EPC Specialist Module

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Before we get started – what is this EPC Specialist Module (… and what it is not)

This module is …

- An **introduction to the financial concept of EPC**
- a tool to enable **standardised and systematic evaluation** of potential energy projects
- able to **consider impact of EPC on EE and REN**
- hands-on and suitable for **capacity-building** initiatives
- **Builds on concepts** (such as NPV and IRR) covered in other learning materials of this series

This module is not …

- an **exhaustive and complete** list of all EPC activities
- a **scientific study** comparing different evaluation methods and proposing "one best" method
- **applicable to all countries** without reflection of local conditions
- a **blueprint** for analysing EPC contracts or EPC processes

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Learning outcomes

- By the end of this module participant should be able to:
  - Explain what EPC is and how firms may use it
  - Distinguish between different kinds of EPC contracts
  - Understand the EPC process and how financing affects it
  - Identify what are the benefits of EPC and what are the forces that drive them
  - Birdseye view of the EPC market in the EU

Overview of what will be covered

- 1 What is EPC and who are the relevant players?
- 2 Types of EPC contracts
  - 2A Shared Savings
  - 2B Guaranteed Savings
    - 2B.1 Benefits in detail
- 3 EPC Process
- 4 EPC Financing
- 5 EPC Barriers
- 6 EPC and EU
- 7 Case study
- 8 Examples and cases

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What is EPC?

- EPC stands for **Energy Performance Contracting**
- It is based on a relatively simple idea: similarly to most energy efficiency financing methods, one can pay for the necessary investments into new energy saving systems through the cost savings of the future. However, in EPC, those **cost savings are guaranteed by the organization implementing and financing the measures.**

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Source: EESI2020 Facilitator Guideline and Trust EPC South: EPC Basics & Financing

Definition

"Energy performance contracting (EPC) is a mechanism for organising the energy efficiency financing. The EPC involves an Energy Service Company (ESCO) which provides various services, such as finances and guaranteed energy savings. The remuneration of the ESCO depends on the achievement of the guaranteed savings. The ESCO stays involved in the measurement and verification process for the energy savings in the repayment period"

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Source: https://ec.europa.eu/energy/en/content/energy-performance-contracting

Relevant players

EPC contract

EPC provider	Client	Energy provider	EPC facilitator (optional) -	Financing institutions (optional)
Energy service company (also referred to as ESCO), who delivers the energy services	Owner of facility or premises who is interested in new EE measures	As the name implies, this is the energy supplier	Consulting companies Provides know-how and experience to support the client .The EPC facilitator can act as a mediator between client and ESCO	Can include traditional banks, specialized financing providers or government instructions (subsidies)

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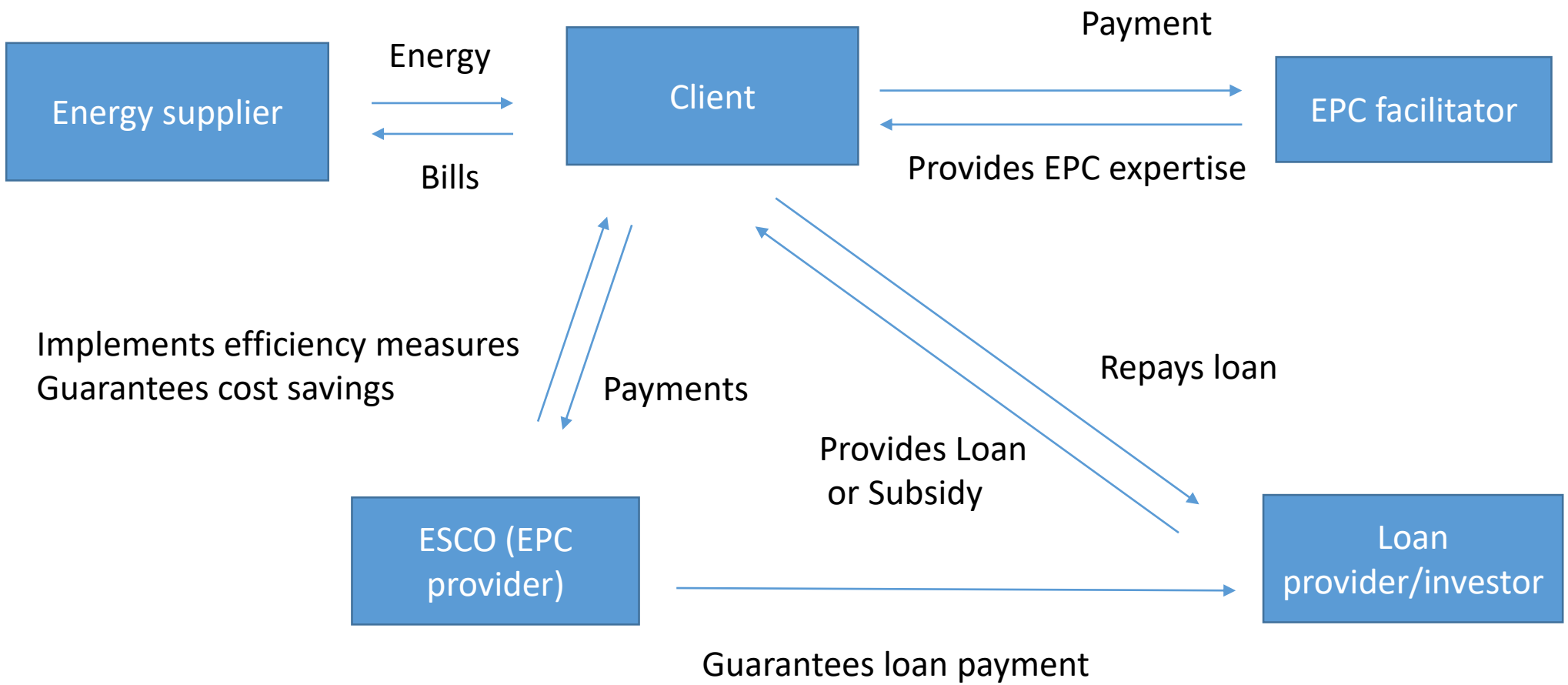
Sources: http://www.transparense.eu/eu/trainings/eu-manual

Example of an EPC arrangement



*Not the only kind of EPC arrangement

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Source:
https://www.eib.org/attachments/pj/guide_to_statistical_treatment_of_epcs_en.pdf

Short highlights

- Energy Performance Contracting reduces the technical performance risk of energy efficiency investments and thus can positively influence financial risk assessments.
  - It can also address the problem of a lack of credit history of customers as off-balance sheet financing is possible.
  - It can also address the lack of availability of funds (own funds/loan) for the project.
- EPC projects have been successfully implemented in the public and private sector
- EPC can be used for ‘quick wins’, or on larger, more ambitious retrofit projects
- Financing can be challenging if local banks do not trust the model

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Source: http://www.buildup.eu/sites/default/files/content/Mobilising_investment_EE_FINAL.pdf

Activate!

- Who are likely to be clients in an EPC contract?
- What is an ESCO?

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Types of EPC contracts

- There are 2 main types EPC models mainly used in European Countries:
  - Shared Savings (higher risk)
  - Guaranteed savings (more frequently used)

Guaranteed Savings	Shared savings
• ESCO designs and implements the project and guarantees the energy savings • If the savings are over the guaranteed level, the additional savings are shared between the client and the ESCO. However, if they are below the guaranteed level the ESCO must compensate the client	• Savings are split in accordance with a prearranged percentage • There usually are also differences in the payment arrangements, the primary technical focus, and the allocation and apportionment of energy savings.

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Sources: http://www.transparense.eu/eu/trainings/eu-manual (pg. 10)

Shared Savings

In a classic shared savings arrangement, the ESCO:

- Provides the financing
- Takes on the performance risks, interest rate risk and risk of rising utility costs

Since the client has no obligation to pay for the energy saving measures (financed by the ESCO). Therefore, the ESCO does not guarantee the savings.

- The client will usually not have to pay for more utilities than it did at the end of the contract.

Payment is linked to the current energy prices

Better suited for developing markets and larger EPC providers (since they have to provide financing)

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Sources: http://www.transparense.eu/eu/trainings/eu-manual (pg. 9)

Guaranteed Savings

Since the EPC provider guarantees a certain level of energy savings and takes over the entire performance and design risk. It is unlikely that it will be willing to assume further credit risk.

- Clients are financed directly by banks or by a financing institution.
- If savings are not enough to cover debt service, the EPC provider guarantees the savings usually covers the difference. This significantly lowers the risks borne by the financial institutions

If savings exceed the guaranteed level, the client usually receives at least 50% of the savings. Payments are usually calculated using the prices of the base year.

Suitable for countries with developed banking, familiarity with project financing and technical expertise and it fosters long term growth of providers and finance industries

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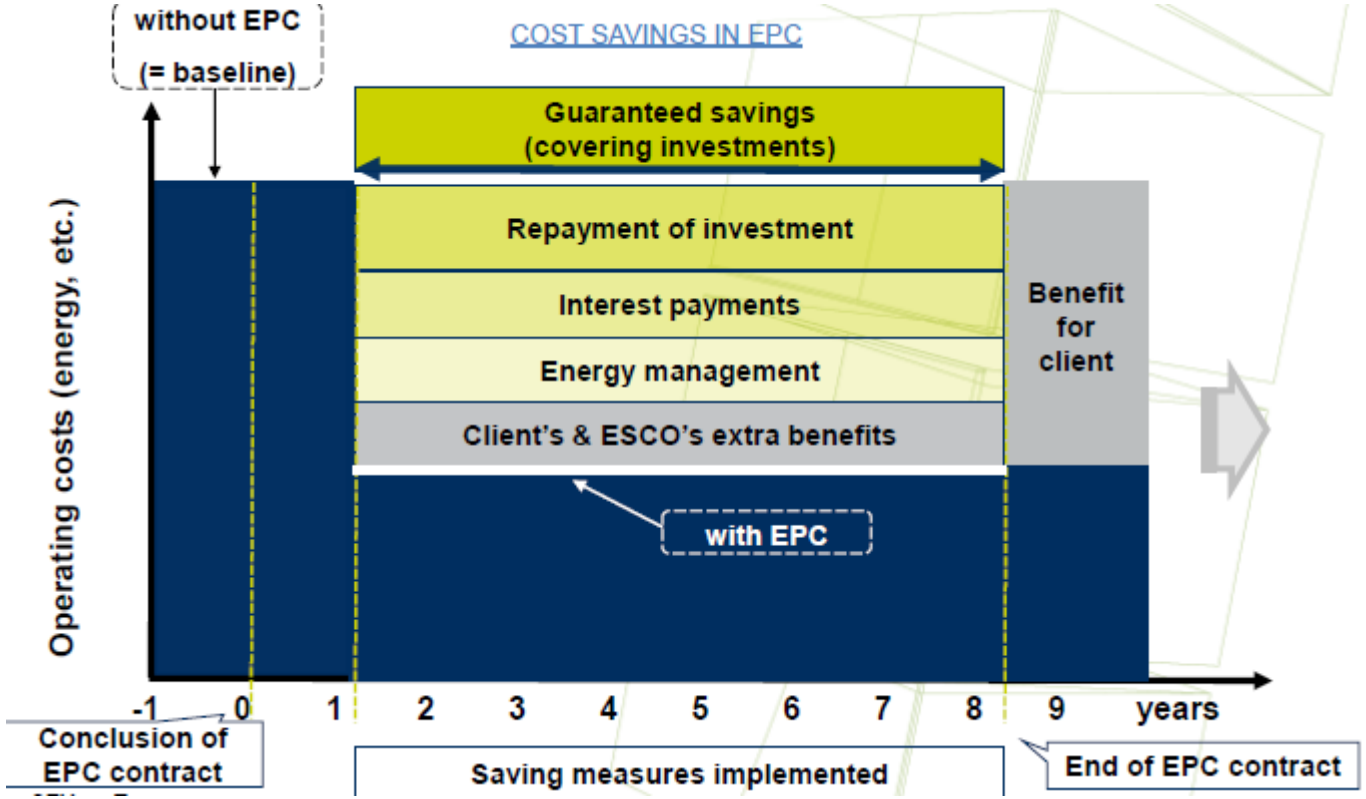
Sources: http://www.transparense.eu/eu/trainings/eu-manual (pg. 8)

Typical cost savings in EPC



Here we can see an example of a how an EPC contract can generate savings.

In this case, the savings are benefitting both, the client and the EPC provider.

All of the benefits after the contract expires go directly to the client. The contract between the ESCO and client contains guarantees for cost savings and takes over financial and technical risks of implementation and operation for the entire project duration of typically 5 to 15 years.

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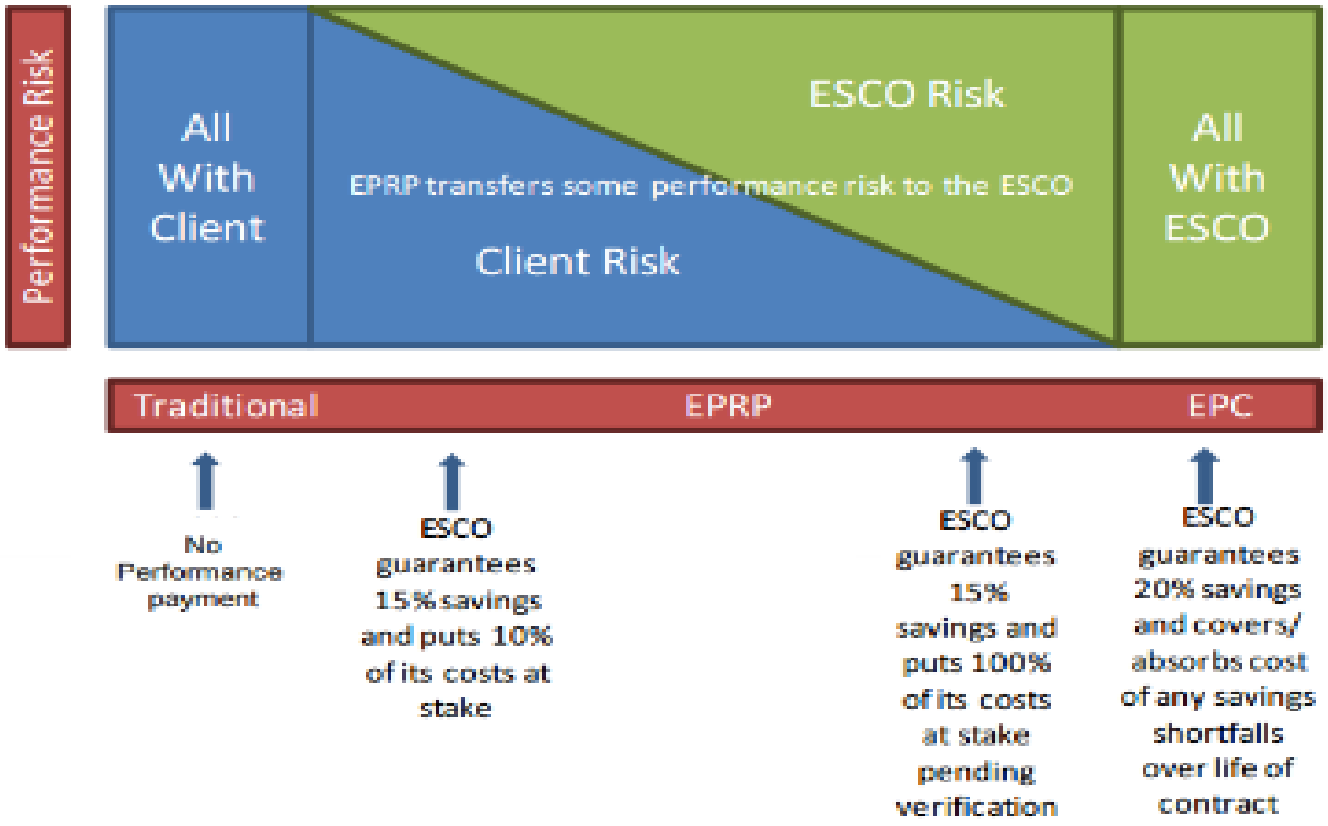
Source: Trust EPC South: EPC Basics & Financing (pg. 67)

Energy performance risk transfer



Here we can see an example of a how an EPC can be used to redistribute risk.

1. On the far right, the risk allocation closely resembles what you would expect in a guaranteed savings contract. The ESCO carries the all the performance risk

2. As you move from right to left, the client takes on some of the performance risk. The risk allocation then more closely resembles a shared savings contract

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Source: http://publications.jrc.ec.europa.eu/repository/bitstream/JRC106624/kjna28716enn.pdf page 44

Types of EPC contracts

- Some key differences

Guaranteed Savings

- Customer carries credit risk (requires creditworthy customer)/ESCO can take on more projects (not as leveraged)
- ESCO guarantees level of energy savings and payments are in constant prices of the base year

Shared savings

- ESCO provides financing (carries credit risk)
- Guarantees are not as usual (although a minimum might be guaranteed) and savings are related to the cost of energy saved (linked to energy prices)

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Sources: http://www.transparense.eu/eu/trainings/eu-manual (pg. 10)

Guaranteed savings: in detail

- Outsourcing technical risk
- Outsourcing financial risk
- One face to customer
- Aligned interests and expectations of clients and ESCO
- Avoids rebound effect
- Client can focus on core business

Maximized savings through professional assistance

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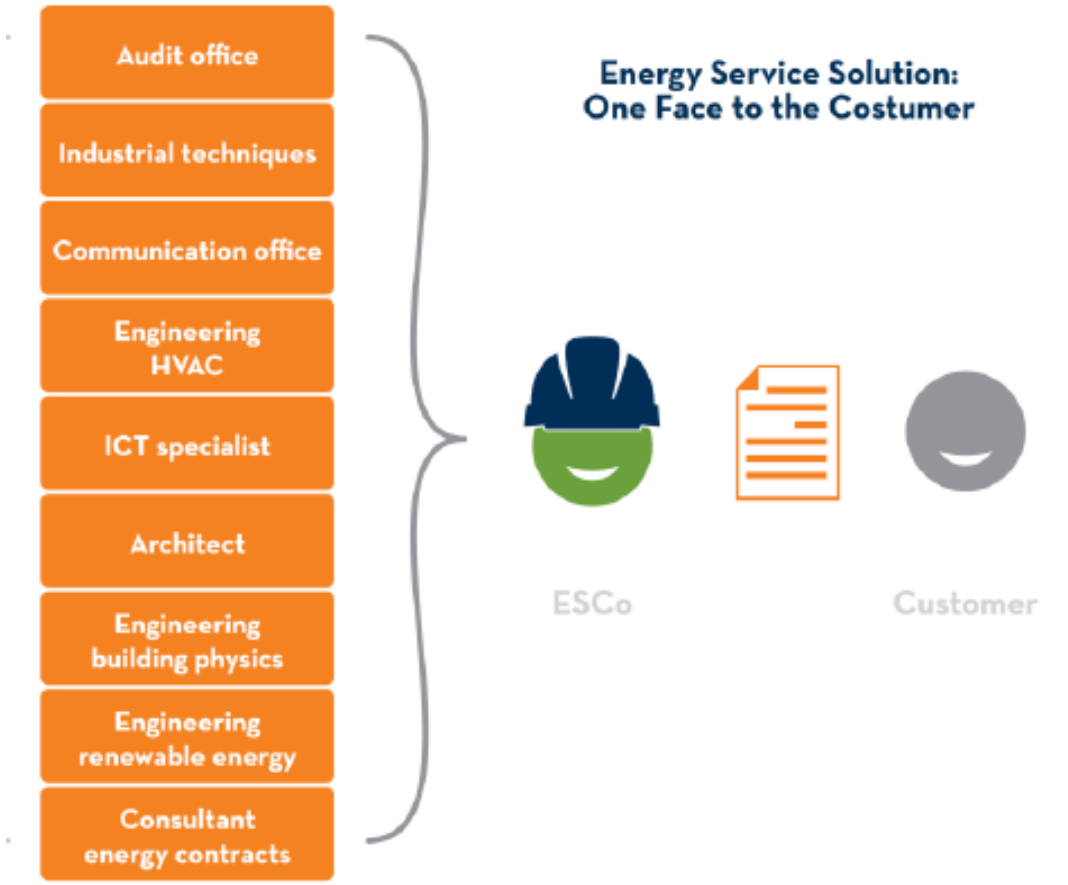
Source: EESI2020 Facilitator Guideline

Outsourcing Technical Risk

- Understandably, many clients do not have the technical capacities or available resources to take on some energy efficiency projects
- In EPC, the ESCO is responsible for the design, construction, maintenance and repairs for the new systems, even – if necessary – the rebuilding or replacement of installed systems which do not operate as they should
- The ESCO guarantees the technical performance and can be held liable if performance and savings targets are not met.



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Source: EESI2020 Facilitator Guideline (pg 19)

Outsourcing Financial Risk

- The ESCO guarantees savings for the duration of the contract.
- ESCO bears the technical and entrepreneurial risk for achieving the guaranteed energy savings, not the client.
- Since the ESCO will have to pay the guaranteed price regardless of the savings achieved AND their returns depend on it, they are highly motivated to perform well.

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Source: EESI2020 Facilitator Guideline (pg 20)

One face to the customer

The client will contact the ESCO for all matters related to the implementation of the measures in the context of the EPC contract.

- One stop shop
  - Understandably, one of the main benefits to EPC is convenience. The client no longer has to involve external service providers or use up their own resources for the planning, construction, and maintenance of a given technical system
- Avoiding the blame game.
  - In the case of a system failure with unclear warranty status, shared responsibilities can result in a difficult and time-consuming process to resolve conflicts between different actors resulting in delays and costs

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Source: EESI2020 Facilitator Guideline (pg 20)

Contractually aligned interests

- Not only are the client and ESCO aligned in that they will both benefit from the achieved savings but also on how to achieve the savings
  - Optimizing the cost-benefit ratio
  - Use of modern, highly energy efficient equipment and keep it well-maintained
  - Adherence to high performance monitoring standards
- However, there are also areas in which the interests of client and ESCO may go into different directions, e.g. comfort levels such as indoor temperatures. Such issues should therefore be **clearly defined in the tender and the contract**, so that conflicts will not arise in practice.

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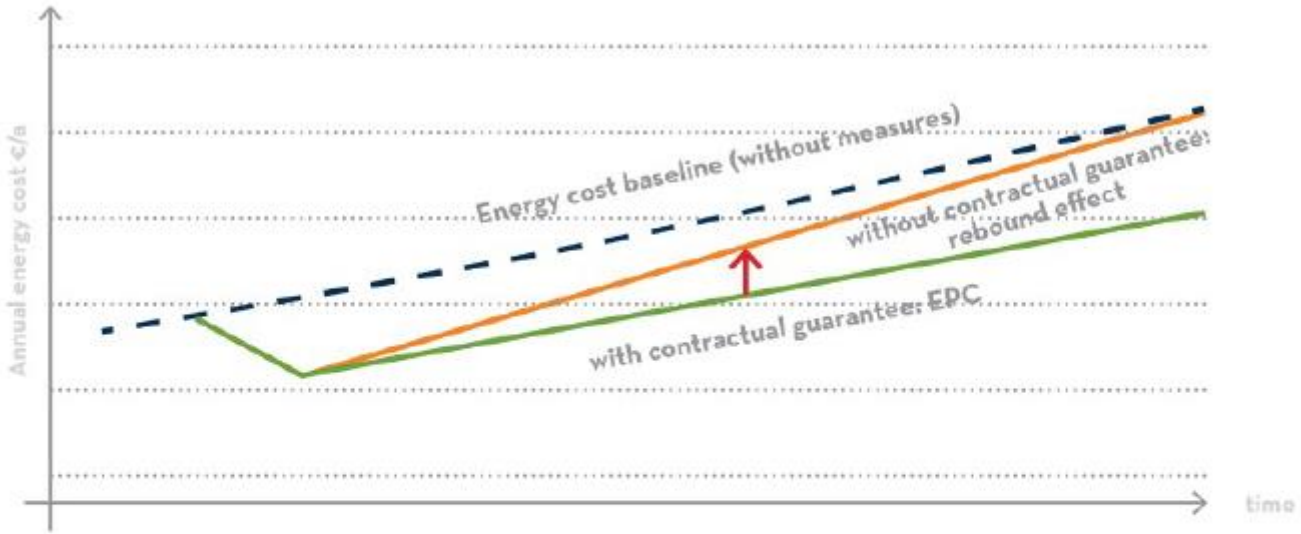
Source: EESI2020 Facilitator Guideline (pg 21)

Avoiding the Rebound Effect

- **Rebound effect (take-back effect):** Happens when some of the energy savings resulting from energy efficient technologies is offset by behaviors.
  - Adding more assets (even if energy efficient) lead to de-facto higher energy consumption
  - Energy efficient technologies kept in standby increase energy consumption
  - Savings stemming from energy efficiency can allow the asset to be used for longer or carelessly
  - Energy efficiency savings can be spent on non-energy efficient assets afterwards



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SOURCES: www.energy-efficiency.gov.uk; https://ac.els-cdn.com/S0301421500000215/1-s2.0-S0301421500000215-main.pdf?_tid=3b8f4c3b-0681-4e73-b7a3-20169192c7c9&acdnat=1551795584_9be91059fdc0c1209cfc3280c37a9343; EESI2020 Facilitator Guideline (pg 23)

Client can focus on core business

- Particularly relevant for institutions with non-technical core businesses – e.g. office buildings or schools
  - The effort and costs involved to keep the building caretaker adequately qualified to operate new systems can be quite high.
  - No need to train in-house personnel to understand and maintain new technical installations

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Source: EESI2020 Facilitator Guideline (pg 21)

Results in Savings through professional assistance

Clients may lack the capacities/willingness to implement EE measures as they might be cumbersome.

- This Is particularly true for clients that do not have energy as a core business.
- Difficult to incentivize staff to act in an energy efficient manner

Bring in highly motivated, specialized assistance with extensive experience that can guarantee savings will be achieved and takes on a significant portion of the risks associated with the project.

- Additionally, reduces the number of parties to deal with and allows the client to focus on their core business.

An EPC project involves a complex tendering process of another kind, which has to be prepared.

- Support might be required from Facilitators or consultants

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Source: EESI2020 Facilitator Guideline

Activate!

- What are the main differences between guaranteed savings and shared savings?
  - Who takes care of the financing?
- What are the main benefits of an EPC contract

Overview of what will be covered

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EPC Process

Like for most complex project that require relatively long term investments, the EPC Process is quite lengthy and complex because EPC contracts are essentially 3 contracts

- A contract for work, a credit contract and a service contract

Please note that the process also differs when the client is in the public sector

- Must adhere to laws and standards
- Process is generally longer

EPC facilitators can be helpful because:

- they provide technical support and answer client concerns
- have experience identifying the relevant measures, contacts, and opportunities
- have know-how in EPC process specifics
- help with financing

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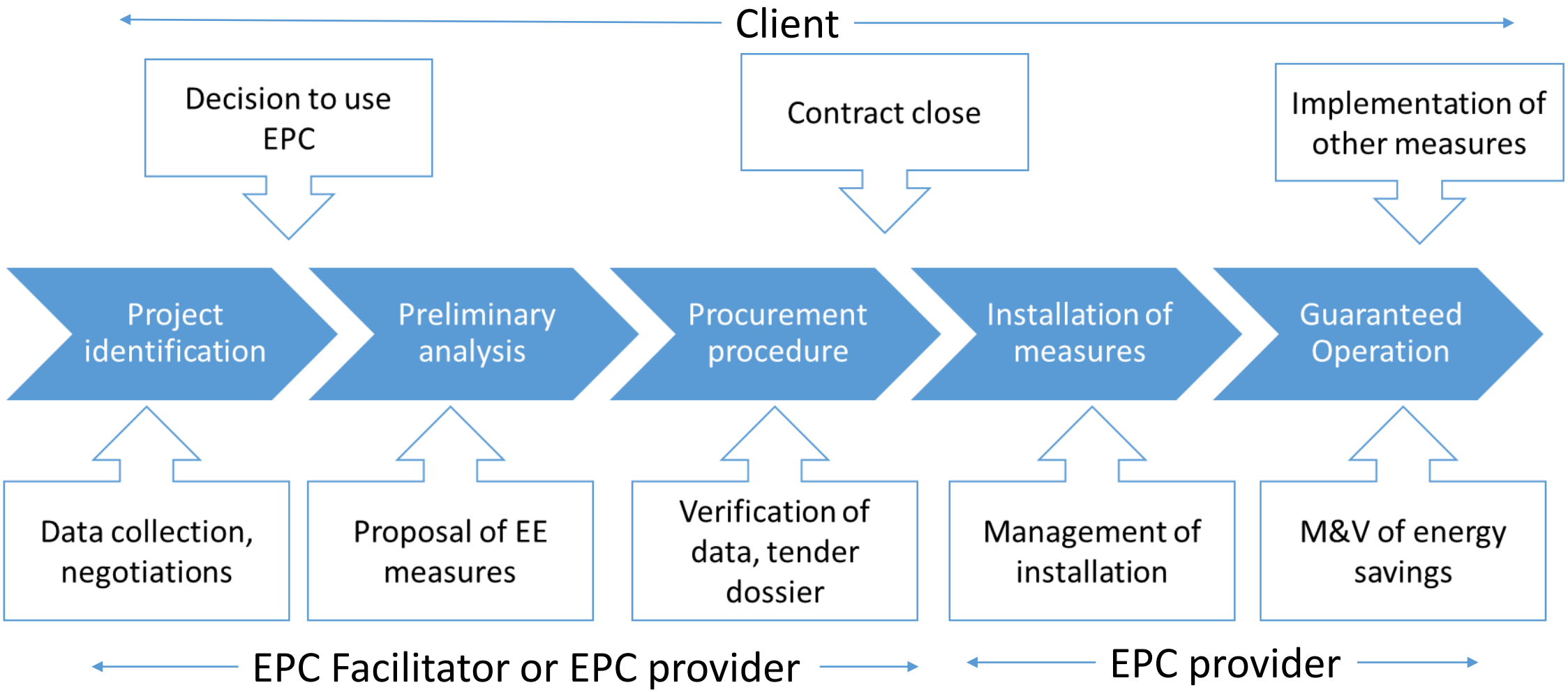
Sources: http://www.transparense.eu/eu/trainings/eu-manual;
Trust EPC South EPC Basics and Financing

EPC Process



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Sources: Transparense project Training Module II (pg. 3)

EPC Process: Breakdown

Project identification

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

Preliminary analysis

Delivery of the first report of recommended measures:

1. Estimate the energy and cost impacts (NPV, simple payback)
2. Benefits other than cost savings should be considered (emissions, comfort)

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Sources: Transparense project Training Module II (pg. 3);
Trust EPC South EPC Basics and Financing (pg. 23-37)

EPC Process: Breakdown

Procurement procedure

- Define energy savings, contract duration, financial savings, guarantees and maintenance
- Financing plays a critical role and the choice depends on several factors (e.g. project specifics, available sources, financing options in the country)

Specifics regarding savings and regulations for financial and technical risks:

1. Duration
2. Volume of investment
3. Party obligations
4. Specific process implementation and timetable
5. Evaluation method

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Sources: Transparense project Training Module II (pg. 3);
Trust EPC South EPC Basics and Financing (pg. 23-37)

EPC Process: Breakdown

Installation of measures

- ESCO develops project according to the agreement
- Must follow international standards
- Appropriate training for right use of equipment

Guaranteed Operation

- Use established protocols to evaluate performance such as the International Measurement and Verification Protocol (IPMVP)
- If conditions are not met, sanctions must be applied

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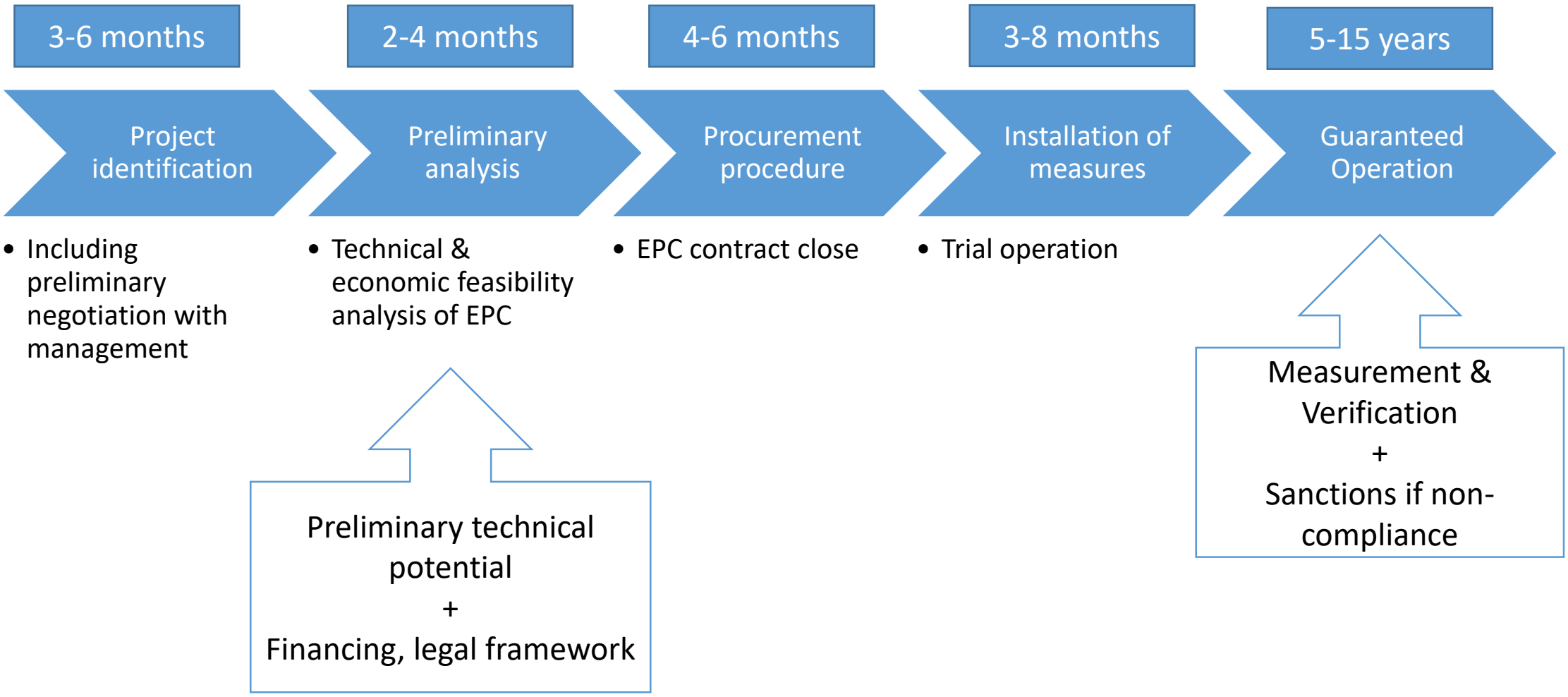
Timing of EPC Process



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Sources: Transparense project Training Module II (pg. 3);
http://www.transparense.eu/eu/trainings/eu-manual (pg. 11)

Activate!

- Why is a the process for working with the public sector most likely more cumbersome than for working with the private sector?
  - Who could help a client navigate this environment?

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EPC Financing

- The financing solution of the project has a **crucial impact on stakeholder structures.**
- An important factor is **who** is responsible for financing:

Is it the client?

- Via credit
- Via leasing

Is it the ESCO?

- Via credit
- Via leasing
- Via forfaiting

Is it a third party?

- Is it a subsidy?
- Is it an investment

Is it a combination of them?

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Source: EESI2020 Facilitator Guideline (pg 34)

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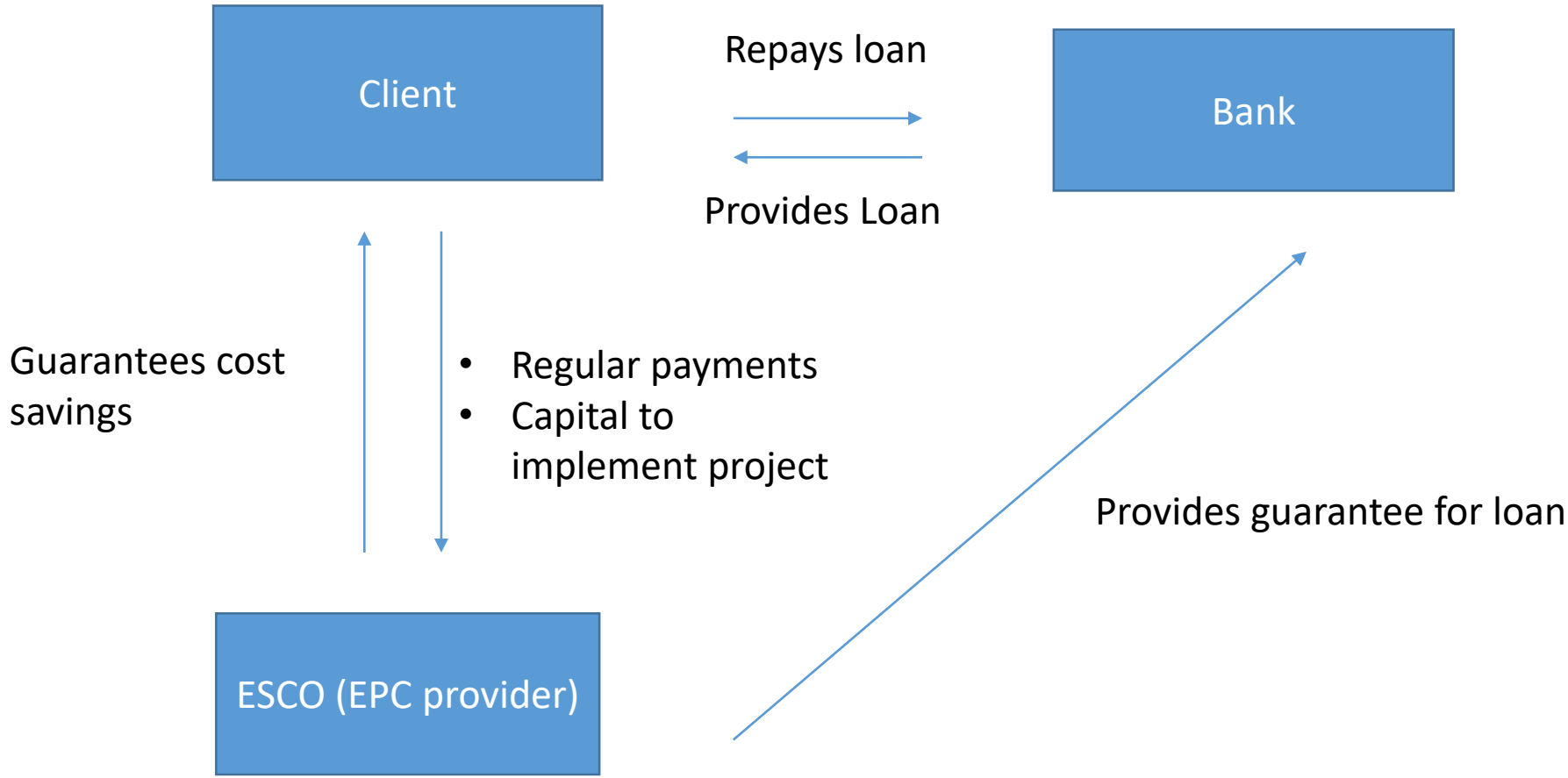
Example of financing by Customer



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Source: EESI2020 Facilitator Guideline (pg 35)

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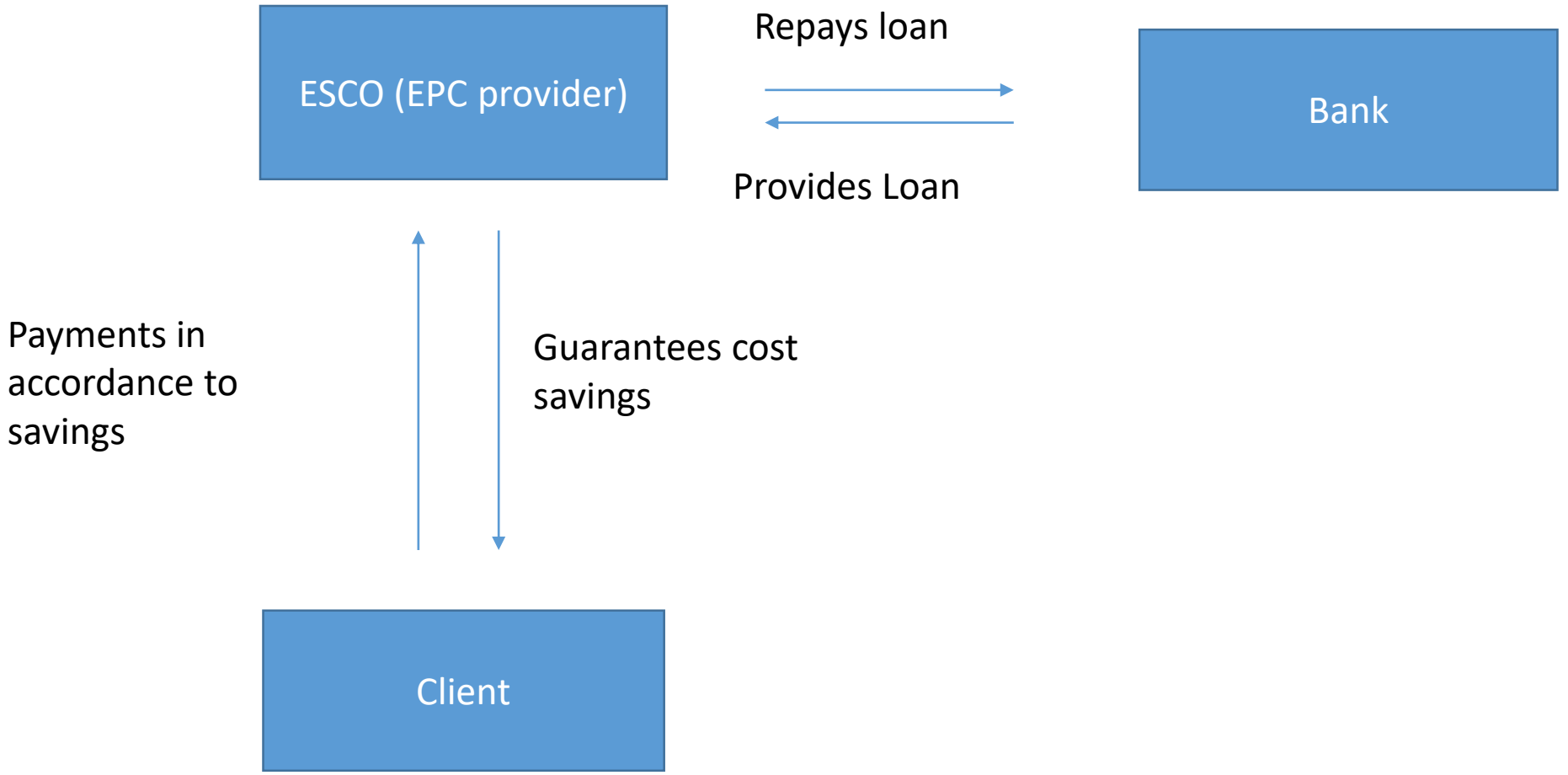
Example of financing by ESCO



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Source: EESI2020 Facilitator Guideline (pg 35)

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Financing Criteria

The decision which is best depends on:

- Direct financing cost (financing conditions, interest rates, fees, …)
- Legal aspects (Rights and duties, ownership, contract cancellation, end of term regulations, …)
- Securities required by financing institution
- Taxation implications (purchase tax/VAT, corporate income tax, acquisition of land tax, …)
- Balance sheet & accounting implications (who activates the investment, balance sheet effects like credit lines, Maastricht criteria, …)
- Business management efforts (transaction cost, comprehensive consultancy

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Source: EESI2020 Facilitator Guideline (pg 36)

Activate!

- In a guaranteed savings contract, who is taking the (most of) financial risks?
  - Why does this mean lower costs for the project?

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Barriers/Challenges

Transaction costs

- One of the main challenges for EPC is that it requires a rather complex contract. It also requires quite a bit of groundwork since the stages of identification to the project all the way to determining the current consumption can be quite time consuming.
- Moreover, EPC contracts may not fit into already existing firm processes and might require additional training

Split incentives

- When working with the public sector, it is often the case that the owners of the managers of the facilities will not benefit from implementing the energy saving measures. The savings can often go into the regional government or state and not directly into the budget of the facility manager. This means there are split incentives between the manager of the building and the owner of the building.
- If this is the case, the manager might be able to solve the problems by pre-contract negotiations, but these are affected by the countries laws. For example, in the Czech Republic, the hospitals can keep the savings but educational buildings cannot.

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Sources: http://www.transparense.eu/eu/trainings/eu-manual (pgs.36-39)

Barriers/Challenges

Legislative framework

- In many EU countries, there are no specific EPC project guidelines. This means the projects follow the general legislation. This means it is often unclear how to administer the project and the accounting rules around it.

Economic conditions

- Not all projects with positive IRRs or NPVs will be funded as they also have to meet other financial criteria. For example, a project might have a positive IRR, but it might not be high enough to meet the internal hurdle rate required for financing. Since EPC projects often have substantial transaction costs, they are only viable for larger projects. This means that smaller energy saving measures might not be suitable for EPC financing.

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EU Energy Efficiency Policy

- EPC's ability to deliver energy savings is recognized by various EU directives and initiatives in the European context, such as the Energy Efficiency Directive (2012/27/EU; EED)
- **Energy Efficiency Directive** – Establishes a common framework of measures for the promotion of energy efficiency in order to ensure the achievement of the European Union's 2020 targets
  - Member States required to set indicative national energy efficiency targets for 2020
  - Requires application of mandatory energy-saving measures, including renovating public buildings, energy-saving schemes for utilities, and energy audits for all large firms
  - Imposes obligations on Member States to **support energy services market in Article 18**

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Sources:
http://www.buildup.eu/sites/default/files/content/Mobilising_investment_EE_FINAL.pdf;
http://publications.jrc.ec.europa.eu/repository/bitstream/JRC106624/kjna28716enn.pdf;
http://www.transparense.eu/eu/trainings/eu-manual

EU Energy Efficiency Policy

- The EU Energy Efficiency Directive also encourages all public bodies including at regional and local level, including social housing bodies, to use Energy Performance Contracting to finance renovations and undertake energy efficiency investments.
- Moreover, the role of EPC is also mentioned in the "Clean Energy for All Europeans" communication. According to this communication, the role of EPC must increase, in particular in the public sector, as they offer a holistic approach to renovations, including financing, carrying out the works and energy management

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Market in the EU (data as of 2016)

	Level of development of		Change between 2013-2016	
Country	the complete ESCO market	EPC sector	ESC part	EPC part
AT	excellent	excellent	slight decrease	slight growth
BE	moderate	moderate	unchanged	slight growth
BG	preliminary	initiation	unchanged	slight decrease (after a previous growth)
CR	preliminary	preliminary - Just initiated	slight growth	slight growth
CY	initiation	initiation	only EPC	first trials
CZ	excellent	well developed	unchanged	slight growth
DK	well developed	well developed	unchanged	slight growth but reaching a halt
EE	non -existent	not existent	minor decrease	minor decrease
FI	moderate	moderate	unchanged	unchanged
FR	excellent	moderate	unchanged	unchanged
DE	excellent	excellent	unchanged	"slight decrease,but growth in some regions e.g. In Baden-Württemberg"
GR	initiation	initiation	unchanged	unchanged
HU	preliminary	preliminary	slight decrease	slight decrease (after some growth)

	Level of development of		Change between 2013-2016	
Country	the complete ESCO market	EPC sector	ESC part	EPC part
IE	n/a	moderate	n/a	increase
IT	excellent	excellent	unchanged	minor expansion
LV	preliminary	preliminary	unchanged	halt
LT	preliminary	preliminary	unchanged	unchanged in terms of size, but improved in terms of market situation
LU	moderate	preliminary	unchanged	minor growth
MT	non-existent	non-existent	unchanged	unchanged
NL	moderate	moderate	unchanged	large growth
PL	preliminary	preliminary	unchanged	slow growth
PT	preliminary	preliminary	small growth	very slow growth
RO	preliminary	preliminary	unchanged	unchanged (condition have somewhat improved)
SK	moderate	moderate	growth	large growth
SI	preliminary	preliminary	slight growth	slight growth
ES	moderate	well developed	n/a	growth
SE	preliminary	moderate	slight growth	decrease
UK	moderate	excellent	growth	major growth

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Source: http://publications.jrc.ec.europa.eu/repository/bitstream/JRC106624/kjna28716enn.pdf (pg 15)

European code of Conduct

- The Code of Conduct for EPC developed under the Transparense project attempting to increase transparency in the energy sector
- It defines critical values and principles that signatories must adhere to
- It is a voluntary commitment and it is not legally binding
- ESCO market stakeholders suggested upgrading the Code of Conduct to a properly controlled quality assurance system, but this still has not been implemented

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Source: https://www.euesco.org/european-code-of-conduct-for-epc/index.html

European code of Conduct

1. The EPC provider delivers economically efficient savings
2. The EPC provider takes over the performance risks
3. Savings are guaranteed by the EPC provider and determined by M&V
4. The EPC provider supports long-term use of energy management
5. The relationship between the EPC provider and the Client is long-term, fair and transparent
6. All steps in the process of the EPC project are conducted lawfully and with integrity
7. The EPC provider supports the Client in financing of EPC project
8. The EPC provider ensures qualified staff for EPC project implementation
9. The EPC provider focuses on high quality and care in all phases of project implementation

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Source: www.transparense.eu/eu/epc-code-of-conduct

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EPC case study: Modernization of street lighting in Radom

May 2019

Overview of the Project and facilities

- **Overview of the Project**
- In 2013 the City of Radom operated approx. 22,500 street lamps, out of which 11,514 units (51%) were owned by Municipal Roads and Transport Company (Miejski Zakład Dróg i Komunikacji – MZDiK). The rest of the street laps were owned by the PGE (Polska Grupa Energetyczna – the largest Polish power utility) – one of the PGE's subsidiaries is providing electricity to the City of Radom. Street lighting lamps are powered from switchgear cubicles, whose property is also shared between the City and PGE.
- The Project was dedicated to 3,566 street lamps owned by MZDiK. The aim of the Project was to achieve at least 40% energy savings.
- Project lifetime was assumed at 11 years (2013-2023).

- **Overview of the facilities prior to the Project implementation**
- Out of 3,566 street lamps being part of the Project 406 of were with power of 400W, 700 units with 250W, 756 units with 150W and 1704 units with 100W.
- The street lightings structure prior to project implementation was characterised by high amplitude of the chosen power of lighting fixtures, poles heights and distance between poles.
- Street lighting structure before the implementation:
- 100W and 150W lamps – lighting poles with heights of 7 to 12m for, distances between poles from 25 to 40m;
- 400W lamps – usually too high powers used, about half of the lighting arrangements were chosen incorrectly;
- 150W and 250W lamps – about 25% of the arrangements chosen correctly

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No-investment scenario (1/2)

Estimation of cost of the no-investment scenario

The energy cost estimation was based on the 2012 tariffs – the unit price was estimated at 0.48 PLN/kWh (including electricity price, distribution fee and fee for the power ordered). The inflation rate for 2012 was assumed at 3.0%, which means that the unit price for the first year of the Project – 2013, was estimated at 0.495 PLN/kWh. The inflation rate for the following years was assumed at 2.2%.

For the purposes of the calculations no changes in prices and maintenance costs in real terms were assumed.

The assumption regarding the number of assets replaced annually was based on the estimated lifetime of the given assets. The lifetime for the light sources and sodium lamp power supply was assumed at 2.5 years and for the luminaires was assumed at 15 years.

Annual operation time of the street light assets was assumed at 4,024 h.

The calculation of the total annual cost of street lightning in the non-investment scenario for 2013 is presented in the table below.

Calculation of the total annual cost of street lightning in the non-investment scenario for 2013

	Total	400 W	250 W	150 W	100 W
Number of luminaires [pc.]	**3,566**	406	700	756	1,704
Energy used [kWh]	**2,940,834**	768,821	828,471	536,849	806,694
Cost of energy [PLN]	**1,455,713**	380,566	410,093	265,740	399,313
Number of sources and power supplies replaced annually [pc.]	**1,426**	162	280	302	682
Cost of replaced sources and power supplies [PLN]	**206,060**	26,796	43,400	43,848	92,016
Number o luminaires replaced annually [pc.]	**238**	27	47	50	114
Cost of replaced luminaires [PLN]	**96,154**	11,503	19,366	20,412	44,872
Total cost of maintenance [PLN}	**302,214**	38,299	62,767	64,260	136,888
Total cost [PLN]	**1,757,927**	**418,865**	**472,860**	**330,000**	**536,201**

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No-investment scenario (2/2)

Summary of the no-investment scenario

The total costs of the no-investment scenario are presented in the table below.

Summary of the total costs in the non-investment scenario

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Total cost of maintenance (in real terms) [PLN]	302,214	302,214	302,214	302,214	302,214	302,214	302,214	302,214	302,214	302,214
Cost of energy (in real terms) [PLN]	1,455,713	1,455,713	1,455,713	1,455,713	1,455,713	1,455,713	1,455,713	1,455,713	1,455,713	1,455,713
Total cost (in real terms) [PLN]	1,757,927	1,757,927	1,757,927	1,757,927	1,757,927	1,757,927	1,757,927	1,757,927	1,757,927	1,757,927
Total cost (in nominal terms) [PLN]	**1,771,155**	**1,806,845**	**1,843,254**	**1,880,396**	**1,918,287**	**1,956,942**	**1,996,375**	**2,036,603**	**2,077,641**	**2,119,507**

Without the investment

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Technical scope, time-schedule and capital expenditures

Technical scope of the Project

The Project was implemented in the City of Radom in accordance with requirements of the Program of NFOŚiGW GIS Part 6, SOWA – Energy savings street light. It covered 100 switchgear cubicles and 3,566 units of street lights. The implementation of the Project lasted 3 years from 2013 to 2015.

The existing lighting infrastructure was to be replaced with lighting made in LED technology with luminous efficiency from 90 to 115 lm/W and energy efficiency of power system on the level of 92%

Project time-schedule

Project time-schedule assumed 6 installation phases - each phase defined as replacement of approx. 600 light units. The time-schedule was as follows:

- 4Q2013 – selection on lighting suppliers
- 1Q2014 preparation works for lighting projects in the first assets-replacement phase
- 2Q2014 – first assets-replacement phase and preparation works for lighting projects in the second assets-replacement phase
- 3Q2014 – second assets-replacement phase and preparation works for lighting projects in the third assets-replacement phase
- 4Q2014 – third assets-replacement phase and preparation works for lighting projects in the fourth assets-replacement phase
- 1Q2015 – fourth assets-replacement phase and preparation works for lighting projects in the fifth assets-replacement phase
- 2Q2015 – fifth assets-replacement phase and preparation works for lighting projects in the sixth assets-replacement phase
- 3Q2015 – sixth assets-replacement phase
- 4Q2015 – finalization works of the installation phase

Capital expenditures related to the Project

Summary of the capital expenditures related to the Project is presented in the table below. No maintenance CAPEX was assumed in the subsequent years.

Capital expenditures related to the Project

	2013				2014				2015			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Audit and project preparation [PLN]	-	56,250	-	-	64,000	64,000	64,000	64,000	64,000	64,000	-	-
Eqipment [PLN]	-	-	-	-	-	932,300	932,300	932,300	932,300	932,300	932,300	-
Installation and activation [PLN]	-	-	-	-	-	106,980	106,980	106,980	106,980	106,980	106,980	-
TOTAL CAPEX [PLN]	**-**	**56,250**	**-**	**-**	**64,000**	**1,103,280**	**1,103,280**	**1,103,280**	**1,103,280**	**1,103,280**	**1,039,280**	**-**

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Financing of the Project

Financing of the Project

The Project was financed from:

- Equity provided by the City (55%)
- SOWA financing mechanism (45%) – SOWA is a financing mechanism offered by the National Fund for Environmental Protection and Water Management dedicated for the investments in street lighting energy efficiency projects. The eligibility criteria for obtaining financing from the SOWA program are: decrease of energy consumption by at least 40% and a 150 MWh reduction of annual energy consumption.

Financing needs of the Project and the financing structure are presented in the table below.

	2013				2014				2015			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Capital expenditure [PLN]	**-**	**56,250**	**-**	**-**	**64,000**	**1,103,280**	**1,103,280**	**1,103,280**	**1,103,280**	**1,103,280**	**1,039,280**	**-**
SOWA (subsidy) [PLN]	-	-	-	-	-	54,113	496,476	496,476	496,476	496,476	496,476	467,676
Own funds of the city [PLN]	-	56,250	-	-	64,000	1,049,168	606,804	606,804	606,804	606,804	542,804	-467,676

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Economic feasibility of the Project (1/3)

The potential savings of MZDiK on the energy consumption was estimated by the authors of the feasibility study at approx. PLN 1.1-1.2m annually. Detailed cash flows that were assumed to be generated by the Project are presented below.

PLN	2013				2014				2015			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Outflows	**-**	**-56,250**	**-**	**-**	**-64,000**	**-1 103,280**	**-1,103,280**	**-1,103,280**	**-1,103,280**	**-1,103,280**	**-1,039,280**	**-**
Capital expenditure	-	-56,250	-	-	-64,000	-1 103,280	-1,103,280	-1,103,280	-1,103,280	-1,103,280	-1,039,280	-
Inflows [PLN]	**-**	**-**	**-**	**-**	**-**	**76,523**	**564,041**	**609,647**	**655,707**	**702,226**	**749,205**	**773,559**
MZDiK's savings	-	-	-	-	-	22,410	67,565	113,171	159,231	205,750	252,729	277,083
SOWA (subsidy)	-	-	-	-	-	54,113	496,476	496,476	496,476	496,476	496,476	496,476
Net change in cash flow [PLN]	**-**	**-56 250**	**-**	**-**	**-64 000**	**-1 026 757**	**-539 239**	**-493 633**	**-447 573**	**-401 054**	**-290 075**	**773 559**

PLN	2016	2017	2018	2019	2020	2021	2022	2023
Outflows [PLN]	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Capital expenditure	-	-	-	-	-	-	-	-
Inflows [PLN]	**1,110,583**	**1,132,962**	**1,155,791**	**1,179,081**	**1,157,014**	**1,041,469**	**1,062,455**	**1,105,166**
MZDiK's savings	1,110,583	1,132,962	1,155,791	1,179,081	1,157,014	1,041,469	1,062,455	1,105,166
SOWA (subsidy)	-	-	-	-	-	-	-	-
Net change in cash flow [PLN]	**1,110,583**	**1,132,962**	**1,155,791**	**1,179,081**	**1,157,014**	**1,041,469**	**1,062,455**	**1,105,166**

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Economic feasibility of the Project (2/3)

The feasibility of the project was analysed for two scenarios: without subsidies (100% financing from equity) and with EU subsidies (45% subsidy, 55% equity). The discount rate for the analysis was assumed at 6.2% (4.0% rate in real terms +2.2% inflation rate). NPV and IRR calculations for both scenarios are presented below:

The financial efficiency of the Project without SOWA subsidy

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Outflows [PLN]	56,250	3,373,840	3,245,840	-	-	-	-	-	-	-	-
Inflows [PLN]	-	203,146	894,793	1,110,583	1,132,962	1,155,791	1,179,081	1,157,014	1,041,469	1,062,455	1,105,166
Net change in cash flow [PLN]	-56,250	-3,170,694	-2,351,047	1,110,583	1,132,962	1,155,791	1,179,081	1,157,014	1,041,469	1,062,455	1,105,166
Discounted cash flow (discount rate 6.2%)	-56,250	-2,985,588	-2,084,550	927,209	890,671	855,572	821,858	759,394	643,651	618,287	605,595
NPV	**995 848**										
IRR	**10.3%**										

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Economic feasibility of the Project (3/3)

The financial efficiency of the Project with SOWA subsidy

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Outflows [PLN]	56,250	3,373,840	3,245,840	-	-	-	-	-	-	-	-
Inflows [PLN]	-	1,250,211	2,880,697	1,110,583	1,132,962	1,155,791	1,179,081	1,157,014	1,041,469	1,062,455	1,105,166
Net change in cash flow [PLN]	-56,250	-2,123,629	-365,143	1,110,583	1,132,962	1,155,791	1,179,081	1,157,014	1,041,469	1,062,455	1,105,166
Discounted cash flow (discount rate 6.2%)	-56,250	-1,999,651	-323,753	927,209	890,671	855,572	821,858	759,394	643,651	618,287	605,595
NPV	**3,742,582**										
IRR	**30.7%**										

Summing up – the feasibility study states that even without the SOWA subsidy the Project would be economically feasible and would generate a NPV of **PLN 1.0m**. Availability of the subsidies made the Project even more feasible with the NPV of **PLN 3.7m**.

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Implementation of the EPC contract (1/2)

EPC contract

The Municipality has signed an EPC contract with a company specialized in the EPC projects. As agreed, the contractor performed the construction works and provided financing for the Project and was granted in the payment in the value of the dotation and an annual payment of 65% of the savings generated by the Project in the period of 2018-2031.

The tables below show the cash flows for both the Municipality and the contractor.

Cash flows and NPV estimation of the Municipality

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Outflows [PLN]	-	-	-	-	-	-	-	-	-	-
Inflows [PLN]	71,101	313,178	388,704	396,537	404,527	412,678	404,955	364,514	371,859	386,808
Net change in cash flow [PLN]	**71,101**	**313,178**	**388,704**	**396,537**	**404,527**	**412,678**	**404,955**	**364,514**	**371,859**	**386,808**
NPV	**2 641 630**									

As no expenditures were assumed the IRR for the Municipality cannot be calculated.

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Implementation of the EPC contract (2/2)

Cash flows and IRR estimation of the contractor

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Outflows [PLN]	-3,373,840	-3,245,840	-	-	-	-	-	-	-	-
Inflows [PLN]	1,179,110	2,567,519	721,879	736,425	751,264	766,403	752,059	676,955	690,596	718,358
Net change in cash flow [PLN]	**-2,194,730**	**-678,321**	**721,879**	**736,425**	**751,264**	**766,403**	**752,059**	**676,955**	**690,596**	**718,358**
NPV	**1 392 729**									
IRR	**15.6%**									

The IRR of the investor in the real terms was evaluated at 15.6%. The calculation of the NPV using the 6.2% discount rate is just for the illustrative purposes – the actual discount rate that should be applied to calculate the NPV is dependent on the individual situation of the contractor and the form of financing of the capital provided for the Project. The contractor agreed on the EPC terms, which indicates that its average weighted cost of capital is lower than 15.6% and it assumes the project to be economically feasible.

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Case study summary

- The case study of MZDiK is an example how a combination of the EPC formula together with available subsidies can be used by public utilities / local authorities to perform energy efficiency projects with low or even no equity involvement.
- The Project was economically feasible even without subsidies but it would consume a major part of the company's investments budget.
- Inclusion of subsidies and the EPC formula allowed MZDiK to implement the Project with almost no capital involvement and potentially use the generated savings on other projects.

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- 5 EPC Barriers
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Municipality case: Exercises

- **Does it make sense to renovate the buildings? Calculate the NPV and the IRR of the project assuming the municipality can pay the project right away with cash**
- **Calculate the NPV and the IRR of the project assuming the municipality will get the 80% subsidy from the EU.**
- **Calculate the NPV and the IRR of the project for the municipality and for the EPC Company. Is it possible to calculate all NPV and IRR for both cases?**

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Solution: Exercise 1

(in €)	2018	2019	2020	2021-2032	2033
Outflow	-6,785	-556,136	0	0	0
Inflow (savings on power & heat)	0	0	25,999	25,999	25,999
Residual value	0	0	0	0	204,595
net cash flow	-6,785	-556,136	25,999	25,999	230,594
NPV	**-163,964**				
IRR	**0.10%**				

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Solution: Exercise 2

(in €)	2018	2019	2020	2021-2032	2033
Outflow	-6,785	-556,136	0	0	0
Total inflow	0	0	476,335	25,999	25,999
Savings on power & heat	0	0	25,999	25,999	25,999
Subsidy	0	0	450,337	0	0
Residual value	0	0	0	0	204,595
net cash flow	-6,785	-556,136	476,335	25,999	230,594
NPV	**252,406**				
IRR	**15.39%**				

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Solution: Exercise 3

- For the Municipality

(in €)	2018	2019	2020	2021-2032	2033
Outflow	0	0	0	0	0
Inflow (10% of savings)	0	0	2600	2600	2600
Residual value	0	0	0	0	204595
Net cash flow	0	0	2600	2600	207195
NPV	**140010**				

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Solution: Exercise 3

- For the Contractor

(in €)	2018	2019	2020	2021-2032	2033
Outflow	-6,785	-556,136	0	0	0
Total inflow	0	0	473,735	23,399	23,399
20% of savings on power & heat	0	0	23,399	23,399	23,399
Subsidy	0	0	450,337	0	0
Net cash flow	-6,785	-556,136	473,735	23,399	23,399
NPV (assuming 4.0% discount rate)	**112,489**				
IRR	**11.44%**				

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Municipality case: Discussion Questions

- **What does the Municipality get out of this deal? Is it a good deal?**
- **Would this project be feasible without a subsidy? What are the roles of subsidies in EE? Should projects with negative NPVs be subsidized?**
- **What does the contractor get out of this deal?**
- **Does this deal resemble a guaranteed savings or a shared savings deal? Why?**

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Conclusion: Main characteristics of EPC

- 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 through long-term Monitoring and Verification (M&V) of project savings.
- Comprehensive Measures
  - The ESCO tailors a comprehensive set of measures to fit the needs of a particular facility, and can include energy efficiency, renewables, distributed generation, water conservation and sustainable materials and operations.
- Risks are allocated to ESCO

Sources:
https://www.energystar.gov/ia/partners/spp_res/Introduction_to_Performance_Contracting.pdf and http://www.transparense.eu/eu/trainings/eu-manual (pg. 8)

Conclusion: Main characteristics of EPC

- Support in Project Financing
  - The capital to finance the EPC project can be either supplied by the client's own fund, 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
- Project Savings Guarantee
  - Depending on the type of contract, the ESCO can provide a guarantee that the savings produced by the project will be sufficient to cover the cost of project financing for the life of the project.

Sources:
https://www.energystar.gov/ia/partners/spp_res/Introduction_to_Performance_Contracting.pdf and http://www.transparense.eu/eu/trainings/eu-manual (pg. 8)