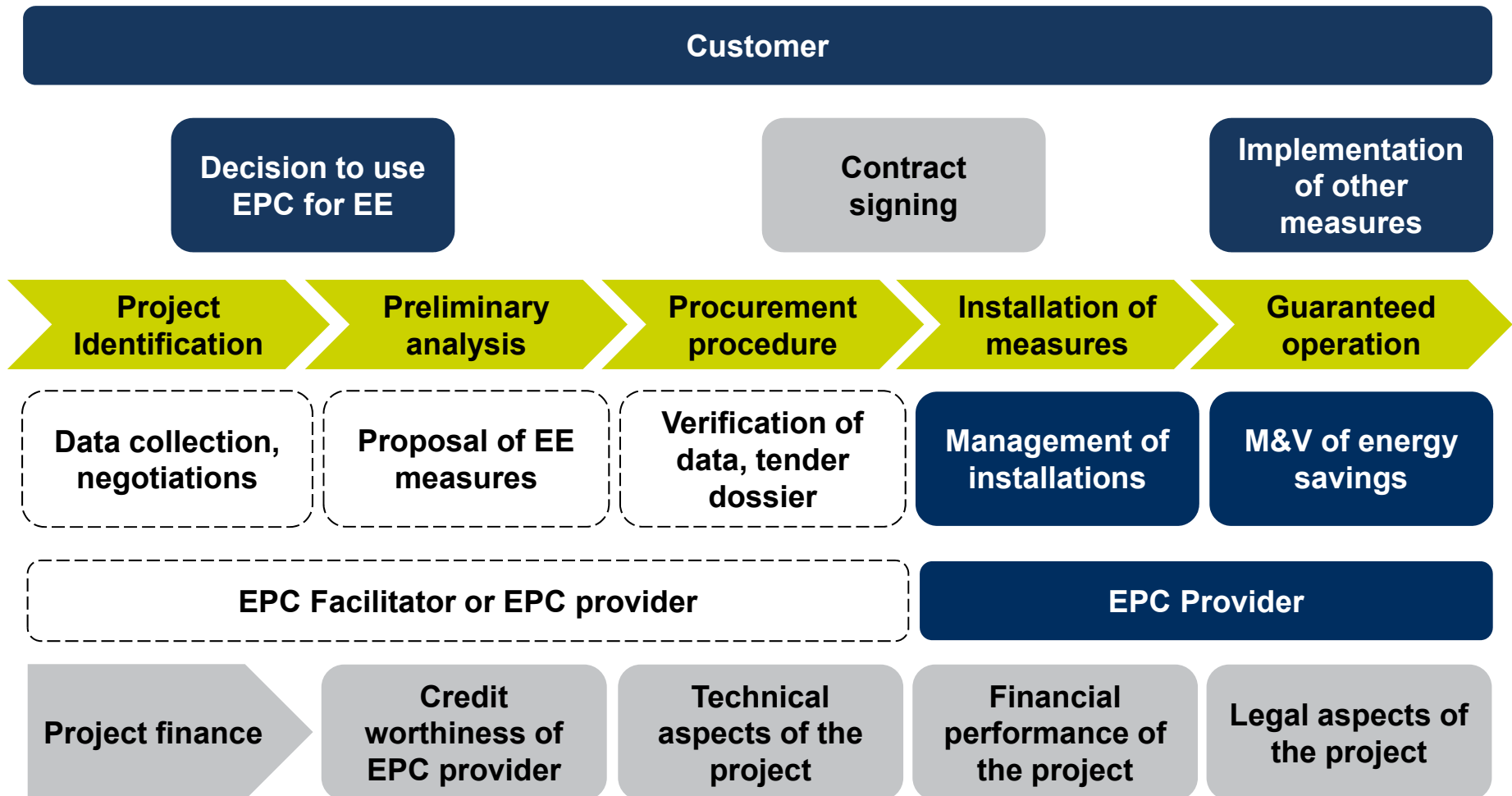
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WHY EPC?



EE & EPC EPC PROCESS



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EPC PROCESS

PROJECT IDENTIFICATION



To identify a project feasibility the EPC provider / facilitator usually follows the following steps:

- Collect and analyze energy use data
- Benchmark all major consumptions
- Perform energy audits / retro-commissioning



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EPC PROCESS

PRELIMINARY ANALYSIS (I / II)



The preliminary analysis consists in the delivery of a first report with the recommended measures that should be implemented

- This is the beginning of building the business case that will help gain project support and management approval



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EPC PROCESS

PRELIMINARY ANALYSIS (II / II)



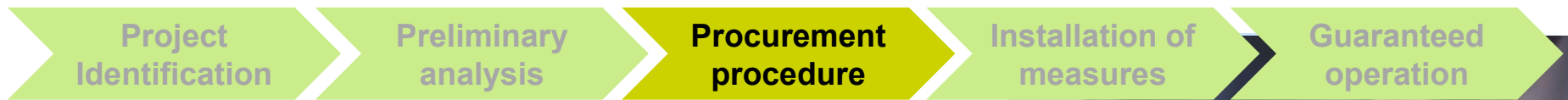
For doing so, the EPC provider / facilitator should estimate the energy and costs impacts that would result from the implementation of any measure

- Simple payback is the most commonly used financial metric to express energy project cost effectiveness and to build the business case

In addition, other than costs savings benefits should be considered (e.g. avoided GHG, better light quality, avoided maintenance costs)



EE & EPC EPC PROCESS PROCUREMENT PROCEDURE



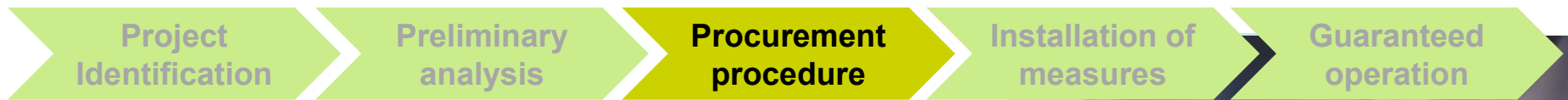
Each company follows their own standards when concerning procurement procedures

If an EPC facilitator has developed all previous steps, it would also help during this step

- EPC facilitators have more experience in the energy efficiency market and, therefore, would know which is the most suitable EPC provider to develop the specific project



EE & EPC EPC PROCESS PROCUREMENT PROCEDURE



The EPC provider will define energy savings, contract duration, financial savings, guarantees and maintenance (if necessary) and every other general condition to develop the project

- If an EPC facilitator is present it could develop the desired conditions of the contract with the customer and choose the appropriate provider to develop the project



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EPC PROCESS

PROCUREMENT PROCEDURE

Project
Identification

Preliminary
analysis

Procurement
procedure

Installation of
measures

Guaranteed
operation

During the procurement procedure the financing of the projects is one of the most relevant factors

The choice of the appropriate financing option depends of several factors, such as, economy of the project, available financial sources and financing options within the country



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EPC PROCESS

PROCUREMENT PROCEDURE

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Financing for EPC projects can come from:

- A third party provides credit to the EPC provider or the customer to develop the project
- The EPC provider, financing with internal funds
- The customer, which could finance with internal funds (CAPEX)
- Combined effort from EPC provider and customer



EE & EPC EPC PROCESS CONTRACTS

Project
Identification

Preliminary
analysis

Procurement
procedure

Installation of
measures

Guaranteed
operation

The **Energy performance contract** must contain guarantees for savings and regulations for allocations of financial and technical risks. Some of the components of the contracts are:

- Duration of contracts
- Volume of investment
- Client / ESCO obligations
- Process for implementation of measures
- Project implementation timetable
- Achieved savings evaluation method



EE & EPC EPC PROCESS

IMPLEMENTATION OF MEASURES

Project
Identification

Preliminary
analysis

Procurement
procedure

Installation of
measures

Guaranteed
operation

After the contract is signed, the EPC Provider develops the project according to the agreement

- A timeframe should be established for all measures to be implemented

All energy efficiency measures implemented must follow international standards

- The EPC facilitator (if present) could verify that this condition is fulfilled



EE & EPC EPC PROCESS

IMPLEMENTATION OF MEASURES

Project
Identification

Preliminary
analysis

Procurement
procedure

Installation of
measures

Guaranteed
operation

The EPC provider should offer an appropriate training in order to ensure the customer makes a right use of new equipments

- This would help obtaining maximum profitability from implemented measures
- The EPC facilitator can also provide training for the customer



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EPC PROCESS

MEASUREMENT & VERIFICATION (I / IV)

Project
Identification

Preliminary
analysis

Procurement
procedure

Installation of
measures

Guaranteed
operation

Savings, of course, account for avoided energy use and cannot be measured directly.

They are established by comparing measured energy use before and after implementation of energy conservation measures with adjustments for changes in weather, occupancy, opening hours, production, etc.

Records of energy use before any changes are made, or Baseline Energy use, are very relevant for a good project follow up



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EPC PROCESS

MEASUREMENT & VERIFICATION (II / IV)

Project
Identification

Preliminary
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Procurement
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Installation of
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Guaranteed
operation

When planning to measure and verify savings, a fundamental consideration is the Boundary, i.e. savings may be determined from measuring a portion of a facility.

The other fundamental consideration is how energy use will be measured to establish savings.

- Taking measurement of instantaneous electrical load
- Logging of energy use at regular intervals over a representative timeframe



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EPC PROCESS

MEASUREMENT & VERIFICATION (III / IV)



All these concepts are generally based on an established protocol, such as the International Performance Measurement and Verification Protocol (IPMVP).

Certified Measurement and Verification Professionals should provide guidance.

All contractual obligations regarding energy efficiency, financial savings and others have to be fulfilled by the EPC provider



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EPC PROCESS

MEASUREMENT & VERIFICATION (IV / IV)

Project
Identification

Preliminary
analysis

Procurement
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Installation of
measures

Guaranteed
operation

If energy savings, financial savings or any other condition established by contract is not fulfilled by the equipments and measures implemented by the EPC provider, it must implement additional measures in order to meet the pre-established terms

- Depending on the conditions established in the contract the EPC provider might have to incur in economical penalties in favor of the customer



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 EPC PROCESS
TIMING OF PROCESS

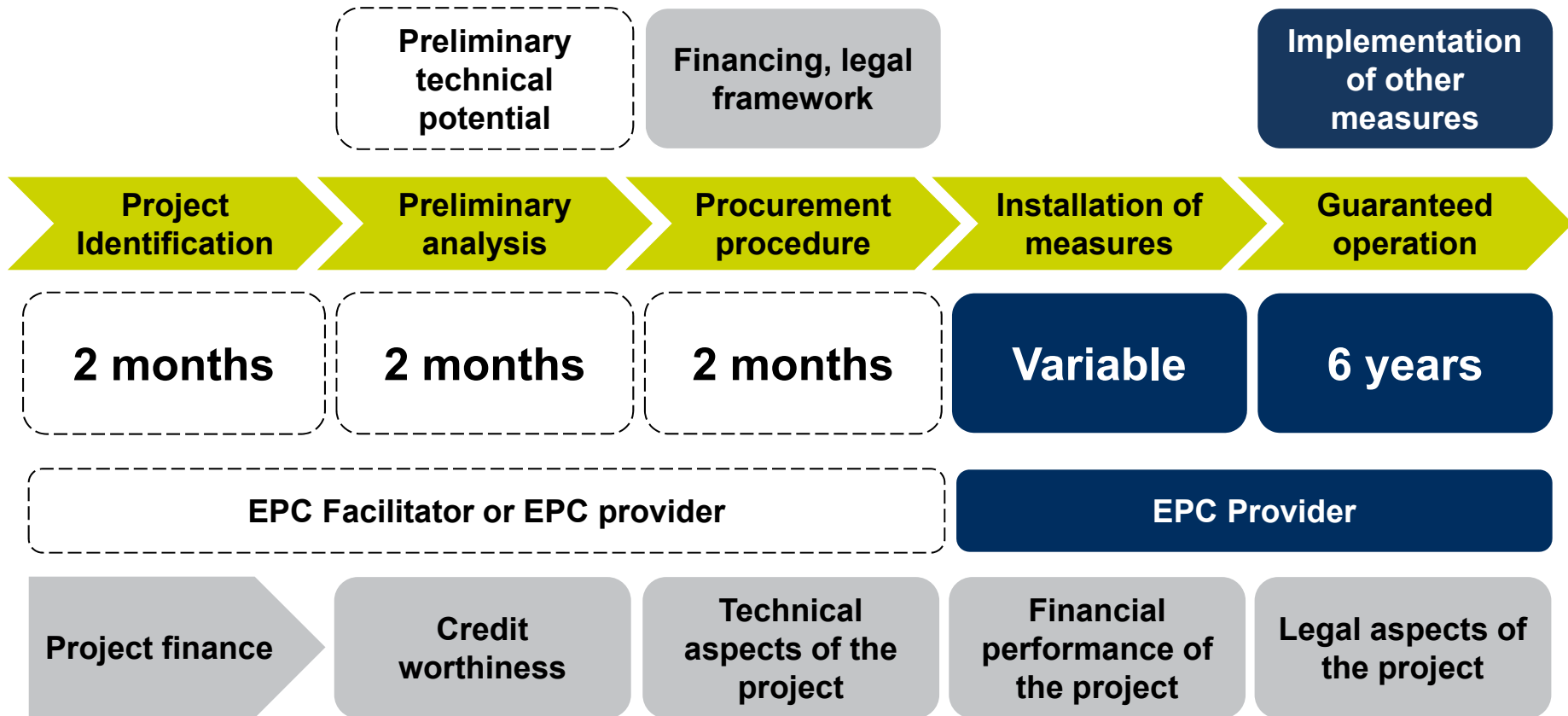


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Source: Grazer Energie Agentur

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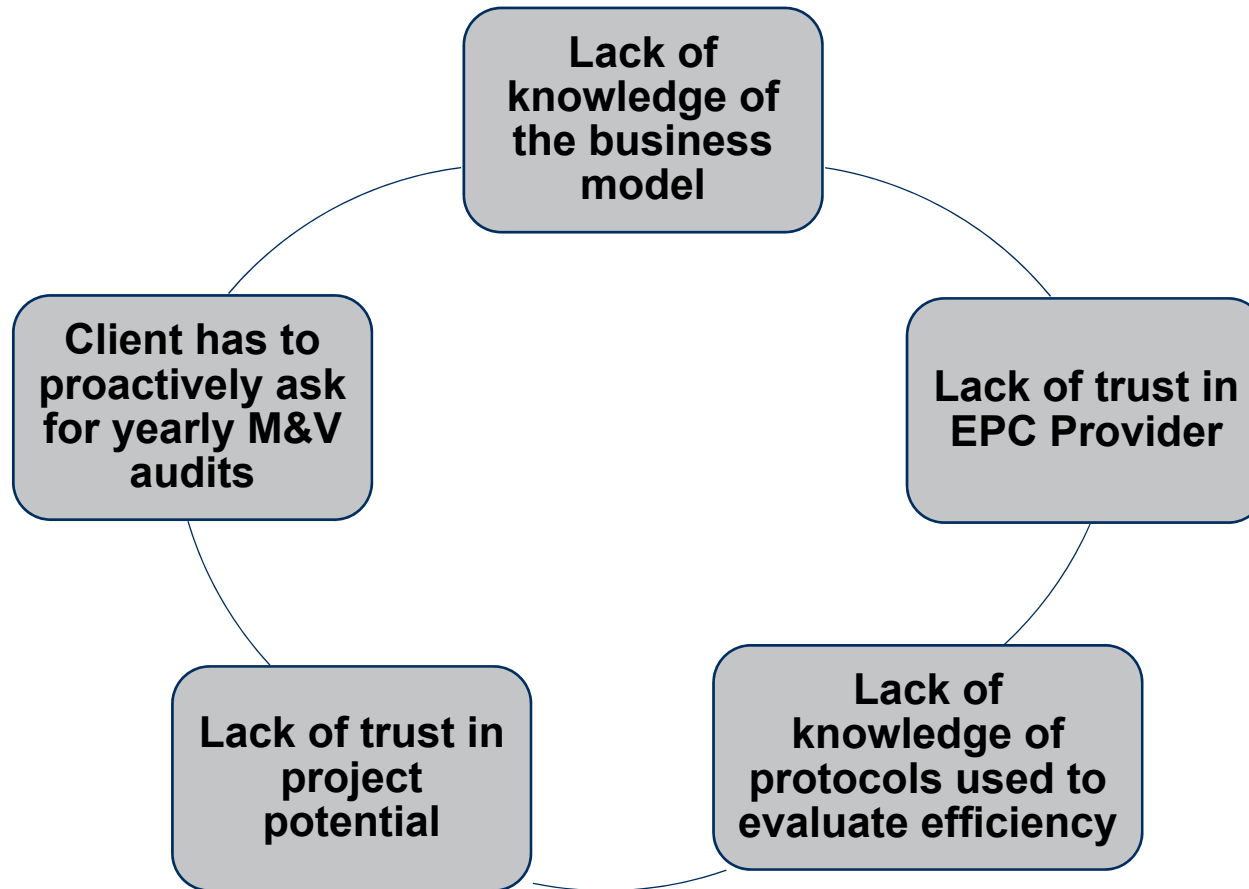
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EPC CONTRACT

Standard contract for all bidders and all projects – as far as possible.

Preamble: basic consensus

- Subject and purpose of the contract, aims of the contractual partners
- Objects of the contract
- Create trust: code of conduct (Transparence CoC) component:
 - www.transparence.eu/eu/epc-code-of-conduct/

Acting persons and dispatches

- Project managers on both sides
- Addresses

Elements of the contract

Preamble: basic consensus

Acting persons & dispatches

Involvement of 3rd parties

Baseline

Savings forecast

Contract termination

Prices and their adjustments

Source: Grazer Energie Agentur

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EPC CONTRACT

Involvement of 3rd parties

- Subcontractors
- Obligation of ESCO to inform client about all sub-contractors

Baseline

- Total consumption or just concerned parts. Connected with M&V.
- Corrective factors (climate, occupation,...)

Savings forecast/guarantees

- Level of performance guarantees
- Method of approval of savings (yearly, one-time, calculation)
- Regulations in case of under/overperformance (symmetric risk, save side)

Elements of the contract

Preamble: basic consensus

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Prices and their adjustments

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EPC CONTRACT

Duration/termination of contract

- Transfer of ownership
- Status of equipment at the end of the contract (residual value)
- Acceptable reasons and procedure for early termination of contract

Prices and their adjustments

- Separation between (re-)investment, O&M, overhead
- Use of suitable indices for each price component:
 - CAPEX: e.g. Euribor
 - O&M: combination of indices for goods and labor

Elements of the contract

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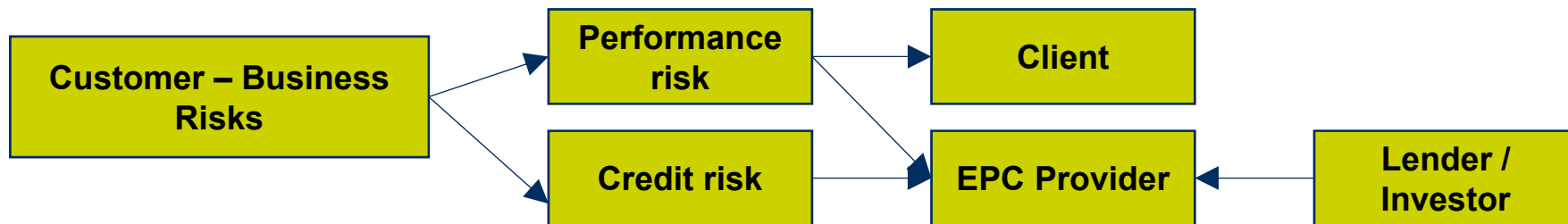


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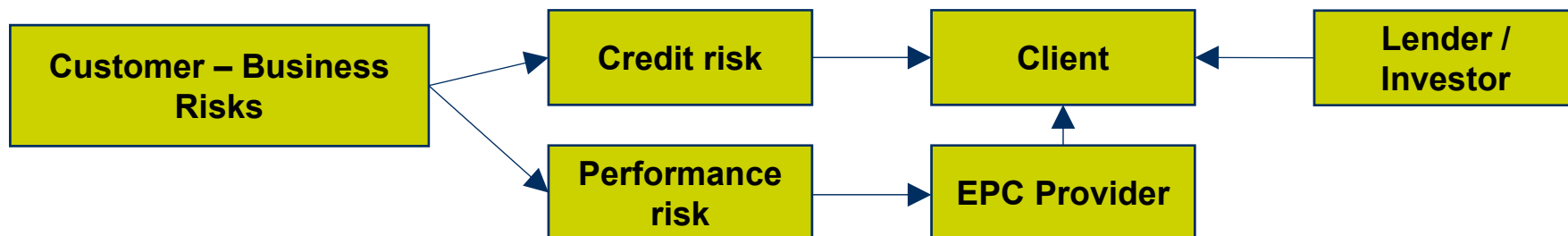
TYPES OF CONTRACTS

There are two major performance contracting models:

Shared savings



Guaranteed savings



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TYPES OF CONTRACTS

SHARED SAVINGS

- **Cost savings** are split for a pre-determined length of time in accordance with a pre-arranged percentage.
- **Client** takes over some performance risk: it's unlikely the client has to assume credit risks
 - the EPC provider usually assumes both credit and performance risks
 - To avoid energy price changes risks, it is possible to stipulate in the contract a fixed energy price
- Good introductory model in developing markets.
- The shared savings model has the added value of the financing service for the customer.
- This model tends to create barriers for small EPC providers as they become too highly leveraged and unable to contract further debt for subsequent projects.

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TYPES OF CONTRACTS GUARANTEED SAVINGS

- The **EPC Provider** usually guarantees a certain level of energy savings and takes over the entire performance and design risk. Unlikely to be willing to further assume credit risk.
 - Customers are financed directly by banks or by a financing institution. Customers repay the loan and assume the investment repayment risk.
 - If the savings are not enough to cover debt service, the EPC Provider, who assumes the performance risk and guarantees the savings, usually covers the difference.
- Likely to function properly in countries with a well established banking structure, high familiarity with project financing and sufficient technical expertise.
- It fosters long-term growth of providers and finance industries.

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TYPES OF CONTRACTS

Shared Savings

- **EPC provider** carries performance and credit risks
- **Performance** related to cost of energy saved
- **Value** of payments to EPC provider is linked to energy service
- Can serve customers that do not have access to financing
- More suitable for large EPC providers
- More suitable for projects with short payback

Guaranteed Savings

- **EPC provider** carries performance risks / **customer** carries credit risks
- **Performance** related to level of energy saved
- **Value** of energy saved is guaranteed
- Requires creditworthy customers
- EPC provider can develop more projects without getting highly leveraged
- Might seem more comprehensive

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TYPES OF CONTRACTS VARIABLE CONTRACT TERM

- EPC provider finances and implements the project.
- If the savings are less than expected, the contract term can be extended to allow the provider to recover its full payment.
- The provider takes all the savings until it has received its full payment.
- This type of contract is very uncommon due to the fact that customers do not see results until the provider has achieved its target

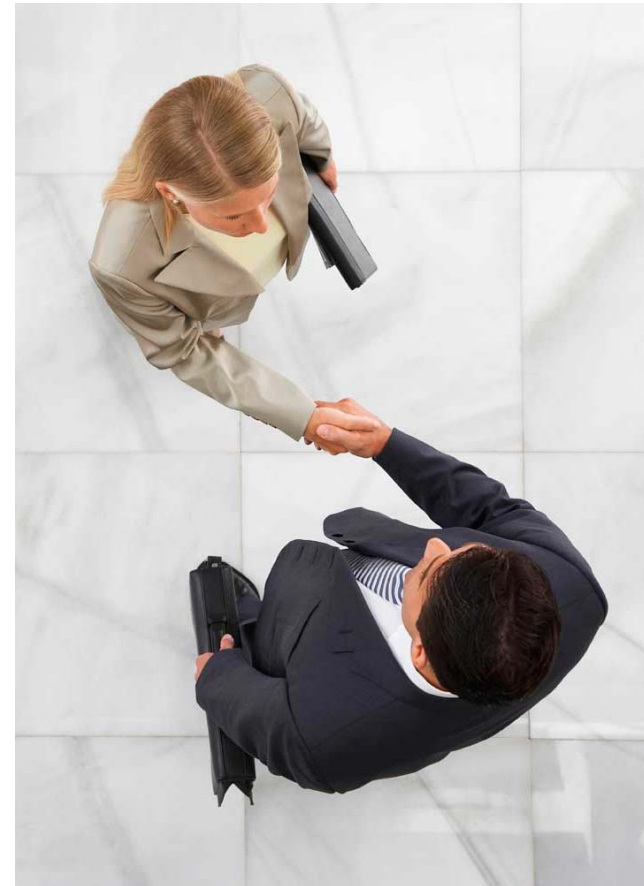


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EPC PROVIDER

Organisations wishing to improve their energy efficiency and reduce energy related costs may engage contractors, product suppliers and service providers to assist.

Both customers and providers have common interests and expectations as they both benefit from achieved savings.

ESCOs = Energy Service Companies



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EPC PROVIDER

The EPC provider bears commercial and technical implementation and operation risks and guarantees the outcome and all inclusive cost of services for the duration of the contract.

It is important to create long-term partnership between the provider and the customer based on their common goals.

Provider should also offer training for the operational staff of the customer.



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EPC PROVIDER

In general, EPC providers try to encompass a complete service and:

- Focus on most economic measures which guarantee best cost-benefit ratio
- Use modern, highly energy efficient equipment
- Adhere to high performance monitoring standards (such as IPMVP Protocol in Spain)
- Offer maintenance of the new equipment for the duration of the contract



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EPC FACILITATOR

An Energy Performance Contract merges three types of contract into one: a contract for work, a credit contract and a service contract.

Traditionally organisations start by engaging an energy consultant to identify opportunities for energy savings, ranging from operating practices, to maintenance, controls and equipment investments.

EPC Facilitator

**Data collection,
negotiations**

**Proposal of EE
measures**

**Verification of
data, tender
dossier**



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EPC FACILITATOR

The technical support and experience in energy efficiency provided from EPC Facilitator's would help improve the customers trust and, therefore, the EPC market. The EPC facilitator:

- provides support to address typical customers concerns
- has experience identifying the most relevant measures and EPC opportunities
- has the know-how to develop long-lasting EPC implementation schemes
- has know-how in ascertaining risks, roadblocks, advantages and potential of every measure to be applied due to its experience obtained after developing several projects



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EPC FINANCING

Selection of the most appropriate financing depends on a number of factors:

- Financing options within the country (experience of local banks in EPC financing)
- Creditworthiness of both the ESCO and the customer
- Available financial sources within the ESCO and the customer
- Payback / IRR of a particular project

Payment Schedule

- **VAT payment linked to invoicing.** In some countries invoicing and VAT payment is done at the time of ownership transfer (after installation).
- **Energy management payed after delivery.** Invoicing annually.

Expenditures

Energy costs

Other operating costs

Investment costs

Equipment repair / replacement costs

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EPC FINANCING

FINANCIAL RISKS

Components of the Financial Risks

EE Project risk

- Energy Savings do not reach the guaranteed level. ESCO has to pay the difference.
- External parameters have changed significantly: renegotiation of the contract. An energy price fluctuation should be foreseen.

Client's risk

- Client's operation differs from the expected one in the contract: renegotiation.
- Client's premises are closed down.

Source: SEVen, Transparense, Grazer Energie Agentur

Risk Management

Golden rule: each risk is evaluated with respect to the probability of occurrence and expected size of the loss (risk potential).

- Project based: performance risk and functionality risk (equipment).
- Client based: debtor risk, creditworthiness

Ways to deal with them

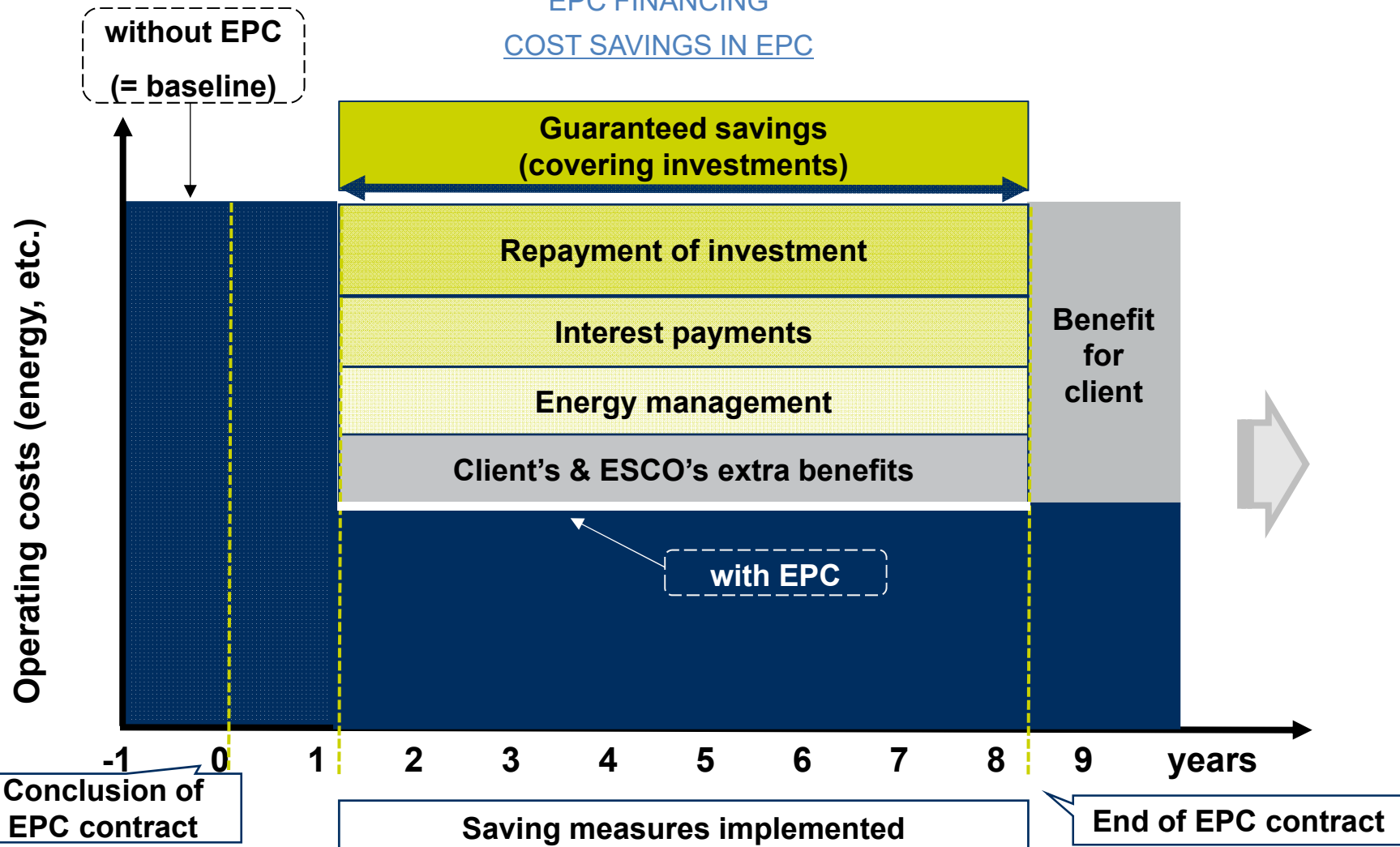
- Avoid risks
 - Risk surcharges
 - Insurances
- } Increase of costs

Generally, client is obliged to have an adequate insurance

EE & EPC

EPC FINANCING

COST SAVINGS IN EPC



Source: SEVen, Transparense

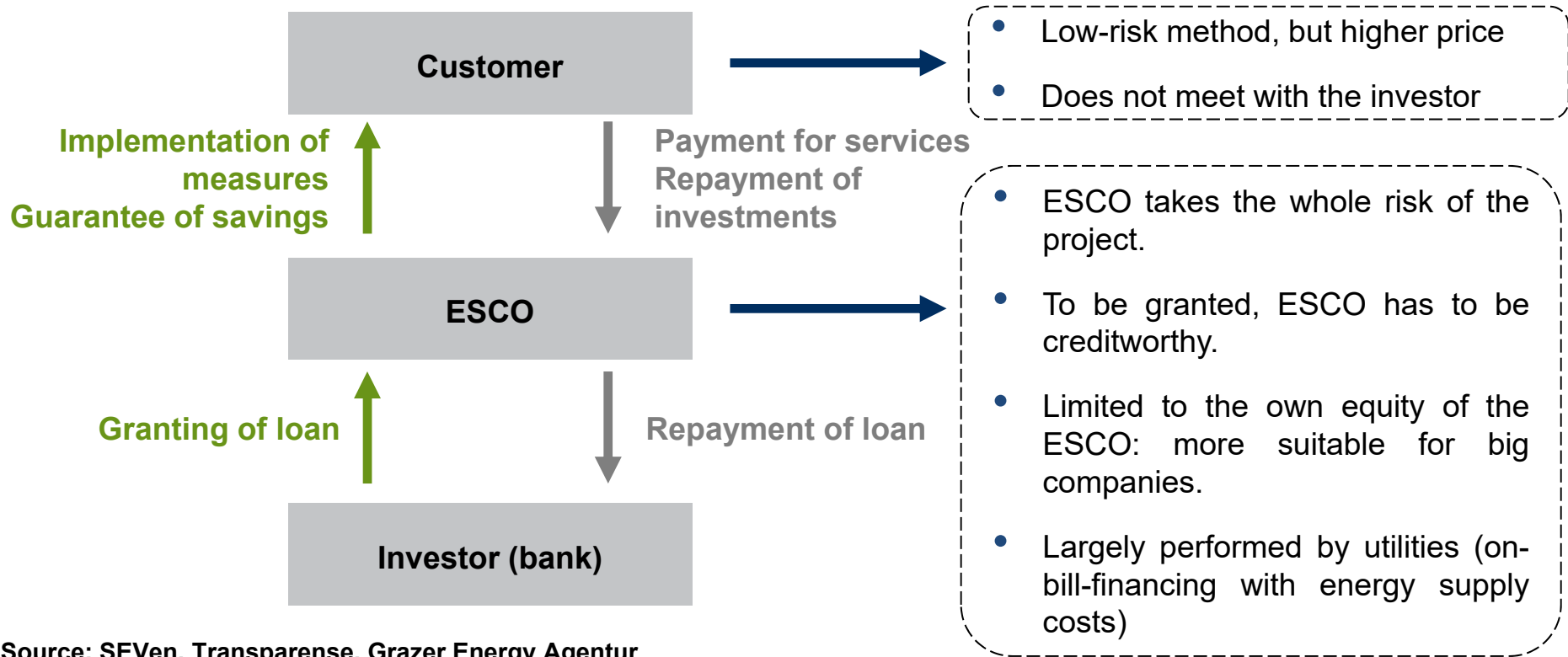
EE & EPC
EPC FINANCING
TYPES OF FINANCING

ESCO Financing

Client's Financing

Combined Financing

- Recourse financing:
 - Simple credit of ESCO
 - Sale of claims (incl. bridge loan)
- Non-recourse financing with SPV (Special Purpose Vehicle lowering risks):
 - ESCO equity
 - ESCO equity and other investors equity
- Other less frequent:
 - Leasing
 - Supplier credit



Source: SEVen, Transparense, Grazer Energy Agentur

EE & EPC

EPC FINANCING
ESCO FINANCING

ESCO FINANCING

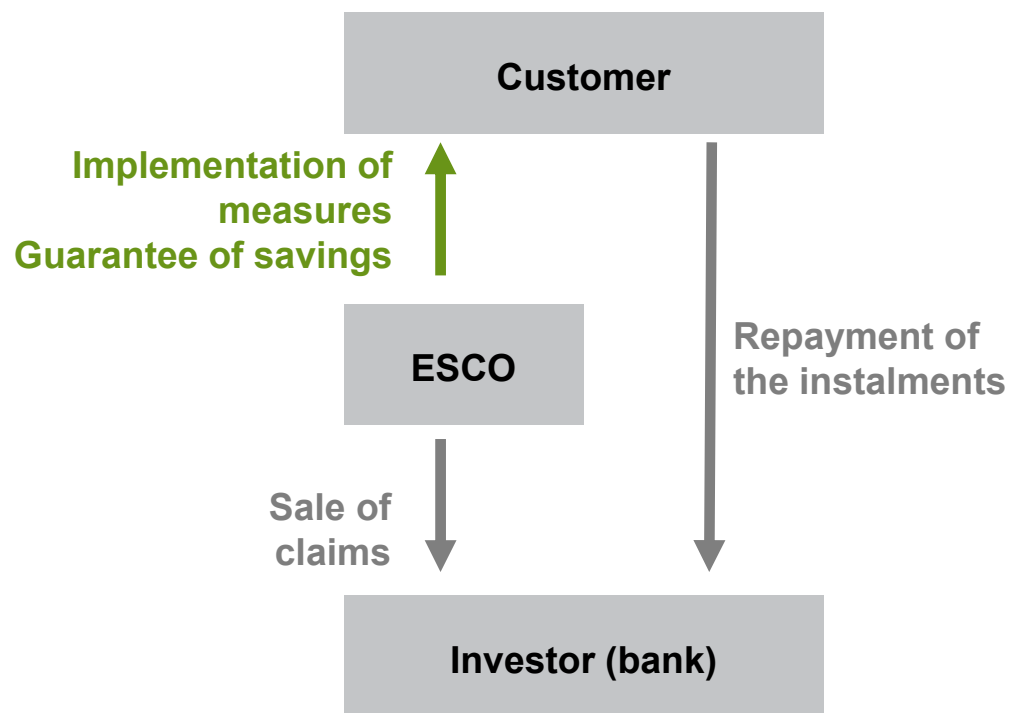
Simple credit

Sales of claims

SPV model

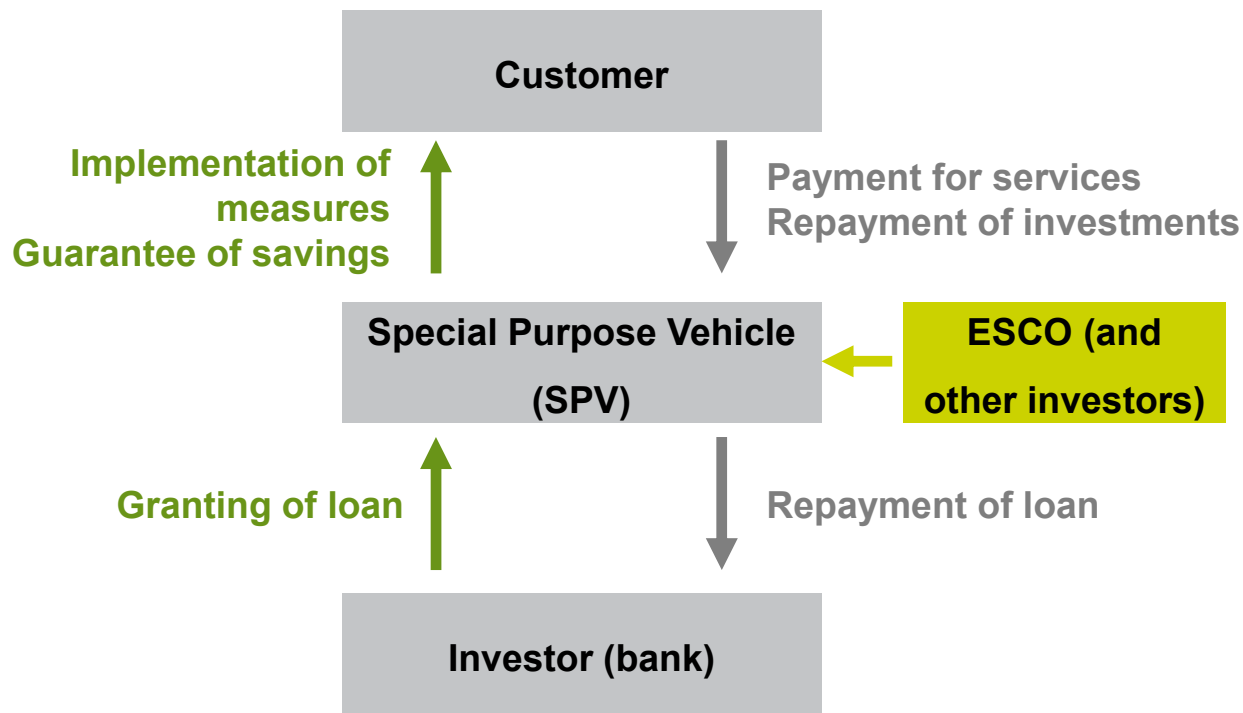
Leasing

Supplier credit



FORFAITING

- Used in most EPC in the last 6-8 years.
- ESCO acquires financial resources and in advance negotiates with the bank a preliminary agreement on future selling claims.
- ESCO installs energy efficient measures.
- The customer takes over all the energy saving technology and ESCO makes out the invoice.
- ESCO sell the claim/receivable to bank.
- No risk for customer. Savings guaranteed.



SPV

- A newly-formed separate entity set up for EE projects.
- Entity uses its equity capital for any agreed EE investment
- Project risks isolated.
- Shareholders: ESCO and other possible actors as customer, energy utility, a public or international bank/funds.
- Various legal form, mostly Ltd.

EE & EPC

EPC FINANCING

ESCO FINANCING

ESCO FINANCING

Simple credit

Sales of claims

SPV model

Leasing

Supplier credit

Reduced financing costs and risks

- External funding under a project-finance basis
- Banks' loaned funds are secured by the project assets, but repaid almost entirely from the project's revenue streams
- Main security for the banks is confined to the SPV's income-generating contracts
- No guarantees from the SPV's shareholders.
- Gearing (the ratio of debt to equity) is much higher in project finance than in on-balance sheet corporate financing.

Complex structure

- Wide array of contracts between the different actors.
- Large transaction costs that imply a very high threshold investment price, usually above 5 M€
- Shareholders: ESCO and other possible actors as customer, energy utility, a public or international bank/funds...
- Best suited for some high-value and long-term EE project.

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ESCO FINANCING

Simple credit

Sales of claims

SPV model

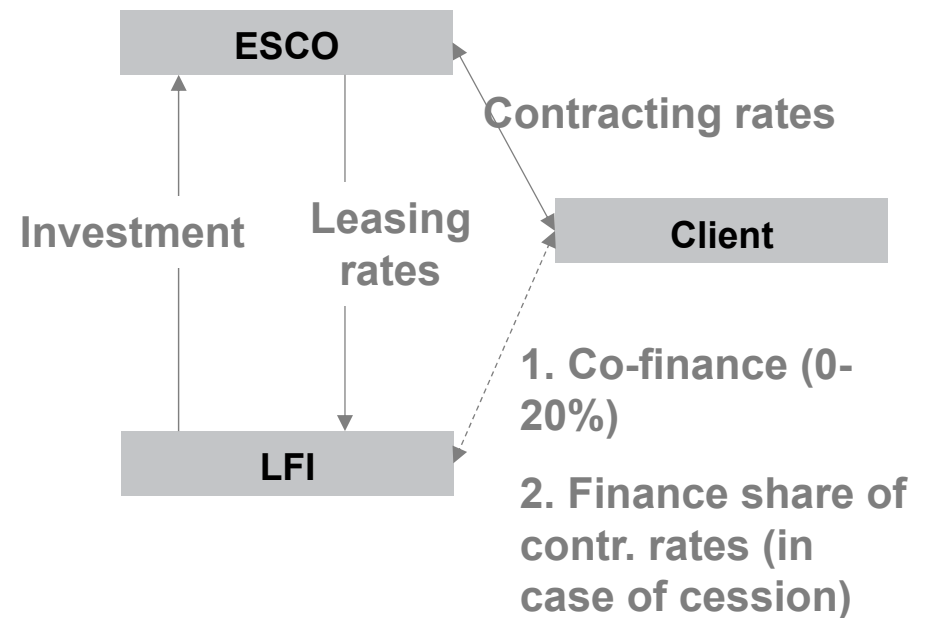
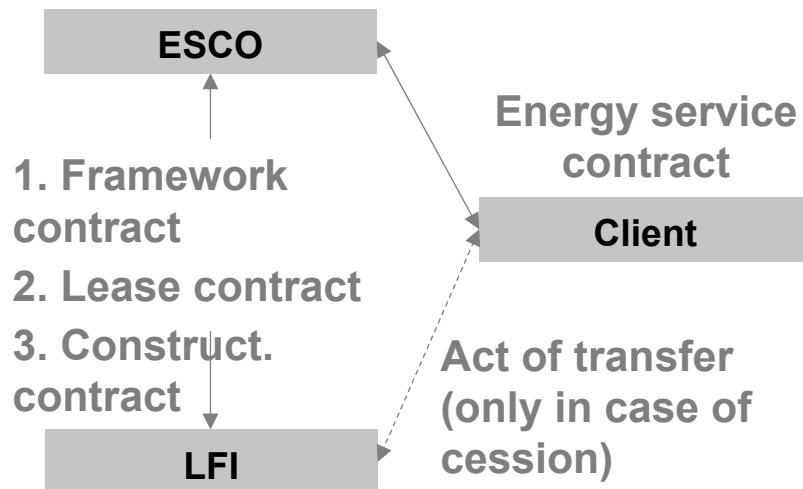
Leasing

Supplier credit

CONTRACTS

ESCO is the lessee

CASH FLOWS



Source: SEVen, Transparense, Grazer Energy Agentur

EE & EPC
EPC FINANCING

ESCO FINANCING

Simple credit

Sales of claims

SPV model

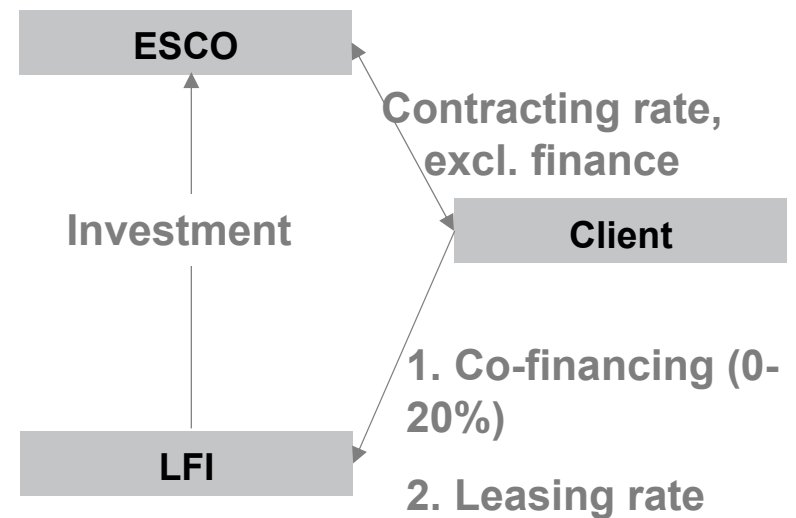
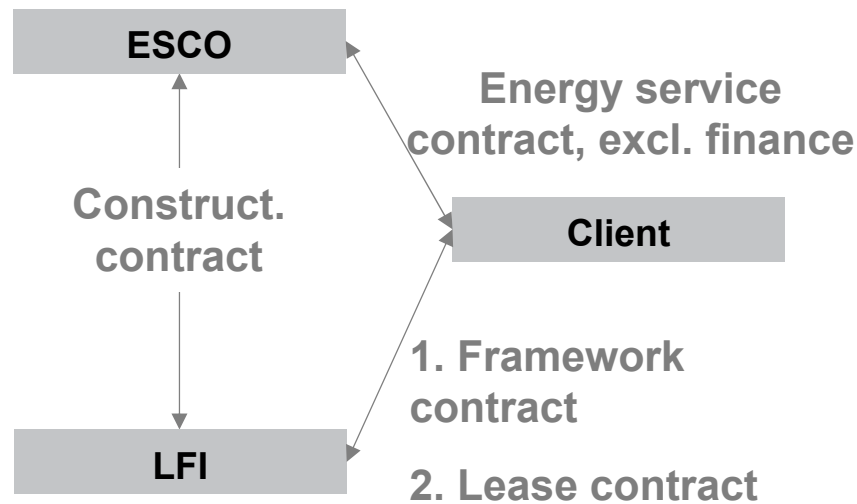
Leasing

Supplier credit

CONTRACTS

Client is the lessee

CASH FLOWS



Source: SEVen, Transparense, Grazer Energy Agentur

EE & EPC
EPC FINANCING

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Simple credit

Sales of claims

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Leasing

Supplier credit

- Preferably used for a single technology (e.g. cogeneration). Largely used for energy supply contracting.
- Applied in some countries. In some others never applied for an EPC project, due to:
 - More expensive when compared with credit financing.
 - Too complex in case EPC project consists of many (different) types of technologies.
 - Legislation: ownership of EE technology by building's owner.
- No automatic transfer of ownership at the end of the contract term.

OPERATING LEASE

FINANCIAL LEASE

Fungibility or interchangeability is necessary

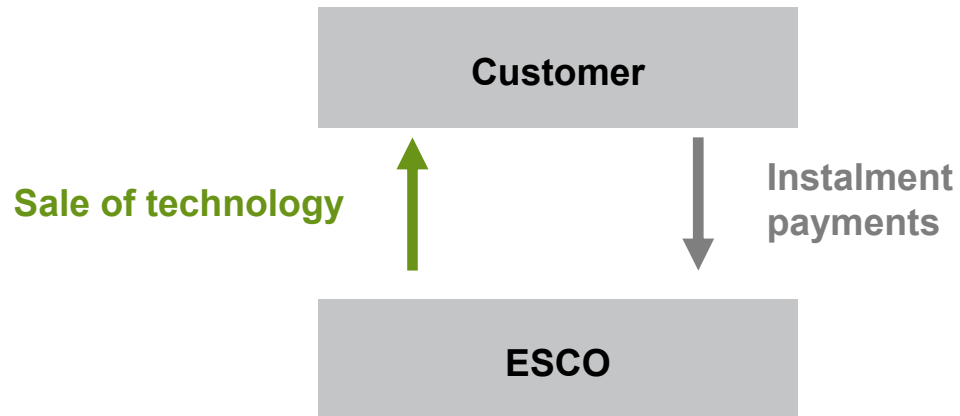
All measures can be financed

Lessor is economic owner

Lessee is economic owner

TAX advantages

VAT by implementation of measures payable



Supplier credit

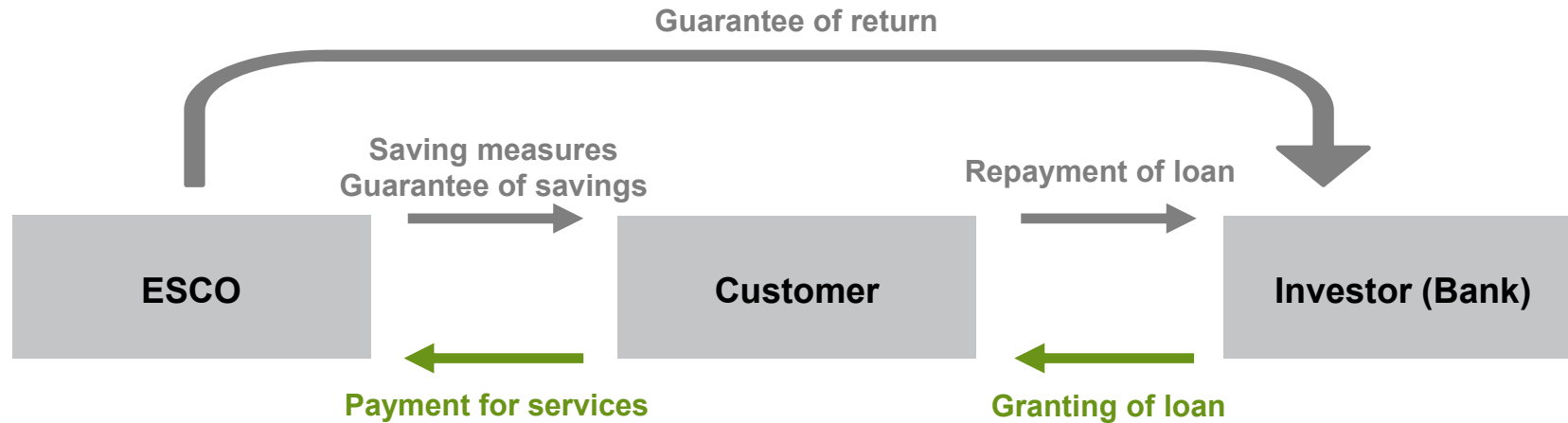
- Agreement between a supplier and a buyer according to which the supplier defers payment.
- The advantage is that the guarantees are provided within the EPC contract and do not have to be approved separately.

EE & EPC
EPC FINANCING
TYPES OF FINANCING

ESCO Financing

Client's Financing

Combined Financing



- A customer contracts directly with the source of financing (usually a bank).
- ESCO only guarantees the achievement of technical parameters of the project.
- If the assumed parameters are not achieved, the ESCO is obliged to compensate the difference between the actual level of savings and the guaranteed savings.

EE & EPC

EPC FINANCING

TYPES OF FINANCING

ESCO Financing

Client's Financing

Combined Financing

- The **ESCO** and the **customer** participate in ensuring the financing.
- Investments in low-payback measures allow for including higher-payback measures to support e.g. strategic goals (e.g. higher environmental or comfort value)
- It helps to eliminate disadvantages of single approach and supports their advantages
- It is a basis for much tighter business relations



EE & EPC

EPC FINANCING

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CONSTRUCTION PROJECT

(2 types of measures)

| TECHNOLOGICAL MEASURES | CONSTRUCTION MEASURES |
|---|---|
| Renovation of energy system | Insulation, windows replacement |
| Payback: 4-8 years | Payback: at least 15 years |
| Suitable for EPC | Possible to co-finance from subsidy |
| Guaranteed savings typically pay back the investment costs in EPC | Co-financing by additional sources |
| <ul style="list-style-type: none"> If savings > investment costs of technological measures, the investments for the construction measures could be partially covered from the „construction measures“ | If co-financed with subsidies, usually subsidy beneficiary may only be the building owner, not ESCO (according to conditions of the local programmes) |

Source: SEVen, Transparens

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EPC CONTRACT

TYPE OF EPC CONTRACTS

EPC FACILITATOR

EPC PROVIDER

EPC FINANCING

WHY EPC?



03/01/2022

This project is co-funded by
the European Union's Horizon 2020
research and innovation programme

EE & EPC

WHY EPC?

In a nutshell, the main benefit of an EPC is the possibility of transferring the technical performance risk using a turnkey solution with guaranteed energy savings (and maintenance), and using those savings to cover the investment cost.



TRUST EPC SOUTH
PARTNERS





TRUST EPC SOUTH
CONSULTING COMMITTEE

