Energy Agency of the Republic of Macedonia

IME
INCREASING MARKET EMPLOYABILITY

Enabling ESCO environment in the Republic of Macedonia technical and legal analysis

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EXECUTIVE SUMMARY

Republic of Macedonia as a member country of the Energy Community has obligations to transpose the EU energy regulation including the **Directive 2006/32/EC on energy end-use efficiency and energy services. One of the main aim of the Directive 2006/32/EC was** to remove the barriers that prevent the efficient use of energy and create a sustainable market for energy services. In this respect, the Directive promotes energy efficiency mechanisms such as financing and informative instruments, public procurement requirements and voluntary agreements and set the concept for Energy Performance Contracting (EPC).

Energy Performance Contracting, also known as energy saving contracts, means operating (and financing) procedures for the provision of building-specific energy services. These procedures aim at saving energy and cutting costs by modernizing and optimizing functions or processes. The goal is to achieve the guaranteed improvement of results in particular with regard to economic efficiency, energy saving, net asset value.

With the premise that "the energy efficiency is the first fuel that should be used" the IME (Increasing Market Employability) project in cooperation with the Energy Agency of the Republic of Macedonia looked at the potentials of the country to develop the energy efficiency market. One of the issues that draw to our attention was that in the Republic of Macedonia there is no energy based contracting.

Therefore, the first assignment within the IME project was to analyze the current gaps and precondition for ESCO (Energy Service Companies) functioning.

The analysis is consisted **from three components:**

- **legal gap analysis of the ESCO energy related legislation;**
- **legal gap analysis of the other related laws that can affect the ESCO contracting; and**
- **analysis of possible models for ESCO contracting.**

National energy-related legislation enables the ESCO contracting and sets the preconditions for its implementation. However, the following gaps identified in the Energy Law, may affect the proper implementation and enforcement of such contract as well limit the contract type and conditions set therein:

- As provisioned in Article 139 paragraph 3 estimated savings from energy efficiency measures application, as well as ***guaranteed energy savings*** and procedures on energy saving assessment. It limits the future EPC contractors to define specific agreed energy performance criterion, such as financial savings into the EPC itself (in the Article only strict energy savings would be the terms in which ESCO can provide profit for itself).
- There are no prescribed or standardized methods for Energy Saving Assessment that contracting parties must use (Measurement and Verification Method).
- ***Mandatory elements of the EPC*** set in the Energy Efficiency Directive must be transposed and be part of the Energy Law or in the special bylaw for EPC. Furthermore, the Law should provide basis for different types of EPC models to be prescribed with secondary legislation, which should be mandatory

for use when the user is an entity from the public sector, while at the same time will not be written in a way that will prevent to be used when both contracting parties are private companies.

- The Energy audit as determined by the Rulebook on Energy Audit does not determine the ***base line scenario for industrial processes***.
- The ***formula for baseline energy consumption*** and the ***methodology on energy performance certification of buildings***, both contained in the Rulebook on Energy performance of buildings, are inadequate to meet the purpose; therefore, must be improved and clarified. ***The***.
- There is ***no Rulebook regulating the methodology on energy performance on fuel and industrial processes.***
- The energy service can be payoff only if there is energy savings. This ***limits the funding from the activities for optimization of the processes***.
- Although it is not directly related to EPC, there is no regulation of the ***cost-benefit analysis*** as provisioned in Annex IX of the Directive 2012/27/EU (setting General principles of the cost-benefit analysis).

Amendments of the energy-related legislation is needed in order to address the identifies gaps. Additionally, in one of the analyzed ESCO models - ESCO as Supplier contract model - one of the limiting legal factors are the preconditions set in the Rules for Electricity Market (only registered entity can participate in the energy market).

When analyzing the other national legislation that could affect the proper functioning of the energy service market, the following important findings/gaps have been identified and need to be addressed:

1. ***Public Procurement Law***:
   - the type of procurement subjects for which multi-annual contracts could be awarded are not specified - due to its nature, energy services contract duration should be multi-annual, even exceeding the three years period that is now determined for the framework agreements;
   - impossibility to use the best price-quality ratio including life-cycle costs as award criteria, as more appropriate for awarding energy service contract to ESCO; and
   - other specifics of the energy services contracts (e.g. remuneration for the services provided) entail slightly different tendering rules to apply for procurement of this type of service, which now are not reflected in the PPL.

2. ***Law on Concessions and Public Private Partnerships***:
   - although not harmonized with the latest EU Directive 2014/23/EU on the award of concession contracts, provisions of the present Law on Concessions and Public Private Partnerships (PPP) are not major obstacle for the public bodies to establish PPP with the ESCO for provision of energy services.
   - The new law should clarify if ESCO and other similar concepts of services provided by private companies are eligible for PPP contracts, and define certain criteria that the Ministry of Finance will be bound to when making decision for allocation of budget funds for establishing PPP.

3. ***Law on Financing of Local Self-governments***:

- If municipal ESCO project has to be financed by using external funds such as earmarked grants from the central budget or borrowed funds, then provisions of this Law might be barrier for it. Use of such grants and funds is dependent among other on the decision of the Ministry of Finance that more or less is not guided or bound by any criteria.
- It is not prescribed that the Ministry of Finance can be a guarantor for the commitments of the municipalities.

4. ***Budget Law***:

- No clear provision that planning and spending of budget funds based on concluded contracts, such as energy service contracts, could be multi-annual.

5. ***Law on Public Debt:***
   Provisions from the Law on Public Debt are not obstacle for concluding and implementing EPC. The prescribed procedure for the public bodies to borrow funds and issue sovereign guarantees (obtaining prior opinions and consents from certain ministries and adoption of special laws / decisions by the Parliament / Government) limit or put additional burden for financing of investments and projects such as the EPCs are, but the goal is to prevent excessive borrowing that increases the public debt.

All these gaps and findings should be addressed in the next changes of the laws and by-laws, and there has to be a clear political decision to enable ESCO environment both in the public and the private sector.

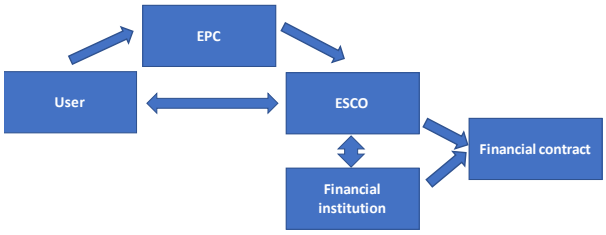
Also, there is crucial need to increase the capacity of the institutions in order to provide stable and professional service in the monitoring and verification of the savings as well of the measures and energy audits preformed in the country.

Concerning the stand points of the financial institutions (creditors) and potential ESCOs, the following should be noted:

- Commercial banks in Macedonia are reluctant to finance (provide loans for) EPC if one of the contracting parties is a municipality or public institution at local level. Even financing an ESCO would be a problem if funds for repayment of the debt come from the municipalities and local institutions revenues. The banks have positive experience in financing central government institutions.
- The commercial banks would feel more confident if the Ministry of Finance is guarantor or mediator in the EPC.
- Renowned energy suppliers are reluctant in becoming becoming ESCOs, i.e. investors of energy efficiency measures to their clients. Provision of collateral for the loans taken and longer period of time for return of investment are the key disadvantages for potential ESCO to implement several energy performance contracts at the same time.

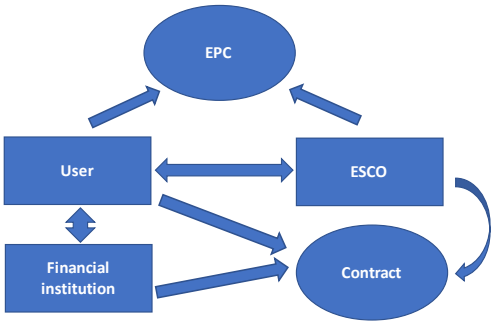
The third component consist of a techno-economic analysis, carried out to explore the different ESCO models and determine the possibility to implement some or all of them on the Macedonian market.

Out of the analyzed 9 ESCO models, the following 4 models were included as favorable models for the Republic of Macedonia:



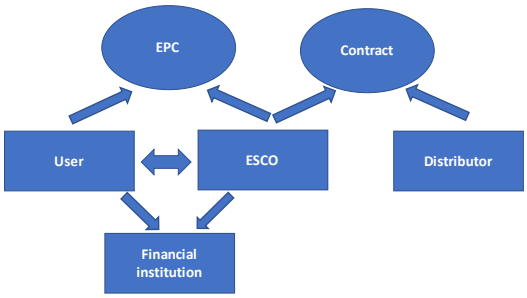
Shared Savings model

As can be seen from the scheme of this model, the financial part of the contract is guaranteed and arranged by the ESCO. The energy and financial savings are shared between the user and the ESCO.



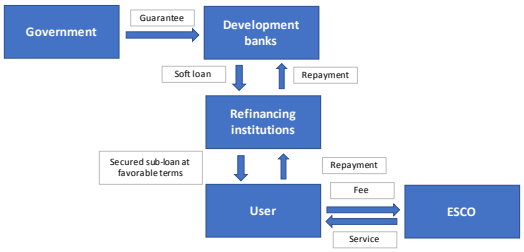
Guaranteed Savings Model

The guaranteed savings model is similar like the previous one, with a major difference that the user is responsible for the financial part of the project. The ESCO is however guaranteeing the energy savings in the financial contract.



ESCO Supplier Model

The ESCO supplier model and Integrated Energy Contracting Model are fused into one model since it was determined that it is favorable for the conditions in Macedonia. These models offer the payment installments (energy savings, operation and maintenance) from the user towards the ESCO to be regulated through the energy price. The regulations towards the financial institution are from both the user and the ESCO.



Development Finance ESCO Model

The Development Finance ESCO Model can be incorporated in all previous models. This model has significant advantage compared to the other models in its grant element. All cases analyzed for this model were calculated with 20% grant due to the development perspective and profitability of the model.

If these models are compared between each other, the ESCO as a Supplier model showed the most promising results, even though that is strictly case by case analysis. The Shared Savings and Guaranteed Savings Models have also shown significant potential, that can be even bigger if there is a possibility for incorporating in it the Development Finance Model and if the loan can include some grant element.

PART 1 LEGAL GAP ANALYSIS (FINDINGS AND RECOMMENDATIONS)

1 What is Energy Performance Contracting and Energy Services Company (ESCO)

Directive 2006/32/EC[1] on energy end-use efficiency and energy services set an energy saving targets for the Community of 9% until 2016 as well as energy end-use reduction target of 1 % per year and obligation for all member states to set up national energy efficiency action plans (NEEAP) and use them as a strategy to reach saving targets. One of the main aim of the Directive 2006/32/EC on energy end-use efficiency and energy services was to remove the barriers that prevent the efficient use of energy and create a sustainable market for energy services. In this respect, the Directive promoted energy efficiency mechanisms such as financing and informative instruments, public procurement requirements and voluntary agreements and set the concept for **Energy Performance Contracting.** Energy Performance Contracting (known as energy saving contracts) means operating (and financing) procedures for the provision of building-specific energy services[2].

These procedures aim at saving energy and cutting costs by modernizing and optimizing functions or processes. The goal is to achieve the guaranteed improvement of results in particular with regard to economic efficiency, energy saving, net asset value. The main distinguishing feature is the financing of the investments. Here the cost of investment is paid back from the savings, and in case the ESCO fails to achieve that, they must cover the difference between the actual and the guaranteed costs. Due to this the Energy Performance Contract is a long term contractual agreement.

The Directive set the following definition

Energy Performance Contract (EPC):

An EPC is a contractual arrangement between the beneficiary and the provider (normally an energy services company) of an energy efficient improvement measure, where investments in that measure are paid for in relation to a contractually agreed level of energy efficiency improvement.[3]

Energy Services Company (ESCO)

An ESCO is a natural or legal person that delivers energy services and/or other energy efficiency improvement measures in a user's facility or premises, and accepts some degree of financial risk in so doing. The payment for the services delivered is based (either wholly or in part) on the achievement of energy efficiency improvements and on the meeting of the other agreed upon performance criteria.[4]

The concept is that the Energy Service Company (ESCO) provides its know-how and financial resources to implement adequate energy efficiency measures and takes on the performance risk (the ESCO's remuneration is directly tied to the savings achieved by the reduced energy consumption) to ensure that the stipulated energy savings are achieved. Performance components of the ESCOs are financing, planning and installation of components for energy generation, distribution and usage as well as their operation and maintenance.

Very important component Energy Performance Contract is the **Measurement and Verification of the energy savings** having in mind that the savings cannot be directly measured, since they represent the

[1] DIRECTIVE 2006/32/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 5 April 2006 on energy end-use efficiency and energy services and repealing Council Directive 93/76/EEC

[2] "Energy service" as defined in the Directive means *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*.

[3] DIRECTIVE 2006/32/EC Article 3 (J)

[4] DIRECTIVE 2006/32/EC Article 3 (I)

absence of energy use. Savings are determined by comparing measured use before and after implementation of a measures/activities, making appropriate adjustments for changes in conditions. Having this in mind Measurement and Verification is the process of using measurement to reliably determine actual saving created within an individual facility by an energy management program. The Directive dedicates separate **ANNEX IV on the General framework for measurement and verification of energy savings**. Crucial element of the measurement and verification system is the **Energy audit.** ***Energy audit is a systematic procedure to obtain adequate knowledge of the existing energy consumption profile of a building or group of buildings, of an industrial operation and/or installation or of a private or public service, identify and quantify cost-effective energy savings opportunities, and report the findings.***[5]

The new **Directive 2012/27/EU on energy efficiency**[6] set 3 significant targets that further enable the development of the Energy Performance Contracting:

- every year, governments in EU countries must carry out energy efficient renovations on at least 3%[7] (by floor area) of the buildings they own and occupy[8];
- energy distributors or retail energy sales companies have to achieve 1.5%[9] energy savings per year through the implementation of energy efficiency measures[10];
- the public sector in EU countries should purchase energy efficient buildings, products and services[11].

The new Directive improves and specify the definition of the Energy Performance Contracting meaning *a contractual arrangement between the beneficiary and the provider of an energy efficiency improvement measure[12], verified and monitored during the whole term of the contract, where investments (work, supply or service) in that measure are paid for in relation to a contractually agreed level of energy efficiency improvement or other agreed energy performance criterion, such as financial savings*.[13] Different to its predecessor the new Directive sets **list of elements that obligatory should be included in energy performance contracts with the public sector or in the associated tender specifications[14] including** the following:

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[5] DIRECTIVE 2006/32/EC Article 3 (L)

[6] Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC Text with EEA relevance

[7] Obligation for R. Macedonia under the Energy Community Treaty 1% to 1,5%

[8] Directive 2012/27/EU *Article 5* **Exemplary role of public bodies' buildings** *Without prejudice to Article 7 of Directive 2010/31/EU, each Member State shall ensure that, as from 1 January 2014, 3 % of the total floor area of heated and/or cooled buildings owned and occupied by its central government is renovated each year to meet at least the minimum energy performance requirements that it has set in application of Article 4 of Directive 2010/31/EU.*

[9] Obligation for R. Macedonia under the Energy Community Treaty 0.7%

[10] Directive 2012/27/EU *Article 7* **Energy efficiency obligation schemes** *Each Member State shall set up an energy efficiency obligation scheme. That scheme shall ensure that energy distributors and/or retail energy sales companies that are designated as obligated parties under paragraph 4 operating in each Member State's territory achieve a cumulative end-use energy savings target by 31 December 2020, without prejudice to paragraph 2*

[11] Directive 2012/27/EU *Article 4* **Building renovation** *Member States shall establish a long-term strategy for mobilising investment in the renovation of the national stock of residential and commercial buildings, both public and private.*

[12] Directive 2012/27/EU Article 2 paragraph (24) 'energy service provider' means a natural or legal person who delivers energy services or other energy efficiency improvement measures in a final customer's facility or premises;

[13] Directive 2012/27/EU Article 2 paragraph (27)

[14] Directive 2012/27/EU **ANNEX XIII Minimum items to be included in energy performance contracts with the public sector or in the associated tender specifications**

- *Clear and transparent list of the efficiency measures to be implemented or the efficiency results to be obtained.*
- *Guaranteed savings to be achieved by implementing the measures of the contract.*
- *Duration and milestones of the contract, terms and period of notice.*
- *Clear and transparent list of the obligations of each contracting party.*
- *Reference date(s) to establish achieved savings.*
- *Clear and transparent list of steps to be performed to implement a measure or package of measures and, where relevant, associated costs.*
- *Obligation to fully implement the measures in the contract and documentation of all changes made during the project.*
- *Regulations specifying the inclusion of equivalent requirements in any subcontracting with third parties.*
- *Clear and transparent display of financial implications of the project and distribution of the share of both parties in the monetary savings achieved (i.e. remuneration of the service provider).*
- *Clear and transparent provisions on measurement and verification of the guaranteed savings achieved, quality checks and guarantees*[15]*.*
- *Provisions clarifying the procedure to deal with changing framework conditions that affect the content and the outcome of the contract (i.e. changing energy prices, use intensity of an installation).*
- *Detailed information on the obligations of each of the contracting party and of the penalties for their* breach.

Also, the new Directive stresses the need to identify and remove regulatory and non-regulatory barriers to the use of energy performance contracting and other third-party financing arrangements for energy savings. These barriers include accounting rules and practices that prevent capital investments and annual financial savings resulting from energy efficiency improvement measures from being adequately reflected in the accounts for the whole life of the investment. Obstacles to the renovating of the existing building stock based on a split of incentives between the different actors concerned should also be tackled at national level.[16] In the Directive it is strongly recommended to have established support mechanisms for promoting EE, most notably such mechanism is the EE fund. In order for EE Fund to function properly, there has to be EPC in place, as well as M&V system that would support such Fund.

[15] Recommendations on Measurement and Verification Methods in the framework of the Directive 2006/32/EC on Energy End-Use Efficiency and Energy Services.

[16] Directive 2012/27/EU Article 18

2 Transposition in the relevant national energy related legislation

2.1 Energy Law - relevant articles

Article 3 Definitions	31) **"energy audit"** shall be the systematized procedure aimed to determine actual energy consumption, identify and quantify cost-effective energy saving possibilities at a building or group of buildings, industrial processes or plants, or at public or private services, and includes preparation of energy audit report; 32) **"energy service"** shall be the service aimed to achieve physical benefits, means or goods as the result of energy use by applying energy efficient technologies and/or activities that include management, maintenance and control procedures as part of energy service performance, and is implemented on the basis of a contract and for which it can be demonstrated that, under normal conditions, contributes to measurable or estimated energy efficiency improvements and/or energy savings; 33) **"energy auditor"** shall be any natural person that has been certified to perform energy audits, pursuant to the provisions from the present law; 37) **"ESCO"** shall be any legal entity that provides energy services or other measures aimed to improve energy efficiency of its users and assuming a particular degree of financial risk in the performance thereof, while the payment of services delivered is fully or partially based on the achieved energy efficiency improvement or the fulfillment of other agreed criteria;
Article 134 EE in public sector	(1) The public-sector entities shall be obliged to apply measures for improvement of the energy efficiency of buildings, building units, devices and plants. (2) In the fulfillment of the obligations referred to in paragraph (1) of this Article, the public-sector entities shall be obliged to: 1) adopt three-year programs for energy efficiency improvement and to implement the measures determined by the program; 2) prepare annual analyses of the energy consumption and organize monitoring of the energy consumption; 3) provide, at least once in every three years, energy audits of the buildings or building units in which they carry out their activity; 4) provide a certificate for energy performance of a building, for the buildings or building units owned by the public-sector entities and 5) install solar collectors for hot water, if economically feasible, in the cases where they construct new or undertake major renovations of buildings or building units in their ownership, in accordance with the Rulebook on Energy Performance of Buildings referred to in Article 136 of this Law. (3) The fulfillment of the obligations referred to in paragraph (2) of this Article by the public institutions and public enterprises established by the Republic of Macedonia or by the local self-government units shall be ensured by the competent ministries, i.e. local self-government units.

	(4) The public-sector entities, i.e. the competent ministries or local self-government units referred to in paragraph (3) of this Article shall be obliged to submit collective reports to the Energy Agency for the completed energy audits in the previous calendar year by the end of February, at the latest. The Energy Agency, on the basis of the collective reports, shall be obliged to prepare and by the end of June at the latest to submit annual reports to the Ministry on the completed energy audits in the previous calendar year. (5) The energy efficiency action plan shall establish the measures that the public-sector entities, depending on the activity they carry out, are obliged to apply in their work in order to achieve the energy savings and energy efficiency goals. (6) In conducting public procurement procedures, the public-sector entities shall be obliged to define that the energy efficiency of the subject of the public procurement is a mandatory criterion for selecting the most favorable bid. (7) In the cases where the public-sector entities rent business premises, there should be an energy performance certificate for the building or the building unit where the business premise is located. (8) The Energy Agency, upon previously obtained opinion from the Public Procurement Bureau, shall adopt instructions on application of the measures for energy efficiency and energy savings when determining the features of the goods and services that are subject of public procurement, as well as on application of the energy efficiency and energy savings criteria for the selection of the most favorable bidder. (9) The instruction referred to in paragraph (8) of this Article shall be published on the web site of the Energy Agency and of the Public Procurement Bureau.
Article 135 **Energy Audit**	(1) The energy audit shall provide for: 1) an assessment and cost-effectiveness of the opportunities for reduction of energy consumption in buildings, additional (auxiliary) plants and equipment, as well as in industrial processes; 2) issuance of an energy performance certificate for a building, in accordance with the special regulations and 3) determination of the realized savings resulting from the application of the measures for improvement of energy efficiency and energy savings. (2) The entity that has ordered the energy audit shall be obliged to submit for insight all data, technical and other documentation for the subject of the energy audit and to ensure conditions for unobstructed conduct of the energy audit to the energy auditor with whom a contract for an energy audit has been concluded. (3) The energy audit shall consist of gathering and analyzing data regarding the subject of the energy audit, measuring of energy consumption in the facility, assessment of energy efficiency and cost-effectiveness of the opportunities for

	energy savings, as well as preparation and submission of a report on the findings of the energy audit. (4) The report on the findings of the energy audit shall contain in particular: 1) data on the basic energy consumption of the building, building unit, devices and plants, including consumption indicators; 2) data on the level of harmonization of the performance of the facility that is subject of the energy audit with the technical regulations on energy performance of construction facilities and other regulations regulating energy efficiency of buildings and building units; 3) an assessment of the energy efficiency; 4) identification of measures for reduction of energy consumption and improvement of energy efficiency; 5) an assessment of the energy savings and the procedure for establishing the savings; 6) calculation of the cost-effectiveness of application of energy efficiency improvement measures; 7) recommendations for application of energy efficiency improvement measures and 8) other necessary data. (5) The Minister shall adopt a Rulebook on Energy Audit that shall regulate in detail: 1) the conduct of the energy audit; 2) the manner of assessment of the basic energy consumption; 3) the content and form of the report on the energy audit; 4) the basic elements for formation of the amount of the charge for conducting the energy audit; 5) the manner, procedure and conditions for selection of legal entities that will conduct trainings for energy auditors; 6) the basic elements of the program and the manner of delivery of the training and taking the professional exam for energy auditors; 7) the issuance, extension and revocation of the authorizations for conducting energy audits, as well as the recognition of the validity of authorizations or other corresponding documents for conducting energy audits issued in other countries; 8) the form, content and manner of keeping the register of persons authorized to conduct energy audits and 9) the content and form of the reports referred to in Article 134 paragraph (4) of this Law submitted by the persons in the public sector, i.e. the Energy Agency. **(6) The methodology for measuring and verification of energy savings shall be an integral part of the Rulebook on Energy Audit.**
Article 136 Energy performance	(1) The certificate for energy performance of a building shall be issued for buildings or building units that have useful floor area more than the area determined by the Rulebook on Energy Performance of Buildings referred to in paragraph (8) of this Article.

	(2) The certificates for energy performance of buildings shall be issued by legal entities authorized to conduct energy audits with a validity period in accordance with the Rulebook on Energy Performance of Buildings referred to in paragraph (8) of this Article that cannot last longer than ten years as of the day of issuance of the certificate. (3) The investor shall be obliged to attach to the request for issuance of an approval for construction of new buildings or for major renovation of existing buildings, as a part of the concept design, a statement from a legal entity authorized to conduct energy audits on the level of harmonization of the concept design with the basic requirements for the building in terms of fulfillment of the minimum requirements determined by the Rulebook on Energy Performance of Buildings referred to in paragraph (8) of this Article. (4) Upon completion of construction of a building or upon major renovation of existing buildings, the investor shall be obliged to provide an energy performance certificate for the building and to submit it with the request for issuance of an approval for use of the building. (5) The sellers or renters of buildings or building units shall be obliged to hand over the certificate for energy performance of the building to the buyers or tenants in its original form or a copy verified by a notary. (6) The sellers or renters of buildings or building units, for the buildings or building units which are not yet completed, shall be obliged to deliver a copy of the statement referred to in paragraph (3) of this Article verified by a notary to the buyers or the tenants, while the obligation referred to in paragraph (5) of this Article shall be fulfilled upon receipt of the approval for use of the building or the building unit. (7) The owners of buildings or building units that have useful floor area larger than the one prescribed by the Rulebook referred to in paragraph (8) of this Article shall be obliged to display in a visible place the energy performance certificate for the buildings or building units in ownership or rented by public sector entities, as well as for buildings or building units of public character. (8) In order to improve the energy efficiency of buildings, the Minister shall by the Rulebook on Energy Performance of Buildings prescribe the requirements and conditions pertaining to: 1) the methodology for determination of energy performance of buildings, i.e. building units; 2) the minimum requirements for energy efficiency of new buildings and building units, as well as buildings and building units which are subject to major renovation; 3) the manner of control of the level of adjustment of buildings and building units, devices and plants to the provisions of the Rulebook; 4) the conditions for design and construction of new and major renovation of existing buildings or building units in terms of energy efficiency;

	5) the manner and period of control of the heating systems with boilers of an effective rated output for space heating purposes of more than 20 kW; 6) the manner and period of control of the air-conditioning systems in buildings of an effective rated output of more than 12 kW; 7) the types of buildings and building units in ownership of public sector entities for which installation of solar collectors for hot water when constructing new and major renovation of existing facilities is mandatory; 8) the labeling of buildings and building units in regard to their energy performance; 9) the form and content of the statement on the level of adjustment of the concept design for construction or renovation to the minimum requirements prescribed by the Rulebook; 10) the form, content, as well as the period of validity of the energy performance certificates for buildings and 11) the smallest useful floor area of buildings or building units for which there is an obligation to obtain and display an energy performance certificate.
Article 137	(1) The energy audit may be conducted by an energy auditor. (2) A physical entity may acquire an authorization for conducting energy audits, if it meets the following requirements: 1) to hold at least a university degree in a technical science; 2) to have at least five years professional working experience in design, surveillance and maintenance of construction facilities, examination of energy or processing plants, performance of energy audits or other energy services or in professional or scientific activities in the field of energy and 3) to pass the professional exam for an energy auditor, in accordance with the Rulebook on Energy Audit. (3) A legal entity may acquire the authorization for conducting energy audits, if it has at least two energy auditors employed constantly. (4) The Minister shall issue an authorization for conduct of energy audits, if the physical entity, i.e. the legal entity meets the requirements determined in paragraphs (2) and (3) of this Article, i.e. a decision rejecting the request for issuance of an authorization for conduct of energy audits, in accordance with the Rulebook on Energy Audit. (5) The legal entity that has acquired an authorization for conduct of energy audits shall be obliged to notify the Ministry on each change of the number of authorized auditors employed therein. (6) The authorization for energy audits for a physical entity shall be valid for a period of three years and may be extended upon the expiry of the validity period only if the energy auditor meets the requirements of the Rulebook on Energy Audit. (7) The Minister shall adopt a decision on revocation of the authorization for conduct of energy audits, if: 1) the energy auditor carries out the audit contrary to the provisions of this Law and the regulations adopted on the basis of this Law and

	2) the employment of all energy auditors in the legal entity has terminated. (8) An administrative dispute may be initiated against the decision of the Minister referred to in paragraphs (4) and (7) of this Article. (9) The Energy Agency shall organize training and exams for energy auditors every year, as well as training for professional development of energy auditors, on the basis of programs for training and examinations prepared by the Energy Agency and approved by the Ministry. (10) The Energy Agency shall select legal entities for the delivery of the training referred to in paragraph (9) of this Article through a public call. (11) The legal entities referred to in paragraph (10) of this Article should hold an authorization for conduct of energy audits and the training should be delivered by energy auditors. (12) A foreign physical entity that holds an authorization or any other corresponding document for conduct of energy audits issued by another country may carry out energy audits in the Republic of Macedonia, if the authorization or the corresponding document is recognized by the Ministry in a procedure prescribed by the Rulebook referred to in Article 135 of this Law. (13) The Ministry shall keep a register of authorized persons for conduct of energy audits and shall publish the register on its web site. The authorizations or other corresponding documents for conduct of the energy audits referred to in paragraph (12) of this Article shall also be entered in the register.
Article 139 Services contracts signed by public sector	(1) The energy services contracts signed by public sector entities shall stipulate the following mandatory elements: 1) the contract subject that includes the scope of energy services or other services aimed at energy efficiency improvement; 2) determining the baseline energy consumption of the building, devices and plants, pursuant to the Rulebook on Energy Audits; 3) estimated savings from energy efficiency measures application, as well as guaranteed energy savings and procedures on energy saving assessment; 4) funds needed and funding sources for the contract implementation; 5) manner of service payment. (2) The funds required for contract implementation referred to in paragraph (1) of this article shall be recovered by ESCO by means of energy bill reduction, which is a result of energy savings, calculated in comparison to the baseline energy consumption prior to contract signing. (3) After the expiration of energy services contract validity, the equipment, devices and plants installed in the building for the purpose of contract implementation referred to in paragraph (1) of this article shall be owned by the public-sector entity.
Article 141	(1) The relevant Energy or Natural Gas Distribution Grid Code shall determine the obligations of distribution system operators, when technically feasible and cost-effective, to define the technical specifications of metering devices for the energy

	consumed that 85 will enable consumers to receive accurate data on energy or natural gas consumed and time of use. (2) When technically feasible and cost-effective in terms of long-term energy savings, the relevant Grid Code can anticipate metering device installation also for portions of buildings that represent an independent unit. (3) When technically feasible and cost-effective, the relevant distribution system operator and/or electricity or heating energy and natural gas suppliers shall be obliged to provide the calculation of energy consumed based on the actual energy consumed and present it clear, unambiguous and understandable manner. (4) As part of their bills and in a clear and unambiguous manner, the electricity or heating energy and natural gas suppliers shall be obliged to provide information to the consumers related to: 1) detailed indication of prices and energy or natural gas consumed; 2) comparison of energy consumed with the energy consumed in the same period the previous year, preferably by means of diagrams; 3) comparison of energy consumed with the normalized values or energy consumed by reference consumer from the same consumer category, when possible and useful; and 4) consumers organizations, energy authorities or institutions, including contact data and Internet address, where they can obtain information on energy efficiency measures, equipment specifications and comparison of energy consumed by different consumer groups. (5) Electricity, heating energy or natural gas distribution system operators and suppliers must not prevent the development of energy services market, implementation of energy efficiency measures and energy services performance by ESCO.

2.2 Decree for Indicative Energy Saving Targets - relevant articles

Article 3	(1) The indicative target for total energy savings by the end of 2018, determined based on Energy Efficiency Strategy and first Energy Efficiency Action Plan, is at least 9 % of average annual final energy consumption in the period from 2002 to 2006. (2) Based on indicative target from paragraph (1) of this Article, the cumulative energy savings by 2018 should be at least 147.2 ktoe (oil equivalent kilotons).
*Annex I of the Decree sets methodology on setting the indicative targets	

2.3 Rulebook on Energy Performance of Buildings - relevant articles

Article 6 Methodology for determining the energy performance of buildings (as original – there is no	Методологијата за определување на енергетските карактеристики на зградите, односно градежните единици, вклучувајќи ги економски оптималните нивоа на енергетските карактеристики и пресметка на годишните потреби од финална и примарна енергија, годишните емисии на CO2, референтни климатски податоци и препорачани вредности на влезните параметри за пресметка е дадена во Прилогот 1 кој е составен дел на овој правилник.

official translation)	
Article 14 **New buildings** (as original – there is no official translation)	(1) За новите згради и градежни единици за домување вкупната специфична годишна потрошувачка на примарна енергија за греење, ладење, подготовка на санитарна топла вода и осветление не треба да биде поголема од вредноста за специфичната годишна потрошувачка на примарна енергија **кај референтни згради за** домување, според категории, во согласност со членот 3 од овој правилник. (2) За новите згради и градежни единици од членот 3 од овој правилник, освен зградите за домување (во натамошниот текст: нестанбени згради и градежни единици) вкупната специфична годишна потрошувачка на примарна енергија за греење, ладење, вентлација, подготовка на санитарна топла вода и осветление не треба да биде поголема од вредноста за вкупната годишна потрошувачка на примарна енергија кај референтни нестанбени згради по категории, во согласност со членот 3 од овој правилник. (3) Пресметката на вкупната специфична годишна потрошувачка на примарна енергија за референтни згради и за новите згради се врши според Методологијата за определување на енергетските карактеристики на зградите, која е дадена во Прилогот 1 од овој правилник. (4) Годишната потрошувачка на примарна енергија се пресметува според Методологијата определување на енергетските карактеристики на зградите, која е дадена во Прилогот 1 од овој правилник. (5) За новите згради и градежни единици од членот 3 од овој правилник најниската енергетска класа може да биде класата "С”. (6) Новите згради треба да бидат проектирани и градени на таков начин за да бидат во согласност со барањата за топлинска заштита од аспект на летен период. Пресметката на топлинската заштита од аспект на летен режим се прави во согласност со македонскиот хармонизиран стандард МКС EN 13363-1. (7) При проектирање и градба на нови згради треба да се применат некои од следните високоефикасни алтернативни системи или нивна комбинација, доколку се достапни и доколку нивната примена е технички, еколошки и економски оправдана, и тоа: 1) Децентрализирани системи за снабдување со енергија кои се засноваат на искористување на обновливите извори на енергија; 2) Комбинирани системи за истовремено производство во еден процес на топлинска и електрична и/или механичка енергија; 3) Системи за централно или греење или ладење по делови од зградите, посебно такви кои целосно или делумно се засноваат на искористување на на обновливи- те извори на енергија и

	4) Топлински пумпи. (8) Анализата на алтернативните системи од став (7) на овој член треба да се документира и да биде достапна за потребите на верификација. Анализа на алтернативни системи може да се направи за индивидуални згради или за групи на слични згради или за згради со заедничка типологија во исто подрачје. Кога предмет на интерес се системите за заедничко греење и ладење, анализата може да се направи за сите згради приклучени на предметниот систем во истото подрачје.
Article 15 Existing building (as original – there is no official translation)	(1) При значителна реконструкција на постојните згради или градежни единици енергетските карактеристики на реконструктуираната зграда, односно градежна единица треба да бидат во согласност со минималните барања за енергетска ефикасност дадени во Прилогот 4 од овој правилник, доколку тие се технички, функционално и економски оправдани, како и согласно македонските хармонизирани стандарди од Прилогот 2 од овој правилник. (2) Барањата за реконструктуираната зграда, односно градежна единица се однесуваат за зградата, односно градежната единица како целина, меѓутоа дополнително, тие се однесуваат и на одделните реконструирани елементи од зградата. (3) Во случаи кога одделните елементи кои формираат дел од обвивката на зградата и кои имаат значително влијание на енергетските карактеристики на обвивката се реконструираат или заменуваат, истите елементи треба да ги задоволат минималните барања за енергетска ефикасност од Прилогот 4 од овој правилник, доколку тие се технички, функционално и економски оправдани. (4) При значителна реконструкција треба да се земат во предвид за вградување високоефикасни системи, доколку е тоа **технички, функционално и економски оправдано.** (5) За зградите и градежни единици од членот 3 од овој правилник кои се предмет на значителна реконструкција најниската енергетска класа може да биде "D".
Article 30 Energy certificate (as original – there is no official translation)	(1) Сертификат за енергетските карактеристики на зградите за нови згради и градежни единици како и за згради и градежни единици кои биле предмет на значителна реконструкција се издава врз основа на податоци од основниот проект или проект на изведена состојба, во врска со рационално користење на енергија и топлинска заштита, како и завршниот извештај за извршениот надзор од правното лице кое вршело надзор и писмени изјави на изведувачите за изведените работи и услови за одржување на зградата. (2) Сертификат за енергетските карактеристики на зградите за постојни згради и градежни единици кои се продаваат или издаваат под закуп, згради и градежни единици кои се во сопственост или се закупени од лица од јавниот сектор како и згради и градежни единици од јавен карактер се издава врз основа на податоци од извештајот за спроведена енергетска контрола.

	(3) Сертификатот за енергетски карактеристики на зграда се издава врз основа на пресметани енергетски карактеристики на зградата, односно градежната единица и на индикаторите за енергетските карактеристики (вкупна годишна потрошувачка на примарна енергија за 1 m2 корисна површина [kWh/m2 god] и годишна емисија на CO2 за 1 m2 корисна површина [kg CO2/m2god]). (4) Пресметката на потребната енергија и влезната енергија за греење, ладење, вентилација, подготовка на санитарна топла вода и осветление треба да се врши во согласност со следните македонските хармонизирани стандарди: МКС EN ISO 13790, МКС EN 15241, МКС EN 15243, МКС EN 15316-2, МКС EN 15316-3 и МКС EN 15193. (5) Одредувањето на вкупната годишна потрошувачка на примарна енергија и емисијата на CO2 се врши врз основа на вкупната годишна влезна, односно испорачана енергија за различни категории на потрошувачи, а во согласност со македонските хармонизирани стандарди МКС EN 15603 и МКС EN ISO 15315. (6) Методите за изразување на енергетските карактеристики на зградите и градежните единици како и за означување на зградите и градежните единици се дадени во македонскиот хармонизиран стандард МКС EN 15217. (7) Пресметките на економските параметри за енергетските системи во зградите се вршат во согласност со македонскиот хармонизиран стандард МКС EN 15459.
Article 31 Energy label (as original – there is no official translation)	**(1) Пресметката и изразувањето на енергетската класа за зградите се врши врз основа на вкупната специфична годишна испорачана енергија за греење во [kWh/m2 god].** (2) Зградите и градежните единици за домување и нестанбените зграда и градежни единици се поделени во осум енергетски класи, и тоа: A+, A, B, C, D, E, F и G. Класата A+ претставува енергетски најповолна, додека класата G е енергетски најнеповолна класа. Вредностите за енергетски класи се дадени во Прилогот 6 од овој правилник. (3) Енергетската класа за згради и градежни единици за домување графички е прикажана на сертификатот даден во Прилогот 6, точката 6.1 од овој правилник. (4) Енергетската класа за нестанбени згради и градежни единици графички е прикажана на сертификатот, даден во Прилогот 6, точка 6.2 од овој правилник. Бидејќи за различни категории на нестанбени згради се разликуваат референтните вредности во графичкиот приказ, референтните вредности се даваат со податоци

	за релативна вкупна специфична годишна испорачана енергија за греење во [kWh/m2 god], која се пресметува согласно равенката: QH,nd,rel = (QH,nd / QH,nd,max) x 100%, каде се: QH,nd [kWh/m2 god] – специфична годишна испорачана енергија за греење; и QH,nd,max [kWh/m2 god] – максимално дозволена специфична годишна испорачана енергија за греење. (5) Енергетските класи се изразуваат во зависност од референтните климатски податоци. Подрачјето на Република Македонија е поделено во три климатски зони. Климатските зони се дадени во Прилогот 7 кој е составен дел на овој правилник и истите се одредени во зависност од вредностите на топлинските степен денови кои, исто така, се дадени во Прилогот 7 од овој правилник.
*Annex I of the Rulebook sets methodology on energy performance certification of buildings	

2.4 Rulebook on energy audit – relevant articles

Article 1 (as original – there is no official translation)	Со овој правилник поблиску се уредува: 1) спроведувањето на енергетската контрола, 2) начинот на процена на основната потрошувачка на енергија, 3) содржината и формата на извештајот за енергетската контрола, 4) основните елементи на програмата за усовршување на енергетските контролори, 5) начинот, постапката и условите за избор на правни лица што ќе вршат обуки за енергетски контролори, 6) основните елементи на програмата и начинот на вршење на обука и полагање на стручен испит за енергетски контролори, 7) постапката за издавање, продолжување и одземање на овластување за енергетски контролор како и постапката за издавање, продолжување и одземање на лиценца за вршење на енергетска контрола, 8) содржината и формата на барањето за издавање, продолжување и признавање на овластување за енергетски контролор и барањето за издавање, продолжување и признавање лиценца за вршење на енергетска контрола, 9) формата, содржината и начинот на водење на ре- гистарот на издадени, одземени и признаени овластувања за енергетски контролори и регистарот на издадени, одземени и признаени лиценци за вршење енергетска контрола, 10) содржината и формата на овластувањето за енергетски контролор и лиценцата за вршење на енергетска контрола, 11) содржината и формата на збирните извештаи за извршените енергетски контроли во претходната календарска година што ги доставуваат лицата од јавниот сектор, односно годишниот извештај за извршените енергетски контроли кај лицата од јавниот сектор во претходната календарска година што се доставува од страна на Агенцијата за енергетика на Република Македонија (во натамошниот текст: Агенција) и 12) методологија за мерење и верификација на заштедите на енергија.

Article 2 **Subject to energy audit** (as original – there is no official translation)	(1) Со енергетската контрола се утврдува ефикасноста при користење на енергијата, како и можностите за намалување на потрошувачката на енергија и остварување на заштеди. (2) Предмет на енергетската контрола се згради и градежни единици со сите помошни постројки и опрема, вклучувајќи и системи за греење и климатизација, како и индустриски процеси кои се одвиваат во нив. Енергетската контрола особено се спроведува на следниве елементи и системи: 1) Елементи од обвивката на зградата или градежната единица, 2) Системот за производство на топлинска енергија, 3) Системот за производство на енергија за ладење, 4) Системот за дистрибуција на топлинска енергија, вода, пареа и воздух, 5) Системот за вентилација и климатизација, 6) Системот за снабдување со електрична енергија, 7) Системот за компримиран воздух, 8) Електромоторните погони, 9) Системот за електрично осветлување, 10) Останати потрошувачи на електрична енергија, 11) Системот за подготовка на санитарна топла вода, 12) Системот за снабдување со вода, и 13) Системот за мерење и управување со енергија. (3) Предмет на енергетска контрола можат да бидат и други технички и технолошки системи во зависност од карактеристиките и намената на зградата, градежната единица, постројката и индустрискиот процес.
Article 3 **Type of energy audit** (as original – there is no official translation)	(1) Енергетската контрола може да биде општа или детална (инвестициска) и ја спроведува правно лице или трговец поединец кое поседува лиценца за вршење на енергетска контрола (во натамошниот текст: субјект за вршење на енергетска контрола). (2) Кога предмет на енергетската контрола е зграда за која постои обврска за издавање на сертификат за енергетски карактеристики на згради, енергетската контрола спроведена за издавање на сертификат за енергетски карактеристики на згради ќе се смета како енергетска контрола во смисла на овој правилник, ако енергетската контрола за издавање на сертификат за енергетски карактеристики на згради опфати анализа на реалната потрошувачка на енергија во зградата, односно управување со енергија во зградата во согласност со овој правилник. (3) Спроведувањето на енергетската контрола на зграда се усогласува со спроведувањето на енергетската контрола за издавање на сертификат за енергетски карактеристики на згради, кога обврската за спроведување на енергетската контрола доаѓа истовремено со обврската за издавање на сертификат за енергетски карактеристики на згради. (4) Контролите на системите за греење со котли и контролите на системите за климатизација во зградите се сметаат како составен дел на општата или деталната енергетска контрола или пак можат да бидат спроведени секоја

	посебно, во согласност со Правилникот за енергетски карактеристики на зградите.
Article 8 Спроведување на општа енергетска контрола (as original – there is no official translation)	(1) Општата енергетска контрола се состои од: 1) Подготвителен дел на енергетската контрола, кој вклучува: ... 2) Анализа на потрошувачката на енергија, како и на праксата за управување со енергијата, зависно од дејноста на нарачателот на енергетската контрола вклучува: ... 3) Утврдување и вреднување на можностите за заштеда и предлагање на поединечни мерки за подобрување на енергетската ефикасност: а) Дефинирање на поединечни мерки за подобрување на енергетската ефикасност, вклучувајќи и разгледување на можноста за промена на енергенсот, како и користење на обновливи извори на енергија, б) Оценка на секоја поединечна мерка преку одредување на можноста за заштеда на енергија, средства и емисија на CO2, како и на периодот на поврат на тие вложувања, в) Предлог решенија за спроведување на мерки за енергетска ефикасност (групирање на мерките) и детална оценка на секоја опција, г) Одредување на можности за заштеда на енергија за секое решение земајќи го предвид и меѓусебното дејство на поединечните мерки, д) Техничко-економска анализа на секоја предложена мерка со помош на финансиски методи, како што е едноставен период на поврат на вложените средства, ѓ) Анализа на секоја предложена мерка во поглед на смалување на емисијата на загадувачи, особено на CO2, е) Предлог план за спроведување на приложените мерки, ж) Одредување на показателите на енергетска ефикасност и постапките за следење, **з) Мерење и верификација на заштедата на енергија во непосредната потрошувачка, и** s) Изработка на финален извештај и предавање на извештајот на нарачателот. ... (7) Насоките за дефинирање и следење на показате- лите на енергетската ефикасност и изработката на планот за следење на остварените заштеди со примена на мерките за подобрување на енергетската ефикасност се утврдени со Методологијата за мерење и верификација на заштедите на енергија. Показателите за енергетската ефикасност можат да се одредат на ниво на предметот на енергетска контрола и тоа за сите енергенси поеди- нечно, за сите видови на енергија, како и на ниво на секој поединечен систем. **(8) Методологијата за мерење и верификација на заштедите на енергија е дадена во Прилог 4 кој е составен дел на овој правилник**
Article 10 Methodology (as original – there is no official translation)	Субјектот кој врши енергетска контрола проценатa на основната потрошувачка на енергија ја врши врз основа на параметрите за основната потрошувачка на енергија кои се дадени во **Прилог 8 кој е составен дел на овој правилник.**

3 MAIN CONCLUSION:

National energy-related legislation enables the ESCO contracting and sets the preconditions for its implementation and enforcement. However, the identified gaps elaborated below, may affect the proper implementation and enforcement of such contract as well limit the contract types and conditions set therein. Until legislative amendments are enacted and enforced the contracting parties to the EPC should have in mind the elaborated gaps and regulate these issues in the specific contracts. Additionally, in the ESCO as Suppliersupplier contract model the party should have in mind the necessary preconditions set in the Rules for Electricity Market (only registered entity can participate in the energy market) as well as the market limits due to the partially liberalized energy market (small enterprises and households)[17].

4 GAPS AND RECOMMENDATIONS:

- **Enabling environment and guaranteed market for ESCO companies is needed on strategic level**

Delays and postponement of energy transformation and implementation of Energy Efficiency requirements on national level (for example, long term postponing of energy audits and subsequently EE renovation of existing buildings) does not create positive environment for development of ESCOs nor guarantee market for their services. Defining the national target for energy efficient renovation of the buildings owned and occupied by its central government and establishing Energy efficiency obligation schemes for energy distributors and/or retail energy sales companies can very effectively address this issue. Development of Energy Efficiency Fund, as provisioned by number of strategic documents, might help foster the development of the ESCO market. Putting into place an effective Energy audit system, both in the households and the industry can support the sector and it can ensure that enough information is available for identifying potential ESCO projects.

- **Regulation of the Energy Performance Contracting is needed in order to facilitate the necessary elements**

The current Energy Law does not reflect the new Directive 2012/27/EU, especially its ANNEX XIII on Minimum items to be included in energy performance contracts with the public sector or in the associated tender specifications. The current Article 139 of the Energy Law fail to specifythe following mandatory elements of EPC contracts:

[17] July 1, 2016 the status of an eligible consumer for the free market will gain consumers who in 2015 achieved total electricity consumption of over 1,000 megawatt-hours. In this category fall about 100 customers with a total expected consumption of 300 gigawatt-hours of electricity.
July 1, 2017 eligible consumer with total consumption of over 500 MW in 2016, or about 150 customers with expected consumption of 300 gigawatt-hours per year.
July 1, 2018 eligible consumers with electricity consumption of more than 100 MW/h in 2017, or 900 customers with expected annual consumption of 300 GWh.
1 July 2019 eligible consumers with consumption of more than 25 MW/h in 2018, ie about 3,500 customers with expected annual consumption of 300 GWh
July 1, 2020 , and in it the market will be liberalized for the remaining 65 small customers and around 600,000 households with a total annual consumption of about 3,200 gigawatt-hours

- *Duration and **milestones** of the contract, terms and period of notice.*
- ***Clear and transparent list of the obligations** of each contracting party.*
- ***Reference date(s)** to establish achieved savings.*
- *Obligation to **fully implement** the measures in the contract and **documentation of all changes** made during the project.*
- *Regulations specifying the inclusion of equivalent requirements in any **subcontracting with third parties**.*
- ***Clear and transparent display of financial implications** of the project and distribution of the share of both parties in the monetary savings achieved (i.e. remuneration of the service provider).*
- *Clear and transparent **provisions on measurement and verification of the guaranteed savings** achieved, quality checks and guarantees[18].*
- *Provisions clarifying the procedure to deal with **changing framework conditions that affect the content and the outcome of the contract** (i.e. changing energy prices, use intensity of an installation).*
- *Detailed information on the **obligations** of each of the contracting party and of the **penalties for their** **breach**.*

Additionally, the Energy Law should enable environment for possible arrangements for specific agreed energy performance criterion, with clearly defined conditions and measurable/calculated benefits for both EPC signatories.

The following issues hinder full and proper enforcement of the ESCO contract as provisioned in Article 139:

- As provisioned in paragraph 3 estimated savings from energy efficiency measures application, as well as ***guaranteed energy savings*** and procedures on energy saving assessment. It limits the future EPC contractors to define specific agreed energy performance criterion, such as financial savings into the EPC itself (in the Article only strict energy savings would be the terms in which ESCO can provide profit for itself). Due to this only ***guaranteed savings*** should be provisioned without connecting the provisions to energy savings.
- The provisions of this article do not prescribe nor make reference to any standardized methods for Energy Saving Assessment (Measurement and Verification Methods). The ***Measurement and Verification Method should be regulated on national level with separate rulebook***.
- ***Mandatory elements of the EPC*** set in the Energy Efficiency Directive must be transposed and be part of the Energy Law or in the special bylaw for EPC. Furthermore, the Law should provide basis for different types of EPC models to be prescribed with secondary legislation. The model contracts should be mandatory for use when the user is an entity from the public sector. At the same time, the contracts should not be written in a way that will prevent to be used when both contracting parties are private companies.
- Energy audit as determine by the Rulebook on Energy Audit cannot determine the ***base line scenario for industrial processes*** but only for buildings. This issue needs to be address in the rulebook.
- ***The formula provided for baseline energy consumption is inadequate to meet the purpose*** and the methodology on energy performance certification of buildings, both contained in the Rulebook on

[18] Recommendations on Measurement and Verification Methods in the framework of the Directive 2006/32/EC on Energy End-Use Efficiency and Energy Services.

Energy performance of buildings are inadequate to meet the purpose; therefore, must be improved and clarified. Additionally, lack of enforcement can derive due to the fact that there is no reference building for specific annual primary energy consumption.

- There is ***no Rulebook determine the methodology on energy performance on fuel and industrial processes.*** This needs to be further regulated.
- The funds required for contract implementation that should be recovered by ESCO is restrictive due to the fact that stipulates only energy bill reduction which is a result of energy savings. This ***limits the funding from the activities for optimization of the process***. The Article should be amended to reflect this issue.
- Although not directly related to EPC, further regulation of the ***cost-benefit analysis*** is needed as provisioned in Annex IX of the Directive 2012/27/EU (setting General principles of the cost-benefit analysis).

5 Findings and recommendations for other relevant national legislation

5.1 Public Procurement Law

- Public Procurement Law (PPL) set out rules and procedures that public bodies (contracting authorities) should follow when procuring goods, services and works. In Macedonia, there are more than 1.380 contracting authorities categorized in: 1. state administrative authorities (eg. ministries, agencies…) and local self-government units, 2. legal entities established for a specific purpose for meeting the public interest needs (eg. schools, hospitals, museums…), 3. associations established by one or several contracting authorities (eg. ZELS), and 4. public enterprises, joint stock companies and limited liability companies established or controlled by the contracting authorities (eg. ELEM, MEPSO, JSP…).

- PPL is relevant for the ESCO concept due to the obligation of the public bodies to follow the rules and procedures contained in this law whenever they procure services or works from the private companies, including ESCO as energy service providers. More precisely, public bodies hire ESCO by concluding energy service contract, which in fact is a public procurement contract because it is concluded: 1. between contracting authority (public body) and economic operator (ESCO), 2. for provision of services (implementation of energy efficiency measures and management of energy consumption) and 3. for financial interest (compensation for ESCO as service provider).

- PPL defines and contains special chapter on utilities contract, which include those in the field of energy. Different (more flexible) rules for conducting public procurements apply to utilities sector. Art. 176 specifies the aspects of the energy that fall under utilities contracts, such as installation and management of fixed networks intended for provision of public services in connection with the

production, transport or distribution, i.e. the supply of gas, heat or electricity to such networks. This clearly means that contracts for energy services to final consumers do not fall under utilities contracts.

- Subsequently, the general rules from the law will apply to energy service contracts. There are demands, especially from the private sector, slightly different rules to apply for procurement of certain goods and services to due to their specifics. This also refers to the procurement of services from ESCO. There is no special standardised procedure for public procurement of energy services, which is causing difficulties and differences in structuring and carrying out of such tenders (eg. street lightning). Namely, ESCO as tenderer bears a certain degree of financial risk when providing a service to a contracting authority, which needs to be reflected in the PPL and then in the tender documentation. From the discussion with the persons who are deeply involved in the creation of the PP policy and legislation and from the review of the PP legislation of other countries in the region, it seems that there is a little or almost no chance that the amended or new PPL will contain such specific provisions.

- Given that energy service contracts will be perennial, the provisions from article 26-a of the PPL are important in terms of planning and implementation of multi-annual public procurement contracts. The main rule is that budget beneficiaries and individual beneficiaries of the central contracting authorities initiate the procedure for awarding a multi-year public procurement contract, stipulated by a program included in the development section of the Budget, on the basis of an approval issued by the Government of the Republic of Macedonia upon a prior opinion from the Ministry of Finance. Funds for energy services contracts should not be part of the programs that are covered by the development section of the budget (this section includes capital infrastructure investments), so the procedure for obtaining Government approval should not apply for these types of contracts. On the other hand, though not specifically indicated in the PPL, duration of the public procurement contracts cannot exceed period of three years. This is derived from the rule for maximum duration of the framework agreements that are awarded through public procurement procedures (according to the new EU public procurement directives it should be four years), as well as from the laws regulating the financial planning and budgeting. In any case, the contracting authority must plan the funds necessary for implementation of multi-annual contracts with the budget, investment program or financial plan for the corresponding year.

- According to the present PPL, only lowest price can be selected as award criteria, while the economically most advantageous tenderer can be defined only in exceptional and in practice very rare cases. This is a solution that is not present anywhere and it is against the EU public procurement legislation. Moreover, the 2014 EU public procurement directives require the best price-quality ratio to be the main award criteria used by the contracting authorities, which also encompasses the life-cycle cost. It is necessary this award criteria to be incorporated in the new PPL, so that contracting authorities can freely choose the criteria they will use to award the energy service contract. It is very likely that best price-quality ratio criterion would be even more appropriate and commonly defined for procurement of energy services from ESCO.

- In practice, so far there was no common approach among the contracting authorities in regards to the manner the contracts for street lightning as typical energy service were awarded. In order to award 1-year contract, most of the contracting authorities conducted standard public procurement procedure for repairing and / or maintaining of the street lightning. Other contracting authorities with less funds but with great need for major reconstruction and modernization of the street lightning, decided to award the contract by establishing public private partnership.

- **In general, provisions of the present PPL are not obstacle for the public bodies to conclude and implement energy service contracts.** Provision of energy services from ESCO will be procured in more or less same manner as any other service (by applying open or simplified competitive procedure). The three main issues at the moment are:

  - the type of procurement subjects for which multi-annual contracts could be awarded - due to its nature, energy services contract duration should be multi-annual, even exceeding the three years period that is now determined for the framework agreements;

  - impossibility to use the best price-quality ratio including life-cycle costs as award criteria, as more appropriate for awarding energy service contract to ESCO; and

  - other specifics of the energy services contracts (eg. remuneration for the services provided) entail slightly different tendering rules to apply for procurement of this type of service, which should be primarily reflected in the PPL and / or to be allowed the rules set in the tender documentation to deviate from the general public procurement rules.

  In that sense the new PPL, which drafting will begin soon and should be completed by the end of this or early next year, must define the procurement subjects that do not belong to the development section of the budget but for which multi-annual contracts could still be concluded, to allow best price-quality ratio to be used as award criteria and possibly incorporate specific rules for procurement of energy services.

Excerpts from the PUBLIC PROCUREMENT LAW *(Official Gazette no. 136/2007, 130/2008, 97/2010, 53/2011, 185/2011, 15/2013, 148/2013, 160/2013, 28/2014, 43/2014, 130/2014, 180/2014, 78/2015, 192/2015, 27/2016 and 120/2016)*

Art.#	Provision	Remark
Art.3, para. (1), item 1	"Public procurement contract" shall mean a contract of financial interest, which includes utilities contracts, concluded in writing between one or more contracting authorities on one side and one or more economic operators on the other side, the subject of which is the execution of works, delivery of goods or provision of services, in accordance with this Law;	Definition of public procurement contract encompasses the energy service contract because it is concluded: 1. between contracting authority (public body) and economic operator (ESCO), 2. for provision of services (implementation of energy efficiency measures and management of energy consumption) and 3. for financial interest (compensation for the service provider).
Art.3, para (1), item 2 Art.176 Art.182	"Utilities contract" shall mean a public procurement contract awarded for the purpose of performing one or more of the activities as referred to in Article 176 paragraph (1) of this Law (1) The activities for which the utilities contracts are awarded (hereinafter: covered activities) shall be: - water supply; - energy; - transport; - postal services, and - other covered activities. (2) Unless otherwise regulated in this Chapter, the provisions of this Law shall apply to the utilities contracts. Covered activities, in terms of this Article 176 paragraph (1) line 2 of this Law shall be the installation and management of fixed networks intended for provision of public services in connection with the production, transport or distribution, i.e. the supply of gas, heat or electricity to such networks.	The Law defines and contains special chapter on utilities contract, which include those in the field of energy. Different (more flexible) rules for conducting public procurements apply to utilities sector. Art. 176 specifies the aspects of the energy that fall under utilities contracts, such as <u>installation and management of fixed networks</u> intended for provision of public services in connection with the production, transport or distribution, i.e. the <u>supply of gas, heat or electricity to such networks</u>. That means contracts for energy services to final consumers do not fall under utilities contracts. Subsequently, the general rules from the law will apply to such contracts.

Art.26-a	(1) Prior to the initiation of the procedure for awarding a multi-year public procurement contract, the contracting authority shall be obliged to plan the funds necessary for its implementation with the budget, investment program or financial plan for the corresponding year. (2) The budget beneficiaries and the individual beneficiaries of the central authorities shall initiate the procedure for awarding a multi-year public procurement contract, stipulated by a program included in the development section of the Budget, on the basis of an approval issued by the Government of the Republic of Macedonia upon a prior opinion from the Ministry of Finance. (3) Upon a previously obtained opinion from the Ministry of Finance, the Government of the Republic of Macedonia shall give an approval regarding the change of the dynamics of the implementation and/or payment of the obligations arising from the concluded public procurement stipulated by the program included in the development section of the Budget, and for whose change a previous consent of the other contracting party is obtained.	Given that energy service contracts will be perennial, these provisions from the law are important in terms of how multi-annual public procurement contracts are planned and realized. Energy services contracts should not be part of the programs that are covered by the development section of the budget (this section includes capital infrastructure investments), so the procedure for obtaining government approval stipulated in paragraphs (2) and (3) should not be applied to them. In any case, the obligation to plan funds for multi-year procurement with a budget, investment program or financial plan remains.

5.2 Law on Concessions and Public Private Partnerships

- This Law regulates the award of a concession for goods of general interest and a contract for establishment of a public private partnership (PPP), the legal protection for any entity that has or had an interest in winning such a contract or that has risked or risks to be damaged in the procedure for awarding such a contract, as well as other issues with regard to the concessions for goods of general interest and the contracts for establishment of a PPP. The main dilemma is if this law is applicable to energy services contracts, i.e. if based on this law PPP could be established between the public body as public partner and ESCO as private partner. Is energy service contract concession of public service? In a strict sense, energy services should not be treated as public services because the service itself is not provided and it is not of interest to the wider public (e.g. citizens) as for example the construction and management of public parking lots is. The only exception would apply to the installation, reconstruction and maintenance of street lightning as energy service provided by ESCO. Still, it is a common practice in the region and Macedonia to establish PPP for energy services provided by private companies, including ESCOs.

- However, if all the elements that comprise the PPP (defined in art.5) are considered, the energy service contract may be eligible for PPP, without making any changes to the law, because ESCO as private partner: 1. provides conditions for the public partner to provide the services to the end users; 2. finances the refurbishment / reconstruction of the facility and manages its energy demand and consumption, 3. takes the risk of financing, management, etc. and 4. is compensated by the public partner.

- It is clear that out of the four forms of PPP determined by the law, energy services provided by ESCO should be considered as procurement of public services. It means that in order the energy service contract to be awarded to the private partner, procedure for public procurement of services based on the PPL must be applied. This is clearly stipulated in Art.15 of the Law.

- Prior to awarding a PPP contract, the public partner must undertake certain preparatory actions defined in Art. 16 of the Law. The report for the previously conducted analysis should be prepared by the public body. It should be short and provide explanation and justification why PPP is deemed as most adequate manner of satisfying the specific need. The final report from this assignment can be treated as a report required in point 1 of this article for all such PPP contracts in the country. However, due to the specifics of each energy service contract, before each procedure for establishing PPP for energy services is initiated, a feasibility study must be carried out.

- PPP contract may be concluded for a period up to 35 years, which is more than sufficient period for any type of energy services contract. The exact period will be proposed in the feasibility study and then formally defined by the public partner. It is not allowed the concession and public private partnership contracts to be simply extended with the same private partner, but new transparent procedure must be carried out. This means that it cannot be guaranteed to the initially contracted ESCO to be a "life-long" partner to the public body.

- Another important aspect for energy services contracts is the obligation of the public partner to determine the maximum amount of funds in the annual budget that could be given to the private partner (ESCO). Provisions from Art. 49 of the Law also give guidance in determining the amount of

funds in the annual budget. ESCO's calculations and guaranteed savings must be as precise as possible so that the maximum amount from the annual budget is not exceeded.

- If determined that in order to realize the PPP contract, funds from the central budget are needed, the public partner before launching the procedure for awarding PPP contract, must obtain consent from the Ministry of Finance. Even if the feasibility study shows that it is justified to establish a PPP and that the requested budget funds are realistic, still the Ministry of Finance has a final word for defining the financial construction. The practice showed that this legal requirement is not mere formality, but major impediment for establishing PPP whenever central budget funds are needed.

- **In general, provisions of the present Law on Concessions and PPP are not major obstacle for the public bodies to establish PPP with the ESCO for provision of energy services.** However, the Law should be harmonized with the latest EU Directive 2014/23/EU on the award of concession contracts. This process would be a good opportunity to:

    - Clarify through some generally applicable provisions if ESCO and other similar concepts of services provided by private companies are eligible for PPP contracts, and

    - Define certain criteria that the Ministry of Finance will be bound to when making decision for allocation of budget funds for establishing PPP.

Excerpts from the LAW ON CONCESSIONS AND PUBLIC PRIVATE PARTNERSHIP *(Official Gazette no. 6/2012, 144/2014, 33/2015, 104/2015 and 215/2015)*

Art.#	Provision	Remark
Art.4, para. (2), item 2	"Public services concession" is a contract of the same type as the contract for procurement of public services, except that the consideration for those services consists in the right to exploit such services or in that right together with payment	It gives definition of what concession of public services is. Energy services should not be treated as public services because the service itself is not provided to the wider public (e.g. citizens) as for example the public parking lots are. The only exception is the street lightning is.
Art.5	Public private partnership is a form of contractually regulated, long-term cooperation between the public partner and the private partner, characterized by the following: a) the private partner assumes the obligation to provide a public service for the end users in fields of competence of the public partner and/or the obligation to provide the necessary prerequisites for the public partner to provide a public service for the end users and/or activities within its competence; b) in order to fulfill the obligations referred to in point a) of this Article, the private partner may assume an obligation to: - finance, design, construct and/or reconstruct/renovate a public infrastructure facility, operate and maintain a new facility and/or a reconstructed/renovated public infrastructure facility or - exploit, manage and maintain an existing public infrastructure facility or - any combination of the abovementioned obligations until the combination of the referred obligations is aimed at achievement of the goals set forth in point a) of this paragraph; c) where assuming the obligation referred to in points a) and b) of this paragraph, the private partner usually assumes a significant part of the risks related to financing, construction, demand and/or availability and other such activities, management, maintenance and technical risks, depending on what has been agreed in the establishment of the public private partnership and is determined case by case;	If all the elements that make up the PPP are considered, the energy service contract may fall under the PPP because the private partner (ESCO): 1. provides the conditions for the public partner to provide the services to the end users; 2. finances the refurbishment / reconstruction of the facility and manages its energy demand and consumption, 3. takes the risk of financing, management, etc. 4. is compensated by the public partner. Out of the four forms of PPP prescribed by the law, energy services provided by ESCO should be considered as procurement of public services.

	d) each partner to the public private partnership during the public private partnership undertakes the responsibility for the risky events within its sphere of influence, or shares the responsibility in order to achieve optimal risk management during the partnership, inter alia , by using the managerial, technical, financial and innovative capacities of the private partner and by promoting exchange of skills and know-how – experience between the public and private partner, without being contrary to point c) of this paragraph; e) in exchange for the assumed obligations, the public partner may award the private partner public works concession or public services concession, or may compensate them by payment; f) the public partner may also enable the private partner to carry out certain commercial, economic activities, in addition to the obligations referred to in points a) and b) of this paragraph, determined by the contract, but only if there is no other possible way to ensure the necessary level of price efficiency of the private participation and reasonable recovery of the investment; and g) the public partner may transfer certain actual rights to the private partner, which are necessary to fulfill the contractually set forth obligations. Depending on the purpose of the funds for consideration by the public partner for provision of public works and/or public services, as well as the distribution of the key existing risks, the public private partnership may be established as: 1) public works concession or 2) public services concession or 3) contract for procurement of public works or 4) contract for procurement of public services. The public private partnership shall be established by a contract.	
Art.11	The facilities built under the public private partnership, including the extensions and improvements, shall be in ownership of the public partner, unless otherwise anticipated in	In principle, everything that will be refurbished and installed as equipment within the PPP contract realization, after the completion of the contract becomes / remains property of the public partner.

	the contract for establishment of a public private partnership. The public partner should set out the conditions for regulation of the rights of ownership referred to in paragraph 1 of this Article in the tender documentation. If the contract for establishment of the public private partnership terminates, the private partner shall be obliged to return, that is, transfer in ownership to the pubic partner the facilities built under the public private partnership, regardless whether they have been completely or partially built, reconstructed, preserved, equipped or improved by the private partner, under conditions and in a manner determined by the contract for establishment of a public private partnership, unless otherwise anticipated. All the matters, including the conditions related to the ownership rights, as well as the necessary quality standards, shall be subject of analysis of the feasibility study which is to justify the award of the contract for establishment of a public private partnership and they shall be anticipated in the tender documentation, as well as in the contract itself.	However, a possibility is provided with the PPP contract to regulate differently the issue of ownership after the conclusion of the contract.
Art.15, para. (1)	The provisions of the Law on Public Procurement that refer to the procedures for awarding contracts for procurement of public works and contracts for procurement of public services shall accordingly apply to the procedures for awarding contracts for establishment of a public private partnership, unless otherwise determined by this Law.	Even if the energy services contract is treated as a form of PPP, still the Public Procurement Law is applied for its awarding.
Art.16, para (1) and (2)	The preparatory activities for awarding a concession for goods of general interest and a contract for establishment of a public private partnership shall be carried out by the concession grantor or the public partner. The preparatory activities shall in particular include: - preparation of a report for the previous analysis of the basic project elements that indicate the nature of the contract to be concluded for the purpose of establishing a	Prior to awarding a PPP contract, the public partner must undertake certain preparatory actions. The report for the previously conducted analysis of the basic project elements that indicate the nature of the contract to be concluded (point 1) should be prepared by the public body and should be short and provide explanation and justification why PPP is considered to is the most adequate manner of satisfying the specific need.

	public private partnership, taking into account the definition of a public private partnership in this Law, - preparation of a feasibility study which is to justify the award of a concession for goods of general interest or a contract for establishment of a public private partnership, - assessment of the environmental impact of the concession for goods of general interest or of the public private partnership, and - other activities necessary for conducting the procedure.	The final report from this assignment can be treated as a report required in the point 1, for all such PPP contracts in the country. However, due to the specifics of each energy service contract, a feasibility study will be necessary before each award of a PPP contract to ESCO.
Art.39	The contracts anticipated by this Law shall be concluded for a period of up to 35 years as of the day of the conclusion of the contract, that is, as of the day of entry into force of the contract, in the case the two dates differ, unless otherwise anticipated by a special law. In determining the period referred to in paragraph 1 of this Article, the financial-economical indicators and the technical and/or technological specifics of the subject of the contract, based on the feasibility study which is to justify the award of the concession for goods of general interest or the contract for establishment of the public private partnership, shall be taken into consideration. The concession grantor, that is, the public partner shall start the procedure for awarding a new concession of goods of general interest, that is, a new contract for establishment of a public private partnership six month before the expiry of the current concession or public private partnership.	According to these provisions, a PPP contract may be concluded for a period up to 35 years. However, a feasibility study that must be carried out before the contract is awarded should indicate the optimal duration of the contract. It is not he concession and public private partnership contract to be simply extended with the same partner, but new transparent procedure must be carried out.
Art.49	The total amount of the funds up to which the public partner may assume financial liabilities in the given year related to the contracts for establishment of a public private partnership should be determined by the budget of the public partner. In the adoption of the budget, the public partner must take into consideration:	The public partner has an obligation to determine the maximum amount of funds in the annual budget to be given to the private partner (ESCO). The provisions of this article also give guidance to be considered when determining the amount of funds in the annual budget.

	- the costs necessary for covering the liabilities arising from the contracts for establishment of a public private partnership, - the effects of rewarding, temporary suspension (discontinuation) or limitation of the venture, possible to result from the contracts for establishment of a public private partnership, and - the compensation costs (consideration) for the private partner, possible to result from the contract for establishment of a public private partnership.	
Art.50	If, on the basis of the feasibility study which is to justify the award of the contract for establishment of a public private partnership, it is confirmed that funds from the Budget of the Republic of Macedonia are necessary for the implementation of the contract for establishment of a public private partnership, it shall be necessary to obtain consent from the Ministry of Finance before the adoption of the decision on commencement of the procedure.	If determined that in order to realize the PPP contract, funds from the central budget are needed, the public partner before launching the procedure for awarding PPP contract, must obtain consent from the Ministry of Finance. Even if the feasibility study shows that it is justified to establish a PPP and that budget funds are needed, still the Ministry of Finance seems to have a final word for defining the financial construction, which can be an obstacle.

5.3 Law on Financing of Local Self-Government Units

- The Law on Financing of Local Self-Government Units is relevant for the energy services contracts, because of the expectation contracts of this type to be commonly concluded by the municipalities or other public bodies within the municipalities (e.g. local public enterprise, schools, etc.). The fact that municipality may not have sufficient funds from its own sources to implement certain measure or service, does not represent an obstacle from a legal point of view. Namely, according to the provisions from this law, municipalities can receive grants from the central budget and they can also borrow funds from financial institutions (e.g. banks).

- There are three major sources of revenues for the municipalities: 1. municipalities' own sources, 2. grants from the Budget of the Republic of Macedonia and the budgets of the Funds and 3. borrowing. Within each source there are several sub-sources.

- According to Art. 10 of the Law, municipalities can use earmarked grants from the central budget only if the responsible line ministry or fund decides so. There are no specific criteria in the law related to the allocation of earmarked grants, only the condition that these types of grants must be used by the municipality for financing concrete activity.

- Unlike the earmarked grant, capital grants and block grants from the central budget can be allocated to and used by the municipalities strictly for financing capital investment projects and financing of the activities / areas that with the decentralization process have been transferred and now managed by the municipalities (culture, social protection and protection of children, education and health protection). Not all capital investment projects can be financed through capital grants. Only those determined in the Government programme and upon a decision of the respective ministry or fund (if the investment project fits into the determined priorities and have defined financial structure). This is not the case with the block grants, for the allocation of which first the Government adopts a methodology and then the responsible line ministry will use a formula to determine the exact amount that will be allocated to each municipality. To summarize, block grants are allocated for very specific purposes and areas (eg. financing of the primary school needs, which include the electricity expences), which means they cannot be used for energy services contracts directly. Use of capital grants for financing of ESCO services is also questionable taking into consideration that energy services might not fit into the determined criteria and investment priorities of the central government institutions.

- The law does not regulate the procedure for transfer of funds from the central budget to the municipalities' budgets, but it makes reference to the regulation (instruction) on treasury operations. The only rule contained in this law refers to the transfer of funds from VAT and block grants which shall be done in at least 12 installments.

- Provisions from Art. 18 of the law prescribe the borrowing procedure. Municipalities are not limited in terms of the types and origin of the institutions they can borrow funds from. However, there are two filters that the municipal management have to pass in order to conclude loan agreement or issue guarantee. First, the Ministry of Finance has to provide consent. The law does not give any criteria based on which the Ministry will make the decision, so it is subjective decision-making process. Second, the municipal council has to take a decision to allow the municipal management (mayor) to conclude the loan agreement or issue the guarantee, which seems to be far easier to meet then the first condition.

- It is forbidden for the municipality to make pledge on a property. This prohibition does not refer to the entire property of the municipality, but only to the property (facilities, equipment, etc.) used for performing activities of public interest. Considering that most of the activities performed by municipalities are of public interest, it can be concluded that by this prohibition more or less the entire municipal owned property is encompassed. Pledges are regularly required by the commercial banks to secure its loan.

- Articles 19, 20 and 21 of this law provide additional conditions that municipalities must satisfy when borrowing (concluding and / or realizing the loan agreement and issuing guarantees). The short-term borrowing is limited to a period of 12 months, while the long-term borrowing to a period of 5 years. In both cases, the amount that can be borrowed must not exceed 30% of the municipality's revenues in the previous fiscal year. Unlike the short-term borrowing, there are four grounds for which the funds from the long-term borrowing can be used for, among them are financing commitments and commitments from loans taken. The procedure for long-term borrowing must be transparent. This means that a public hearing must be organized before Municipal Council approves the long-term borrowing. In that way, unnecessary debts are avoided and possible abuse of funds timely prevented. Public enterprises and companies established, managed or controlled by the municipality authorities go through a slightly different procedure for borrowing. Namely, they may borrow only after having obtained a guarantee from the municipal council.

- If the strict rules and procedures for short-term or long-term borrowing prescribed in this law have not been observed then severe penalties (fines) can be imposed to the municipal mayor. This makes the mayors bit more cautious or reserved towards making any borrowing.

- **If municipal ESCO project has to be financed by using external funds such as funds from the central budget or borrowed funds, then provisions of this law might be barrier for it**. Use of such funds is dependent among other on the decision of the Ministry of Finance that more or less is not guided or bound by any criteria. Therefore, for more frequent implementation of energy service projects and use of ESCO services, especially those of higher value, it will be necessary to amend the law in order to:
    - Define certain criteria based on which the Ministry of Finance will allocate earmarked grants,
    - Define certain criteria based on which the Ministry of Finance will provide consent to the municipality to borrow funds,
    - Determine that Ministry of Finance may be a guarantor for the commitments of the municipalities if certain conditions that will be prescribed in the law are met, and
    - Alleviate the fines for the mayors who may breach the procedure for use of external funds.

Excerpts from the LAW ON FINANCING OF LOCAL SELF-GOVERNMENT UNITS *(Official Gazette no. 61/2004; 96/2004; 67/2007; 156/2009; 47/2011 and 192/2015)*

Art.#	Provision	Remark
Art.2, item 15, 16, 17 and 18	15. Borrowing is a procedure for creation of financial obligations by signing the loan agreement and / or the issuance of securities; 16. Guarantee from a municipality is potential liability, undertaken by the municipality on behalf of a public company and a company being fully or predominantly owned by the municipality, on whose behalf the guarantee was issued; 17. Short-term loan are funds provided from the central budget of the Republic of Macedonia in order to overcome the temporal mismatch of revenues and other revenues with expenditures and other outflows with obligation to repay by the end of the current fiscal year in which it was approved, without interest, and 18. Long term loan are funds provided from the central budget of the Republic of Macedonia with a commitment to repay up to five years without interest.	The definitions given in this law clearly define what borrowing means as well as the instruments that the municipalities can use to borrow funds.
Art.3	The municipality shall realize revenues from own sources, grants from the Budget of the Republic of Macedonia and the budgets of the Funds and from borrowing.	According to this provision there are three major sources of revenues for the municipalities, but within each source there are several sub-sources. Borrowing is one of the major sources.
Art.10	(1) Earmarked grant (*from the central budget*) shall be used for financing concrete activity. (2) The line Ministries and the Funds shall propose to the Ministry of Finance to allocate the earmarked grants per municipality, per project, institution and/or program with a Budget calculation for the following budget year. (3) The line Ministries and the Funds shall monitor the usage of the earmarked grant of this Article. (4) The line ministries and the funds shall cease to transfer earmarked grants if any irregularity is	The municipalities can use earmarked grants from the central budget only if the responsible line ministry or fund decides so. There are no specific criteria in the law related to the allocation of earmarked grants, only the condition that these types of grants must be used for financing concrete activity.

	identified and notify the Ministry of Finance for that.	
Art.11	(1) The Capital Grant shall be used to finance investment projects based on a programme determined by the Government. (2) The respective Ministries and Funds shall, in distributing the capital grants, give priorities to ones with fully defined financial structure. (3) The line Ministries and the Funds shall monitor the usage of the capital grant. (4) The line ministries and the funds shall cease to transfer capital grants if any irregularity is identified and notify the Ministry of Finance for that. (5) Financing of capital investments may be ceased improper spending of funds is determined.	Unlike the earmarked grant, capital grants and block grants from the central budget can be allocated to and used by the municipalities strictly for financing capital investment projects and financing of the activities / areas which with the decentralization process are now managed by the municipalities. Not all capital investment projects can be financed. Only those determined in the Government programme and upon a decision of the respective ministry or fund (if the investment project fits into the determined priorities and have defined financial structure). This is not the case with the block grants, for the allocation of which first the Government adopts a methodology and then the responsible line ministry will use a formula to determine the exact amount that will be allocated to each municipality.
Art.12, para. (1) and (2)	(1) A Block grant shall be used for financing the competencies prescribed in Article 22 items 5 (culture), 7 (social protection and protection of children), 8 (education) and 9 (health protection) in the Law on Local Self-Government through concrete programmes. (2) The line ministries and the funds shall prepare methodology for allocation of the block grants which shall be based on a formula by using appropriate indicators for the requirements for each program. The Government of the Republic of Macedonia shall pass Decree for the methodology for determining of and the allocation of the block grants on the proposal of the competent ministry, and with a prior consent of the Ministry of Finance and the Commission for monitoring of the system development.	
Art.17, para (1) and (2)	(1) The funds from the State Budget and budgets of the funds shall be transferred in accordance with the regulations for treasury operations. (2) The transfer of revenues from VAT and block grants from the State Budget to the municipal budget is carried out in at least 12 installments.	When it comes to the transfer of funds from the central budget to the municipalities' budgets, the law does not regulate this procedure, but it makes reference to the regulation (instruction) on treasury operations. The only rules contained in this law refers to the transfer of funds from VAT and block grants which shall be done in at least 12 installments.

Art.18	(1) The municipality may borrow in the country and abroad according to the conditions laid down by this and other laws. (2) The municipalities may begin the borrowing procedure with the consent of the Ministry of Finance. (3) The municipality may borrow or issue guarantee following a decision of the municipal council. Council Decision applies only if the agreement on borrowing or issuing a guarantee is concluded in the fiscal year in which it was taken. (4) The municipality submits the loan agreement and repayment plan to the Ministry of Finance within ten working days from the date of its signing. (5) The municipality may borrow by issuing securities in accordance with law.	Provisions from this article prescribe the borrowing procedure. Municipalities are not limited in terms of the types and origin of the institutions they can borrow funds from. However, there are two filters that the municipal management have to pass in order to conclude loan agreement or issue guarantee. First, the Ministry of Finance has to provide consent. The law does not give any criteria based on which the Ministry will make the decision, so it is subjective decision-making process. Second, the municipal council has to take a decision to let the municipal management (mayor) conclude the loan agreement or issue the guarantee.
Art.18-a	In order to secure the debt, the municipality cannot establish a pledge on the property that is used for performing activities of public interest determined by law.	This article amended the initial text of the law in order to clearly forbid the municipality to make pledge on a property. This prohibition does not refer to the entire property of the municipality, but only the property (facilities, equipment, etc.) used for performing activities of public interest. Considering that most of the activities performed by municipalities are of public interest, it can be concluded that by this prohibition more or less the entire municipal owned property is encompassed.
Art.19	(1) The municipality may borrow short-term loan that will be repaid within 12 months from the date of conclusion of the borrowing. (2) In the short-term borrowing, the total debt of the municipality made on the basis of short-term borrowing and short-term borrowing from the central budget of the Republic of Macedonia during the fiscal year cannot exceed 30% of the overall realized revenues of the operational budget of the municipality in previous fiscal year.	These three articles provide conditions that municipalities must satisfy when borrowing (concluding and / or realizing the loan agreement and issuing guarantees). The short-term borrowing is limited to a period of 12 months, while the long-term borrowing to a period of 5 years. In both cases, the amount that can be borrowed must not exceed 30% of the municipality's revenues in the previous fiscal year. Unlike the short-
Art.20	(1) The municipality can borrow long-term for:	

	- financing of capital projects and investments; - financing commitments; - commitments from loans taken; and - protection and elimination of the consequences caused by natural or environmental disasters. (2) The Municipal Council approves long-term borrowing only after a public hearing is held in the municipality. The subject of public hearing is a description of the project and the conditions for its financing. (3) In the long-term debt, total annual debt repayment (principal, interest and other costs) made on the basis of long-term debt and long-term borrowing from the central budget of the Republic of Macedonia cannot exceed 30% of total revenues in the operating budget of the municipality in the previous fiscal year. (4) The total amount of outstanding long-term debt of the municipality including all guarantees issued shall not exceed the amount of total revenues in the operational budget of the municipality in the previous year. (5) Funds provided by long-term borrowing shall be used for the purpose for which it is approved.	term borrowing, there are four grounds for which the funds from the long-term borrowing can be used for, among them are financing commitments and commitments from loans taken. The procedure for long-term borrowing must be transparent. This means that a public hearing must be organized before Municipal Council approves the long-term borrowing. In that way, unnecessary debts are avoided and possible abuse of funds timely prevented. Public enterprises and companies established, managed or controlled by the municipality go through a slightly different procedure for borrowing. Namely, they may borrow only after having obtained a guarantee from the municipal council for which the council makes a decision.
Art.21, para (1)	(1) The public enterprises and companies being fully or predominantly owned by the municipality and established by the municipality may borrow only after having obtained a guarantee from the municipal council for which the council makes a decision.	
Art.47	(1) A fine of 1,500 EUR to 3,000 EUR in denar equivalent shall be imposed on the mayor if: - municipality exceeds the limit of 30% of the overall realized revenues of the operational budget of the municipality in the previous fiscal year on the basis of short-term borrowing and short-term borrowing from the central budget of the Republic of Macedonia during the fiscal year (Article 19 (2)),	If the strict rules and procedures for short-term or long-term borrowing prescribed in this law, have not been observed then severe penalties can be imposed to the mayor. This makes the mayors bit more cautious or reserved towards making any borrowing.

	... (2) A fine of 5,000 EUR to 10,000 EUR in denar equivalent shall be imposed on the mayor if: - established pledge on the municipal property that is used for performing activities of public interest determined by law (Article 18 a); - the municipality does not use funds provided by long-term debt in accordance with the defined purpose (Article 20, paragraph 5); - municipality exceeds the limit of 30% of the total revenues of the operating budget of the municipality in the previous fiscal year for the total annual debt repayment (principal, interest and other costs), made on the basis of long-term debt and long-term borrowing from the central budget Republic of Macedonia (Article 20 paragraph (3)	

5.4 Budget Law

- Budget Law regulates the procedure for drafting, adopting, executing the Budget of the Republic of Macedonia and the budgets of the municipalities and reporting on the execution of the same. From the ESCO projects point of view, this law is important for the planning and spending of funds for energy service contracts.

- An important rule for planning and especially executing the budget is the prohibition for the budget users to make commitments (payments) that would exceed the planned revenue for the current year, unless [*additional*] funding sources are proposed.

- In general, the planning and spending of funds by central government institutions and funds depend on the decision of the Ministry of Finance and the Government. The consent / approvals of these two authorities are essential in the following procedures:

    - Planning and determining the fund limits. Although the planning procedure is participatory, still these two authorities have the final word on the appropriation limits;

    - Re-allocation of funds within the approved budget. This makes even the small amount reallocations complicated;

    - Increase of the projected revenues and other inflows and of the plan of appropriations (in case of donations, grants, loans, etc.); and

    - Commitment of funds from the development part of the budget that goes beyond the current (budgeted) year.

- In case of municipalities, these consents / approvals are obtained from the municipal Council as the highest authority within the local self-government system, which seems to be easier procedure to implement.

- Article 29 of the Law stipulates what each of the three main parts of the budget is consisted of, including the development part of the budget which is too generally defined. The specific types of programs or criteria for the programs that are eligible to be part of the development program plans are not provided. Although the development program plans are multi-years, they are revised annually.

- **In general, provisions of the present Budget Law are not major obstacle for the public bodies to plan and spend funds for energy services.** The power of the Government and the Ministry of Finance to have a final word on determining the budget limits and allocation for each central government institution, however, might strongly influence any decision or plan of the institution to procure energy services from ESCO. Furthermore, this law should give clear provision that planning and spending of budget funds based on concluded contracts, such as energy service contracts, could be multi-annual.

Excerpts from the BUDGET LAW *(Official Gazette no. 64/2005; 4/2008; 103/2008; 156/2009; 95/2010; 180/2011; 171/2012; 192/2015 and 167/2016)*

Art.#	Provision	Remark
Art.7 para (1) and (2) Art.27	(1) Budgets referred to in Article 2 of this Law shall include the appropriations broken down by budget users and determined purposes pertaining to funding the current, capital and other expenditures of the budget users and their spending units for performing the activities shown as programs and sub-programs. (2) Budget users shall not make commitments that are due in the current year or incur expenditures exceeding the appropriations of the Budget of the Republic of Macedonia and the municipal budget. Notwithstanding Article 7, paragraph (2) of this law, should during the fiscal year, following the adoption of the Budget, it is necessary to make commitments exceeding the appropriations, the sources of funds for their financing shall be proposed.	These provisions clearly define the budget structure and the types of expenditures therein. Additionally, very important rule is set out in paragraph (2) forbidding the budget users to make commitments (payments) that would exceed the planned revenue for the current year. An exception to this strict rule is stipulated in Art.27, but only if funding sources are proposed.
Art.18	(1) The Ministry of Finance, on the basis of the Fiscal Strategy, shall propose to the Government of the Republic of Macedonia appropriation limits for the next three fiscal years by budget users of the central government and the funds. (2) The Government of the Republic of Macedonia shall determine the maximum amounts of funds referred to in paragraph 1 of this Article, by end-May of the current fiscal year at the latest	According to these provisions, the fund limits of the budget users from the central government and the funds depend on the decision of the Ministry of Finance and the Government. Although the planning procedure is participatory, still these two institutions have the final word on the appropriation limits.
Art.29	(2) The Budget of the Republic of Macedonia consists of general, special and development part. - The general part consists of the total revenues and other inflows and the total expenditures and other outflows of the budget for the fiscal year, as well as global projection of the revenues, inflows, expenditures and outflows for the next two years and other data. - The special part consists of a plan of appropriations of the budget users and the funds by programs, sub-programs and items for the fiscal year.	This article stipulates what each of the three main parts of the budget is consisted of, including the development part of the budget. It is too generally defined, without precising the specific types of programs or criteria for the programs that are eligible to be part of the development program plans. Although the development program plans are multi-years, they are revised annually.

	- The development part consists of the budget users' development program plans. (3) The development program plan includes the mid-term projections of appropriations by: - different budget users; - different budget programs and sub-programs; - years when they will be implemented and - sources of financing, i.e. budgets. (4) The development program plan from paragraph (3) of this article shall be revised each year.	
Art.33, para (2)	(2) The budget users can make reallocations within the approved budgets in the current fiscal year. The Ministry of Finance shall approve the reallocation for the central government budget users and the Funds, and the Municipal Council shall approve the reallocation for the municipalities.	Although re-allocation of funds within the approved budget are allowed, still a prior consent from the Ministry of Finance (for the budget users and funds) and municipal council (for municipalities) must be obtained, thus making even the small amount reallocations complicated.
Art.34, para (4) and (5)	(4) In case the projected revenues and other revenues are executed above the projected level, the budget users having budget of donations, budget of loans, budget of grants and/or budget of self-financing activities, shall submit request for increase of the projected revenues and other inflows and of the plan of appropriations in these budgets. (5) Central budget users and the Funds shall submit their requests for increase to the Ministry of Finance. The Mayors shall submit request for municipal increase to the respective Municipal Councils.	Similar procedure is applied in case the budget users have executed the projected revenues and other revenues above the projected level (in case of donations, grants, loans, etc.). The final word if there would be an increase of the projected revenues and other inflows and of the plan of appropriations of their budgets depend on the decision of the Ministry of Finance (for budget users and funds) and municipal councils (for municipalities).
Art.37-g	(1) After the adoption of the Budget, the budget users shall prepare an annual financial plan by quarters on the use of the appropriations. (2) The budget users which have spending units shall submit an extract from the Budget containing the appropriations to each spending unit. The spending units shall prepare an annual financial plan by quarters on the use of the appropriations and	Provisions from these articles elaborate the procedure for preparation of annual, quarterly and monthly financial plans. These plans are basis for the Treasury to allocate the appropriations to the budget users and to execute payments based on request for payments.

	they shall submit it to the budget user through which they are funded. The budget user shall prepare a consolidated annual financial plan by quarters on the use of the appropriations. (3) The budget users shall submit the annual financial plans by quarters referred to in paragraphs (1) and (2) of this article to the Treasury for the use of the appropriations. (4) The Treasury shall allocate the appropriations by quarters based on the submitted annual financial plans by the budget users in order to adjust the expenditures with the dynamics of the realization of the revenues, taking into consideration the seasonal nature of certain expenditures, as well as the specifics of the capital and investment projects. (5) In order to use the appropriations in a given quarter, the budget users shall submit a financial plan by months. (6) In order to use the appropriations in a given quarter, the budget users that have spending units shall submit financial plans by months, and after their approval by the Treasury, they shall allocate the approved monthly spending right by spending units.	
Art.43, para (1) and (3)	(1) The budget users and spending units shall submit payment requests to the Treasury for execution of payments. (3) The Treasury shall control the submitted payment requests in the manner specified by the Minister of Finance.	
Art.47	(1) In case the budget users and the spending units make commitments in the programs covered in the development part of the budget, that require the use of budget funds in the following years, the budget users or the spending units have to obtain prior approval. (2) The budget users and the spending units of the central government shall obtain the approval referred to in paragraph 1 of this Article from the Government of Republic of Macedonia, after previous opinion by the Ministry of Finance, and the budget users and the spending units of the funds	For any commitment of funds from the development part of the budget that goes beyond the current (budgeted) year, that budget users must obtain prior approval. Again, same central level institutions are included in this procedure – opinion from the Ministry of Finance and approval from the Government. It is not specified what is the competent authority to give the approval for multi-year commitments that the

	and the municipalities shall obtain the approval from a competent authority. (3) In case of changes in the dynamics of the obligations arising from the concluded contracts for which the budget users and the spending units have received prior consent referred to in paragraph (1) of this Article and provided the consent of the other contracting party, they shall obtain amended Government's consent, upon previous opinion of the Ministry of Finance.	municipalities and funds would like to make.

5.5 Law on Public Debt

- If the Law on Financing of Local Self-Government Units was important for the municipal financing of ESCO projects, the Law on Public Debt is important for financing of ESCO projects through borrowing and issuing of sovereign guarantee at all levels, including central and local government institutions. More specifically, this law regulates the public debt management, purposes of the government debt, procedure and manner of borrowing, procedure of issuance, servicing and termination of sovereign guarantees, as well as information on public debt.

- According to the provisions of this law, the debt can occur, among other, for financing projects and investments, financing liabilities assumed by the municipalities, municipalities within the City of Skopje and the City of Skopje, and payments upon issued sovereign guarantees. Provision of energy services can be deemed as investments by public bodies, for which sovereign guarantees can be issued to the creditors. Even if the energy service contracts are to be considered as projects, still the conditions for the public bodies to enter such projects and to borrow funds are fulfilled (energy efficiency is part of the Government strategic documents and usually each public body is and will co-finance such project).

- The procedure for borrowing includes mandatory opinions and / or consent from high government institutions. The public administrative bodies on central and local level cannot start the borrowing procedure before they obtain consent from the Ministry of Finance. Furthermore, before concluding the contract for borrowing, the Ministry of Justice has to give legal opinion and then the Parliament to approve it with a special law (in case of foreign creditor) or the Government to approve it with a decision (in case of domestic creditor).

- The loan aquired by the Ministry of Finance can only be on-lend to public debt issuers, for the purpose of which loan agreement must be concluded. If public debt issuers fail to timely settle the liabilities arising from this agreement, the Ministry of Finance has the right to collect the claim, and in case a municipality is a debtor Ministry of Finance allocates resources from the budget account of the municipality to the account of the Budget of the Republic of Macedonia or it keeps part of the grants that should be distributed to the municipality, in both cases up to the amount necessary to collect the claim.

- Conditions and procedures for issuing of sovereign guarantee are very similar to those for borrowing. Only the Government of the Republic of Macedonia may issue sovereign guarantee on behalf of the Republic of Macedonia in case of borrowing by public debt issuer. However, public debt issuer, on behalf of which the sovereign guarantee was issued, must service the debt guaranteed.

- Provisions from the Law on Public Debt are not obstacle for concluding and implementing EPC. The prescribed procedure for the public bodies to borrow funds and issue sovereign guarantees (obtaining prior opinions and consents from certain ministries and adoption of special laws / decisions by the

Parliament / Government) limit or put additional burden for financing of investments and projects such as the EPCs are, but the goal is to prevent excessive borrowing that increases the public debt.

Excerpts from the LAW ON PUBLIC DEBT *("Official Gazette of the Republic of Macedonia" no. 62/2005, 88/2008, 35/2011 and 139/2014)*

Art.#	Provision
Art.2, items 1, 2, 4 and 11	1. government debt shall comprise all financial liabilities created on the basis of borrowing by the Republic of Macedonia, public institutions established by the Republic of Macedonia and municipalities, municipalities within the City of Skopje and the City of Skopje, excluding debt of public enterprises and companies being fully or predominantly owned by the state, by the municipalities and the debt of National Bank of the Republic of Macedonia; 2. public debt shall comprise government debt and debt of public enterprises being established by the state or by the municipalities, municipalities within the City of Skopje and the City of Skopje, as well as companies being fully or predominantly owned by the state or by the municipalities, municipalities within the City of Skopje and the City of Skopje, the government having issued sovereign guarantee therefore; 4. borrowing shall mean procedure for incurring financial liabilities by concluding a loan agreement and/or issuance of debt securities by the state or the municipality, municipalities within the City of Skopje and the City of Skopje; 11. sovereign guarantee shall mean contingent liability assumed by the Republic of Macedonia on behalf of the public debt issuer for the account of which the guarantee is issued.
Art. 8	(3) Debt of municipalities, municipalities within the City of Skopje and the city of Skopje and debt of public enterprises established by the state or the municipalities, municipalities within the City of Skopje and the City of Skopje, as well as companies being fully or predominantly owned by the state and the municipalities, municipalities within the City of Skopje and the City of Skopje shall not be considered as liability of the Budget of the Republic of Macedonia, except in cases of issuance of sovereign guarantee.
Art.12	(1) Government debt shall be incurred and used for the following: − financing projects and investments, − supporting balance of payments, − supporting foreign currency reserves of the Republic of Macedonia, − fostering development of financial markets in the Republic of Macedonia, − budget deficit financing,

	− interim financing of liquidity connected with cash flows, − government debt refinancing, − financing liabilities assumed by the municipalities, municipalities within the City of Skopje and the City of Skopje, − payments upon issued sovereign guarantees, and − protection against and elimination of consequences caused by natural and environmental disaster. (2) Projects proposed for financing referred to in paragraph (1), indent 1 of this Article shall fulfill the following criteria: − shall be in compliance with the strategic documents of the Government of the Republic of Macedonia, and − public debt issuers shall provide co-financing resources to the end of smooth project implementation.
Art.16	(2) Legislative, judicial and executive branch shall commence the borrowing procedure by submitting a borrowing initiative to the Government of the Republic of Macedonia, which shall mandatory include opinion by the Ministry of Finance. (3) Public institutions established by the Republic of Macedonia and municipalities, municipalities within the City of Skopje and the City of Skopje shall commence borrowing procedure upon consent by the Ministry of Finance. (3) Public institutions established by the Republic of Macedonia and municipalities, municipalities within the City of Skopje and the City of Skopje shall submit the following to the Ministry of Finance in order to obtain the consent referred to in paragraph (3) of this Article: − Decision on Borrowing, which shall mandatory include the amount and the purpose of the borrowing; − request form for borrowing, including information on the project and data on the financial capacity of public institutions established by the Republic of Macedonia and municipalities, municipalities within the City of Skopje and the City of Skopje. (6) Issuers referred to in paragraphs (2) and (3) of this Article shall conclude loan agreements upon adoption of a special law for each new foreign borrowing at foreign lenders. (7) Minister of Justice shall deliver legal opinion on the legal validity of the loan agreement for each new borrowing by the issuers referred to in paragraph (2) of this Article at foreign lender.

	(8) Issuers referred to in paragraphs (2) and (3) of this Article shall conclude loan agreements upon adoption of a decision by the Government of the Republic of Macedonia for each new foreign borrowing at domestic lenders.
Art.17	(3) Minister of Finance shall conclude loan agreement with public debt issuers, which shall define the terms and the conditions under which the loan funds shall be on-lent. (4) If public debt issuers fail to timely settle the liabilities arising from the agreement referred to in paragraph (3) of this Article, Ministry of Finance shall have the right to collect the claim, including principal, interest, default interest and other costs therefrom. (5) If the loan is extended to a municipality, a municipality within the City of Skopje, the City of Skopje, a public enterprise established by municipalities, municipalities within the City of Skopje and the City of Skopje, as well as a company being fully or predominantly owned by municipalities, municipalities within the City of Skopje and the City of Skopje, Ministry of Finance shall be entitled to the following so as to collect the claim referred to in paragraph (4) of this Article: - to allocate resources from the budget account of the municipality to the account of the Budget of the Republic of Macedonia, up to the amount necessary to collect the claim, and/or - to keep part of the grants to be distributed to the municipality, up to the amount necessary to collect the claim. (6) Minister of Finance shall have the right to undertake additional measures so as to collect the amount referred to in paragraph (4) of this Article envisaged in the agreement referred to in paragraph (3) of this Article, as well as other measures pursuant to law.
Art.21	(1) Government of the Republic of Macedonia may issue sovereign guarantee on behalf of the Republic of Macedonia in case of borrowing by public debt issuer. (2) Projects, financing of which requires issuance of sovereign guarantee, shall fulfill the following criteria: − shall be in compliance with the strategic documents of the Government of the Republic of Macedonia, − co-financing resources shall be provided to the end of smooth project implementation.
Art.23	(1) Public debt issuer, on behalf of which the sovereign guarantee was issued, shall service the debt guaranteed by the Republic of Macedonia and/or the payment of other costs. (2) Should public debt issuer, on behalf of which the sovereign guarantee was issued, fail to service the debt and/or fail to pay the other costs referred to in paragraph (1) of this Article on the date it falls due, Ministry of Finance shall, on behalf of the Republic of Macedonia, settle the liability due on the basis of sovereign guarantee. (3) In case Ministry of Finance settles, on behalf of the Republic of Macedonia, the liability on the basis of sovereign guarantee, it shall be entitled to collect the claim, including principal, interest, default interest and other costs incurred due to the inability of the public debt issuer,

	on behalf of which the sovereign guarantee was issued, to service the debt and/or pay the other costs referred to in paragraph (1) of this Article on the date it falls due. (4) Public debt issuer, on behalf of which the sovereign guarantee was issued, shall be obliged, within the period specified in the agreements referred to in Article 22, paragraphs (2) and (3) of this Law, to pay the funds paid by the Ministry of Finance on the basis of sovereign guarantee to the account of the Budget of the Republic of Macedonia. (5) Obligation referred to in paragraph (4) of this Article shall be unconditional and irrevocable. (6) Should public debt issuer, on behalf of which the sovereign guarantee was issued, be a municipality, municipality within the City of Skopje or the City of Skopje, a public enterprise established by municipalities, municipalities within the City of Skopje and the City of Skopje, as well as a company being fully or predominantly owned by municipalities, municipalities within the City of Skopje and the City of Skopje, Ministry of Finance shall be entitled, as regards collection of claims referred to in paragraph (3) of this Article: − to allocate resources from the budget account of the municipality, the municipality within the City of Skopje and the City of Skopje to the account of the Budget of the Republic of Macedonia, up to the amount necessary to collect the claim, and/or − to keep part of the grants to be distributed to the municipality, the municipality within the City of Skopje and the City of Skopje, up to the amount necessary to collect the claim. (7) Minister of Finance shall have the right to undertake additional measures so as to collect the amount referred to in paragraph (3) of this Article envisaged in the agreement on securing the issued sovereign guarantee referred to in paragraphs (2) and (3) in Article22 of this Law.
Art.25	(1) Public enterprise established by the state or municipalities, municipalities within the City of Skopje and the City of Skopje, as well as company being fully or predominantly owned by the state or municipalities, municipalities within the City of Skopje and the City of Skopje, may borrow on long-term basis with an issued sovereign guarantee as follows: - for financing capital projects and investments, - for refinancing debt incurred on the basis of borrowing referred to in indent 1 of this Article, - for financing assumed liabilities and - for protection against and elimination of consequences caused by natural and environmental disaster. (2) Public enterprise established by the state or municipalities, municipalities within the City of Skopje and the City of Skopje, as well as company being fully or predominantly owned by the state or municipalities, municipalities within the City of Skopje and the City of Skopje, shall commence the procedure for borrowing with issued sovereign guarantee on the basis of a consent by the Ministry of Finance.

	(3) In order to obtain the consent referred to in paragraph (2) of this Article, public enterprise established by the state or municipalities, municipalities within the City of Skopje and the City of Skopje, as well as a company being fully or predominantly owned by the state or municipalities, municipalities within the City of Skopje and the City of Skopje, shall submit the following to the Ministry of Finance: - Decision on Borrowing, which shall mandatory include the amount and the purpose of the borrowing; and - request form for borrowing through issuing sovereign guarantee, including information on the project and data on the financial capacity of the public enterprise established by the state or municipalities, municipalities within the City of Skopje and the City of Skopje, as well as company being fully or predominantly owned by the state or municipalities, municipalities within the City of Skopje and the City of Skopje. (5) Representatives from the Ministry of Finance and other authorized representatives from the Government of the Republic of Macedonia, shall mandatorily participate in the procedure for borrowing through sovereign guarantee. (6) Loan agreement shall be concluded upon adoption of a special law on each borrowing through issuing sovereign guarantee at foreign lenders, i.e. upon adoption of a decision by the Government of the Republic of Macedonia for each borrowing with issued sovereign guarantee at domestic lenders. (7) Loan servicing and payment of other costs incurred on the basis of borrowing by public enterprises established by the state or municipalities, municipalities within the City of Skopje and the City of Skopje, as well as companies being fully or predominantly owned by the state or municipalities, municipalities within the City of Skopje and the City of Skopje, shall be carried out by the public enterprises established by the state or municipalities, municipalities within the City of Skopje and the City of Skopje, as well as companies being fully or predominantly owned by the state or municipalities, municipalities within the City of Skopje and the City of Skopje.
Art.25-a	(1) Public enterprise established by municipalities, municipalities within the City of Skopje and the City of Skopje, as well as company being fully or predominantly owned by municipalities, municipalities within the City of Skopje and the City of Skopje, may borrow on long-term basis without an issued sovereign guarantee as follows: - for financing capital projects and investments, - for refinancing debt incurred on the basis of borrowing referred to in indent 1 of this Article, - for financing assumed liabilities and - for protection against and elimination of consequences caused by natural and environmental disaster. (2) Public enterprise established by municipalities, municipalities within the City of Skopje and the City of Skopje, as well as company being fully or predominantly owned by municipalities,

	municipalities within the City of Skopje and the City of Skopje, shall commence the procedure for borrowing without issued sovereign guarantee on the basis of a consent by the Ministry of Finance. (3) In order to obtain the consent referred to in paragraph (2) of this Article, public enterprise established by municipalities, municipalities within the City of Skopje and the City of Skopje, as well as a company being fully or predominantly owned by the state or municipalities, municipalities within the City of Skopje and the City of Skopje, shall submit the following to the Ministry of Finance: - Decision on Borrowing, which shall mandatory include the amount and the purpose of the borrowing; and - request form for borrowing without an issued sovereign guarantee, including information on the project and data on the financial capacity of the public enterprise established by municipalities, municipalities within the City of Skopje and the City of Skopje, as well as company being fully or predominantly owned by municipalities, municipalities within the City of Skopje and the City of Skopje.
Art.25-b	(1) The public enterprise established by the state, as well as company being fully or predominantly owned by the state, shall commence on-lending procedure on the basis of a consent by the Ministry of Finance. (2) In order to obtain the consent referred to in paragraph (1) of this Article, public enterprise established by the state, as well as company being fully or predominantly owned by the state, shall submit the following to the Ministry of Finance: - Decision on Borrowing, which shall mandatory include the amount and the purpose of the borrowing; and - request form for borrowing, including information on the project and data on the financial capacity of the public enterprise established by the state, as well as company being fully or predominantly owned by the state. (4) Loan servicing and payment of other costs incurred on the basis of borrowing by public enterprises established by the state, as well as companies being fully or predominantly owned by the state, shall be carried out by the public enterprises established by state, as well as companies being fully or predominantly owned by the state.

6 Additional findings and recommendations related to the financing and implementation of energy performance contracts

- Commercial banks in Macedonia are reluctant to finance (provide loans for) energy performance contracts if one of the contracting parties is a municipality or public institution at local level. Even financing an ESCO would be a problem if funds for repayment of the debt come from the municipalities and local institutions revenues. Currently, only 10% of the municipalities have credit rating acceptable for the banks. Providing municipal owned property as collateral is forbidden, thus making the external financing of energy performance contracts at local level even more difficult.

- The situation is different when it comes to central government institutions. The banks have positive experience in financing these institutions. The banks would feel more confident when the Ministry of Finance is involved as some kind of guarantor or mediator in the energy performance contracts.

- Other countries' experiences show that renowned energy suppliers are becoming ESCOs. This might not be the case in Macedonia, as these companies are reluctant in becoming investors of energy efficiency measures to their clients, especially because of the requirement from the commercial banks to provide collateral for the loans (project financing is rarely accepted).

- Provision of collateral for the loans taken and longer period of time for return of investment are the key disadvantages for potential ESCO to implement several energy performance contracts at the same time. This will also slow down the pace for development of ESCO market.

- One of the conditions for establishing any kind of public-private partnership is preparation of a feasibility study. These studies are always outsourced, take time and additional funds, which for the smaller public authorities might be a burden.

- Well-developed municipalities would prefer using funds from the state energy efficiency fund (if and when established) and preferential loans from international development banks to implement their energy efficiency programs, which include measures to achieve energy savings.

PART 2 ANALYSIS OF ESCO MODELS

7 Methodology and assumptions

The scope of the analysis was to investigate the different ESCO models and determine the possibility to implement some or all of them on the Macedonian market and future ESCO's and energy performance contracts.

In order to gain full picture and possibilities for ESCO penetration in the market, a wide range of types of buildings and possible measures were chosen. Apart from that, the possible projects were also chosen by economic criteria's, like wide range of simple payback, different investment costs etc.

The following types of buildings / institutions were chosen:

- Industry
- Multifamily residential building
- Single-family residential building
- Public building
- Public lightning

The following types of projects / measures were analyzed:

- Change of fuel
- Preparation of domestic hot water
- Full renovation of the building envelope
- Installing of thermal façade
- Heating control
- Replacement of old and inefficient lightning

These types of buildings and measures include most of the possibilities for an ESCO to gain knowledge of what can be utilized and prepare its strategy and policy. Even though the cases present the majority of the possibilities, it should be mentioned that the limited amount of cases that are analyzed in this report can produce differences with the actual situation. It is aimed to give overall structure for future development in the sector.

In the case of analysis variety of economic parameters, the case studies have the following range of values:

- Simple payback period: 2 months – 11 years
- Investment: 250.000,00 – 5.500.000,00 MKD

The energy related gathering of data and calculations were performed according to the national legislative and methodologies and all case studies have energy audits performed by certified energy auditors.

The data for the technical equipment and its characteristics that was used is:

Table 1 Technical equipment data[19][20][21]

After Reconstruction				
Building Element	Maintenance [%]	Disposal [%]	Lifetime	Economic Lifetime
Insulation of external walls	0%	0%	30	25
Wall towards a room that is not in use	0%	0%	30	25
Roof, upper floor	0%	0%	30	25
Ground floor	0%	0%	30	25
Windows	1%	0%	25	24
Shading systems	1%	0%	15	
Building's Technical Systems	Maintenance [%]	Disposal [%]	Lifetime	Economic Lifetime
Chiller	4,0%	0%	15	17
Boiler	2,0%	0%	20	17
Heat pump	4,0%	0%	17	15
Radiators		0%	35	
Heat emitting panels		0%	50	
Fan coiler		0%	15	
Convectors		0%	20	
Air ducts		0%	50	
Solar thermal collectors	1,0%	0%	20	20
Photovoltaic panels	1,0%	0%	25	23
Lightning	9,0%	0%	6	6000 hours
Heating control	0%	0%	20	10

The economic and financial calculations are mainly related to the ESCO models and for that purpose, new tool was created. The tool takes into account all relevant models parameters and modifications.

The inflation rate was set at 1.5%. This differs from the current inflation rate (even though it does not differ greatly for the prediction for the next year). The inflation rate was set keeping in mind that the analysis is made for long term projects, so the last 8 years were considered in the used inflation rate.

[19] Rulebook for energy audit, Official Gazette of Republic of Macedonia – No. 94 on 04 July 2013

[20] Recommendations on Measurement and Verification Methods in the Framework of Directive 2006/32/EC on Energy End-Use Efficiency and Energy Services, page 66; Download: https://www.energycommunity.org/pls/portal/docs/906182.PDF, 30 June 2015

[21] D4.3 REPORT ON NATIONAL RESULTS OF THE T.4.1 AND T.4.2 TOOLS APPLICATION TO THE REFERENCE BUILDINGS AND ENERGY EFFICIENCY MEASURES, REPUBLIC_ZEB project, Download: http://www.republiczeb.org/filelibrary/WP4/D4.3_Final_2016-10-25.pdf

The nominal rate was taken from The National Bank of the Republic of Macedonia and the Fisher Equation was used to calculate the real interest rate for the calculation.

Since the length of the contract can be long, and it is influencing significantly towards the successful implementation of the project from the ESCO side, all analysis was performed for contracts with length of 10, 15 and 20 years.

Sensitivity analysis

Because of the nature of the EPC and ESCO, a sensitivity analysis is a key element in determining the possibilities. For the sensitivity analysis, 4 main framework elements were followed:

Annual savings: This element includes two main factors – technology and energy price. The technology characteristics will change over time and also the planned and implemented equipment may not show the desirable effects. But the technology factor has significantly lower influence that the energy price. Since Macedonia has no fully liberated energy market, the energy price can change in -35% to +35% which can make the initial assessment unusable.

Equity capital: The equity capital is changing the cashflow significantly, since the amount of interest from loans can be large.

Interest rate – It is crucial for the ESCO to gain favorable interest rate, but if that is not possible, this element from the sensitivity analysis shows all possible options for the loan.

Baseline – As baseline for the analysis, the worth of the ESCO money if invested in bank was considered for all 3 main framework elements stated above.

Analyzed ESCO Models

Even though a total of 9 ESCO models were analyzed, as favorable models for Republic of Macedonia, the following 4 models were included:

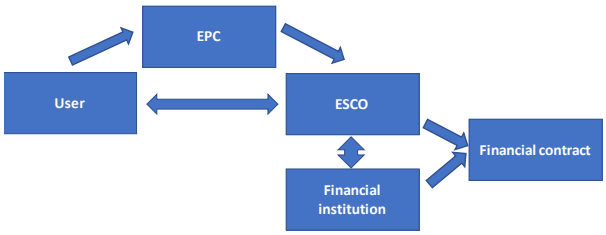


Figure 1. Shared Savings Model

Shared Savings model

As can be seen from the scheme of this model, the financial part of the contract is guaranteed and ranged by the ESCO. The energy and financial savings are shared between the user and the ESCO.

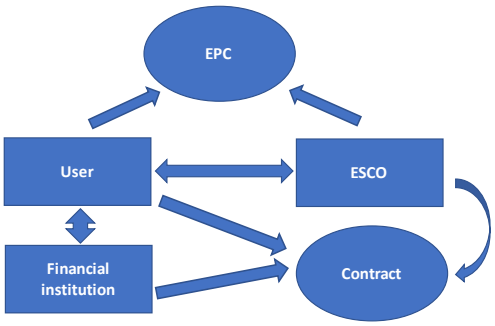


Figure 2. Guaranteed Savings Model

Guaranteed Savings Model

The guaranteed savings model is similar like the previous case, with a major difference that the user is responsible for the financial part of the project. The ESCO is however guaranteeing the energy savings in the financial contract.

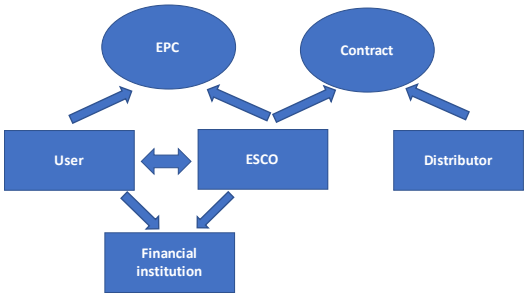


Figure 3. ESCO Supplier Model

ESCO Supplier Model

The ESCO supplier model and Integrated Energy Contracting Model are fused into one model since it was determined that it is favorable for the conditions in Macedonia. These models offer the payment installments (energy savings, operation and maintenance) from the user towards the ESCO to be regulated through the energy price. The regulations towards the financial institution are from both the user and the ESCO.

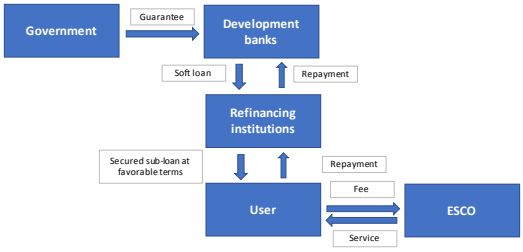


Figure 4. Development Finance ESCO Model

Development Finance ESCO Model

The Development Finance ESCO Model can be incorporated in all previous models. This model has significant advantage before the other models in its Grant element. All cases analyzed for this model were at the basis the model that was least promising ones but with 20% grant in the calculations.

8 Improvement of the Envelope and Preparation of Domestic Hot Water in Residential Building

8.1 Description of the Measures

The measures include complete renovation of the building envelope including preparation of domestic hot water with solar thermal collectors.

External walls - The building had 5cm of insulation in a cavity wall construction. Still, several major thermal bridges were detected, so additional 5cm insulation material (EPS) will be installed.

U_{old} = 0,57 W/m^{2}K U_{new} = 0,27 W/m^{2}K

Flat Roof - The building also has 5 cm of mineral wool on the roof. But the insulation material is positioned between wooden beams with 10cm thickness and they react as a thermal bridge. Additional 5 cm of mineral wool above the beams will remove the thermal bridges.

Tilted Roof – Installation of suspended ceiling with 10cm mineral wool.

U_{old} = 0.39 W/m^{2}K U_{new} = 0.25 W/m^{2}K

U_{old} = 0.35 W/m^{2}K U_{new} = 0.17 W/m^{2}K

Windows – The building has double frame wooden windows with double glazing. The new windows will be PVC frames and triple glazing.

U_{old} = 2.65 W/m^{2}K U_{new} = 1.85 W/m^{2}K

Domestic Hot Water – no existing system for central preparation of hot water. It is planned to be installed 3 solar thermal collectors with 150l tank.

8.2 Energy Calculations

The basic energy data is:

Energy consumption before measures:	59405 kWh/yr
Total energy savings:	12085 kWh/yr
Energy price – heating energy:	6.6 MKD/kWh
Energy price – electricity	6.6 MKD/kWh

The heating is using electricity as energy source.

8.3 Profitability Calculations

Name	Residential Envelope + DHW	
Total Investment	418476	MKD
Annual Savings	79762	MKD
Annual O&M Cost	1417	MKD
Net Savings	78345	MKD
Economic Lifetime	20	yr
Maximum Pay-Off	20	yr

Payback	5,34	yr
Pay-off		yr
Internal Rate of Return	17,9%	
Net Present Value	836181	
Net Present Value Quotient	2,00	
Maximum Investment	1254657	

Figure 5. Profitability calculations - input data and results

The profitability calculations show that this project is economically feasible and it is worth to be considered for financing. The payback period is relatively short and the internal rate of return and net present value quotient are highly motivating.

8.4 Cashflow input data

Economic Conditions		
Alternative Name	Residential Envelope + DHW	
Cashflow Period	20	yr
Equity Capital	125543	MKD
Grant	0	MKD
Total Loan	292933	MKD
Annual Savings	79762	MKD
Annual O&M	1417	MKD
Annual ESCO costs	0	MKD
Net Savings	78345	MKD
Inflation Rate	1,5%	

Loan Conditions		
Loan From	Bank 1	
Ammount	292933	MKD
Interest	6%	
Years	10	yr
Term	1 month	month/yr
Grace Period	0	month/yr
Total Investment	418476	MKD

6. *Figure 6. Cashflow input data*

8.5 Shared Savings Model

8.5.1 Cashflow Calculations

The following table shows the financial data for the period of 20 years, considering the specific model requirements and indicators.

Table 2. Cashflow

Cashflow Shared Savings								
Yr	Savings	O&M	ESCO cost	Net Savings	Loan	Shared Savings	Net Cashflow	Accumulating cashflow
0	0,00	0,00	0,00	0,00	0,00	0,00	-125.542,80	-125.542,80
1	79.762,00	1.417,00	0,00	78.345,00	39.800,24	54.841,50	15.041,26	-110.501,54
2	80.958,43	1.438,26	0,00	79.520,18	39.800,24	55.664,12	15.863,89	-94.637,65

3	82.172,81	1.459,83	0,00	80.712,98	39.800,24	56.499,08	16.698,85	-77.938,80
4	83.405,40	1.481,73	0,00	81.923,67	39.800,24	57.346,57	17.546,33	-60.392,47
5	84.656,48	1.503,95	0,00	83.152,53	39.800,24	58.206,77	18.406,53	-41.985,93
6	85.926,33	1.526,51	0,00	84.399,82	39.800,24	59.079,87	19.279,63	-22.706,30
7	87.215,22	1.549,41	0,00	85.665,81	39.800,24	59.966,07	20.165,83	-2.540,46
8	88.523,45	1.572,65	0,00	86.950,80	39.800,24	60.865,56	21.065,32	18.524,86
9	89.851,30	1.596,24	0,00	88.255,06	39.800,24	61.778,54	21.978,31	40.503,17
10	91.199,07	1.620,18	0,00	89.578,89	39.800,24	62.705,22	22.904,99	63.408,15
11	92.567,06	1.644,49	0,00	90.922,57	0,00	45.461,29	45.461,29	108.869,44
12	93.955,56	1.669,15	0,00	92.286,41	0,00	46.143,20	46.143,20	155.012,64
13	95.364,90	1.694,19	0,00	93.670,71	0,00	46.835,35	46.835,35	201.848,00
14	96.795,37	1.719,60	0,00	95.075,77	0,00	47.537,88	47.537,88	249.385,88
15	98.247,30	1.745,40	0,00	96.501,90	0,00	48.250,95	48.250,95	297.636,83
16	99.721,01	1.771,58	0,00	97.949,43	0,00	48.974,72	48.974,72	346.611,55
17	101.216,83	1.798,15	0,00	99.418,67	0,00	49.709,34	49.709,34	396.320,88
18	102.735,08	1.825,12	0,00	100.909,95	0,00	50.454,98	50.454,98	446.775,86
19	104.276,10	1.852,50	0,00	102.423,60	0,00	51.211,80	51.211,80	497.987,66
20	105.840,25	1.880,29	0,00	103.959,96	0,00	51.979,98	51.979,98	549.967,64
Total	**1.844.389,94**	**32.766,24**	**0,00**	**1.811.623,70**	**398.002,36**		**549.967,64**	

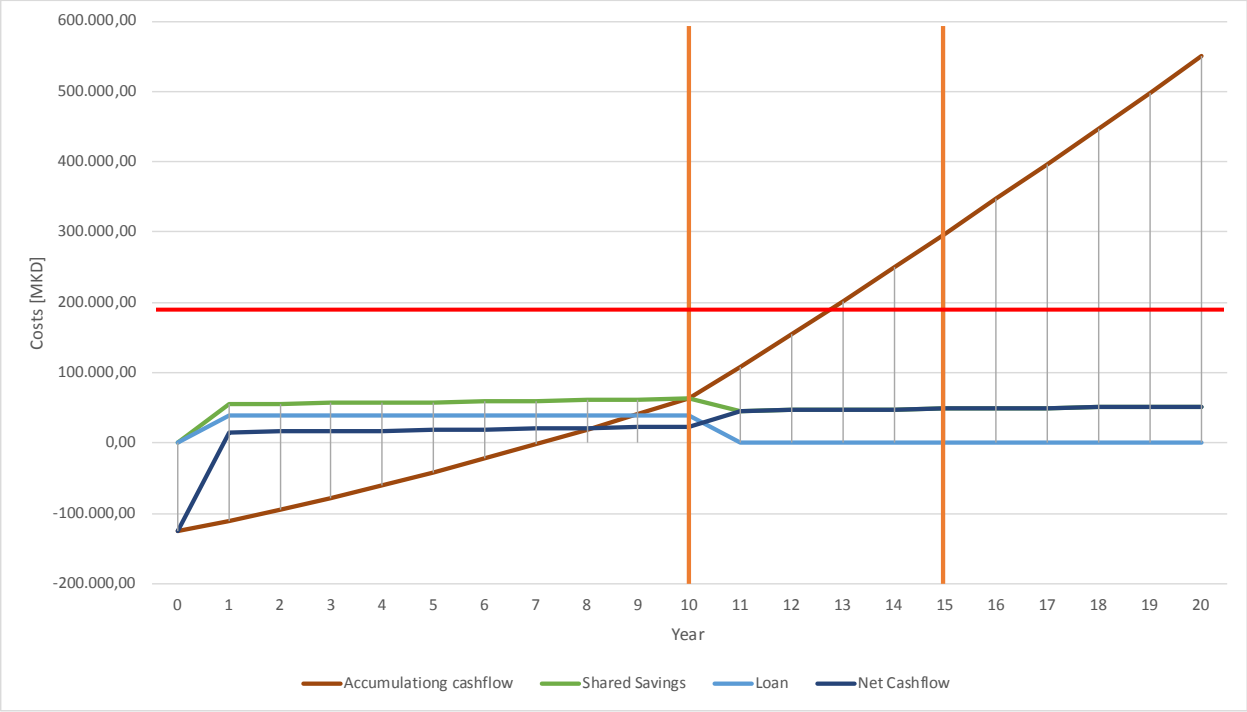


Figure 7. Cashflow chart

According to the above table and chart for the cashflow in the case of shared savings ESCO model, this project has significant potential.

The chart shows that the payoff for the project is in the 8th year and at the end of the 3 durations of the contracts (10, 15 and 20 years), the project will be with positive balance.

The vertical red lines of the chart show the results in the case of 10, 15 and 20-year contract between the user and the ESCO. The red horizontal line shows the defined baseline as explained in the methodology. According to this chart, even though the project has relatively small payback period, and even though after 10 years the project is positive in financial terms, the profit is significantly below the determined baseline. That is not the case if the contract length is longer – 15 or 20 years.

8.5.2 Sensitivity Analysis

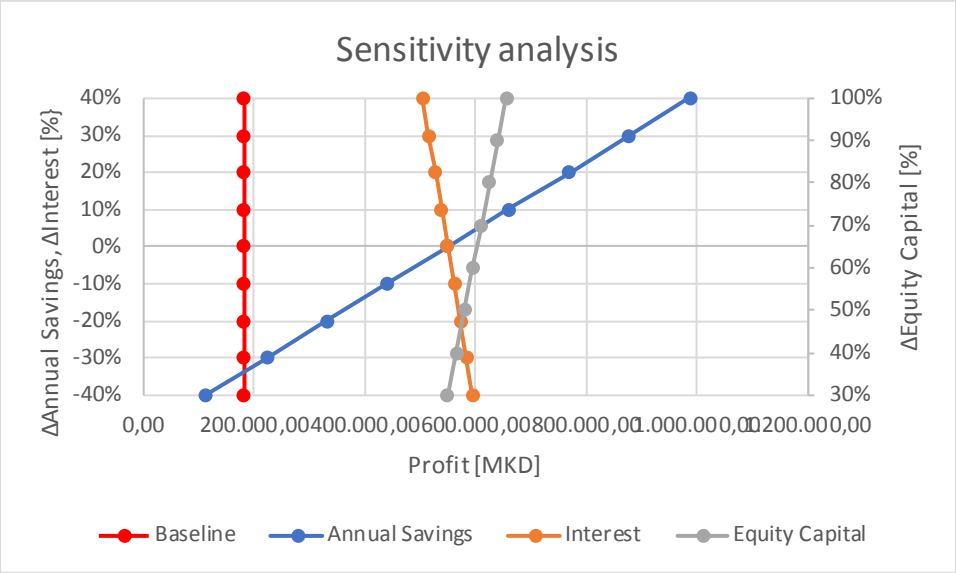


Figure 8. Sensitivity analysis for the Shared Savings Model

The sensitivity analysis only backs up the promising data from the cashflow calculations. It can be seen that only in extreme cases of deviations in the annual savings framework element, the project goes beyond the set baseline. That case can only be achieved if the technology underperforms and the energy price is significantly lowered (cca -35% from the current price).

8.6 Guaranteed Savings Model

8.6.1 Cashflow Calculations

The following table shows the financial data for the period of 20 years, considering the specific model requirements and indicators.

Table 3. Cashflow

Cashflow Guaranteed Savings										
Year	Savings	O&M	Esco cost	Net Savings	Loan	User Savings	User Cashflow	ESCO Cashflow	Net Cashflow	Accumulationg cashflow
0	0,00	0,00	0,00	0,00	0,00				-125.542,80	-125.542,80
1	79.762,00	1.417,00	0,00	78.345,00	39.800,24	54.841,50	15.041,26	23.503,50	23.503,50	-102.039,30
2	80.958,43	1.438,26	0,00	79.520,18	39.800,24	55.664,12	15.863,89	23.856,05	23.856,05	-78.183,25
3	82.172,81	1.459,83	0,00	80.712,98	39.800,24	56.499,08	16.698,85	24.213,89	24.213,89	-53.969,35
4	83.405,40	1.481,73	0,00	81.923,67	39.800,24	57.346,57	17.546,33	24.577,10	24.577,10	-29.392,25
5	84.656,48	1.503,95	0,00	83.152,53	39.800,24	58.206,77	18.406,53	24.945,76	24.945,76	-4.446,49
6	85.926,33	1.526,51	0,00	84.399,82	39.800,24	59.079,87	19.279,63	25.319,94	25.319,94	20.873,45
7	87.215,22	1.549,41	0,00	85.665,81	39.800,24	59.966,07	20.165,83	25.699,74	25.699,74	46.573,19
8	88.523,45	1.572,65	0,00	86.950,80	39.800,24	60.865,56	21.065,32	26.085,24	26.085,24	72.658,43
9	89.851,30	1.596,24	0,00	88.255,06	39.800,24	61.778,54	21.978,31	26.476,52	26.476,52	99.134,95
10	91.199,07	1.620,18	0,00	89.578,89	39.800,24	62.705,22	22.904,99	26.873,67	26.873,67	126.008,62
11	92.567,06	1.644,49	0,00	90.922,57	0,00	45.461,29	45.461,29	45.461,29	45.461,29	171.469,90
12	93.955,56	1.669,15	0,00	92.286,41	0,00	46.143,20	46.143,20	46.143,20	46.143,20	217.613,11
13	95.364,90	1.694,19	0,00	93.670,71	0,00	46.835,35	46.835,35	46.835,35	46.835,35	264.448,46
14	96.795,37	1.719,60	0,00	95.075,77	0,00	47.537,88	47.537,88	47.537,88	47.537,88	311.986,34
15	98.247,30	1.745,40	0,00	96.501,90	0,00	48.250,95	48.250,95	48.250,95	48.250,95	360.237,30
16	99.721,01	1.771,58	0,00	97.949,43	0,00	48.974,72	48.974,72	48.974,72	48.974,72	409.212,01
17	101.216,83	1.798,15	0,00	99.418,67	0,00	49.709,34	49.709,34	49.709,34	49.709,34	458.921,35
18	102.735,08	1.825,12	0,00	100.909,95	0,00	50.454,98	50.454,98	50.454,98	50.454,98	509.376,32
19	104.276,10	1.852,50	0,00	102.423,60	0,00	51.211,80	51.211,80	51.211,80	51.211,80	560.588,13
20	105.840,25	1.880,29	0,00	103.959,96	0,00	51.979,98	51.979,98	51.979,98	51.979,98	612.568,10
Total	**1.844.389,94**	**32.766,24**	**0,00**	**1.811.623,70**	**398.002,36**		**675.510,44**	**738.110,90**	**612.568,10**	

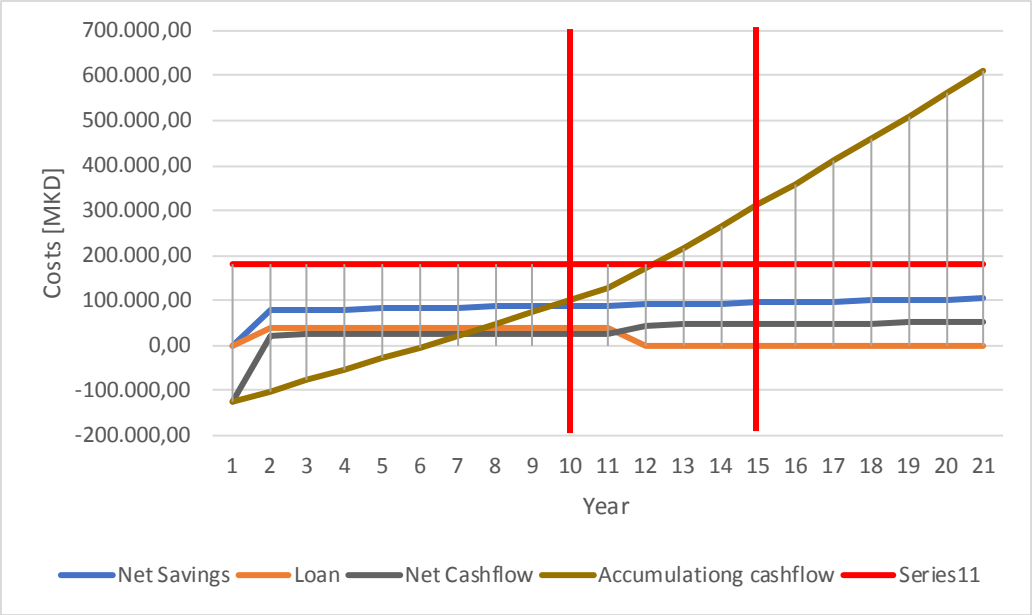


Figure 9. Cashflow chart

According to the above table and chart for the cashflow in the case of guaranteed savings ESCO model, this project has significant potential.

The chart shows that the payoff for the project is in the 6th year and at the end of the 3 durations of the contracts (10, 15 and 20 years), the project will be with positive balance.

The vertical red lines of the chart show the results in the case of 10, 15 and 20-year contract between the user and the ESCO. The red horizontal line shows the defined baseline as explained in the methodology. According to this chart, even though the project has relatively small payback period, and even though after 10 years the project is positive in financial terms, the profit is significantly below the determined baseline. That is not the case if the contract length is longer – 15 or 20 years, since the accumulating cashflow passes the baseline after the 12th year.

8.6.2 Sensitivity Analysis

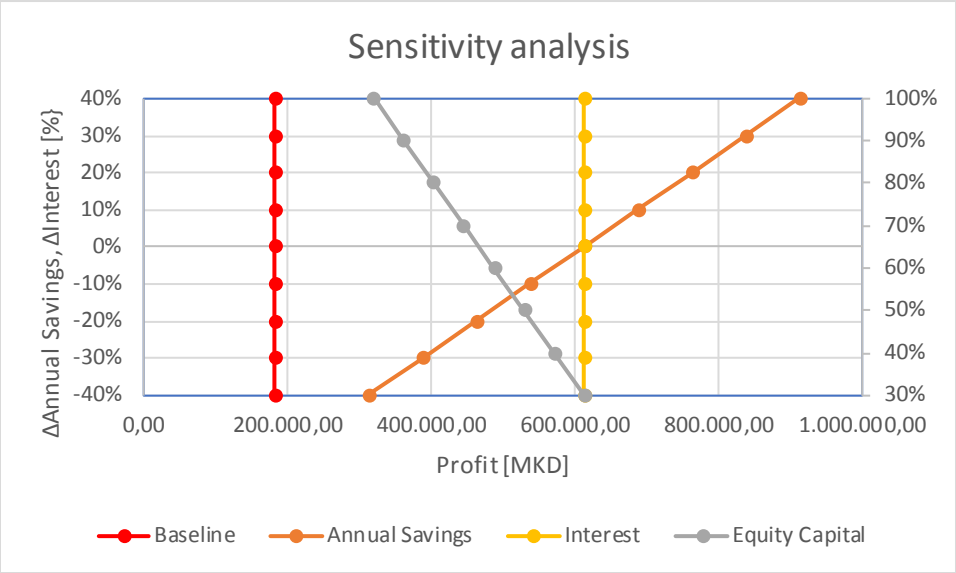


Figure 10. Sensitivity analysis for the Shared Savings Model

The sensitivity analysis only backs up the promising data from the cashflow calculations. Since the payment is on the side of the user, it can be noted that the interest rate does not have any influence on the ESCO side. Also, due to the same reason, increasing the equity capital has negative effect, but does not influence significantly the outcome of the investment.

8.7 ESCO Supplier Model

8.7.1 Input data

This model is completely different compared to the previous models. The input data about the annual savings is calculated considering the following input data:

ESCO Provider data		
Electricity consumption	59405	kWh/yr
Electricity Cost	392073	MKD/yr
Electricity Price	6,6	MKD/kWh
Electricity Savings	12085	MKD/yr
Electricity Consumption After	47320	kWh/yr
Electricity Price After Measur	8,25	MKD/kWh
Electricity Cost After Measure	390390	MKD/yr
Consumer Savings After Meas	1683	MKD/yr
ESCO Savings After Measures	78078	MKD/yr

Figure 11. ESCO as Supplier input data

8.7.2 Cashflow Calculations

The following table shows the financial data for the period of 20 years, considering the specific model requirements and indicators.

Table 4. Cashflow

Cashflow Guaranteed Savings										
	Costumer Side				Esco Side					
Year	Savings	Loan	Net Savings	Accumulating cashflow	Savings	O&M	Net Savings	Loan	Net Cashflow	Accumulationg cashflow
0	0,00	0,00	0,00	0,00	0,00	0,00			-125.542,80	-125.542,80
1	1.683,00	0,00	1.683,00	1.683,00	78.078,00	1.417,00	76.661,00	39.800,24	36.860,76	-88.682,04
2	1.708,25	0,00	1.708,25	3.391,25	79.249,17	1.438,26	77.810,92	39.800,24	38.010,68	-50.671,36
3	1.733,87	0,00	1.733,87	5.125,11	80.437,91	1.459,83	78.978,08	39.800,24	39.177,84	-11.493,51
4	1.759,88	0,00	1.759,88	6.884,99	81.644,48	1.481,73	80.162,75	39.800,24	40.362,51	28.869,00
5	1.786,27	0,00	1.786,27	8.671,27	82.869,14	1.503,95	81.365,19	39.800,24	41.564,96	70.433,96
6	1.813,07	0,00	1.813,07	10.484,33	84.112,18	1.526,51	82.585,67	39.800,24	42.785,43	113.219,39
7	1.840,27	0,00	1.840,27	12.324,60	85.373,86	1.549,41	83.824,45	39.800,24	44.024,22	157.243,61
8	1.867,87	0,00	1.867,87	14.192,47	86.654,47	1.572,65	85.081,82	39.800,24	45.281,59	202.525,19
9	1.895,89	0,00	1.895,89	16.088,36	87.954,29	1.596,24	86.358,05	39.800,24	46.557,81	249.083,00
10	1.924,33	0,00	1.924,33	18.012,68	89.273,60	1.620,18	87.653,42	39.800,24	47.853,18	296.936,19
11	1.953,19	0,00	1.953,19	19.965,87	90.612,71	1.644,49	88.968,22	0,00	88.968,22	385.904,41
12	1.982,49	0,00	1.982,49	21.948,36	91.971,90	1.669,15	90.302,74	0,00	90.302,74	476.207,15
13	2.012,23	0,00	2.012,23	23.960,58	93.351,48	1.694,19	91.657,28	0,00	91.657,28	567.864,44
14	2.042,41	0,00	2.042,41	26.002,99	94.751,75	1.719,60	93.032,14	0,00	93.032,14	660.896,58
15	2.073,04	0,00	2.073,04	28.076,04	96.173,02	1.745,40	94.427,63	0,00	94.427,63	755.324,21
16	2.104,14	0,00	2.104,14	30.180,18	97.615,62	1.771,58	95.844,04	0,00	95.844,04	851.168,25
17	2.135,70	0,00	2.135,70	32.315,88	99.079,85	1.798,15	97.281,70	0,00	97.281,70	948.449,95
18	2.167,74	0,00	2.167,74	34.483,62	100.566,05	1.825,12	98.740,93	0,00	98.740,93	1.047.190,87
19	2.200,25	0,00	2.200,25	36.683,87	102.074,54	1.852,50	100.222,04	0,00	100.222,04	1.147.412,91
20	2.233,26	0,00	2.233,26	38.917,13	103.605,66	1.880,29	101.725,37	0,00	101.725,37	1.249.138,29
Total	**38.917,13**	**0,00**	**38.917,13**		**1.805.449,68**	**32.766,24**	**1.772.683,44**	**398.002,36**	**1.249.138,29**	

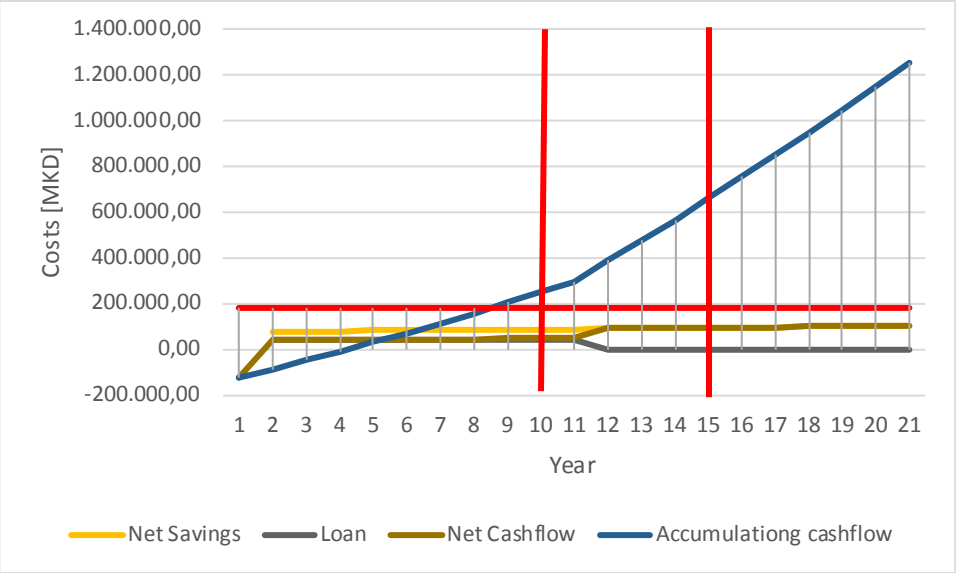


Figure 12. Cashflow chart

According to the above table and chart for the cashflow in the case of ESCO as a supplier model, this project has the best potential compared to the other models.

The chart shows that the payoff for the project is in the 4th year and at the end of the 3 durations of the contracts (10, 15 and 20 years), the project will be with positive balance.

The vertical red lines of the chart show the results in the case of 10, 15 and 20-year contract between the user and the ESCO. The red horizontal line shows the defined baseline as explained in the methodology. According to this chart, all project durations are acceptable for the ESCO side of the model. Also, the profits from the project is highest in this model compared to the other models.

The user benefits, as it can be seen in the table above, are positive, but not very significant. Considering that this case is about single family house, the users benefits are acceptable.

8.7.3 Sensitivity Analysis

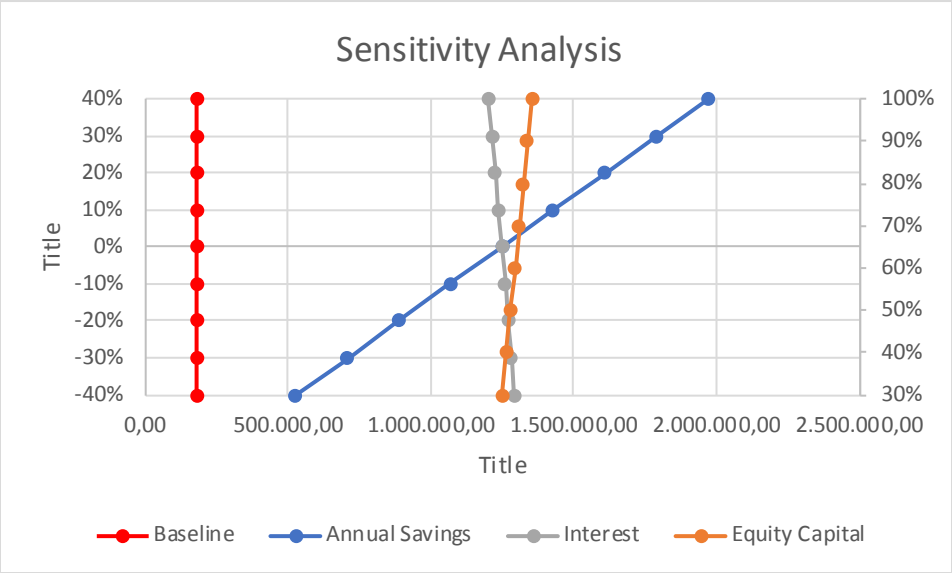


Figure 13. Sensitivity analysis for the Shared Savings Model

The sensitivity analysis only backs up the promising data from the cashflow calculations. It can be seen that the equity capital has slight positive influence when it is ascending, while the interest rate has slight negative influence. The influence is small and can be ignored.

8.8 Development Finance ESCO Model

8.8.1 Cashflow Calculations

The following table shows the financial data for the period of 20 years, considering the specific model requirements and indicators.

Table 5. Cashflow

Cashflow Guaranteed Savings									
Year	Savings	O&M	Esco cost	Net Savings	Loan	User Savings	ESCO Cashflow	Net Cashflow	Accumulationg cashflow
0	0,00	0,00	0,00	0,00	0,00			-100.434,24	-100.434,24
1	79.762,00	1.417,00	0,00	78.345,00	31.840,19	54.841,50	23.503,50	23.001,31	-76.930,74
2	80.958,43	1.438,26	0,00	79.520,18	31.840,19	55.664,12	23.856,05	23.823,93	-53.074,69
3	82.172,81	1.459,83	0,00	80.712,98	31.840,19	56.499,08	24.213,89	24.658,90	-28.860,79
4	83.405,40	1.481,73	0,00	81.923,67	31.840,19	57.346,57	24.577,10	25.506,38	-4.283,69
5	84.656,48	1.503,95	0,00	83.152,53	31.840,19	58.206,77	24.945,76	26.366,58	20.662,07
6	85.926,33	1.526,51	0,00	84.399,82	31.840,19	59.079,87	25.319,94	27.239,68	45.982,01

7	87.215,22	1.549,41	0,00	85.665,81	31.840,19	59.966,07	25.699,74	28.125,88	71.681,75
8	88.523,45	1.572,65	0,00	86.950,80	31.840,19	60.865,56	26.085,24	29.025,37	97.766,99
9	89.851,30	1.596,24	0,00	88.255,06	31.840,19	61.778,54	26.476,52	29.938,35	124.243,51
10	91.199,07	1.620,18	0,00	89.578,89	31.840,19	62.705,22	26.873,67	30.865,03	151.117,18
11	92.567,06	1.644,49	0,00	90.922,57		45.461,29	45.461,29	45.461,29	196.578,46
12	93.955,56	1.669,15	0,00	92.286,41		46.143,20	46.143,20	46.143,20	242.721,67
13	95.364,90	1.694,19	0,00	93.670,71		46.835,35	46.835,35	46.835,35	289.557,02
14	96.795,37	1.719,60	0,00	95.075,77		47.537,88	47.537,88	47.537,88	337.094,90
15	98.247,30	1.745,40	0,00	96.501,90		48.250,95	48.250,95	48.250,95	385.345,86
16	99.721,01	1.771,58	0,00	97.949,43		48.974,72	48.974,72	48.974,72	434.320,57
17	101.216,83	1.798,15	0,00	99.418,67		49.709,34	49.709,34	49.709,34	484.029,91
18	102.735,08	1.825,12	0,00	100.909,95		50.454,98	50.454,98	50.454,98	534.484,88
19	104.276,10	1.852,50	0,00	102.423,60		51.211,80	51.211,80	51.211,80	585.696,69
20	105.840,25	1.880,29	0,00	103.959,96		51.979,98	51.979,98	51.979,98	637.676,66
Total	**1.844.389,94**	**32.766,24**	**0,00**	**1.811.623,70**	**318.401,89**		**738.110,90**	**654.676,67**	

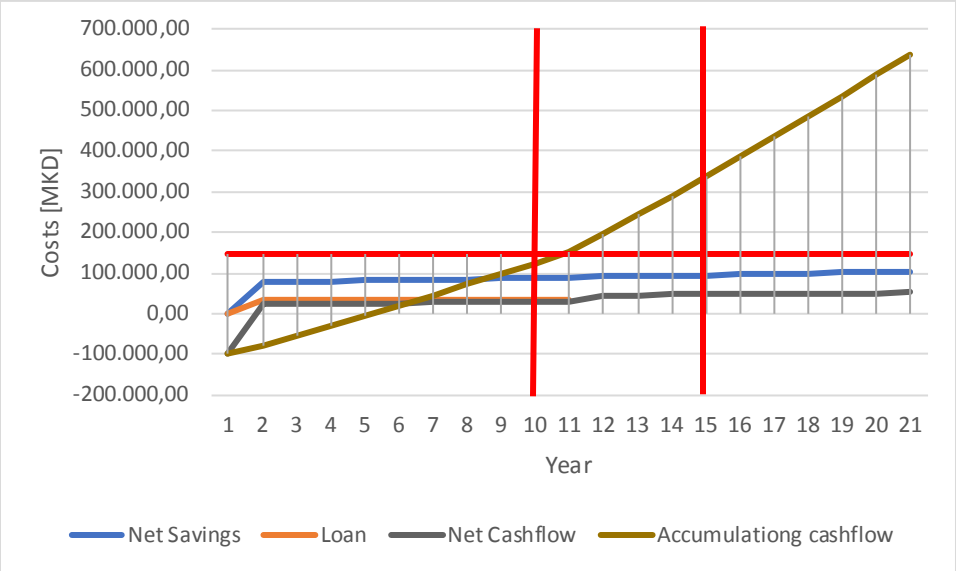


Figure 14. Cashflow chart

According to the above table and chart for the cashflow in the case of development finance ESCO model, this project has significant potential.

The chart shows that the payoff for the project is in the 5^{h} year and at the end of the 3 durations of the contracts (10, 15 and 20 years), the project will be with positive balance.

The conclusions are similar to the ones in the Guaranteed Savings Model (which is taken as a basis for this model), but with slight improvements of the results as it is shown below.

The vertical red lines of the chart show the results in the case of 10, 15 and 20-year contract between the user and the ESCO. The red horizontal line shows the defined baseline as explained in the methodology. According to this chart, even though the project has relatively small payback period, and even though after 10 years the project is positive in financial terms, the profit is significantly below the determined baseline. That is not the case if the contract length is longer – 15 or 20 years, since the accumulating cashflow passes the baseline after the 11th year.

8.8.2 Sensitivity Analysis

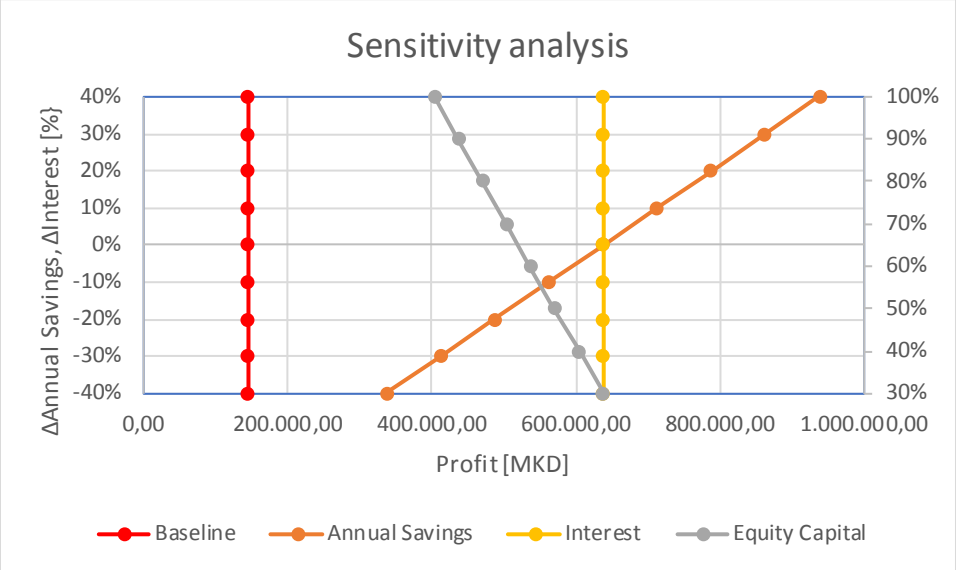


Figure 15. Sensitivity analysis for the Shared Savings Model

The sensitivity analysis only backs up the promising data from the cashflow calculations. Since the payment is on the side of the user, it can be noted that the interest rate does not have any influence on the ESCO side. Also, due to the same reason, increasing the equity capital has negative effect, but does not influence significantly the outcome of the investment.

8.9 Conclusions

The above analysis shows that in this concrete case, all four models can be successfully implemented in Macedonia.

Still, the most promising case is the ESCO as Supplier model, with almost double the profit from the other three models. This model from the aspect of the legislation is the hardest to be implemented in the residential buildings sector, but in near future, it is intended that this will be changed, and that is the reason to be included in this case study also.

9 Improvement of the Envelope and Heating Control in School / Public Building

9.1 Description of the Measures

The measures includes renovation of the building envelope including installation of heating control in public / school building.

External walls - The building has no thermal insulation. Also, several major thermal bridges were detected, so additional 10cm insulation material (EPS) will be installed.

U_{old} = 1.70 W/m^{2}K U_{new} = 0,33 W/m^{2}K

Installing heating control system for the boiler – No existing heating control system. The solution will follow the indoor and external temperature to regulate the heating automatically.

This case study is very similar to the previous one, and the aim is to prove the validity of the data from the previous case study. Also, with this, the public buildings are included, as well as bigger buildings.

9.2 Energy Calculations

The basic energy data is:

Energy consumption before measures:	463961 kWh/yr
Total energy savings:	102346 kWh/yr
Energy price – heating energy:	9.33 MKD/kWh
Energy price – electricity	6.54 MKD/kWh

The heating is using light fuel oil as energy source.

9.3 Profitability Calculations

Name	School Envelope + Heating Control	
Total Investment	4541950	MKD
Annual Savings	669350	MKD
Annual O&M Cost	6693,5	MKD
Net Savings	662656,5	MKD
Economic Lifetime	20	yr
Maximum Pay-Off	20	yr

Payback	6,85	yr
Pay-off		yr
Internal Rate of Return	13,2%	
Net Present Value	6070169	
Net Present Value Quotient	1,34	
Maximum Investment	10612119	

Figure 16. Profitability calculations - input data and results

The profitability calculations show that this project is economically feasible and it is worth to be considered for financing. The payback period is relatively short and the internal rate of return and net present value quotient are highly motivating.

9.4 Cashflow input data

Alternative Name	School Envelope + Heating Control	
Cashflow Period	20	yr
Equity Capital	1362585	MKD
Grant	0	MKD
Total Loan	3179365	MKD
Annual Savings	669350	MKD
Annual O&M	6693,5	MKD
Annual ESCO costs	0	MKD
Net Savings	662656,5	MKD
Inflation Rate	1,5%	

Loan From	Bank 1	
Ammount	3179365	MKD
Interest	6%	
Years	10	yr
Term	1 month	month/yr
Grace Period	0	month/yr
Total Investment	4541950	MKD

7. *Figure 17. Cashflow input data*

9.5 Shared Savings Model

9.5.1 Cashflow Calculations

The following table shows the financial data for the period of 20 years, considering the specific model requirements and indicators.

Table 6. Cashflow

Cashflow Shared Savings								
Year	Savings	O&M	Esco cost	Net Savings	Loan	Shared Savings	Net Cashflow	Accumulationg cashflow
0	0,00	0,00	0,00	0,00	0,00		-1.362.585,00	-1.362.585,00
1	669.350,00	6.693,50	0,00	662.656,50	431.973,83	463.859,55	31.885,72	-1.330.699,28
2	679.390,25	6.793,90	0,00	672.596,35	431.973,83	470.817,44	38.843,61	-1.291.855,67
3	689.581,10	6.895,81	0,00	682.685,29	431.973,83	477.879,70	45.905,87	-1.245.949,79
4	699.924,82	6.999,25	0,00	692.925,57	431.973,83	485.047,90	53.074,07	-1.192.875,73
5	710.423,69	7.104,24	0,00	703.319,46	431.973,83	492.323,62	60.349,79	-1.132.525,94
6	721.080,05	7.210,80	0,00	713.869,25	431.973,83	499.708,47	67.734,64	-1.064.791,30
7	731.896,25	7.318,96	0,00	724.577,29	431.973,83	507.204,10	75.230,27	-989.561,03
8	742.874,69	7.428,75	0,00	735.445,95	431.973,83	514.812,16	82.838,33	-906.722,69
9	754.017,81	7.540,18	0,00	746.477,63	431.973,83	522.534,34	90.560,51	-816.162,18
10	765.328,08	7.653,28	0,00	757.674,80	431.973,83	530.372,36	98.398,53	-717.763,65
11	776.808,00	7.768,08	0,00	769.039,92		538.327,94	538.327,94	-179.435,71
12	788.460,12	7.884,60	0,00	780.575,52		546.402,86	546.402,86	366.967,16
13	800.287,02	8.002,87	0,00	792.284,15		554.598,91	554.598,91	921.566,06
14	812.291,33	8.122,91	0,00	804.168,42		562.917,89	562.917,89	1.484.483,95
15	824.475,70	8.244,76	0,00	816.230,94		571.361,66	571.361,66	2.055.845,61
16	836.842,83	8.368,43	0,00	828.474,41		579.932,08	579.932,08	2.635.777,70
17	849.395,48	8.493,95	0,00	840.901,52		588.631,07	588.631,07	3.224.408,76
18	862.136,41	8.621,36	0,00	853.515,04		597.460,53	597.460,53	3.821.869,29
19	875.068,45	8.750,68	0,00	866.317,77		606.422,44	606.422,44	4.428.291,73
20	888.194,48	8.881,94	0,00	879.312,54		615.518,78	615.518,78	5.043.810,51
Total	**15.477.826,58**	**154.778,27**	**0,00**	**15.323.048,31**	**4.319.738,31**		**5.043.810,51**	

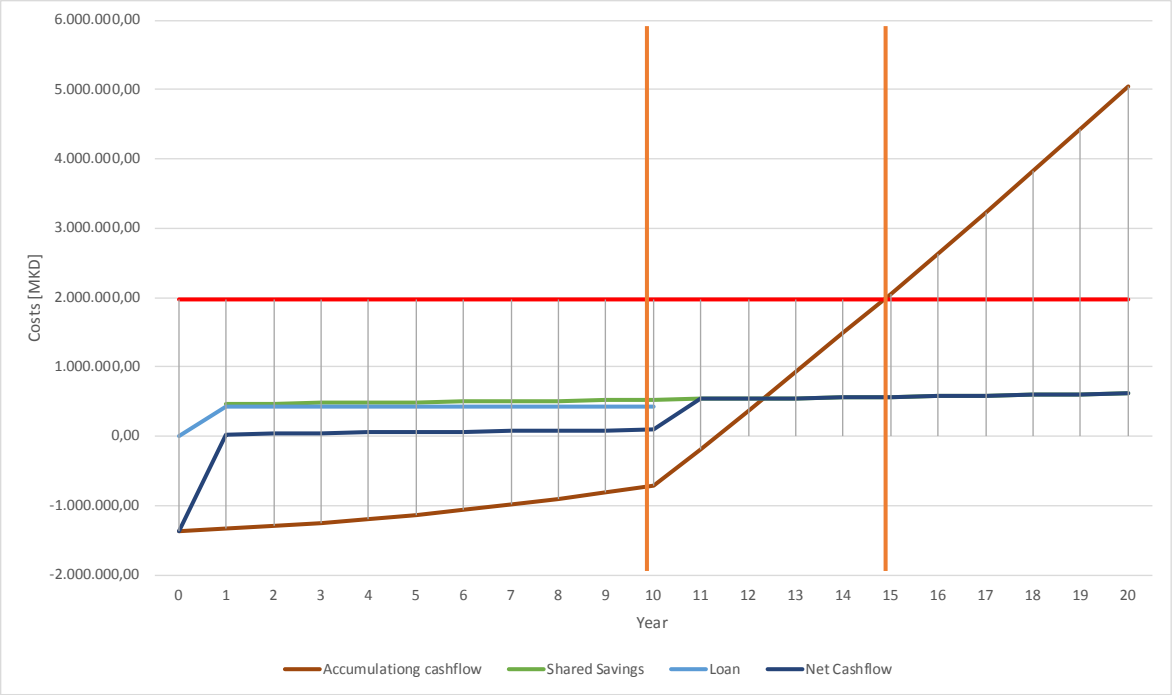


Figure 18. Cashflow chart

According to the above table and chart for the cashflow in the case of shared savings ESCO model, this project has significant potential.

The chart shows that the payoff for the project is in the 12th year and at the end of the 2 durations of the contracts (15 and 20 years), the project will be with positive balance.

The vertical red lines of the chart show the results in the case of 10, 15 and 20-year contract between the user and the ESCO. The red horizontal line shows the defined baseline as explained in the methodology. According to this chart, even though the project has relatively small payback period, and after 10 years the project is negative in financial terms and the profit is significantly below the determined baseline. That is not the case if the contract length is longer 15 or 20 years. The figure and the table shows that after 15 years, the project is slightly above the determined baseline.

9.5.2 Sensitivity Analysis

i.

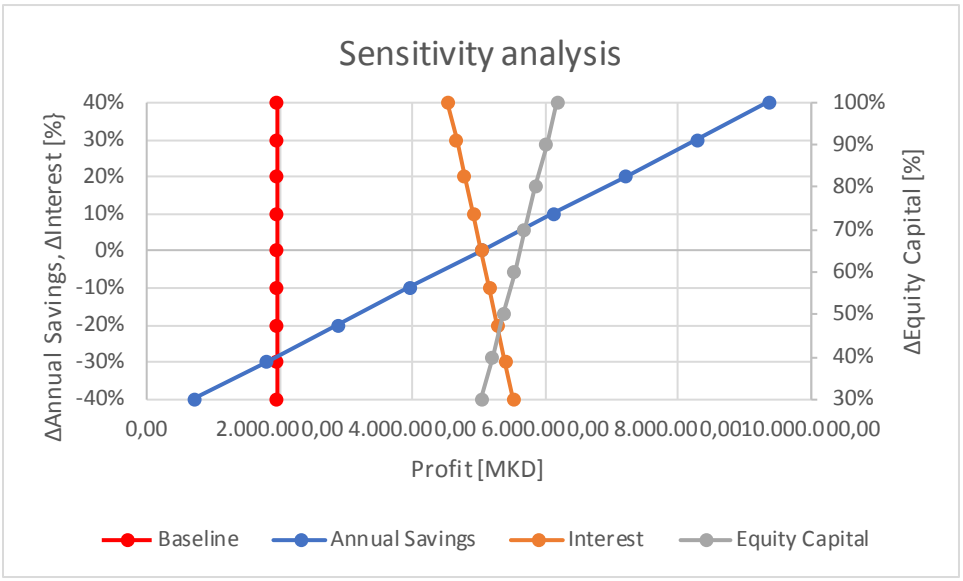


Figure 19. Sensitivity analysis for the Shared Savings Model

The sensitivity analysis only backs up the promising data from the cashflow calculations. It can be seen that only in extreme cases of deviations in the annual savings framework element, the project goes beyond the set baseline. That case can only be achieved if the technology underperforms and the energy price is significantly lowered (cca 350% from the current price). This conclusion is similar to the previous case study.

9.6 Guaranteed Savings Model

9.6.1 Cashflow Calculations

The following table shows the financial data for the period of 20 years, considering the specific model requirements and indicators.

Table 7. Cashflow

Cashflow Guaranteed Savings										
Year	Savings	O&M	Esco cost	Net Savings	Loan	User Savings	User Cashflow	ESCO Cashflow	Net Cashflow	Accumulationg cashflow
0	0,00	0,00	0,00	0,00	0,00				-1.362.585,00	-1.362.585,00
1	669.350,00	6.693,50	0,00	662.656,50	431.973,83	463.859,55	31.885,72	198.796,95	198.796,95	-1.163.788,05
2	679.390,25	6.793,90	0,00	672.596,35	431.973,83	470.817,44	38.843,61	201.778,90	201.778,90	-962.009,15
3	689.581,10	6.895,81	0,00	682.685,29	431.973,83	477.879,70	45.905,87	204.805,59	204.805,59	-757.203,56
4	699.924,82	6.999,25	0,00	692.925,57	431.973,83	485.047,90	53.074,07	207.877,67	207.877,67	-549.325,89
5	710.423,69	7.104,24	0,00	703.319,46	431.973,83	492.323,62	60.349,79	210.995,84	210.995,84	-338.330,05
6	721.080,05	7.210,80	0,00	713.869,25	431.973,83	499.708,47	67.734,64	214.160,77	214.160,77	-124.169,28
7	731.896,25	7.318,96	0,00	724.577,29	431.973,83	507.204,10	75.230,27	217.373,19	217.373,19	93.203,91
8	742.874,69	7.428,75	0,00	735.445,95	431.973,83	514.812,16	82.838,33	220.633,78	220.633,78	313.837,69
9	754.017,81	7.540,18	0,00	746.477,63	431.973,83	522.534,34	90.560,51	223.943,29	223.943,29	537.780,98
10	765.328,08	7.653,28	0,00	757.674,80	431.973,83	530.372,36	98.398,53	227.302,44	227.302,44	765.083,42
11	776.808,00	7.768,08	0,00	769.039,92	0,00	384.519,96	384.519,96	384.519,96	384.519,96	1.149.603,38
12	788.460,12	7.884,60	0,00	780.575,52	0,00	390.287,76	390.287,76	390.287,76	390.287,76	1.539.891,14
13	800.287,02	8.002,87	0,00	792.284,15	0,00	396.142,08	396.142,08	396.142,08	396.142,08	1.936.033,22
14	812.291,33	8.122,91	0,00	804.168,42	0,00	402.084,21	402.084,21	402.084,21	402.084,21	2.338.117,43
15	824.475,70	8.244,76	0,00	816.230,94	0,00	408.115,47	408.115,47	408.115,47	408.115,47	2.746.232,90
16	836.842,83	8.368,43	0,00	828.474,41	0,00	414.237,20	414.237,20	414.237,20	414.237,20	3.160.470,10
17	849.395,48	8.493,95	0,00	840.901,52	0,00	420.450,76	420.450,76	420.450,76	420.450,76	3.580.920,86
18	862.136,41	8.621,36	0,00	853.515,04	0,00	426.757,52	426.757,52	426.757,52	426.757,52	4.007.678,39
19	875.068,45	8.750,68	0,00	866.317,77	0,00	433.158,89	433.158,89	433.158,89	433.158,89	4.440.837,27
20	888.194,48	8.881,94	0,00	879.312,54	0,00	439.656,27	439.656,27	439.656,27	439.656,27	4.880.493,54
Total	**15.477.826,58**	**154.778,27**	**0,00**	**15.323.048,31**	**4.319.738,31**		**4.760.231,46**	**6.243.078,54**	**4.880.493,54**	

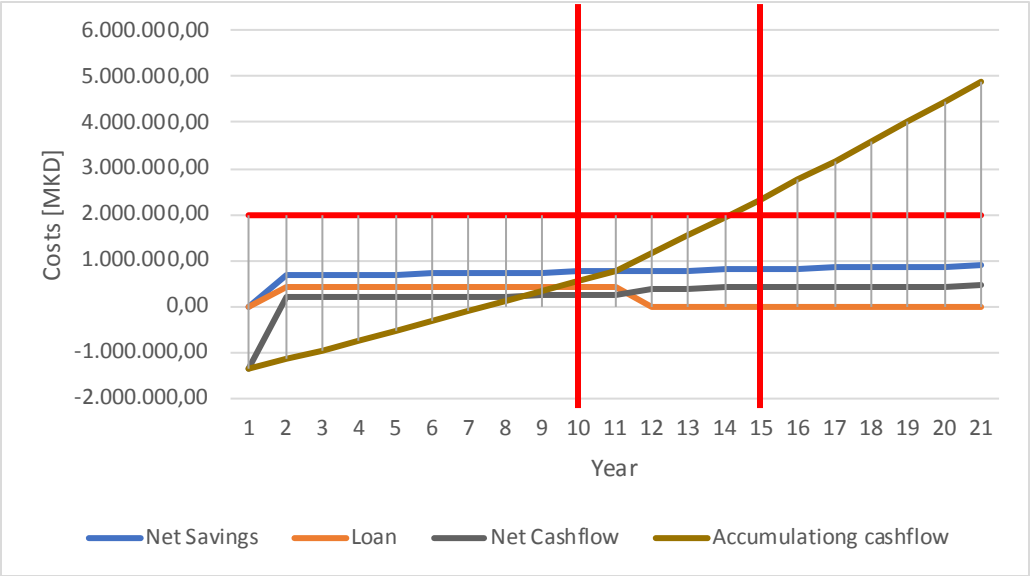


Figure 20. Cashflow chart

According to the above table and chart for the cashflow in the case of guaranteed savings ESCO model, this project has significant potential.

The chart shows that the payoff for the project is in the 7th year and at the end of the 3 durations of the contracts (10, 15 and 20 years), the project will be with positive balance.

The vertical red lines of the chart show the results in the case of 10, 15 and 20-year contract between the user and the ESCO. The red horizontal line shows the defined baseline as explained in the methodology. According to this chart, even though the project has relatively small payback period, and even though after 10 years the project is positive in financial terms, the profit is significantly below the determined baseline. That is not the case if the contract length is longer – 15 or 20 years, since the accumulating cashflow passes the baseline after the 14th year.

9.6.2 Sensitivity Analysis

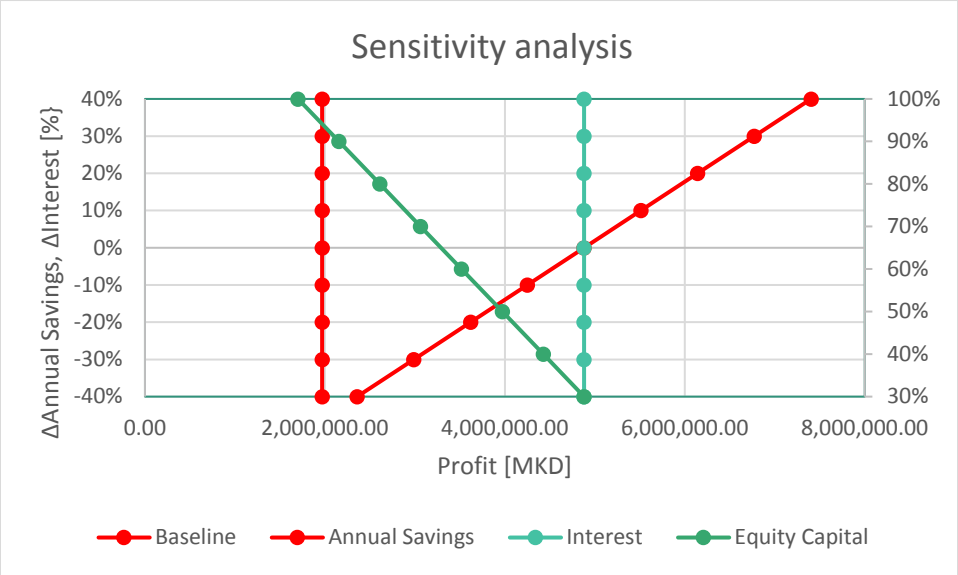


Figure 21. Sensitivity analysis for the Shared Savings Model

The sensitivity analysis only backs up the promising data from the cashflow calculations. Since the payment is on the side of the user, it can be noted that the interest rate does not have any influence on the ESCO side. Also, due to the same reason, increasing the equity capital has negative effect, but only the extreme cases makes the project pass the determined baseline (100% equity capital).

9.7 ESCO Supplier Model

9.7.1 Input data

This model is completely different compared to the previous models. The input data about the annual savings is calculated considering the following input data:

ESCO Provider data		
Electricity consumption	436961	kWh/yr
Electricity Cost	2857724,94	MKD/yr
Electricity Price	6,54	MKD/kWh
Electricity Savings	102346	MKD/yr
Electricity Consumption After	334615	kWh/yr
Electricity Price After Measur	8,175	MKD/kWh
Electricity Cost After Measure	2735477,625	MKD/yr
Consumer Savings After Meas	122247,315	MKD/yr
ESCO Savings After Measures	547095,525	MKD/yr

Figure 22. ESCO as Supplier input data

9.7.2 Cashflow Calculations

The following table shows the financial data for the period of 20 years, considering the specific model requirements and indicators.

Table 8. Cashflow

Cashflow Guaranteed Savings										
	Costumer Side				Esco Side					
Year	Savings	Loan	Net Savings	Accumulating cashflow	Savings	O&M	Net Savings	Loan	Net Cashflow	Accumulationg cashflow
0	0,00	0,00	0,00	0,00	0,00	0,00			-1.362.585,00	-1.362.585,00
1	122.247,31	0,00	122.247,31	122.247,31	547.095,53	6.693,50	540.402,03	431.973,83	108.428,19	-1.254.156,81
2	124.081,02	0,00	124.081,02	246.328,34	555.301,96	6.793,90	548.508,06	431.973,83	116.534,22	-1.137.622,58
3	125.942,24	0,00	125.942,24	372.270,58	563.631,49	6.895,81	556.735,68	431.973,83	124.761,85	-1.012.860,74
4	127.831,37	0,00	127.831,37	500.101,95	572.085,96	6.999,25	565.086,71	431.973,83	133.112,88	-879.747,86
5	129.748,84	0,00	129.748,84	629.850,80	580.667,25	7.104,24	573.563,01	431.973,83	141.589,18	-738.158,67
6	131.695,08	0,00	131.695,08	761.545,87	589.377,26	7.210,80	582.166,46	431.973,83	150.192,63	-587.966,05
7	133.670,50	0,00	133.670,50	895.216,38	598.217,92	7.318,96	590.898,95	431.973,83	158.925,12	-429.040,93
8	135.675,56	0,00	135.675,56	1.030.891,94	607.191,19	7.428,75	599.762,44	431.973,83	167.788,61	-261.252,32
9	137.710,69	0,00	137.710,69	1.168.602,63	616.299,05	7.540,18	608.758,87	431.973,83	176.785,04	-84.467,27
10	139.776,35	0,00	139.776,35	1.308.378,99	625.543,54	7.653,28	617.890,26	431.973,83	185.916,43	101.449,15
11	141.873,00	0,00	141.873,00	1.450.251,99	634.926,69	7.768,08	627.158,61	0,00	627.158,61	728.607,76
12	144.001,09	0,00	144.001,09	1.594.253,08	644.450,59	7.884,60	636.565,99	0,00	636.565,99	1.365.173,76
13	146.161,11	0,00	146.161,11	1.740.414,19	654.117,35	8.002,87	646.114,48	0,00	646.114,48	2.011.288,24
14	148.353,53	0,00	148.353,53	1.888.767,72	663.929,11	8.122,91	655.806,20	0,00	655.806,20	2.667.094,43
15	150.578,83	0,00	150.578,83	2.039.346,55	673.888,05	8.244,76	665.643,29	0,00	665.643,29	3.332.737,73
16	152.837,51	0,00	152.837,51	2.192.184,06	683.996,37	8.368,43	675.627,94	0,00	675.627,94	4.008.365,67
17	155.130,08	0,00	155.130,08	2.347.314,14	694.256,31	8.493,95	685.762,36	0,00	685.762,36	4.694.128,03
18	157.457,03	0,00	157.457,03	2.504.771,17	704.670,16	8.621,36	696.048,80	0,00	696.048,80	5.390.176,82
19	159.818,88	0,00	159.818,88	2.664.590,05	715.240,21	8.750,68	706.489,53	0,00	706.489,53	6.096.666,35
20	162.216,17	0,00	162.216,17	2.826.806,22	725.968,81	8.881,94	717.086,87	0,00	717.086,87	6.813.753,22
Total	**2.826.806,22**	**0,00**	**2.826.806,22**		**12.650.854,79**	**154.778,27**	**12.496.076,53**	**4.319.738,31**	**6.813.753,22**	

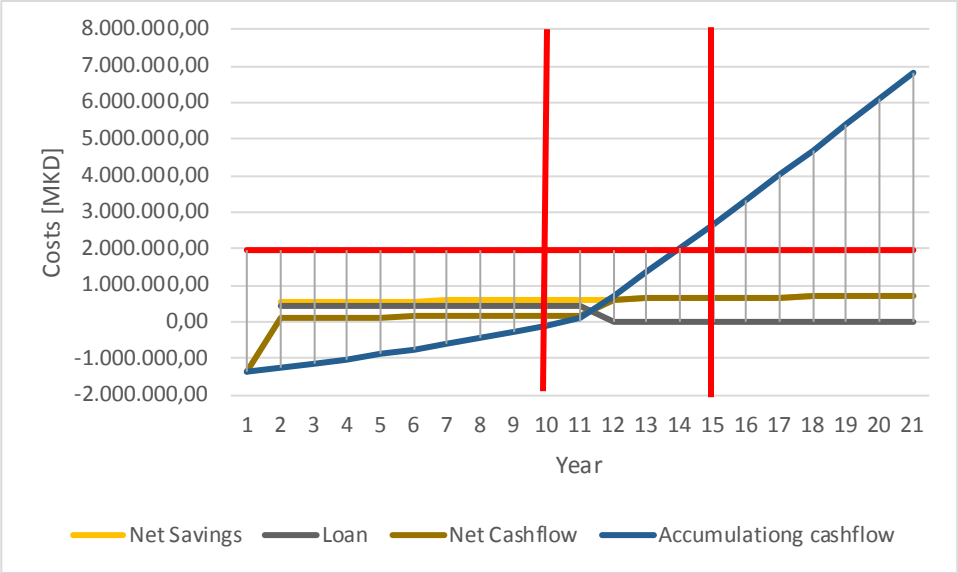


Figure 23. Cashflow chart

According to the above table and chart for the cashflow in the case of ESCO as a supplier model, this project has the best potential compared to the other models.

The chart shows that the payoff for the project is in the 10th year and at the end of the 3 durations of the contracts (10, 15 and 20 years), the project will be with positive balance.

The vertical red lines of the chart show the results in the case of 10, 15 and 20-year contract between the user and the ESCO. The red horizontal line shows the defined baseline as explained in the methodology.

The profit for the ESCO and the user highly depend on the arranged price of the energy including ESCO services. The price can be set higher than the one used in this case study, and then the potential of the project will be more motivating for the ESCO side, since higher prices are also showing positive results for the user. In order to compare the first two case studies, the presented price was chosen in this case.

9.7.3 Sensitivity Analysis

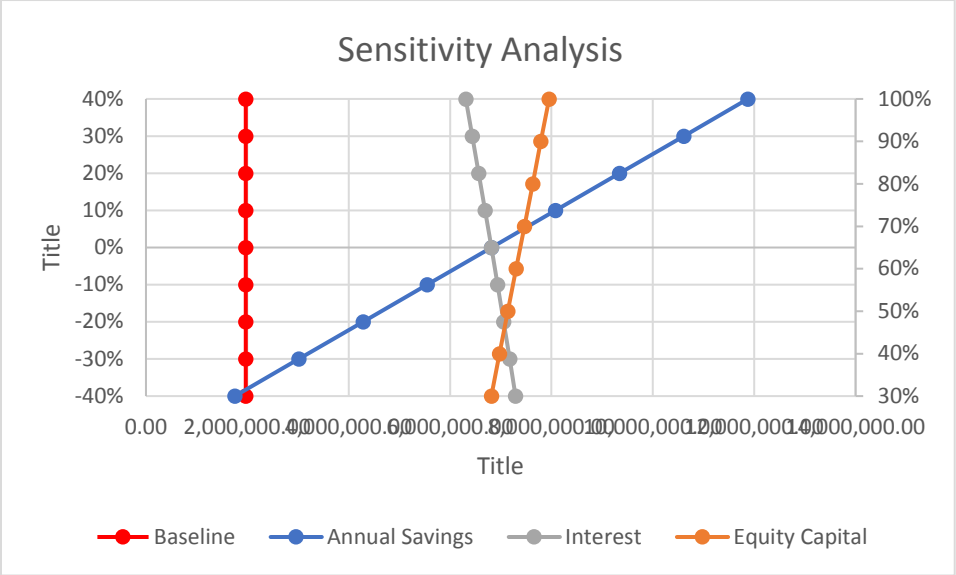


Figure 24. Sensitivity analysis for the Shared Savings Model

The sensitivity analysis only backs up the promising data from the cashflow calculations. It can be seen that the equity capital has slight positive influence when it is ascending, while the interest rate has slight negative influence. The influence is small and can be ignored.

Only extreme cases of fluctuation of the base price of energy can have significant influence on the project (cca 35% lower price of energy).

9.8 Development Finance ESCO Model

9.8.1 Cashflow Calculations

The following table shows the financial data for the period of 20 years, considering the specific model requirements and indicators.

Table 9. Cashflow

Cashflow Guaranteed Savings									
Year	Savings	O&M	Esco cost	Net Savings	Loan	User Savings	ESCO Cashflow	Net Cashflow	Accumulating cashflow
0	0,00	0,00	0,00	0,00	0,00		-1.090.068,00		-1.090.068,00
1	669.350,00	6.693,50	0,00	662.656,50	345.579,06	463.859,55	198.796,95	118.280,49	-891.271,05
2	679.390,25	6.793,90	0,00	672.596,35	345.579,06	470.817,44	201.778,90	125.238,38	-689.492,15
3	689.581,10	6.895,81	0,00	682.685,29	345.579,06	477.879,70	204.805,59	132.300,64	-484.686,56

4	699.924,82	6.999,25	0,00	692.925,57	345.579,06	485.047,90	207.877,67	139.468,84	-276.808,89
5	710.423,69	7.104,24	0,00	703.319,46	345.579,06	492.323,62	210.995,84	146.744,55	-65.813,05
6	721.080,05	7.210,80	0,00	713.869,25	345.579,06	499.708,47	214.160,77	154.129,41	148.347,72
7	731.896,25	7.318,96	0,00	724.577,29	345.579,06	507.204,10	217.373,19	161.625,04	365.720,91
8	742.874,69	7.428,75	0,00	735.445,95	345.579,06	514.812,16	220.633,78	169.233,10	586.354,69
9	754.017,81	7.540,18	0,00	746.477,63	345.579,06	522.534,34	223.943,29	176.955,28	810.297,98
10	765.328,08	7.653,28	0,00	757.674,80	345.579,06	530.372,36	227.302,44	184.793,29	1.037.600,42
11	776.808,00	7.768,08	0,00	769.039,92		384.519,96	384.519,96	384.519,96	1.422.120,38
12	788.460,12	7.884,60	0,00	780.575,52		390.287,76	390.287,76	390.287,76	1.812.408,14
13	800.287,02	8.002,87	0,00	792.284,15		396.142,08	396.142,08	396.142,08	2.208.550,22
14	812.291,33	8.122,91	0,00	804.168,42		402.084,21	402.084,21	402.084,21	2.610.634,43
15	824.475,70	8.244,76	0,00	816.230,94		408.115,47	408.115,47	408.115,47	3.018.749,90
16	836.842,83	8.368,43	0,00	828.474,41		414.237,20	414.237,20	414.237,20	3.432.987,10
17	849.395,48	8.493,95	0,00	840.901,52		420.450,76	420.450,76	420.450,76	3.853.437,86
18	862.136,41	8.621,36	0,00	853.515,04		426.757,52	426.757,52	426.757,52	4.280.195,39
19	875.068,45	8.750,68	0,00	866.317,77		433.158,89	433.158,89	433.158,89	4.713.354,27
20	888.194,48	8.881,94	0,00	879.312,54		439.656,27	439.656,27	439.656,27	5.153.010,54
Total	**15.477.826,58**	**154.778,27**	**0,00**	**15.323.048,31**	**3.455.790,65**		**5.153.010,54**	**5.624.179,12**	

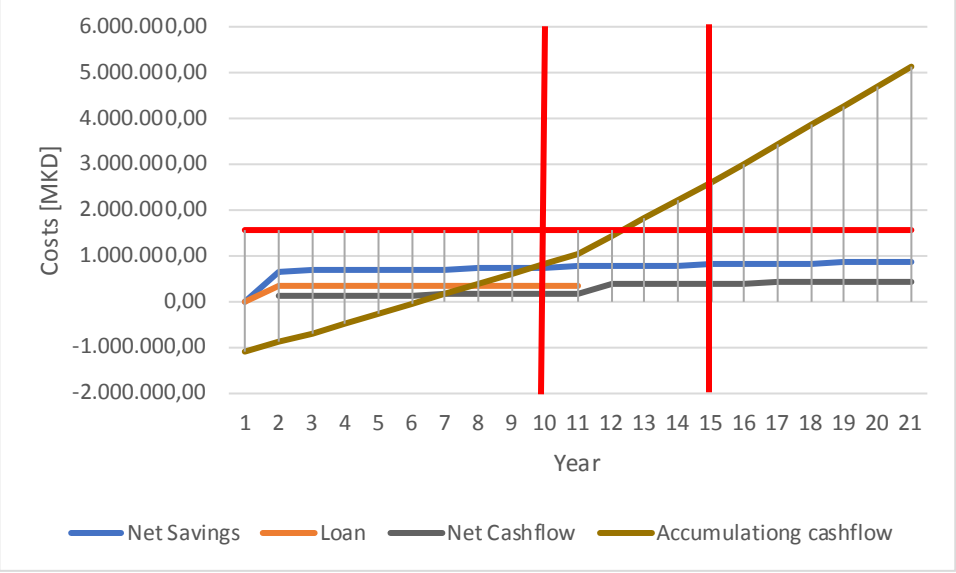


Figure 25. Cashflow chart

According to the above table and chart for the cashflow in the case of development finance ESCO model, this project has significant potential.

The chart shows that the payoff for the project is in the 6^{h} year and at the end of the 3 durations of the contracts (10, 15 and 20 years), the project will be with positive balance.

The conclusions are similar to the ones in the Guaranteed Savings Model (which is taken as a basis for this model), but with slight improvements of the results as it is shown below.

The vertical red lines of the chart show the results in the case of 10, 15 and 20-year contract between the user and the ESCO. The red horizontal line shows the defined baseline as explained in the methodology. According to this chart, even though the project has relatively small payback period, and even though after 10 years the project is positive in financial terms, the profit is significantly below the determined baseline. That is not the case if the contract length is longer – 15 or 20 years, since the accumulating cashflow passes the baseline after the 13th year.

9.8.2 Sensitivity Analysis

ii.

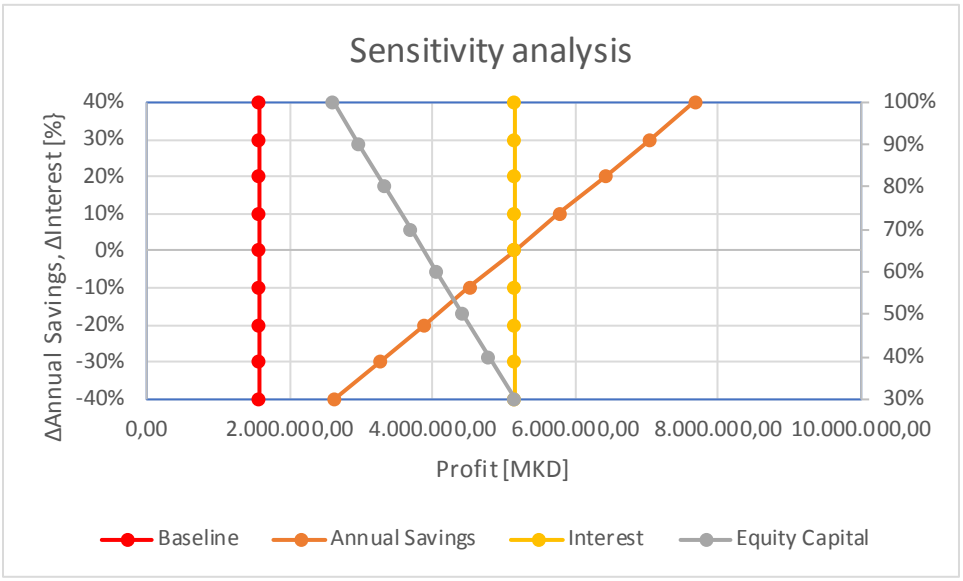


Figure 26. Sensitivity analysis for the Shared Savings Model

The sensitivity analysis only backs up the promising data from the cashflow calculations. Since the payment is on the side of the user, it can be noted that the interest rate does not have any influence on the ESCO side. Also, due to the same reason, increasing the equity capital has negative effect, but does not influence significantly the outcome of the investment.

9.9 Conclusions

The above analysis shows that in this concrete case, all four models can be successfully implemented in Macedonia.

Still, the most promising case is the Guaranteed Savings ESCO as Supplier model, with slight increase of the profit from the other three models. Also, the Shared Savings ESCO model has similar results.

10 Installing Solar Thermal Collectors for multifamily building

10.1 Description of the Measures

The measures include installation of solar thermal collectors for multifamily building – cca 80 flats.

The exiting situation is that the domestic hot water is prepared by individual electric heaters.

10.2 Energy Calculations

The basic energy data is:

Energy consumption before measures: 188354 kWh/yr

Total energy savings: 90169 kWh/yr

Energy price – heating energy: 1.92 MKD/kWh

Energy price – electricity 5.56 MKD/kWh

The heating is using the city's district heating.

10.3 Profitability Calculations

Name	DHW		Payback	11,12	yr
Total Investment	5520000	MKD	Pay-off		yr
Annual Savings	501340	MKD	Internal Rate of Return	6,0%	
Annual O&M Cost	5013,4	MKD	Net Present Value	2428427	
Net Savings	496326,6	MKD	Net Present Value Quotient	0,44	
Economic Lifetime	20	yr	Maximum Investment	7948427	
Maximum Pay-Off	20	yr			

Figure 27. Profitability calculations - input data and results

The profitability calculations show that this project is borderline economically feasible and may be worth to be considered for financing. Additional analysis in needed. The payback period is relatively long and the internal rate of return and net present value quotient are not convincing.

10.4 Cashflow input data

Alternative Name	DHW	
Cashflow Period	20	yr
Equity Capital	1656000	MKD
Grant	0	MKD
Total Loan	3864000	MKD
Annual Savings	501340	MKD
Annual O&M	5013,4	MKD
Annual ESCO costs	0	MKD
Net Savings	496326,6	MKD
Inflation Rate	1,5%	

Loan Conditions		
Loan From	Bank 1	
Ammount	3864000	MKD
Interest	6%	
Years	10	yr
Term	1 month	month/yr
Grace Period	0	month/yr
Total Investment	5520000	MKD

8. Figure 28. Cashflow input data

10.5 Shared Savings Model

10.5.1 Cashflow Calculations

The following table shows the financial data for the period of 20 years, considering the specific model requirements and indicators.

Table 10. Cashflow

Cashflow Shared Savings								
Year	Savings	O&M	Esco cost	Net Savings	Loan	Shared Savings	Net Cashflow	Accumulationg cashflow
0	0,00	0,00	0,00	0,00	0,00		-1.656.000,00	-1.656.000,00
1	501.340,00	5.013,40	0,00	496.326,60	524.993,79	347.428,62	-177.565,17	-1.833.565,17
2	508.860,10	5.088,60	0,00	503.771,50	524.993,79	352.640,05	-172.353,74	-2.005.918,91
3	516.493,00	5.164,93	0,00	511.328,07	524.993,79	357.929,65	-167.064,14	-2.172.983,05
4	524.240,40	5.242,40	0,00	518.997,99	524.993,79	363.298,59	-161.695,20	-2.334.678,25
5	532.104,00	5.321,04	0,00	526.782,96	524.993,79	368.748,07	-156.245,72	-2.490.923,96
6	540.085,56	5.400,86	0,00	534.684,71	524.993,79	374.279,29	-150.714,50	-2.641.638,46
7	548.186,85	5.481,87	0,00	542.704,98	524.993,79	379.893,48	-145.100,31	-2.786.738,77
8	556.409,65	5.564,10	0,00	550.845,55	524.993,79	385.591,89	-139.401,90	-2.926.140,67
9	564.755,79	5.647,56	0,00	559.108,24	524.993,79	391.375,76	-133.618,03	-3.059.758,70
10	573.227,13	5.732,27	0,00	567.494,86	524.993,79	397.246,40	-127.747,39	-3.187.506,09
11	581.825,54	5.818,26	0,00	576.007,28		403.205,10	403.205,10	-2.784.300,99
12	590.552,92	5.905,53	0,00	584.647,39		409.253,17	409.253,17	-2.375.047,82
13	599.411,21	5.994,11	0,00	593.417,10		415.391,97	415.391,97	-1.959.655,84
14	608.402,38	6.084,02	0,00	602.318,36		421.622,85	421.622,85	-1.538.032,99
15	617.528,42	6.175,28	0,00	611.353,13		427.947,19	427.947,19	-1.110.085,80
16	626.791,34	6.267,91	0,00	620.523,43		434.366,40	434.366,40	-675.719,40
17	636.193,21	6.361,93	0,00	629.831,28		440.881,90	440.881,90	-234.837,50

18	645.736,11	6.457,36	0,00	639.278,75		447.495,13	447.495,13	212.657,63
19	655.422,15	6.554,22	0,00	648.867,93		454.207,55	454.207,55	666.865,18
20	665.253,49	6.652,53	0,00	658.600,95		461.020,67	461.020,67	1.127.885,85
Total	**11.592.819,27**	**115.928,19**	**0,00**	**11.476.891,07**	**5.249.937,91**		**1.127.885,85**	

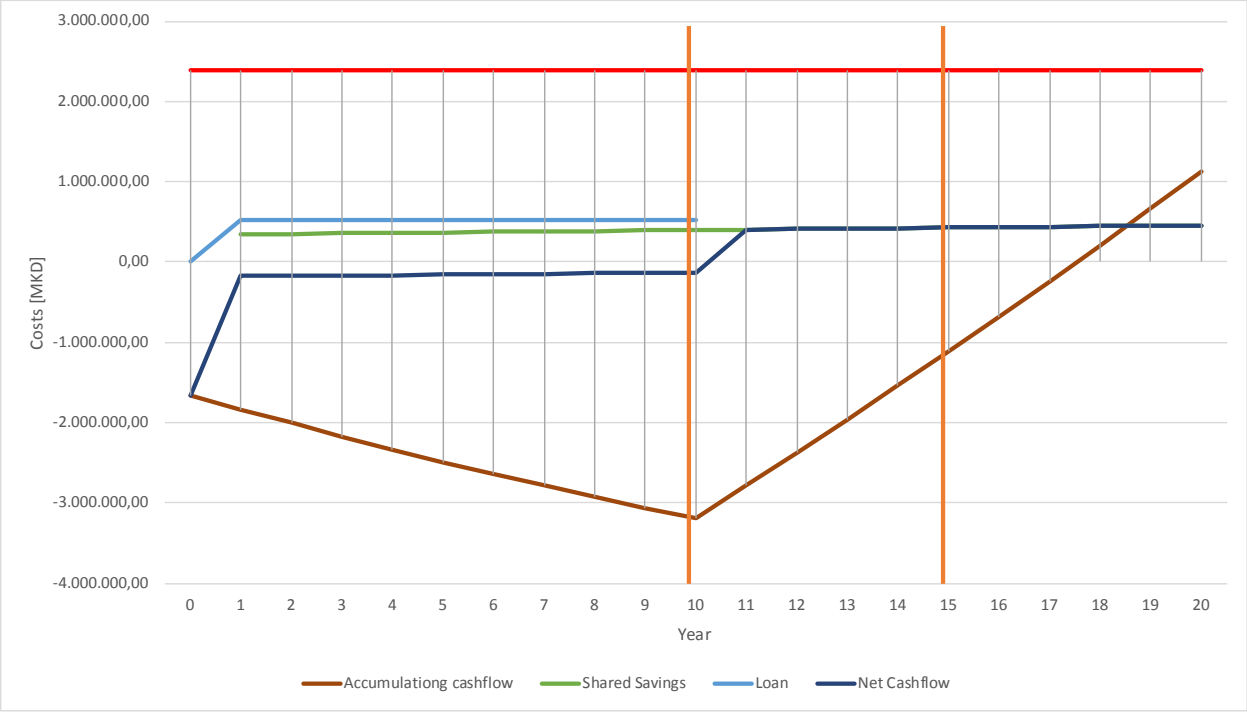


Figure 29. Cashflow chart

According to the above table and chart for the cashflow in the case of shared savings ESCO model, this project has no potential.

The chart shows that the payoff for the project is in the 18th year and at the end of the 3th duration of the contracts (20 years), the project will be with positive balance.

The vertical red lines of the chart show the results in the case of 10, 15 and 20-year contract between the user and the ESCO. The red horizontal line shows the defined baseline as explained in the methodology. According to this chart, even though the project has relatively long payback period, and even after 20 years the project is significantly below the determined baseline.

10.5.2 Sensitivity Analysis

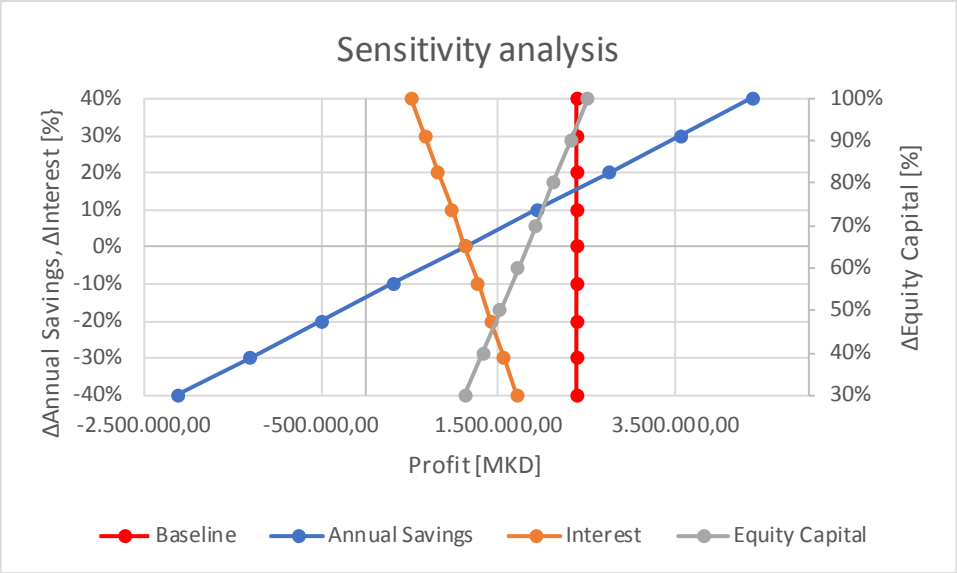


Figure 30. Sensitivity analysis for the Shared Savings Model

The sensitivity analysis only backs up the data from the cashflow calculations. It can be seen that only in extreme cases of deviations in the annual savings framework element, the project goes beyond the set baseline. That case can only be achieved if the technology overperforms and the energy price is significantly higher (cca 20% from the current price). Similar results can be seen for the equity capital. Only in the case of 100% equity capital, the profit goes beyond the set baseline, and even that, unsignificantly.

10.6 Guaranteed Savings Model

10.6.1 Cashflow Calculations

The following table shows the financial data for the period of 20 years, considering the specific model requirements and indicators.

Table 11. Cashflow

Cashflow Guaranteed Savings										
Year	Savings	O&M	ESCO cost	Net Savings	Loan	User Savings	User Cashflow	ESCO Cashflow	Net Cashflow	accumulating cashflow
0	0,00	0,00	0,00	0,00	0,00				-1.656.000,00	-1.656.000,00
1	501.340,00	5.013,40	0,00	496.326,60	524.993,79	347.428,62	-177.565,17	148.897,98	148.897,98	-1.507.102,02
2	508.860,10	5.088,60	0,00	503.771,50	524.993,79	352.640,05	-172.353,74	151.131,45	151.131,45	-1.355.970,57

3	516.493,00	5.164,93	0,00	511.328,07	524.993,79	357.929,65	-167.064,14	153.398,42	153.398,42	-1.202.572,15
4	524.240,40	5.242,40	0,00	518.997,99	524.993,79	363.298,59	-161.695,20	155.699,40	155.699,40	-1.046.872,75
5	532.104,00	5.321,04	0,00	526.782,96	524.993,79	368.748,07	-156.245,72	158.034,89	158.034,89	-888.837,86
6	540.085,56	5.400,86	0,00	534.684,71	524.993,79	374.279,29	-150.714,50	160.405,41	160.405,41	-728.432,45
7	548.186,85	5.481,87	0,00	542.704,98	524.993,79	379.893,48	-145.100,31	162.811,49	162.811,49	-565.620,96
8	556.409,65	5.564,10	0,00	550.845,55	524.993,79	385.591,89	-139.401,90	165.253,67	165.253,67	-400.367,29
9	564.755,79	5.647,56	0,00	559.108,24	524.993,79	391.375,76	-133.618,03	167.732,47	167.732,47	-232.634,82
10	573.227,13	5.732,27	0,00	567.494,86	524.993,79	397.246,40	-127.747,39	170.248,46	170.248,46	-62.386,36
11	581.825,54	5.818,26	0,00	576.007,28	0,00	288.003,64	288.003,64	288.003,64	288.003,64	225.617,28
12	590.552,92	5.905,53	0,00	584.647,39	0,00	292.323,70	292.323,70	292.323,70	292.323,70	517.940,97
13	599.411,21	5.994,11	0,00	593.417,10	0,00	296.708,55	296.708,55	296.708,55	296.708,55	814.649,52
14	608.402,38	6.084,02	0,00	602.318,36	0,00	301.159,18	301.159,18	301.159,18	301.159,18	1.115.808,70
15	617.528,42	6.175,28	0,00	611.353,13	0,00	305.676,57	305.676,57	305.676,57	305.676,57	1.421.485,27
16	626.791,34	6.267,91	0,00	620.523,43	0,00	310.261,72	310.261,72	310.261,72	310.261,72	1.731.746,99
17	636.193,21	6.361,93	0,00	629.831,28	0,00	314.915,64	314.915,64	314.915,64	314.915,64	2.046.662,63
18	645.736,11	6.457,36	0,00	639.278,75	0,00	319.639,38	319.639,38	319.639,38	319.639,38	2.366.302,00
19	655.422,15	6.554,22	0,00	648.867,93	0,00	324.433,97	324.433,97	324.433,97	324.433,97	2.690.735,97
20	665.253,49	6.652,53	0,00	658.600,95	0,00	329.300,48	329.300,48	329.300,48	329.300,48	3.020.036,45
Total	**11.592.819,27**	**115.928,19**	**0,00**	**11.476.891,07**	**5.249.937,91**		**1.550.916,72**	**4.676.036,45**	**3.020.036,45**	

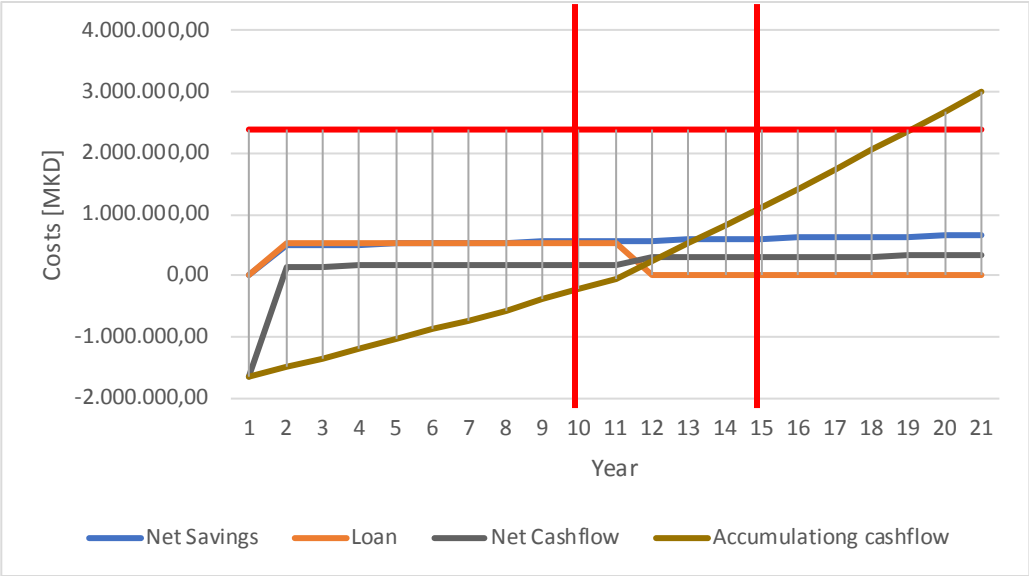


Figure 31. Cashflow chart

According to the above table and chart for the cashflow in the case of guaranteed savings ESCO model, this project has potential but only in long term contracts.

The chart shows that the payoff for the project is in the 11th year and at the end of the last 2 durations of the contracts (15 and 20 years), the project will be with positive balance.

The vertical red lines of the chart show the results in the case of 10, 15 and 20-year contract between the user and the ESCO. The red horizontal line shows the defined baseline as explained in the methodology. According to this chart, even though the project has relatively long payback period, and even though after 15 years the project is positive in financial terms, the profit is significantly below the determined baseline. That is not the case if the contract length is longer –20 years, since the accumulating cashflow passes the baseline after the 17th year.

10.6.2 Sensitivity Analysis

4.1.1.

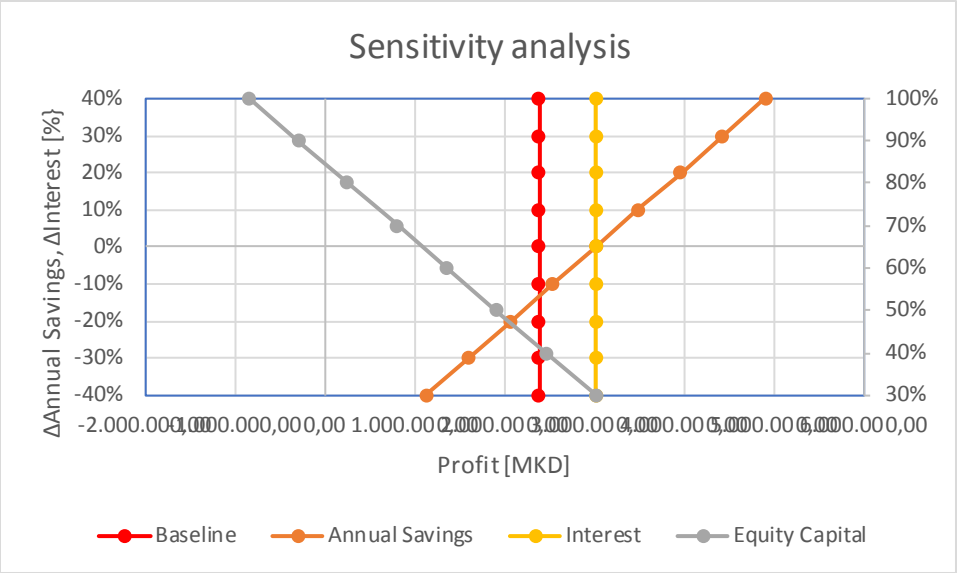


Figure 32. Sensitivity analysis for the Shared Savings Model

The sensitivity analysis only backs up the data from the cashflow calculations. Since the payment is on the side of the user, it can be noted that the interest rate does not have any influence on the ESCO side. Also, due to the same reason, increasing the equity capital has negative effect, but only the basis cases makes the project acceptable (40% equity capital).

10.7 ESCO Supplier Model

10.7.1 Input data

This model is completely different compared to the previous models. The input data about the annual savings is calculated considering the following input data:

ESCO Provider data		
Electricity consumption	188354	kWh/yr
Electricity Cost	1047248,24	MKD/yr
Electricity Price	5,56	MKD/kWh
Electricity Savings	90169	MKD/yr
Electricity Consumption After	98185	kWh/yr
Electricity Price After Measur	10,008	MKD/kWh
Electricity Cost After Measure	982635,48	MKD/yr
Consumer Savings After Meas	64612,76	MKD/yr
ESCO Savings After Measures	436726,88	MKD/yr

Figure 33. ESCO as Supplier input data

10.7.2 Cashflow Calculations

The following table shows the financial data for the period of 20 years, considering the specific model requirements and indicators.

Table 12. Cashflow

Cashflow Guaranteed Savings										
	Costumer Side				Esco Side					
Year	Savings	Loan	Net Savings	Accumulating cashflow	Savings	O&M	Net Savings	Loan	Net Cashflow	Accumulationg cashflow
0	0,00	0,00	0,00	0,00	0,00	0,00			-1.656.000,00	-1.656.000,00
1	64.612,76	0,00	64.612,76	64.612,76	436.726,88	5.013,40	431.713,48	524.993,79	-93.280,31	-1.749.280,31
2	65.581,95	0,00	65.581,95	130.194,71	443.277,78	5.088,60	438.189,18	524.993,79	-86.804,61	-1.836.084,92
3	66.565,68	0,00	66.565,68	196.760,39	449.926,95	5.164,93	444.762,02	524.993,79	-80.231,77	-1.916.316,69
4	67.564,17	0,00	67.564,17	264.324,56	456.675,85	5.242,40	451.433,45	524.993,79	-73.560,34	-1.989.877,03
5	68.577,63	0,00	68.577,63	332.902,19	463.525,99	5.321,04	458.204,95	524.993,79	-66.788,84	-2.056.665,87
6	69.606,29	0,00	69.606,29	402.508,48	470.478,88	5.400,86	465.078,03	524.993,79	-59.915,76	-2.116.581,63
7	70.650,39	0,00	70.650,39	473.158,87	477.536,07	5.481,87	472.054,20	524.993,79	-52.939,59	-2.169.521,23
8	71.710,14	0,00	71.710,14	544.869,01	484.699,11	5.564,10	479.135,01	524.993,79	-45.858,78	-2.215.380,01
9	72.785,80	0,00	72.785,80	617.654,80	491.969,59	5.647,56	486.322,03	524.993,79	-38.671,76	-2.254.051,76
10	73.877,58	0,00	73.877,58	691.532,39	499.349,14	5.732,27	493.616,87	524.993,79	-31.376,93	-2.285.428,69
11	74.985,75	0,00	74.985,75	766.518,13	506.839,37	5.818,26	501.021,12	0,00	501.021,12	-1.784.407,57
12	76.110,53	0,00	76.110,53	842.628,66	514.441,96	5.905,53	508.536,44	0,00	508.536,44	-1.275.871,14
13	77.252,19	0,00	77.252,19	919.880,85	522.158,59	5.994,11	516.164,48	0,00	516.164,48	-759.706,65
14	78.410,97	0,00	78.410,97	998.291,83	529.990,97	6.084,02	523.906,95	0,00	523.906,95	-235.799,71
15	79.587,14	0,00	79.587,14	1.077.878,96	537.940,84	6.175,28	531.765,55	0,00	531.765,55	295.965,85
16	80.780,94	0,00	80.780,94	1.158.659,91	546.009,95	6.267,91	539.742,04	0,00	539.742,04	835.707,88
17	81.992,66	0,00	81.992,66	1.240.652,57	554.200,10	6.361,93	547.838,17	0,00	547.838,17	1.383.546,05
18	83.222,55	0,00	83.222,55	1.323.875,12	562.513,10	6.457,36	556.055,74	0,00	556.055,74	1.939.601,79
19	84.470,89	0,00	84.470,89	1.408.346,00	570.950,80	6.554,22	564.396,58	0,00	564.396,58	2.503.998,37
20	85.737,95	0,00	85.737,95	1.494.083,95	579.515,06	6.652,53	572.862,52	0,00	572.862,52	3.076.860,89
Total	**1.494.083,95**	**0,00**	**1.494.083,95**		**10.098.726,99**	**115.928,19**	**9.982.798,80**	**5.249.937,91**	**3.076.860,89**	

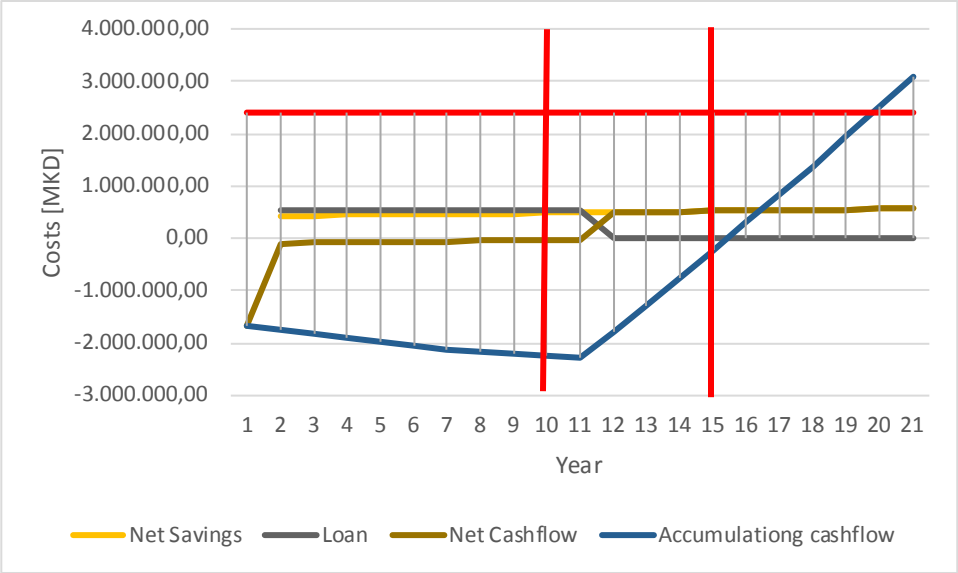


Figure 34. Cashflow chart

The chart shows that the payoff for the project is in the 15th year and at the end of the 3 longest durations of the contracts (20 years), the project will be with positive balance.

The vertical red lines of the chart show the results in the case of 10, 15 and 20-year contract between the user and the ESCO. The red horizontal line shows the defined baseline as explained in the methodology.

The figure shows that only in the case of 20 year contract the project has promising results. All other considered durations of the contract are not convincing.

10.7.3 Sensitivity Analysis

4.1.2.

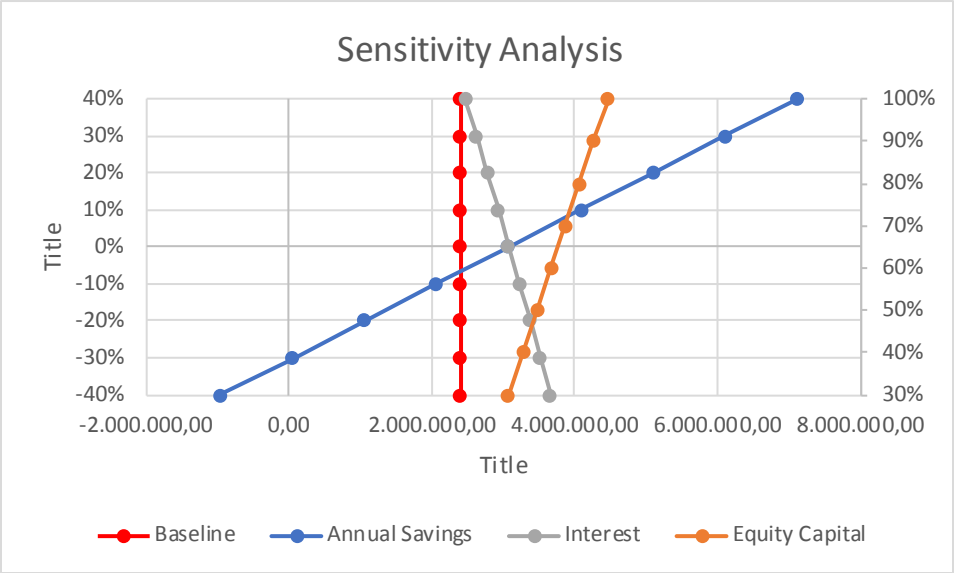


Figure 35. Sensitivity analysis for the Shared Savings Model

The sensitivity analysis only backs up the promising data from the cashflow calculations. It can be seen that the equity capital has slight positive influence when it is ascending, while the interest rate has slight negative influence. The influence is small and can be ignored.

Also, the sensitivity analysys shows that the project is not feasible mainly because of the annual savings. Also, it can be noticed that if the prices are higher in near future, this project can be considered for the ESCO.

10.8 Development Finance ESCO Model

10.8.1 Cashflow Calculations

The following table shows the financial data for the period of 20 years, considering the specific model requirements and indicators.

Table 13. Cashflow

Cashflow Guaranteed Savings									
Year	Savings	O&M	Esco cost	Net Savings	Loan	User Savings	ESCO Cashflow	Net Cashflow	Accumulationg cashflow
0	0,00	0,00	0,00	0,00	0,00		-1.324.800,00		-1.324.800,00
1	501.340,00	5.013,40	0,00	496.326,60	419.995,03	347.428,62	148.897,98	-72.566,41	-1.175.902,02
2	508.860,10	5.088,60	0,00	503.771,50	419.995,03	352.640,05	151.131,45	-67.354,98	-1.024.770,57
3	516.493,00	5.164,93	0,00	511.328,07	419.995,03	357.929,65	153.398,42	-62.065,38	-871.372,15

4	524.240,40	5.242,40	0,00	518.997,99	419.995,03	363.298,59	155.699,40	-56.696,44	-715.672,75
5	532.104,00	5.321,04	0,00	526.782,96	419.995,03	368.748,07	158.034,89	-51.246,96	-557.637,86
6	540.085,56	5.400,86	0,00	534.684,71	419.995,03	374.279,29	160.405,41	-45.715,74	-397.232,45
7	548.186,85	5.481,87	0,00	542.704,98	419.995,03	379.893,48	162.811,49	-40.101,55	-234.420,96
8	556.409,65	5.564,10	0,00	550.845,55	419.995,03	385.591,89	165.253,67	-34.403,15	-69.167,29
9	564.755,79	5.647,56	0,00	559.108,24	419.995,03	391.375,76	167.732,47	-28.619,27	98.565,18
10	573.227,13	5.732,27	0,00	567.494,86	419.995,03	397.246,40	170.248,46	-22.748,63	268.813,64
11	581.825,54	5.818,26	0,00	576.007,28		288.003,64	288.003,64	288.003,64	556.817,28
12	590.552,92	5.905,53	0,00	584.647,39		292.323,70	292.323,70	292.323,70	849.140,97
13	599.411,21	5.994,11	0,00	593.417,10		296.708,55	296.708,55	296.708,55	1.145.849,52
14	608.402,38	6.084,02	0,00	602.318,36		301.159,18	301.159,18	301.159,18	1.447.008,70
15	617.528,42	6.175,28	0,00	611.353,13		305.676,57	305.676,57	305.676,57	1.752.685,27
16	626.791,34	6.267,91	0,00	620.523,43		310.261,72	310.261,72	310.261,72	2.062.946,99
17	636.193,21	6.361,93	0,00	629.831,28		314.915,64	314.915,64	314.915,64	2.377.862,63
18	645.736,11	6.457,36	0,00	639.278,75		319.639,38	319.639,38	319.639,38	2.697.502,00
19	655.422,15	6.554,22	0,00	648.867,93		324.433,97	324.433,97	324.433,97	3.021.935,97
20	665.253,49	6.652,53	0,00	658.600,95		329.300,48	329.300,48	329.300,48	3.351.236,45
Total	**11.592.819,27**	**115.928,19**	**0,00**	**11.476.891,07**	**4.199.950,32**		**3.351.236,45**	**2.600.904,30**	

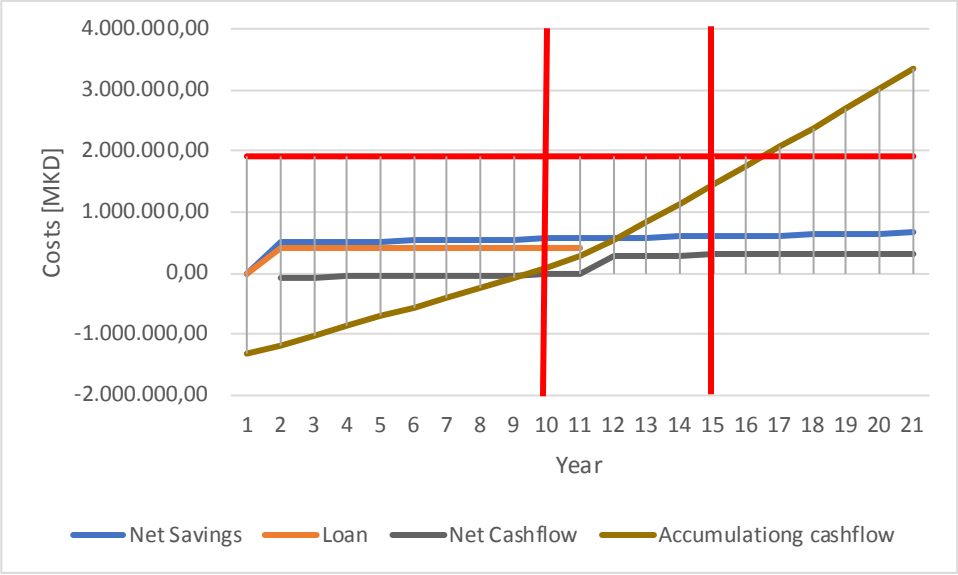


Figure 36. Cashflow chart

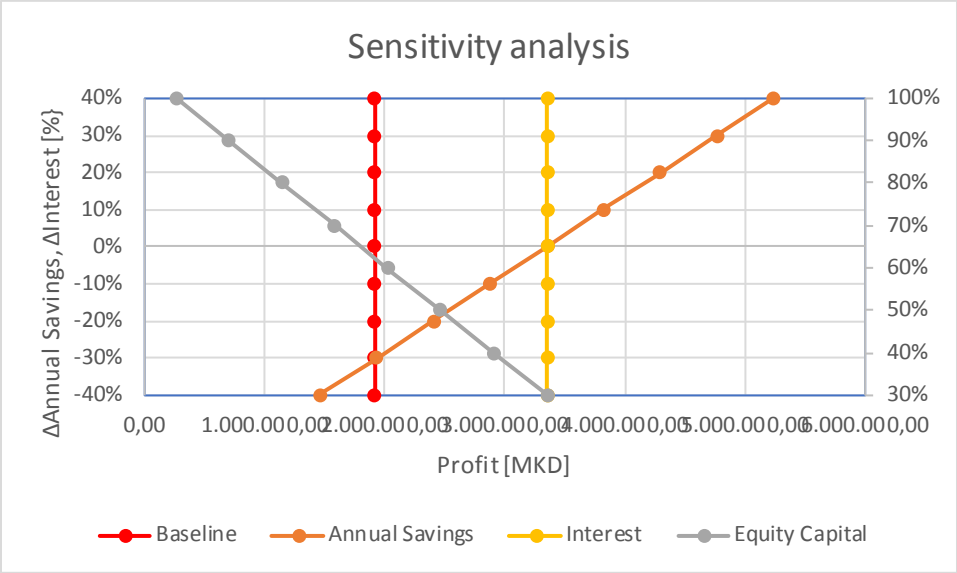
According to the above table and chart for the cashflow in the case of development finance ESCO model, this project has similar potential as the previously considered models.

The chart shows that the payoff for the project is in the 9^{h} year and at the end of the 2 durations of the contracts (15 and 20 years), the project will be with positive balance.

The conclusions are similar to the ones in the Guaranteed Savings Model (which is taken as a basis for this model), but with slight improvements of the results as it is shown below.

The vertical red lines of the chart show the results in the case of 10, 15 and 20-year contract between the user and the ESCO. The red horizontal line shows the defined baseline as explained in the methodology. According to this chart, even though the project has relatively small payback period, and even though after 15 years the project is positive in financial terms, the profit is slightly below the determined baseline. That is not the case if the contract length is longer –20 years, since the accumulating cashflow passes the baseline after the 17th year.

10.8.2 Sensitivity Analysis



4.1.3.

Figure 37. Sensitivity analysis for the Shared Savings Model

The sensitivity analysis only backs up the data from the cashflow calculations. Since the payment is on the side of the user, it can be noted that the interest rate does not have any influence on the ESCO side. Also, due to the same reason, increasing the equity capital has negative effect, but does not influence significantly the outcome of the investment until 70% equity capital.

10.9 Conclusions

The above analysis shows that in this concrete case, all four models can be successfully implemented in Macedonia if longer contracts are used.

Still, the most promising case is the Development finance ESCO model, with slight increase of the profit from the other three models. Also, the price of the energy is crucial factor for the conclusion for the length of the contracts.

11 Change of fuel in industry

11.1 Description of the Measures

The measure includes change of fuel for preparation of steam. The existing system is using light fuel oil, and the new system will be using natural gas.

It should be mentioned that this measures (and large number of similar systems) can change the fuel with minor renovation, like installment of gas ramp, in the current case. The investment is small and the financial gains are large, which makes these cases desirable for ESCOs and other investors.

11.2 Energy Calculations

The basic energy data is:

Energy consumption before measures: 1162712 kWh/yr

Total energy savings: 0 kWh/yr

Financial savings: 2255000 MKD/yr

Energy price – light fuel oil: 34 MKD/l

11.3 Profitability Calculations

Name	Industry - Fuel change Oil to Gas				
Total Investment	246000	MKD	Payback	0.11	yr
Annual Savings	2255000	MKD	Pay-off		yr
Annual O&M Cost	4920	MKD	Internal Rate of Return	914.7%	
Net Savings	2250080	MKD	Net Present Value	31336805	
Economic Lifetime	17	yr	Net Present Value Quotient	127.39	
Maximum Pay-Off	20	yr	Maximum Investment	36033928	

Figure 38. Profitability calculations - input data and results

The profitability calculations show that this project is extremely economically feasible because of the small investment and significant savings. The payback period is short and the internal rate of return and net present value quotient are extremely convincing.

11.4 Cashflow input data

	Industry - Fuel change Oil to Gas	
Alternative Name		
Cashflow Period	20	yr
Equity Capital	73800	MKD
Grant	0	MKD
Total Loan	172200	MKD
Annual Savings	2255000	MKD
Annual O&M	4920	MKD
Annual ESCO costs	0	MKD
Net Savings	2250080	MKD
Inflation Rate	1.5%	

Loan Conditions		
Loan From	Bank 1	
Ammount	172200	MKD
Interest	6%	
Years	10	yr
Term	1 month	month/yr
Grace Period	0	month/yr
Total Investment	246000	MKD

9. *Figure 39. Cashflow input data*

11.5 Shared Savings Model

11.5.1 Cashflow Calculations

The following table shows the financial data for the period of 20 years, considering the specific model requirements and indicators.

Table 14. Cashflow

Cashflow Shared Savings								
Year	Savings	O&M	Esco cost	Net Savings	Loan	Shared Savings	Net Cashflow	Accumulationg cashflow
0	0.00	0.00	0.00	0.00	0.00		-73,800.00	-73,800.00
1	2,255,000.00	4,920.00	0.00	2,250,080.00	23,396.46	1,575,056.00	1,551,659.54	1,477,859.54
2	2,288,825.00	4,993.80	0.00	2,283,831.20	23,396.46	1,598,681.84	1,575,285.38	3,053,144.92
3	2,323,157.38	5,068.71	0.00	2,318,088.67	23,396.46	1,622,662.07	1,599,265.61	4,652,410.52
4	2,358,004.74	5,144.74	0.00	2,352,860.00	23,396.46	1,647,002.00	1,623,605.54	6,276,016.06
5	2,393,374.81	5,221.91	0.00	2,388,152.90	23,396.46	1,671,707.03	1,648,310.57	7,924,326.62
6	2,429,275.43	5,300.24	0.00	2,423,975.19	23,396.46	1,696,782.63	1,673,386.17	9,597,712.79
7	2,465,714.56	5,379.74	0.00	2,460,334.82	23,396.46	1,722,234.37	1,698,837.91	11,296,550.71
8	2,502,700.28	5,460.44	0.00	2,497,239.84	23,396.46	1,748,067.89	1,724,671.43	13,021,222.13
9	2,540,240.78	5,542.34	0.00	2,534,698.44	23,396.46	1,774,288.91	1,750,892.45	14,772,114.58
10	2,578,344.39	5,625.48	0.00	2,572,718.92	23,396.46	1,800,903.24	1,777,506.78	16,549,621.36
11	2,617,019.56	5,709.86	0.00	2,611,309.70		1,827,916.79	1,827,916.79	18,377,538.15
12	2,656,274.85	5,795.51	0.00	2,650,479.35		1,855,335.54	1,855,335.54	20,232,873.69
13	2,696,118.98	5,882.44	0.00	2,690,236.54		1,883,165.57	1,883,165.57	22,116,039.26
14	2,736,560.76	5,970.68	0.00	2,730,590.08		1,911,413.06	1,911,413.06	24,027,452.32
15	2,777,609.17	6,060.24	0.00	2,771,548.93		1,940,084.25	1,940,084.25	25,967,536.57

16	2,819,273.31	6,151.14	0.00	2,813,122.17		1,969,185.52	1,969,185.52	27,936,722.09
17	2,861,562.41	6,243.41	0.00	2,855,319.00		1,998,723.30	1,998,723.30	29,935,445.39
18	2,904,485.85	6,337.06	0.00	2,898,148.79		2,028,704.15	2,028,704.15	31,964,149.54
19	2,948,053.13	6,432.12	0.00	2,941,621.02		2,059,134.71	2,059,134.71	34,023,284.26
20	2,992,273.93	6,528.60	0.00	2,985,745.33		2,090,021.73	2,090,021.73	36,113,305.99
Total	**52,143,869.32**	**113,768.44**	**0.00**	**52,030,100.88**	**233,964.62**		**36,113,305.99**	

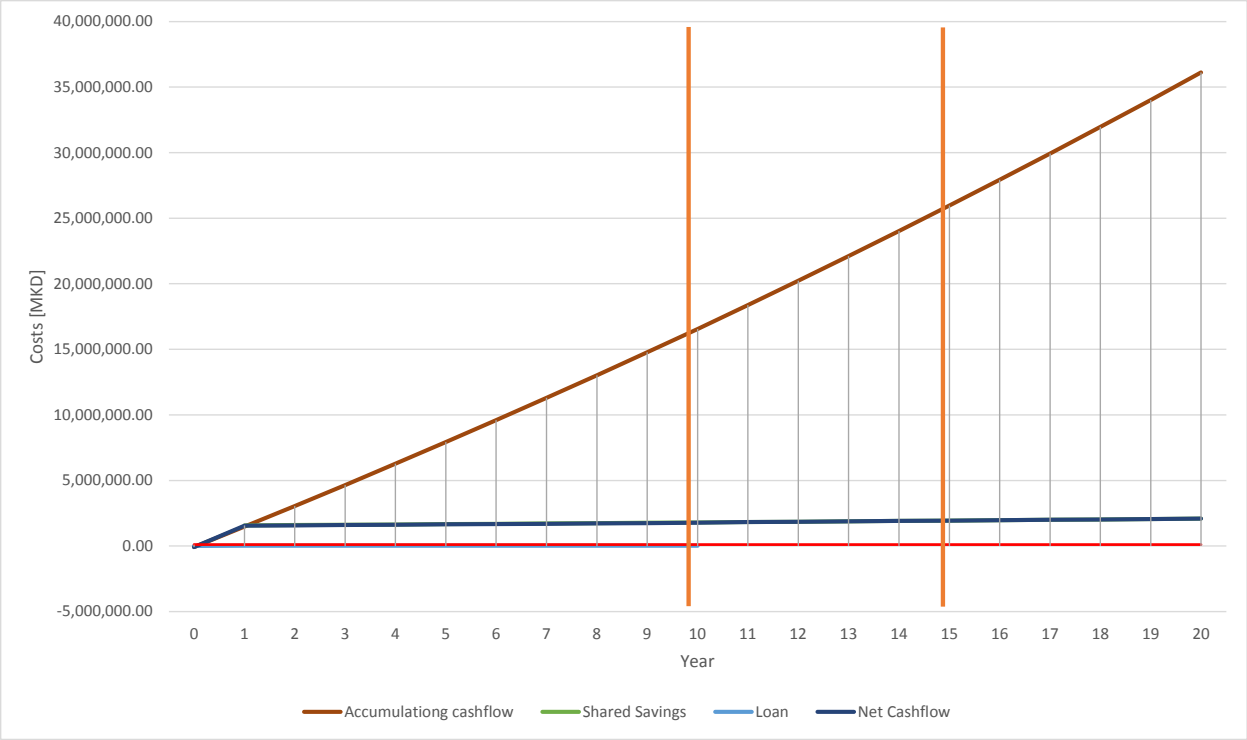


Figure 40. Cashflow chart

According to the above table and chart for the cashflow in the case of shared savings ESCO model, this project has significant potential.

The chart shows that the payoff for the project is in the 1th year and at the end of the 3th duration of the contracts (20 years), the project will be with positive balance and above the set baseline.

The vertical red lines of the chart show the results in the case of 10, 15 and 20-year contract between the user and the ESCO. The red horizontal line shows the defined baseline as explained in the methodology.

11.5.2 Sensitivity Analysis

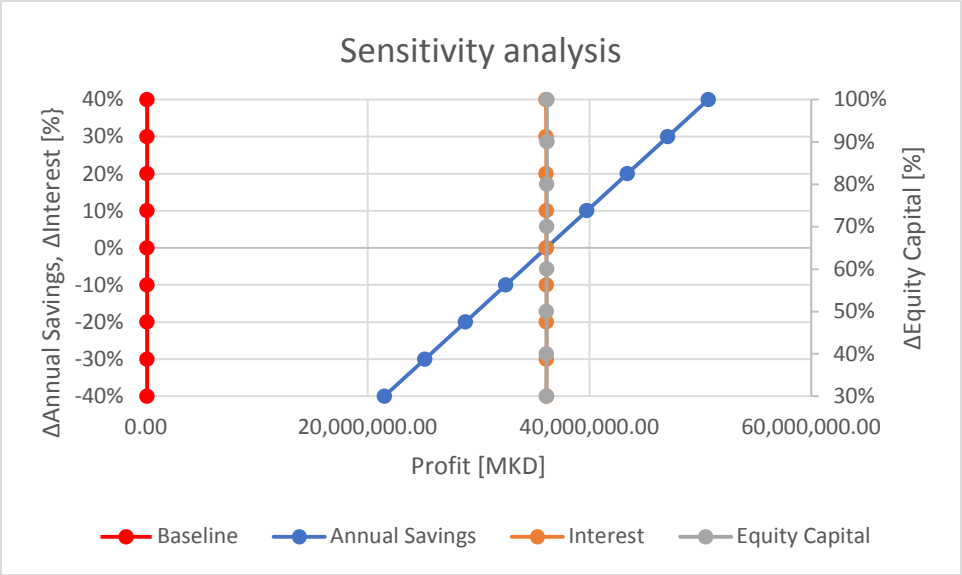


Figure 41. Sensitivity analysis for the Shared Savings Model

The sensitivity analysis only backs up the data from the cashflow calculations. It can be seen that in any case, the project is not going behind the set baseline.

11.6 Guaranteed Savings Model

11.6.1 Cashflow Calculations

The following table shows the financial data for the period of 20 years, considering the specific model requirements and indicators.

Table 15. Cashflow

Cashflow Guaranteed Savings										
Year	Savings	O&M	Esco cost	Net Savings	Loan	User Savings	User Cashflow	ESCO Cashflow	Net Cashflow	Accumulationg cashflow
0	0.00	0.00	0.00	0.00	0.00				-73,800.00	-73,800.00
1	2,255,000.00	4,920.00	0.00	2,250,080.00	23,396.46	1,575,056.00	1,551,659.54	675,024.00	675,024.00	601,224.00
2	2,288,825.00	4,993.80	0.00	2,283,831.20	23,396.46	1,598,681.84	1,575,285.38	685,149.36	685,149.36	1,286,373.36
3	2,323,157.38	5,068.71	0.00	2,318,088.67	23,396.46	1,622,662.07	1,599,265.61	695,426.60	695,426.60	1,981,799.96
4	2,358,004.74	5,144.74	0.00	2,352,860.00	23,396.46	1,647,002.00	1,623,605.54	705,858.00	705,858.00	2,687,657.96
5	2,393,374.81	5,221.91	0.00	2,388,152.90	23,396.46	1,671,707.03	1,648,310.57	716,445.87	716,445.87	3,404,103.83
6	2,429,275.43	5,300.24	0.00	2,423,975.19	23,396.46	1,696,782.63	1,673,386.17	727,192.56	727,192.56	4,131,296.39
7	2,465,714.56	5,379.74	0.00	2,460,334.82	23,396.46	1,722,234.37	1,698,837.91	738,100.45	738,100.45	4,869,396.83

8	2,502,700.28	5,460.44	0.00	2,497,239.84	23,396.46	1,748,067.89	1,724,671.43	749,171.95	749,171.95	5,618,568.78
9	2,540,240.78	5,542.34	0.00	2,534,698.44	23,396.46	1,774,288.91	1,750,892.45	760,409.53	760,409.53	6,378,978.32
10	2,578,344.39	5,625.48	0.00	2,572,718.92	23,396.46	1,800,903.24	1,777,506.78	771,815.67	771,815.67	7,150,793.99
11	2,617,019.56	5,709.86	0.00	2,611,309.70	0.00	1,305,654.85	1,305,654.85	1,305,654.85	1,305,654.85	8,456,448.84
12	2,656,274.85	5,795.51	0.00	2,650,479.35	0.00	1,325,239.67	1,325,239.67	1,325,239.67	1,325,239.67	9,781,688.51
13	2,696,118.98	5,882.44	0.00	2,690,236.54	0.00	1,345,118.27	1,345,118.27	1,345,118.27	1,345,118.27	11,126,806.78
14	2,736,560.76	5,970.68	0.00	2,730,590.08	0.00	1,365,295.04	1,365,295.04	1,365,295.04	1,365,295.04	12,492,101.82
15	2,777,609.17	6,060.24	0.00	2,771,548.93	0.00	1,385,774.47	1,385,774.47	1,385,774.47	1,385,774.47	13,877,876.29
16	2,819,273.31	6,151.14	0.00	2,813,122.17	0.00	1,406,561.08	1,406,561.08	1,406,561.08	1,406,561.08	15,284,437.37
17	2,861,562.41	6,243.41	0.00	2,855,319.00	0.00	1,427,659.50	1,427,659.50	1,427,659.50	1,427,659.50	16,712,096.88
18	2,904,485.85	6,337.06	0.00	2,898,148.79	0.00	1,449,074.39	1,449,074.39	1,449,074.39	1,449,074.39	18,161,171.27
19	2,948,053.13	6,432.12	0.00	2,941,621.02	0.00	1,470,810.51	1,470,810.51	1,470,810.51	1,470,810.51	19,631,981.78
20	2,992,273.93	6,528.60	0.00	2,985,745.33	0.00	1,492,872.67	1,492,872.67	1,492,872.67	1,492,872.67	21,124,854.44
Total	**52,143,869.32**	**113,768.44**	**0.00**	**52,030,100.88**	**233,964.62**		**30,597,481.81**	**21,198,654.44**	**21,124,854.44**	

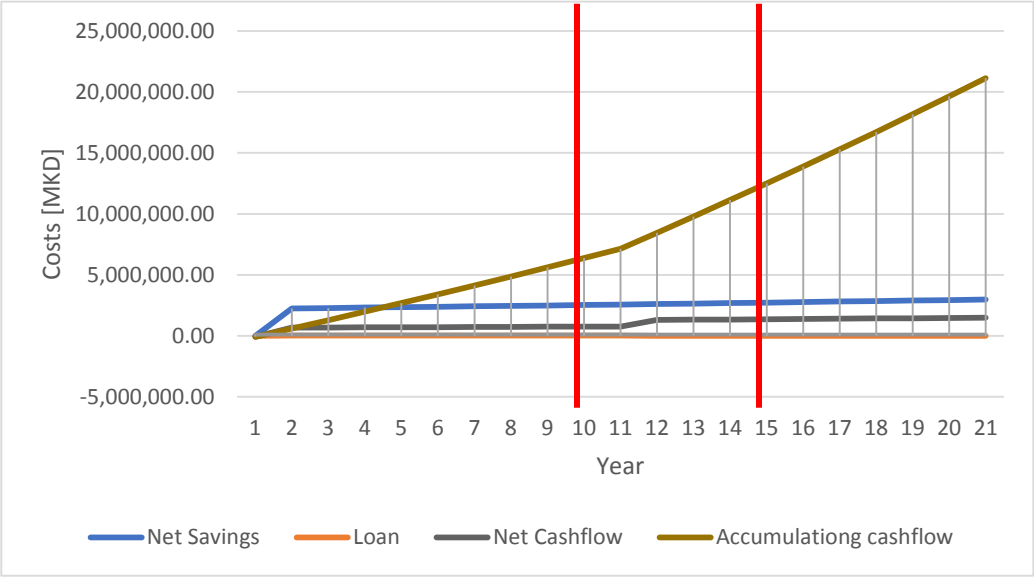


Figure 42. Cashflow chart

According to the above table and chart for the cashflow in the case of guaranteed savings ESCO model, this project has significant potential for all lengths of contracts.

The chart shows that the payoff for the project is in the 1th year and at the end of all durations of the contracts (10, 15 and 20 years), the project will be with positive balance.

The vertical red lines of the chart show the results in the case of 10, 15 and 20-year contract between the user and the ESCO. The red horizontal line shows the defined baseline as explained in the methodology. According to this chart the project has short payback period, and all cases are significantly above the determined baseline.

11.6.2 Sensitivity Analysis

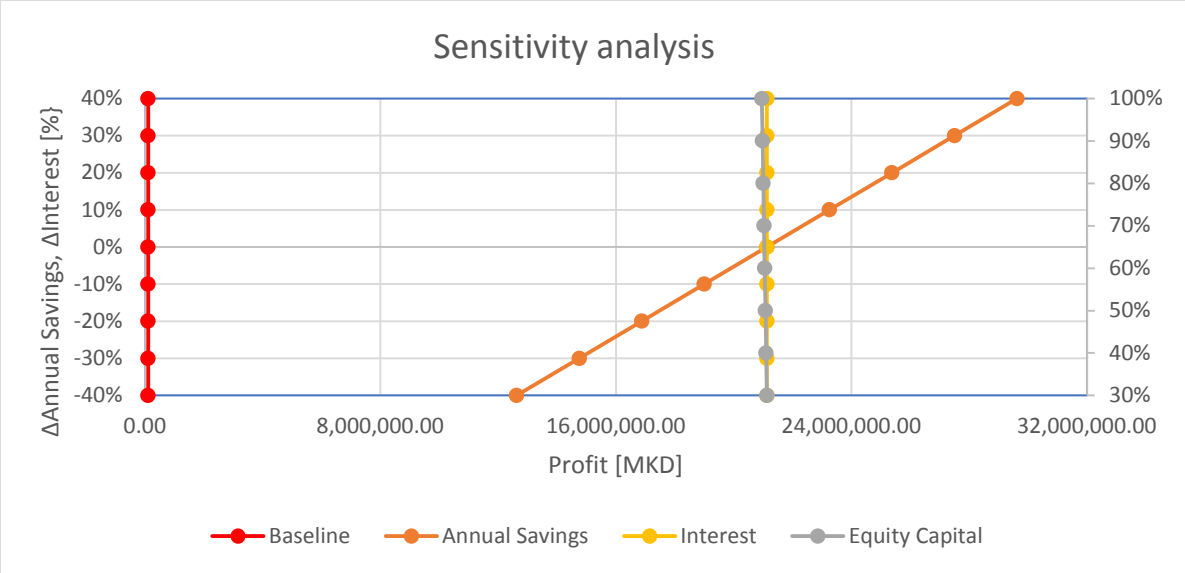


Figure 43. Sensitivity analysis for the Shared Savings Model

The sensitivity analysis only backs up the data from the cashflow calculations. It can be seen that in any case, the project is not going behind the set baseline.

11.7 ESCO Supplier Model

This model was not considered in this case as it is not applicable.

11.8 Development Finance ESCO Model

11.8.1 Cashflow Calculations

The following table shows the financial data for the period of 20 years, considering the specific model requirements and indicators.

Table 16. Cashflow

Cashflow Guaranteed Savings									
Year	Savings	O&M	Esco cost	Net Savings	Loan	User Savings	ESCO Cashflow	Net Cashflow	Accumulationg cashflow
0	0.00	0.00	0.00	0.00	0.00		-59,040.00		-59,040.00

1	2,255,000.00	4,920.00	0.00	2,250,080.00	18,717.17	1,575,056.00	675,024.00	1,556,338.83	615,984.00
2	2,288,825.00	4,993.80	0.00	2,283,831.20	18,717.17	1,598,681.84	685,149.36	1,579,964.67	1,301,133.36
3	2,323,157.38	5,068.71	0.00	2,318,088.67	18,717.17	1,622,662.07	695,426.60	1,603,944.90	1,996,559.96
4	2,358,004.74	5,144.74	0.00	2,352,860.00	18,717.17	1,647,002.00	705,858.00	1,628,284.83	2,702,417.96
5	2,393,374.81	5,221.91	0.00	2,388,152.90	18,717.17	1,671,707.03	716,445.87	1,652,989.86	3,418,863.83
6	2,429,275.43	5,300.24	0.00	2,423,975.19	18,717.17	1,696,782.63	727,192.56	1,678,065.46	4,146,056.39
7	2,465,714.56	5,379.74	0.00	2,460,334.82	18,717.17	1,722,234.37	738,100.45	1,703,517.20	4,884,156.83
8	2,502,700.28	5,460.44	0.00	2,497,239.84	18,717.17	1,748,067.89	749,171.95	1,729,350.72	5,633,328.78
9	2,540,240.78	5,542.34	0.00	2,534,698.44	18,717.17	1,774,288.91	760,409.53	1,755,571.74	6,393,738.32
10	2,578,344.39	5,625.48	0.00	2,572,718.92	18,717.17	1,800,903.24	771,815.67	1,782,186.07	7,165,553.99
11	2,617,019.56	5,709.86	0.00	2,611,309.70		1,305,654.85	1,305,654.85	1,305,654.85	8,471,208.84
12	2,656,274.85	5,795.51	0.00	2,650,479.35		1,325,239.67	1,325,239.67	1,325,239.67	9,796,448.51
13	2,696,118.98	5,882.44	0.00	2,690,236.54		1,345,118.27	1,345,118.27	1,345,118.27	11,141,566.78
14	2,736,560.76	5,970.68	0.00	2,730,590.08		1,365,295.04	1,365,295.04	1,365,295.04	12,506,861.82
15	2,777,609.17	6,060.24	0.00	2,771,548.93		1,385,774.47	1,385,774.47	1,385,774.47	13,892,636.29
16	2,819,273.31	6,151.14	0.00	2,813,122.17		1,406,561.08	1,406,561.08	1,406,561.08	15,299,197.37
17	2,861,562.41	6,243.41	0.00	2,855,319.00		1,427,659.50	1,427,659.50	1,427,659.50	16,726,856.88
18	2,904,485.85	6,337.06	0.00	2,898,148.79		1,449,074.39	1,449,074.39	1,449,074.39	18,175,931.27
19	2,948,053.13	6,432.12	0.00	2,941,621.02		1,470,810.51	1,470,810.51	1,470,810.51	19,646,741.78
20	2,992,273.93	6,528.60	0.00	2,985,745.33		1,492,872.67	1,492,872.67	1,492,872.67	21,139,614.44
Total	**52,143,869.32**	**113,768.44**	**0.00**	**52,030,100.88**	**187,171.70**		**21,139,614.44**	**30,644,274.73**	

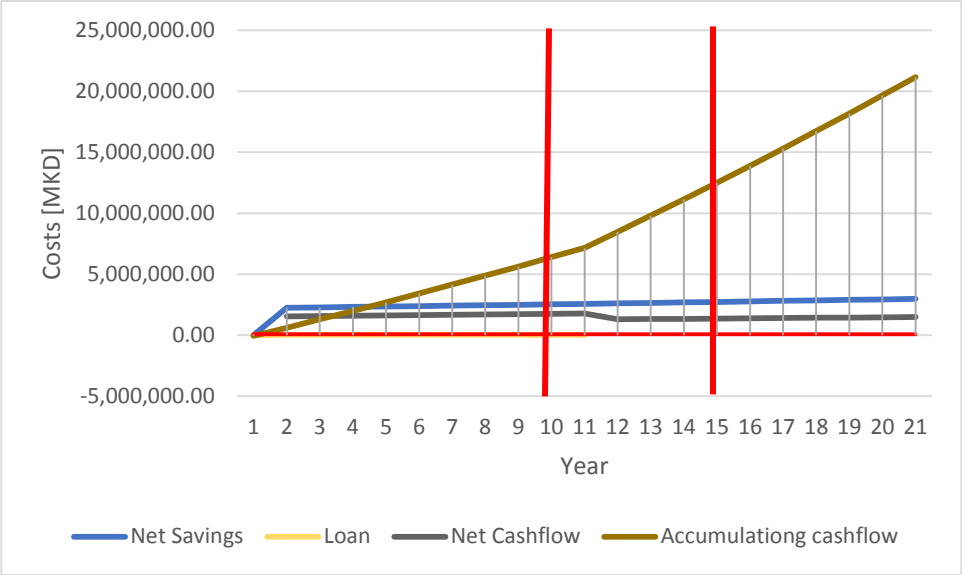


Figure 44. Cashflow chart

According to the above table and chart for the cashflow in the case of development finance ESCO model, this project has similar potential as the previously considered models.

The chart shows that the payoff for the project is in the 1^{h} year and at the end of the 3 durations of the contracts (10, 15 and 20 years), the project will be with positive balance.

The conclusions are similar to the ones in the Guaranteed Savings Model (which is taken as a basis for this model), but with slight improvements of the results as it is shown below.

The vertical red lines of the chart show the results in the case of 10, 15 and 20-year contract between the user and the ESCO. The red horizontal line shows the defined baseline as explained in the methodology.

11.8.2 Sensitivity Analysis

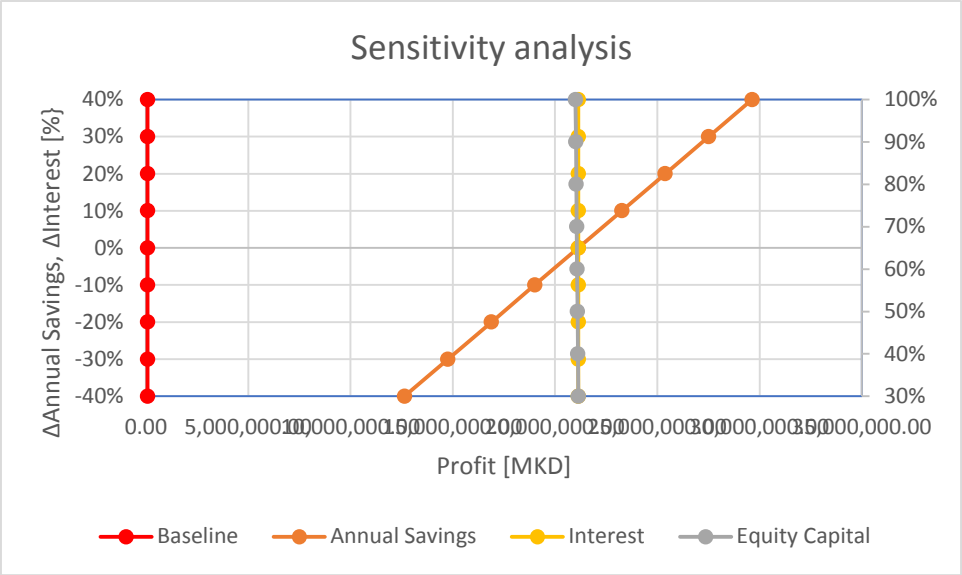


Figure 45. Sensitivity analysis for the Shared Savings Model

The sensitivity analysis only backs up the data from the cashflow calculations. It can be seen that in any case, the project is not going behind the set baseline.

11.9 Conclusions

The above analysis shows that in this concrete case, all four models can be successfully implemented in Macedonia for all contract lengths. Since the benefits are significant, and the motivation of the user to engage with ESCO small, the smaller lengths of the contracts are more preferable.

12 Public Lighting – Installing of Sodium Lighting

12.1 Description of the Measures

The measure includes change of the incandescent bulbs in the public lighting of one municipality with sodium lightings. A total of 6700 lighting fixtures needs to be replaced.

Important parameter is that the analysis includes longer contracts than the lifetime of the bulbs. Th bulbs needs to be replaced on the 6th, 11th and the 16th year. The analysis assumes that only the initial investment will be made through loan, and the next investments can be implemented through the savings. Shorter period is also considered in the analysis.

12.2 Energy Calculations

The basic energy data is:

Energy consumption before measures: 4501518 kWh/yr

Total energy savings: 1767789 kWh/yr

Financial savings: 20562831 MKD/yr

Energy price – electricity: 8 MKD/kWh

12.3 Profitability Calculations

Name	Public lighting		Payback	2,21	yr
Total Investment	45004000	MKD	Pay-off		yr
Annual Savings	20562831	MKD	Internal Rate of Return	28,8%	
Annual O&M Cost	205628,31	MKD	Net Present Value	50348189	
Net Savings	20357202,69	MKD	Net Present Value Quotient	1,12	
Economic Lifetime	5	yr	Maximum Investment	326010624	
Maximum Pay-Off	20	yr			

Figure 46. Profitability calculations - input data and results

The profitability calculations show that this project is extremely economically feasible because of the small investment and significant savings. The payback period is short and the internal rate of return and net present value quotient are extremely convincing. Still, further analysis needs to be done, since the investment is recurring on short period of time.

12.4 Cashflow input data

Alternative Name	Public lighting	
Cashflow Period	20	yr
Equity Capital	13501200	MKD
Grant	0	MKD
Total Loan	31502800	MKD
Annual Savings	20562831	MKD
Annual O&M	205628,31	MKD
Annual ESCO costs	0	MKD
Net Savings	20357202,69	MKD
Inflation Rate	1,5%	

Loan Conditions		
Loan From	Bank 1	
Ammount	31502800	MKD
Interest	6%	
Years	5	yr
Term	1 month	month/yr
Grace Period	0	month/yr
Total Investment	45004000	MKD

10. Figure 47. Cashflow input data

12.5 Shared Savings Model

12.5.1 Cashflow Calculations

The following table shows the financial data for the period of 20 years, considering the specific model requirements and indicators.

Table 17. Cashflow

Cashflow Shared Savings								
Year	Savings	O&M	Esco cost	Net Savings	Loan	Shared Savings	Net Cashflow	Accumulationg cashflow
0	0,00	0,00	0,00	0,00	0,00		-13.501.200,00	-13.501.200,00
1	20.562.831,00	205.628,31	0,00	20.357.202,69	7.478.651,32	14.250.041,88	6.771.390,56	-6.729.809,44
2	20.871.273,47	208.712,73	0,00	20.662.560,73	7.478.651,32	14.463.792,51	6.985.141,19	255.331,75
3	21.184.342,57	211.843,43	0,00	20.972.499,14	7.478.651,32	14.680.749,40	7.202.098,08	7.457.429,82
4	21.502.107,71	215.021,08	0,00	21.287.086,63	7.478.651,32	14.900.960,64	7.422.309,32	14.879.739,14
5	21.824.639,32	218.246,39	0,00	21.606.392,93	7.478.651,32	15.124.475,05	7.645.823,73	22.525.562,87
6	22.152.008,91	221.520,09	0,00	21.930.488,82		15.351.342,18	-29.652.657,82	-7.127.094,96
7	22.484.289,04	224.842,89	0,00	22.259.446,15		15.581.612,31	15.581.612,31	8.454.517,35
8	22.821.553,38	228.215,53	0,00	22.593.337,85		15.815.336,49	15.815.336,49	24.269.853,84
9	23.163.876,68	231.638,77	0,00	22.932.237,91		16.052.566,54	16.052.566,54	40.322.420,38
10	23.511.334,83	235.113,35	0,00	23.276.221,48		16.293.355,04	16.293.355,04	56.615.775,42
11	23.864.004,85	238.640,05	0,00	23.625.364,81		16.537.755,36	-28.466.244,64	28.149.530,78
12	24.221.964,93	242.219,65	0,00	23.979.745,28		16.785.821,69	16.785.821,69	44.935.352,48
13	24.585.294,40	245.852,94	0,00	24.339.441,46		17.037.609,02	17.037.609,02	61.972.961,50
14	24.954.073,82	249.540,74	0,00	24.704.533,08		17.293.173,15	17.293.173,15	79.266.134,65
15	25.328.384,92	253.283,85	0,00	25.075.101,07		17.552.570,75	17.552.570,75	96.818.705,40

16	25.708.310,70	257.083,11	0,00	25.451.227,59		17.815.859,31	-27.188.140,69	69.630.564,72
17	26.093.935,36	260.939,35	0,00	25.832.996,00		18.083.097,20	18.083.097,20	87.713.661,92
18	26.485.344,39	264.853,44	0,00	26.220.490,94		18.354.343,66	18.354.343,66	106.068.005,58
19	26.882.624,55	268.826,25	0,00	26.613.798,31		18.629.658,82	18.629.658,82	124.697.664,40
20	27.285.863,92	272.858,64	0,00	27.013.005,28		18.909.103,70	18.909.103,70	143.606.768,09
Total	**475.488.058,75**	**4.754.880,59**	**0,00**	**470.733.178,16**	**37.393.256,62**		**143.606.768,09**	

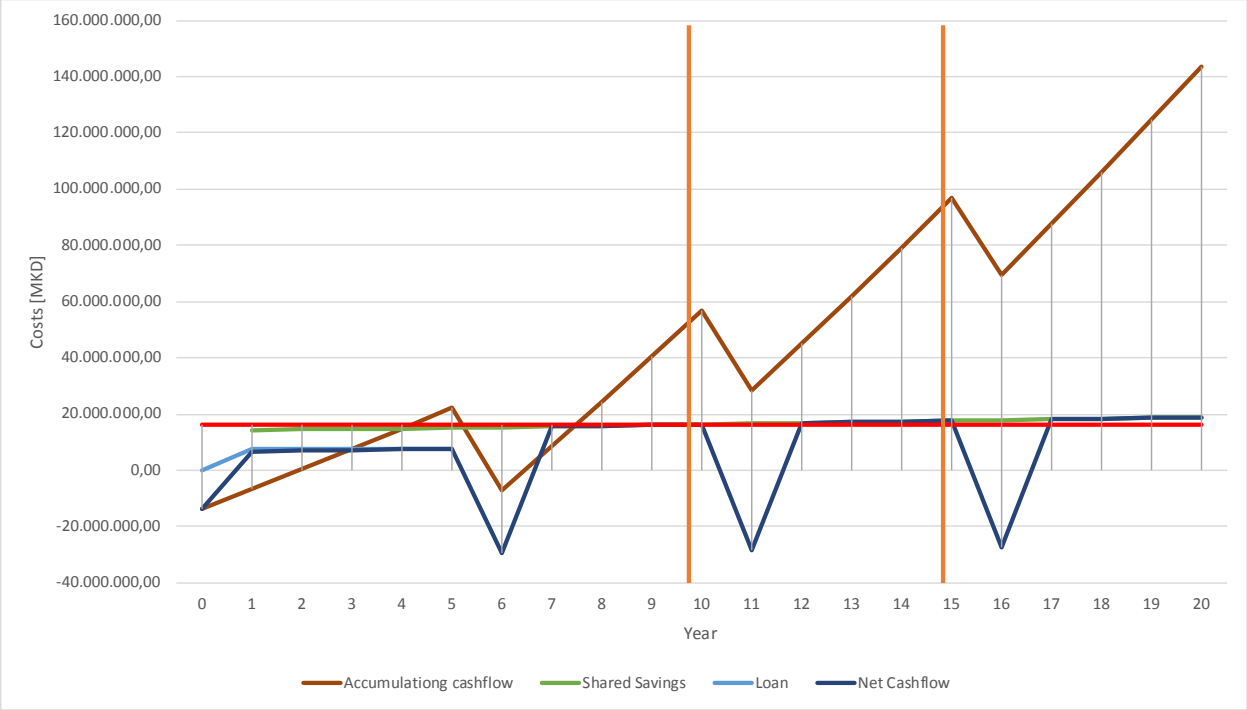


Figure 48. Cashflow chart

According to the above table and chart for the cashflow in the case of shared savings ESCO model, this project has significant potential.

The chart shows that the payoff for the project is in the 3th year and at the end of the 3 duration of the contracts (10, 15 and 20 years), the project will be with positive balance and above the set baseline.

The vertical red lines of the chart show the results in the case of 10, 15 and 20-year contract between the user and the ESCO. The red horizontal line shows the defined baseline as explained in the methodology. Even after 5 years, the project is above the baseline.

The conclusion is that the project is above the baseline in all three cases and that the assumption about the recurring investment (all after the first can be paid from the profit instead of loan) is true.

12.5.2 Sensitivity Analysis

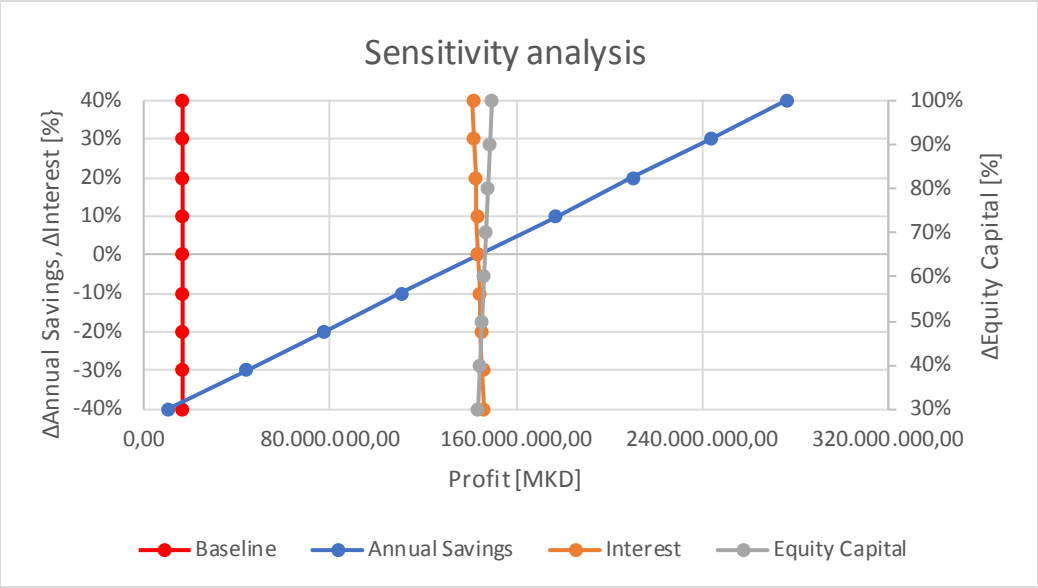


Figure 49. Sensitivity analysis for the Shared Savings Model

The sensitivity analysis only backs up the promising data from the cashflow calculations. It can be seen that only in extreme cases of deviations in the annual savings framework element, the project goes beyond the set baseline. That case can only be achieved if the technology underperforms and the energy price is significantly lowered (cca 35% from the current price).

12.6 Guaranteed Savings Model

12.6.1 Cashflow Calculations

The following table shows the financial data for the period of 20 years, considering the specific model requirements and indicators.

Table 18. Cashflow

Cashflow Guaranteed Savings										
Year	Savings	O&M	Esco cost	Net Savings	Loan	User Savings	User Cashflow	ESCO Cashflow	Net Cashflow	Accumulationg cashflow
0	0,00	0,00	0,00	0,00	0,00				-13.501.200,00	-13.501.200,00
1	20.562.831,00	205.628,31	0,00	20.357.202,69	7.478.651,32	8.142.881,08	664.229,75	12.214.321,61	12.214.321,61	-1.286.878,39
2	20.871.273,47	208.712,73	0,00	20.662.560,73	7.478.651,32	8.265.024,29	786.372,97	12.397.536,44	12.397.536,44	11.110.658,05
3	21.184.342,57	211.843,43	0,00	20.972.499,14	7.478.651,32	8.388.999,66	910.348,33	12.583.499,48	12.583.499,48	23.694.157,54
4	21.502.107,71	215.021,08	0,00	21.287.086,63	7.478.651,32	8.514.834,65	1.036.183,33	12.772.251,98	12.772.251,98	36.466.409,51

5	21.824.639,32	218.246,39	0,00	21.606.392,93	7.478.651,32	8.642.557,17	1.163.905,85	12.963.835,76	12.963.835,76	49.430.245,27
6	22.152.008,91	221.520,09	0,00	21.930.488,82		8.772.195,53	8.772.195,53	13.158.293,29	-31.845.706,71	17.584.538,56
7	22.484.289,04	224.842,89	0,00	22.259.446,15		8.903.778,46	8.903.778,46	13.355.667,69	13.355.667,69	30.940.206,26
8	22.821.553,38	228.215,53	0,00	22.593.337,85		9.037.335,14	9.037.335,14	13.556.002,71	13.556.002,71	44.496.208,96
9	23.163.876,68	231.638,77	0,00	22.932.237,91		9.172.895,17	9.172.895,17	13.759.342,75	13.759.342,75	58.255.551,71
10	23.511.334,83	235.113,35	0,00	23.276.221,48		9.310.488,59	9.310.488,59	13.965.732,89	13.965.732,89	72.221.284,60
11	23.864.004,85	238.640,05	0,00	23.625.364,81		9.450.145,92	9.450.145,92	14.175.218,88	-30.828.781,12	41.392.503,49
12	24.221.964,93	242.219,65	0,00	23.979.745,28		9.591.898,11	9.591.898,11	14.387.847,17	14.387.847,17	55.780.350,65
13	24.585.294,40	245.852,94	0,00	24.339.441,46		9.735.776,58	9.735.776,58	14.603.664,87	14.603.664,87	70.384.015,53
14	24.954.073,82	249.540,74	0,00	24.704.533,08		9.881.813,23	9.881.813,23	14.822.719,85	14.822.719,85	85.206.735,37
15	25.328.384,92	253.283,85	0,00	25.075.101,07		10.030.040,43	10.030.040,43	15.045.060,64	15.045.060,64	100.251.796,02
16	25.708.310,70	257.083,11	0,00	25.451.227,59		10.180.491,04	10.180.491,04	15.270.736,55	-29.733.263,45	70.518.532,57
17	26.093.935,36	260.939,35	0,00	25.832.996,00		10.333.198,40	10.333.198,40	15.499.797,60	15.499.797,60	86.018.330,17
18	26.485.344,39	264.853,44	0,00	26.220.490,94		10.488.196,38	10.488.196,38	15.732.294,57	15.732.294,57	101.750.624,74
19	26.882.624,55	268.826,25	0,00	26.613.798,31		10.645.519,32	10.645.519,32	15.968.278,99	15.968.278,99	117.718.903,73
20	27.285.863,92	272.858,64	0,00	27.013.005,28		10.805.202,11	10.805.202,11	16.207.803,17	16.207.803,17	133.926.706,90
Total	**475.488.058,75**	**4.754.880,59**	**0,00**	**470.733.178,16**	**37.393.256,62**		**150.900.014,65**	**282.439.906,90**	**133.926.706,90**	

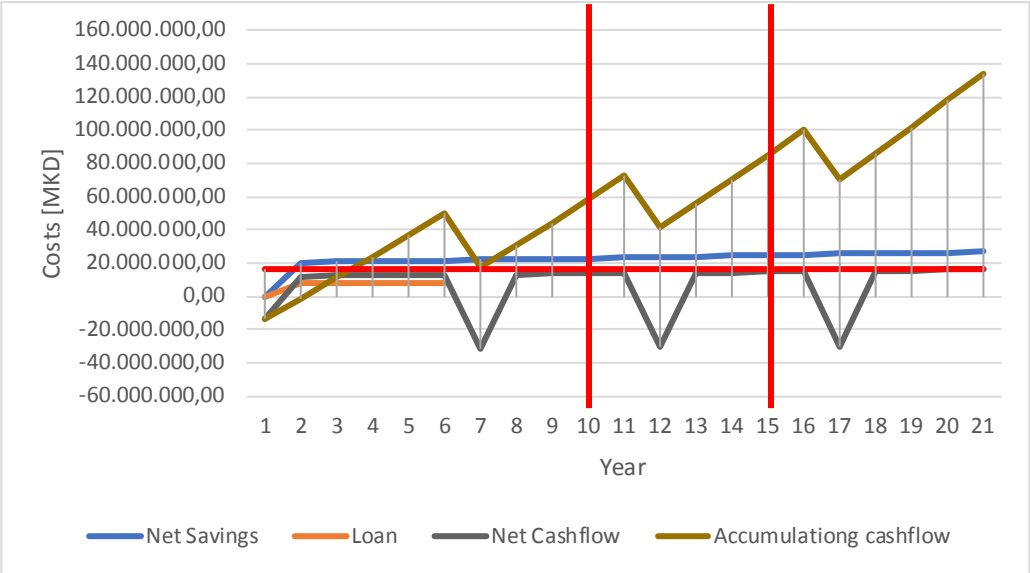


Figure 50. Cashflow chart

According to the above table and chart for the cashflow in the case of guaranteed savings ESCO model, this project has significant potential for all lengths of contracts.

The chart shows that the payoff for the project is in the 3th year and at the end of all durations of the contracts (10, 15 and 20 years), the project will be with positive balance.

The vertical red lines of the chart show the results in the case of 10, 15 and 20-year contract between the user and the ESCO. The red horizontal line shows the defined baseline as explained in the methodology. According to this chart the project has short payback period, and all cases are significantly above the determined baseline. The results are similar to the Shared Savings Model, but for the ESCO side, they show bigger progress.

12.6.2 Sensitivity Analysis

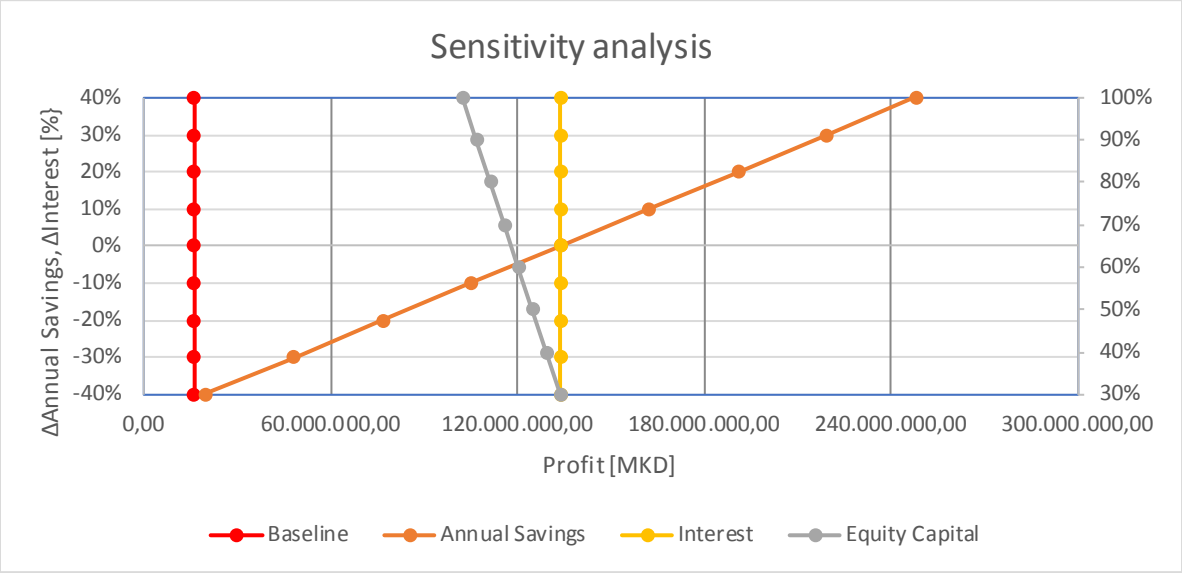


Figure 51. Sensitivity analysis for the Shared Savings Model

The sensitivity analysis only backs up the data from the cashflow calculations. It can be seen that in any case, the project is not going behind the set baseline.

12.7 ESCO Supplier Model

12.7.1 Input data

This model is completely different compared to the previous models. The input data about the annual savings is calculated considering the following input data:

ESCO Provider data		
Electricity consumption	4501518	kWh/yr
Electricity Cost	36057159	MKD/yr
Electricity Price	8,00999996	MKD/kWh
Electricity Savings	1767789	MKD/yr
Electricity Consumption After	2733729	kWh/yr
Electricity Price After Measur	12,41549994	MKD/kWh
Electricity Cost After Measure	33940612,23	MKD/yr
Consumer Savings After Meas	2116546,77	MKD/yr
ESCO Savings After Measures	12043443,05	MKD/yr

Figure 52. ESCO as Supplier input data

12.7.2 Cashflow Calculations

The following table shows the financial data for the period of 20 years, considering the specific model requirements and indicators.

Table 19. Cashflow

Cashflow Guaranteed Savings										
	Costumer Side				Esco Side					
Year	Savings	Loan	Net Savings	Accumulating cashflow	Savings	O&M	Net Savings	Loan	Net Cashflow	Accumulationg cashflow
0	0,00	0,00	0,00	0,00	0,00	0,00			-13.501.200,00	-13.501.200,00
1	2.116.546,77	0,00	2.116.546,77	2.116.546,77	12.043.443,05	205.628,31	11.837.814,74	7.478.651,32	4.359.163,42	-9.142.036,58
2	2.148.294,97	0,00	2.148.294,97	4.264.841,74	12.224.094,70	208.712,73	12.015.381,96	7.478.651,32	4.536.730,64	-4.605.305,95
3	2.180.519,40	0,00	2.180.519,40	6.445.361,14	12.407.456,12	211.843,43	12.195.612,69	7.478.651,32	4.716.961,37	111.655,42
4	2.213.227,19	0,00	2.213.227,19	8.658.588,32	12.593.567,96	215.021,08	12.378.546,88	7.478.651,32	4.899.895,56	5.011.550,98
5	2.246.425,59	0,00	2.246.425,59	10.905.013,92	12.782.471,48	218.246,39	12.564.225,08	7.478.651,32	5.085.573,76	10.097.124,74
6	2.280.121,98	0,00	2.280.121,98	13.185.135,90	12.974.208,55	221.520,09	12.752.688,46	0,00	-32.251.311,54	-22.154.186,80
7	2.314.323,81	0,00	2.314.323,81	15.499.459,71	13.168.821,68	224.842,89	12.943.978,79	0,00	12.943.978,79	-9.210.208,02
8	2.349.038,67	0,00	2.349.038,67	17.848.498,37	13.366.354,00	228.215,53	13.138.138,47	0,00	13.138.138,47	3.927.930,45
9	2.384.274,25	0,00	2.384.274,25	20.232.772,62	13.566.849,31	231.638,77	13.335.210,55	0,00	13.335.210,55	17.263.141,00
10	2.420.038,36	0,00	2.420.038,36	22.652.810,98	13.770.352,05	235.113,35	13.535.238,70	0,00	13.535.238,70	30.798.379,70
11	2.456.338,93	0,00	2.456.338,93	25.109.149,91	13.976.907,33	238.640,05	13.738.267,28	0,00	-31.265.732,72	-467.353,02
12	2.493.184,02	0,00	2.493.184,02	27.602.333,93	14.186.560,94	242.219,65	13.944.341,29	0,00	13.944.341,29	13.476.988,28
13	2.530.581,78	0,00	2.530.581,78	30.132.915,71	14.399.359,36	245.852,94	14.153.506,41	0,00	14.153.506,41	27.630.494,69

14	2.568.540,51	0,00	2.568.540,51	32.701.456,21	14.615.349,75	249.540,74	14.365.809,01	0,00	14.365.809,01	41.996.303,70
15	2.607.068,61	0,00	2.607.068,61	35.308.524,83	14.834.579,99	253.283,85	14.581.296,14	0,00	14.581.296,14	56.577.599,84
16	2.646.174,64	0,00	2.646.174,64	37.954.699,47	15.057.098,69	257.083,11	14.800.015,59	0,00	-30.203.984,41	26.373.615,43
17	2.685.867,26	0,00	2.685.867,26	40.640.566,73	15.282.955,17	260.939,35	15.022.015,82	0,00	15.022.015,82	41.395.631,25
18	2.726.155,27	0,00	2.726.155,27	43.366.722,00	15.512.199,50	264.853,44	15.247.346,06	0,00	15.247.346,06	56.642.977,31
19	2.767.047,60	0,00	2.767.047,60	46.133.769,60	15.744.882,49	268.826,25	15.476.056,25	0,00	15.476.056,25	72.119.033,55
20	2.808.553,31	0,00	2.808.553,31	48.942.322,92	15.981.055,73	272.858,64	15.708.197,09	0,00	15.708.197,09	87.827.230,65
Total	**48.942.322,92**	**0,00**	**48.942.322,92**		**278.488.567,85**	**4.754.880,59**	**273.733.687,26**	**37.393.256,62**	**87.827.230,65**	

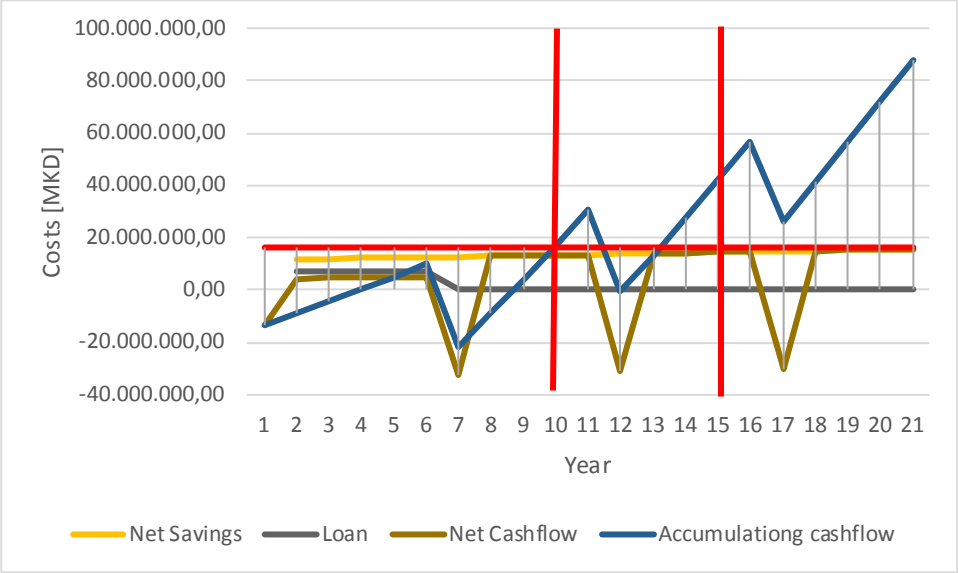


Figure 53. Cashflow chart

According to the above table and chart for the cashflow in the case of ESCO as a supplier model, this project has the best potential compared to the other models.

The chart shows that the payoff for the project is in the 4th year and at the end of the 3 durations of the contracts (10, 15 and 20 years), the project will be with positive balance.

The vertical red lines of the chart show the results in the case of 10, 15 and 20-year contract between the user and the ESCO. The red horizontal line shows the defined baseline as explained in the methodology. According to this chart, all project durations are acceptable for the ESCO side of the model.

12.7.3 Sensitivity Analysis

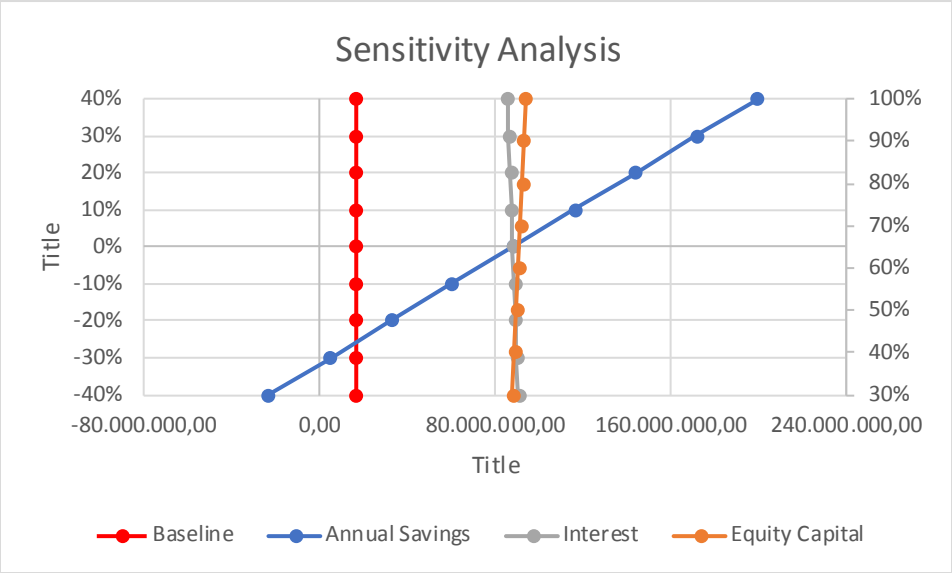


Figure 54. Sensitivity analysis for the Shared Savings Model

5. The sensitivity analysis only backs up the promising data from the cashflow calculations. It can be seen that only in extreme cases of deviations in the annual savings framework element, the project goes beyond the set baseline. That case can only be achieved if the technology underperforms and the energy price is significantly lowered (cca 30% from the current price).

12.8 Development Finance ESCO Model

12.8.1 Cashflow Calculations

The following table shows the financial data for the period of 20 years, considering the specific model requirements and indicators.

Table 20. Cashflow

Cashflow Guaranteed Savings									
Year	Savings	O&M	Esco cost	Net Savings	Loan	User Savings	ESCO Cashflow	Net Cashflow	Accumulationg cashflow
0	0,00	0,00	0,00	0,00	0,00		-10.800.960,00		-10.800.960,00
1	20.562.831,00	205.628,31	0,00	20.357.202,69	5.982.921,06	8.142.881,08	12.214.321,61	2.159.960,02	1.413.361,61
2	20.871.273,47	208.712,73	0,00	20.662.560,73	5.982.921,06	8.265.024,29	12.397.536,44	2.282.103,23	13.810.898,05
3	21.184.342,57	211.843,43	0,00	20.972.499,14	5.982.921,06	8.388.999,66	12.583.499,48	2.406.078,60	26.394.397,54
4	21.502.107,71	215.021,08	0,00	21.287.086,63	5.982.921,06	8.514.834,65	12.772.251,98	2.531.913,59	39.166.649,51

5	21.824.639,32	218.246,39	0,00	21.606.392,93	5.982.921,06	8.642.557,17	12.963.835,76	2.659.636,11	52.130.485,27
6	22.152.008,91	221.520,09	0,00	21.930.488,82		8.772.195,53	-31.845.706,71	8.772.195,53	20.284.778,56
7	22.484.289,04	224.842,89	0,00	22.259.446,15		8.903.778,46	13.355.667,69	8.903.778,46	33.640.446,26
8	22.821.553,38	228.215,53	0,00	22.593.337,85		9.037.335,14	13.556.002,71	9.037.335,14	47.196.448,96
9	23.163.876,68	231.638,77	0,00	22.932.237,91		9.172.895,17	13.759.342,75	9.172.895,17	60.955.791,71
10	23.511.334,83	235.113,35	0,00	23.276.221,48		9.310.488,59	13.965.732,89	9.310.488,59	74.921.524,60
11	23.864.004,85	238.640,05	0,00	23.625.364,81		9.450.145,92	-30.828.781,12	9.450.145,92	44.092.743,49
12	24.221.964,93	242.219,65	0,00	23.979.745,28		9.591.898,11	14.387.847,17	9.591.898,11	58.480.590,65
13	24.585.294,40	245.852,94	0,00	24.339.441,46		9.735.776,58	14.603.664,87	9.735.776,58	73.084.255,53
14	24.954.073,82	249.540,74	0,00	24.704.533,08		9.881.813,23	14.822.719,85	9.881.813,23	87.906.975,37
15	25.328.384,92	253.283,85	0,00	25.075.101,07		10.030.040,43	15.045.060,64	10.030.040,43	102.952.036,02
16	25.708.310,70	257.083,11	0,00	25.451.227,59		10.180.491,04	-29.733.263,45	10.180.491,04	73.218.772,57
17	26.093.935,36	260.939,35	0,00	25.832.996,00		10.333.198,40	15.499.797,60	10.333.198,40	88.718.570,17
18	26.485.344,39	264.853,44	0,00	26.220.490,94		10.488.196,38	15.732.294,57	10.488.196,38	104.450.864,74
19	26.882.624,55	268.826,25	0,00	26.613.798,31		10.645.519,32	15.968.278,99	10.645.519,32	120.419.143,73
20	27.285.863,92	272.858,64	0,00	27.013.005,28		10.805.202,11	16.207.803,17	10.805.202,11	136.626.946,90
Total	**475.488.058,75**	**4.754.880,59**	**0,00**	**470.733.178,16**	**29.914.605,29**		**136.626.946,90**	**158.378.665,97**	

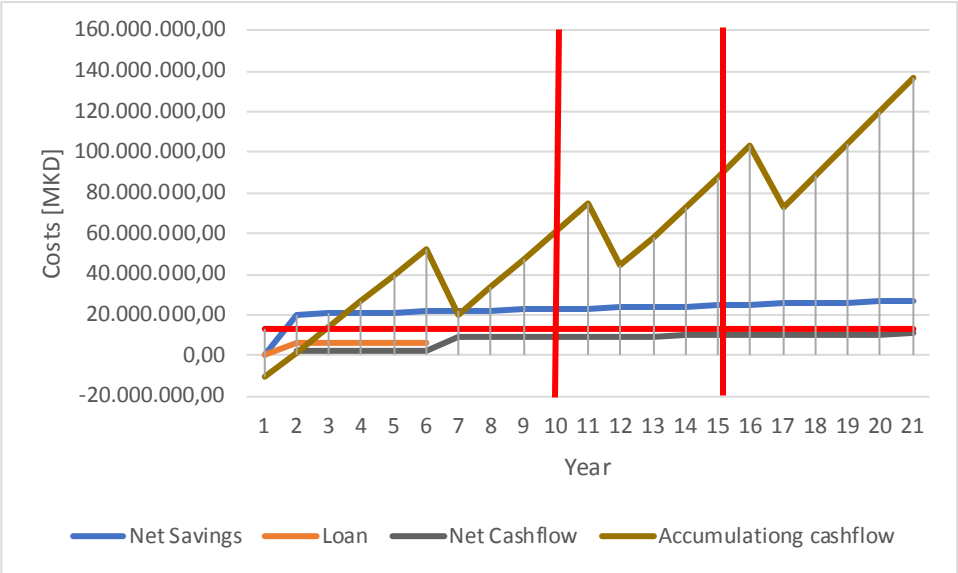


Figure 55. Cashflow chart

According to the above table and chart for the cashflow in the case of development finance ESCO model, this project has similar potential as the previously considered models.

The chart shows that the payoff for the project is in the 1^{h} year and at the end of the 3 durations of the contracts (10, 15 and 20 years), the project will be with positive balance.

The conclusions are similar to the ones in the Guaranteed Savings Model (which is taken as a basis for this model), but with slight improvements of the results as it is shown below.

The vertical red lines of the chart show the results in the case of 10, 15 and 20-year contract between the user and the ESCO. The red horizontal line shows the defined baseline as explained in the methodology.

12.8.2 Sensitivity Analysis

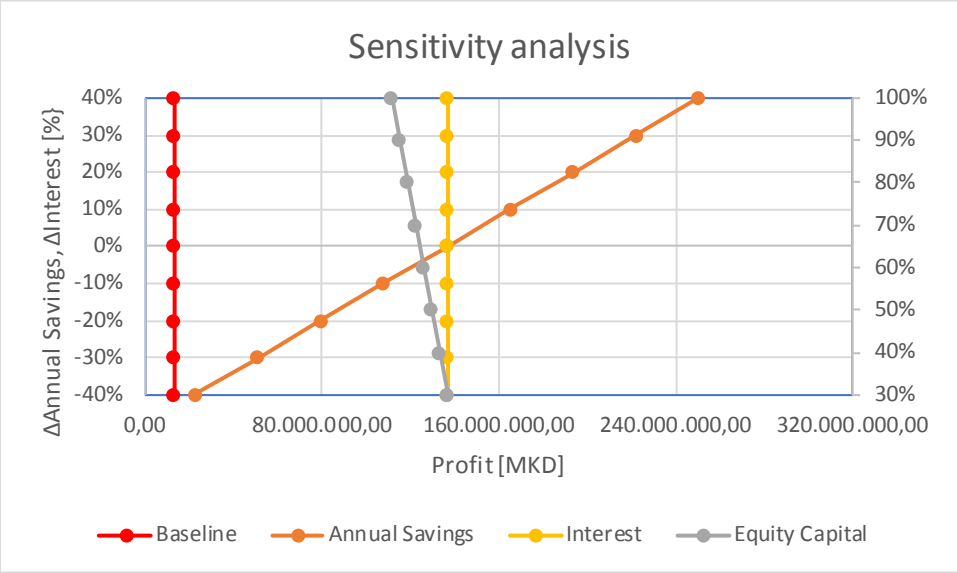


Figure 56. Sensitivity analysis for the Shared Savings Model

The sensitivity analysis only backs up the data from the cashflow calculations. It can be seen that in any case, the project is not going behind the set baseline.

12.9 Conclusions

The above analysis shows that in this concrete case, all four models can be successfully implemented in Macedonia for all contract lengths. Since the benefits are significant, and the motivation of the user to engage with ESCO small, the smaller lengths of the contracts are more preferable. The Guaranteed Savings Model and the Development Finance Model shows best results, but all of the cases are promising.

13 Public Lighting – LED

13.1 Description of the Measures

The measure includes change of the incandescent bulbs in the public lighting of one municipality with LED.

This case study is different from the previous. The analysis considers another municipality. Also, the lifetime of the LED is significantly longer, so the recurring investment is not considered in this case.

13.2 Energy Calculations

The basic energy data is:

Energy consumption before measures: 294300 kWh/yr

Total energy savings: 163500 kWh/yr

Financial savings: 1082400 MKD/yr

Energy price – electricity: 6.6 MKD/kWh

13.3 Profitability Calculations

Name	Public lighting				
Total Investment	12841200	MKD	Payback	11,98	yr
Annual Savings	1082400	MKD	Pay-off		yr
Annual O&M Cost	10824	MKD	Internal Rate of Return	2,1%	
Net Savings	1071576	MKD	Net Present Value	707092	
Economic Lifetime	15	yr	Net Present Value Quotient	0,06	
Maximum Pay-Off	20	yr	Maximum Investment	17160764	

Figure 57. Profitability calculations - input data and results

The profitability calculations show that this project is borderline economically feasible and may be worth to be considered for financing. Additional analysis in needed. The payback period is relatively long and the internal rate of return and net present value quotient are not convincing.

13.4 Cashflow input data

Alternative Name	Public lighting	
Cashflow Period	20	yr
Equity Capital	3852360	MKD
Grant	0	MKD
Total Loan	8988840	MKD
Annual Savings	1082400	MKD
Annual O&M	10824	MKD
Annual ESCO costs	0	MKD
Net Savings	1071576	MKD
Inflation Rate	1,5%	

Loan From	Bank 1	
Ammount	8988840	MKD
Interest	6%	
Years	10	yr
Term	1 month	month/yr
Grace Period	0	month/yr
Total Investment	12841200	MKD

11. Figure 58. Cashflow input data

13.5 Shared Savings Model

13.5.1 Cashflow Calculations

The following table shows the financial data for the period of 20 years, considering the specific model requirements and indicators.

Table 21. Cashflow

Cashflow Shared Savings								
Year	Savings	O&M	Esco cost	Net Savings	Loan	Shared Savings	Net Cashflow	Accumulating cashflow
0	0,00	0,00	0,00	0,00	0,00		-3.852.360,00	-3.852.360,00
1	1.082.400,00	10.824,00	0,00	1.071.576,00	1.221.295,34	750.103,20	-471.192,14	-4.323.552,14
2	1.098.636,00	10.986,36	0,00	1.087.649,64	1.221.295,34	761.354,75	-459.940,59	-4.783.492,73
3	1.115.115,54	11.151,16	0,00	1.103.964,38	1.221.295,34	772.775,07	-448.520,27	-5.232.013,00
4	1.131.842,27	11.318,42	0,00	1.120.523,85	1.221.295,34	784.366,70	-436.928,64	-5.668.941,64
5	1.148.819,91	11.488,20	0,00	1.137.331,71	1.221.295,34	796.132,20	-425.163,14	-6.094.104,78
6	1.166.052,21	11.660,52	0,00	1.154.391,68	1.221.295,34	808.074,18	-413.221,16	-6.507.325,94
7	1.183.542,99	11.835,43	0,00	1.171.707,56	1.221.295,34	820.195,29	-401.100,05	-6.908.425,98
8	1.201.296,13	12.012,96	0,00	1.189.283,17	1.221.295,34	832.498,22	-388.797,12	-7.297.223,10
9	1.219.315,58	12.193,16	0,00	1.207.122,42	1.221.295,34	844.985,69	-376.309,64	-7.673.532,75
10	1.237.605,31	12.376,05	0,00	1.225.229,26	1.221.295,34	857.660,48	-363.634,86	-8.037.167,60
11	1.256.169,39	12.561,69	0,00	1.243.607,70		870.525,39	870.525,39	-7.166.642,22
12	1.275.011,93	12.750,12	0,00	1.262.261,81		883.583,27	883.583,27	-6.283.058,95
13	1.294.137,11	12.941,37	0,00	1.281.195,74		896.837,02	896.837,02	-5.386.221,93
14	1.313.549,17	13.135,49	0,00	1.300.413,67		910.289,57	910.289,57	-4.475.932,36
15	1.333.252,40	13.332,52	0,00	1.319.919,88		923.943,92	923.943,92	-3.551.988,45
16	1.353.251,19	13.532,51	0,00	1.339.718,68		937.803,07	937.803,07	-2.614.185,37

17	1.373.549,96	13.735,50	0,00	1.359.814,46		951.870,12	951.870,12	-1.662.315,25
18	1.394.153,21	13.941,53	0,00	1.380.211,67		966.148,17	966.148,17	-696.167,08
19	1.415.065,50	14.150,66	0,00	1.400.914,85		980.640,39	980.640,39	284.473,31
20	1.436.291,49	14.362,91	0,00	1.421.928,57		995.350,00	995.350,00	1.279.823,31
Total	**25.029.057,27**	**250.290,57**	**0,00**	**24.778.766,70**	**12.212.953,38**		**1.279.823,31**	

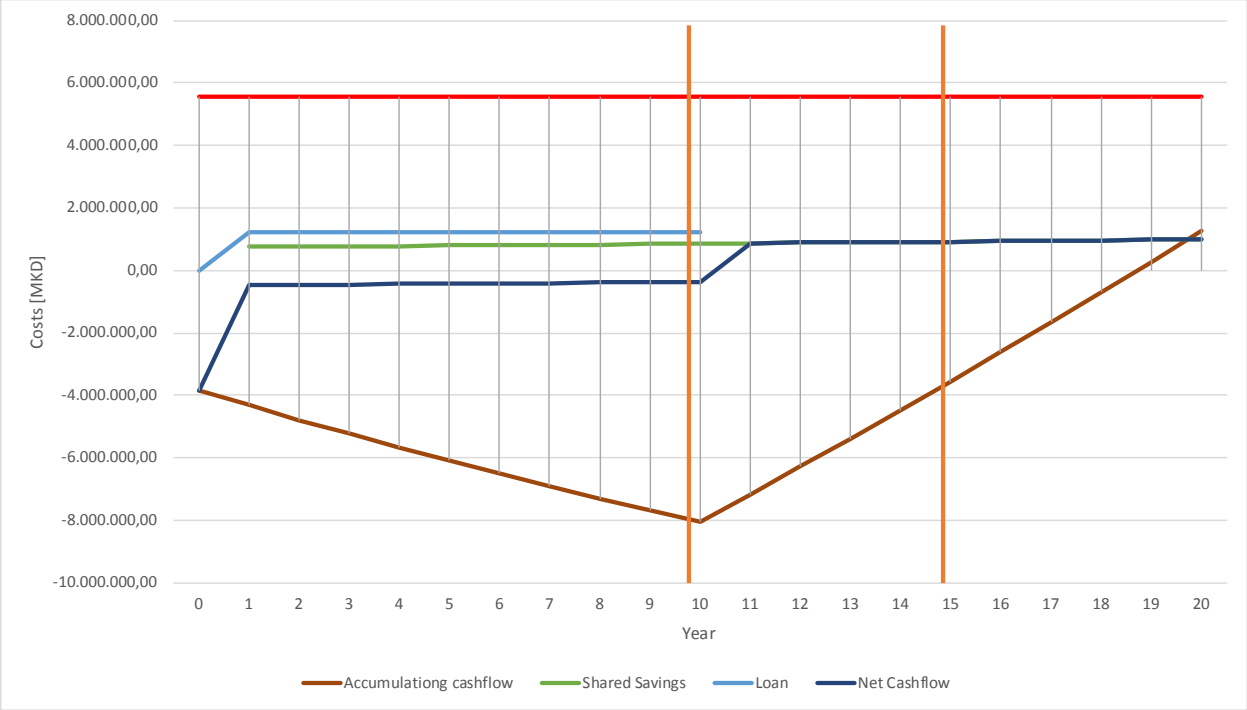


Figure 59. Cashflow chart

According to the above table and chart for the cashflow in the case of shared savings ESCO model, this project has но potential.

The chart shows that the payoff for the project is in the 3th year and at the end of the longest duration of the contracts (20 years), the project will be with positive balance but below the baseline.

The vertical red lines of the chart show the results in the case of 10, 15 and 20-year contract between the user and the ESCO. The red horizontal line shows the defined baseline as explained in the methodology. Even after 5 years, the project is above the baseline.

The conclusion is that the project is below the baseline in all three cases. The analysis was done considering 70-30% sharing of the savings in the benefit for the ESCO and still the project has no potential. In all other cases, the share is the same as this case only for the duration of the loan, and after that the share is divided 50-50%.

13.5.2 Sensitivity Analysis

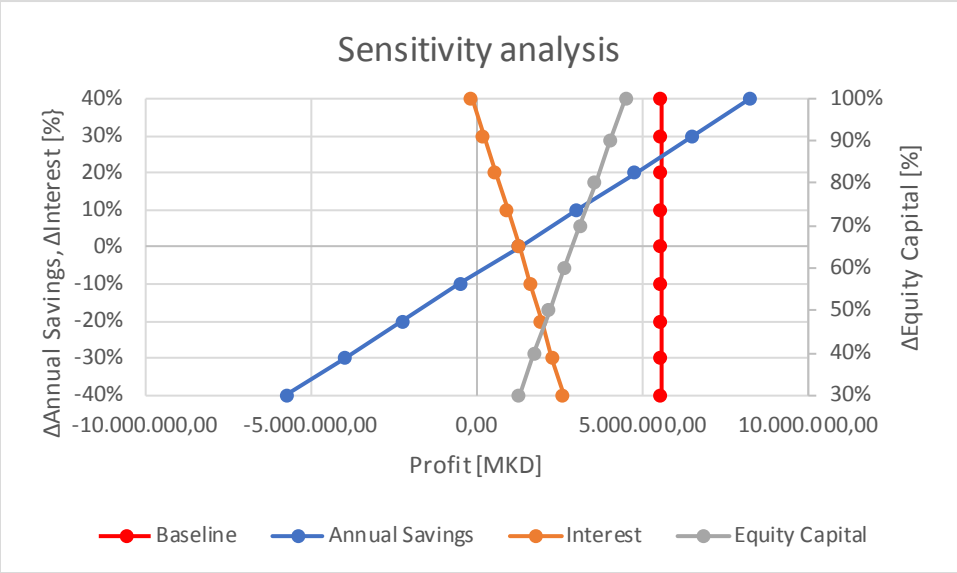


Figure 60. Sensitivity analysis for the Shared Savings Model

The sensitivity analysis only backs up the data from the cashflow calculations. It can be seen that only in extreme cases of deviations in the annual savings framework element, the project goes beyond the set baseline. That case can only be achieved if the technology overperforms and the energy price is significantly higher (cca 20% from the current price).

13.6 Guaranteed Savings Model

13.6.1 Cashflow Calculations

The following table shows the financial data for the period of 20 years, considering the specific model requirements and indicators.

Table 22. Cashflow

Cashflow Guaranteed Savings										
Year	Savings	O&M	Esco cost	Net Savings	Loan	User Savings	User Cashflow	ESCO Cashflow	Net Cashflow	Accumulating cashflow
0	0,00	0,00	0,00	0,00	0,00				-3.852.360,00	-3.852.360,00
1	1.082.400,00	10.824,00	0,00	1.071.576,00	1.221.295,34	750.103,20	-471.192,14	321.472,80	321.472,80	-3.530.887,20
2	1.098.636,00	10.986,36	0,00	1.087.649,64	1.221.295,34	761.354,75	-459.940,59	326.294,89	326.294,89	-3.204.592,31
3	1.115.115,54	11.151,16	0,00	1.103.964,38	1.221.295,34	772.775,07	-448.520,27	331.189,32	331.189,32	-2.873.402,99
4	1.131.842,27	11.318,42	0,00	1.120.523,85	1.221.295,34	784.366,70	-436.928,64	336.157,16	336.157,16	-2.537.245,84

5	1.148.819,91	11.488,20	0,00	1.137.331,71	1.221.295,34	796.132,20	-425.163,14	341.199,51	341.199,51	-2.196.046,33
6	1.166.052,21	11.660,52	0,00	1.154.391,68	1.221.295,34	808.074,18	-413.221,16	346.317,51	346.317,51	-1.849.728,82
7	1.183.542,99	11.835,43	0,00	1.171.707,56	1.221.295,34	820.195,29	-401.100,05	351.512,27	351.512,27	-1.498.216,55
8	1.201.296,13	12.012,96	0,00	1.189.283,17	1.221.295,34	832.498,22	-388.797,12	356.784,95	356.784,95	-1.141.431,60
9	1.219.315,58	12.193,16	0,00	1.207.122,42	1.221.295,34	844.985,69	-376.309,64	362.136,73	362.136,73	-779.294,87
10	1.237.605,31	12.376,05	0,00	1.225.229,26	1.221.295,34	857.660,48	-363.634,86	367.568,78	367.568,78	-411.726,10
11	1.256.169,39	12.561,69	0,00	1.243.607,70	0,00	621.803,85	621.803,85	621.803,85	621.803,85	210.077,75
12	1.275.011,93	12.750,12	0,00	1.262.261,81	0,00	631.130,91	631.130,91	631.130,91	631.130,91	841.208,66
13	1.294.137,11	12.941,37	0,00	1.281.195,74	0,00	640.597,87	640.597,87	640.597,87	640.597,87	1.481.806,52
14	1.313.549,17	13.135,49	0,00	1.300.413,67	0,00	650.206,84	650.206,84	650.206,84	650.206,84	2.132.013,36
15	1.333.252,40	13.332,52	0,00	1.319.919,88	0,00	659.959,94	659.959,94	659.959,94	659.959,94	2.791.973,30
16	1.353.251,19	13.532,51	0,00	1.339.718,68	0,00	669.859,34	669.859,34	669.859,34	669.859,34	3.461.832,64
17	1.373.549,96	13.735,50	0,00	1.359.814,46	0,00	679.907,23	679.907,23	679.907,23	679.907,23	4.141.739,87
18	1.394.153,21	13.941,53	0,00	1.380.211,67	0,00	690.105,84	690.105,84	690.105,84	690.105,84	4.831.845,70
19	1.415.065,50	14.150,66	0,00	1.400.914,85	0,00	700.457,42	700.457,42	700.457,42	700.457,42	5.532.303,13
20	1.436.291,49	14.362,91	0,00	1.421.928,57	0,00	710.964,29	710.964,29	710.964,29	710.964,29	6.243.267,42
Total	**25.029.057,27**	**250.290,57**	**0,00**	**24.778.766,70**	**12.212.953,38**		**2.470.185,91**	**10.095.627,42**	**6.243.267,42**	

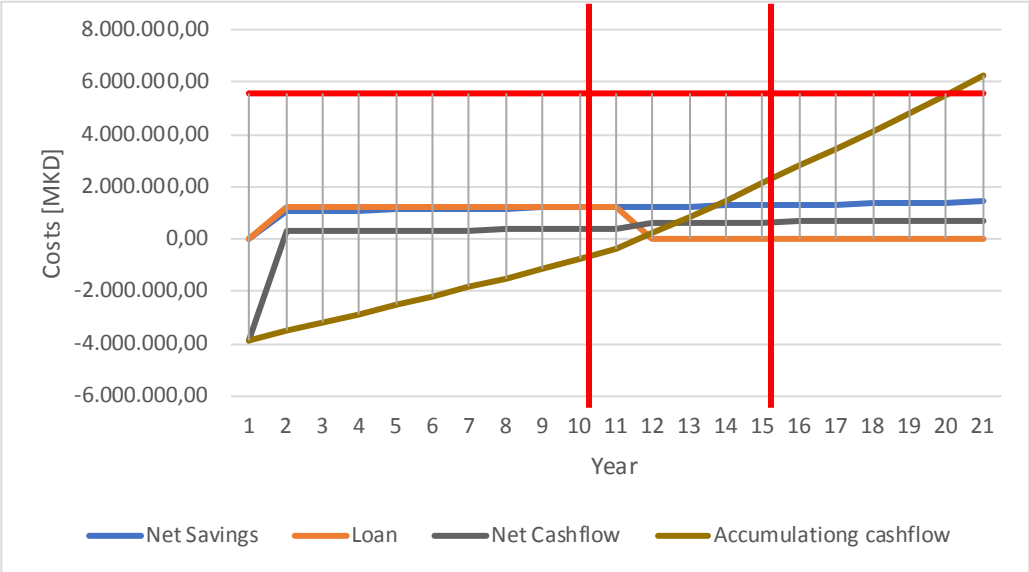


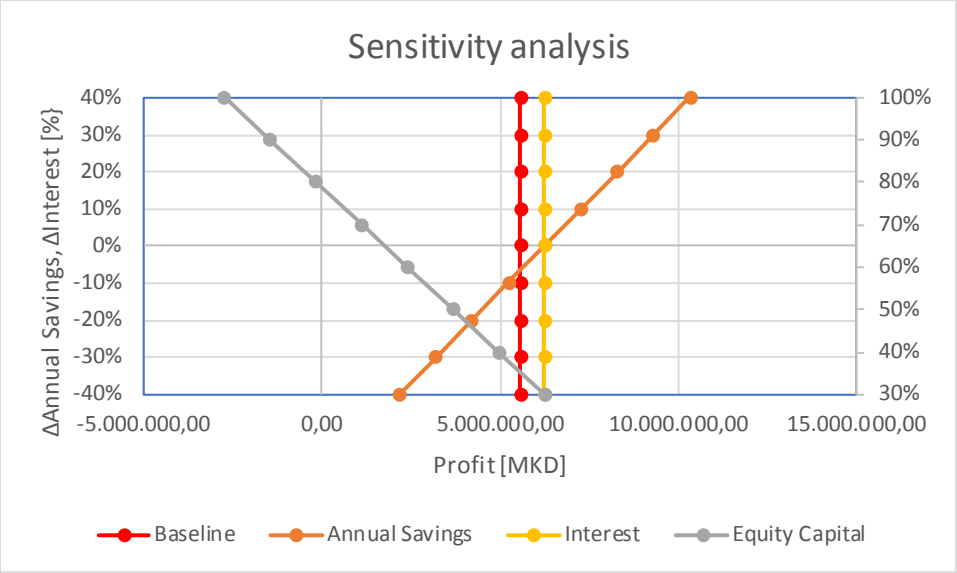
Figure 61. Cashflow chart

According to the above table and chart for the cashflow in the case of guaranteed savings ESCO model, this project has potential.

The chart shows that the payoff for the project is in the 12th year and at the end of the 2 durations of the contracts (15 and 20 years), the project will be with positive balance.

The vertical red lines of the chart show the results in the case of 10, 15 and 20-year contract between the user and the ESCO. The red horizontal line shows the defined baseline as explained in the methodology. According to this chart, the profit is significantly below the determined baseline for a contract of 10 years. That is not the case if the contract length is longer - 20 years, since the accumulating cashflow passes the baseline after the 19h year.

13.6.2 Sensitivity Analysis



5.1.1.

Figure 62. Sensitivity analysis for the Shared Savings Model

As it can be seen, the initial solution for a contract with period of 20 years is above the baseline. But all cases with lower electricity price or if the technology is underachieving, as well as bigger equity capital, is below the baseline. So, this project has no potential for ESCO contract.

13.7 ESCO Supplier Model

13.7.1 Input data

This model is completely different compared to the previous models. The input data about the annual savings is calculated considering the following input data:

ESCO Provider data		
Electricity consumption	294300	kWh/yr
Electricity Cost	1943400	MKD/yr
Electricity Price	6,603465851	MKD/kWh
Electricity Savings	163500	MKD/yr
Electricity Consumption After	130800	kWh/yr
Electricity Price After Measur	14,52762487	MKD/kWh
Electricity Cost After Measure	1900213,333	MKD/yr
Consumer Savings After Meas	43186,66667	MKD/yr
ESCO Savings After Measures	1036480	MKD/yr

Figure 63. ESCO as Supplier input data

13.7.2 Cashflow Calculations

The following table shows the financial data for the period of 20 years, considering the specific model requirements and indicators.

Table 23. Cashflow

Cashflow Guaranteed Savings										
	Costumer Side				Esco Side					
Year	Savings	Loan	Net Savings	Accumulating cashflow	Savings	O&M	Net Savings	Loan	Net Cashflow	Accumulating cashflow
0	0,00	0,00	0,00	0,00	0,00	0,00			-3.852.360,00	-3.852.360,00
1	43.186,67	0,00	43.186,67	43.186,67	1.036.480,00	10.824,00	1.025.656,00	1.221.295,34	-195.639,34	-4.047.999,34
2	43.834,47	0,00	43.834,47	87.021,13	1.052.027,20	10.986,36	1.041.040,84	1.221.295,34	-180.254,50	-4.228.253,84
3	44.491,98	0,00	44.491,98	131.513,12	1.067.807,61	11.151,16	1.056.656,45	1.221.295,34	-164.638,88	-4.392.892,72
4	45.159,36	0,00	45.159,36	176.672,48	1.083.824,72	11.318,42	1.072.506,30	1.221.295,34	-148.789,04	-4.541.681,76
5	45.836,75	0,00	45.836,75	222.509,23	1.100.082,09	11.488,20	1.088.593,89	1.221.295,34	-132.701,44	-4.674.383,20
6	46.524,31	0,00	46.524,31	269.033,54	1.116.583,32	11.660,52	1.104.922,80	1.221.295,34	-116.372,54	-4.790.755,74
7	47.222,17	0,00	47.222,17	316.255,71	1.133.332,07	11.835,43	1.121.496,64	1.221.295,34	-99.798,69	-4.890.554,43
8	47.930,50	0,00	47.930,50	364.186,21	1.150.332,06	12.012,96	1.138.319,09	1.221.295,34	-82.976,24	-4.973.530,67
9	48.649,46	0,00	48.649,46	412.835,67	1.167.587,04	12.193,16	1.155.393,88	1.221.295,34	-65.901,46	-5.039.432,13
10	49.379,20	0,00	49.379,20	462.214,87	1.185.100,84	12.376,05	1.172.724,79	1.221.295,34	-48.570,55	-5.088.002,68
11	50.119,89	0,00	50.119,89	512.334,76	1.202.877,35	12.561,69	1.190.315,66	0,00	1.190.315,66	-3.897.687,02
12	50.871,69	0,00	50.871,69	563.206,45	1.220.920,51	12.750,12	1.208.170,40	0,00	1.208.170,40	-2.689.516,62
13	51.634,76	0,00	51.634,76	614.841,21	1.239.234,32	12.941,37	1.226.292,95	0,00	1.226.292,95	-1.463.223,67
14	52.409,28	0,00	52.409,28	667.250,50	1.257.822,84	13.135,49	1.244.687,35	0,00	1.244.687,35	-218.536,33

15	53.195,42	0,00	53.195,42	720.445,92	1.276.690,18	13.332,52	1.263.357,66	0,00	1.263.357,66	1.044.821,33
16	53.993,36	0,00	53.993,36	774.439,28	1.295.840,53	13.532,51	1.282.308,02	0,00	1.282.308,02	2.327.129,35
17	54.803,26	0,00	54.803,26	829.242,53	1.315.278,14	13.735,50	1.301.542,64	0,00	1.301.542,64	3.628.671,99
18	55.625,30	0,00	55.625,30	884.867,84	1.335.007,31	13.941,53	1.321.065,78	0,00	1.321.065,78	4.949.737,77
19	56.459,68	0,00	56.459,68	941.327,52	1.355.032,42	14.150,66	1.340.881,77	0,00	1.340.881,77	6.290.619,54
20	57.306,58	0,00	57.306,58	998.634,10	1.375.357,91	14.362,91	1.360.994,99	0,00	1.360.994,99	7.651.614,53
Total	**998.634,10**	**0,00**	**998.634,10**		**23.967.218,48**	**250.290,57**	**23.716.927,91**	**12.212.953,38**	**7.651.614,53**	

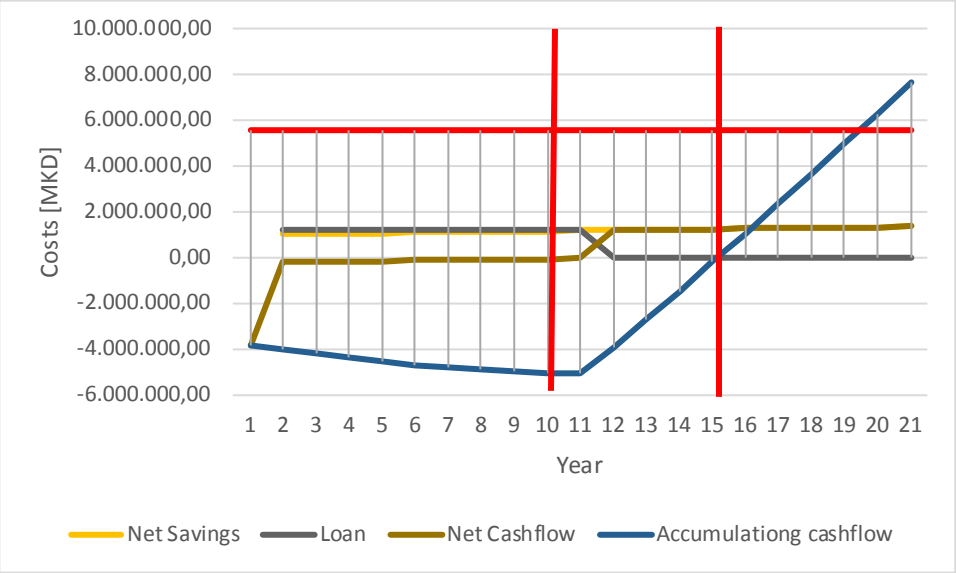
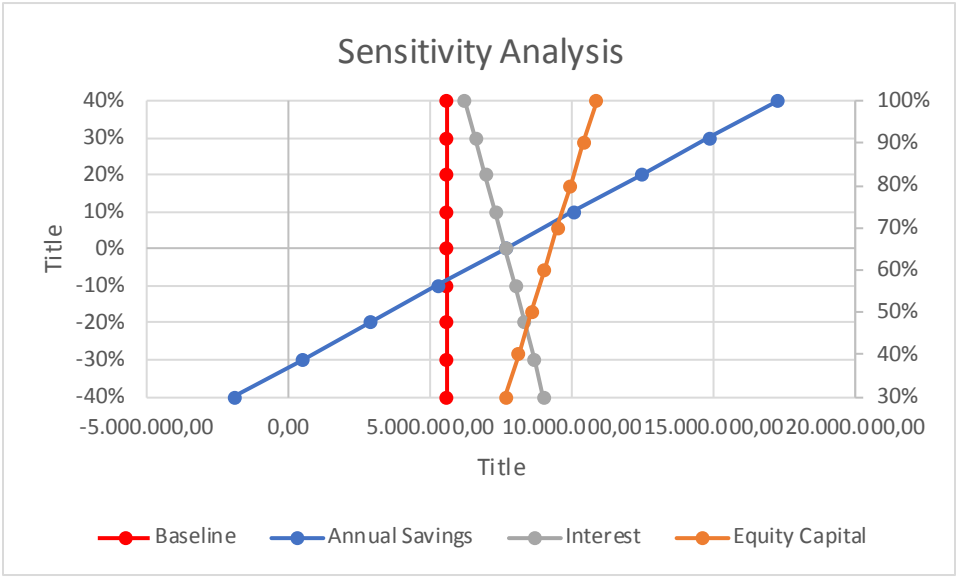


Figure 64. Cashflow chart

The conclusions in this case are similar to the previous one. Only extremely long contracts are above the baseline (20 years).

13.7.3 Sensitivity Analysis



2.5.1.

Figure 65. Sensitivity analysis for the Shared Savings Model

The ESCO as Supplier Model, in the sensitivity analysis is slightly different from the previous case. Again, electricity price and technology performance influence negatively on the profits, but all values for the equity capital and the interest rates are keeping the project above the baseline.

13.8 Development Finance ESCO Model

13.8.1 Cashflow Calculations

The following table shows the financial data for the period of 20 years, considering the specific model requirements and indicators.

Table 24. Cashflow

Cashflow Guaranteed Savings									
Year	Savings	O&M	Esco cost	Net Savings	Loan	User Savings	ESCO Cashflow	Net Cashflow	Accumulating cashflow
0	0,00	0,00	0,00	0,00	0,00		-3.081.888,00		-3.081.888,00
1	1.082.400,00	10.824,00	0,00	1.071.576,00	977.036,27	750.103,20	321.472,80	-226.933,07	-2.760.415,20
2	1.098.636,00	10.986,36	0,00	1.087.649,64	977.036,27	761.354,75	326.294,89	-215.681,52	-2.434.120,31
3	1.115.115,54	11.151,16	0,00	1.103.964,38	977.036,27	772.775,07	331.189,32	-204.261,20	-2.102.930,99
4	1.131.842,27	11.318,42	0,00	1.120.523,85	977.036,27	784.366,70	336.157,16	-192.669,57	-1.766.773,84
5	1.148.819,91	11.488,20	0,00	1.137.331,71	977.036,27	796.132,20	341.199,51	-180.904,07	-1.425.574,33
6	1.166.052,21	11.660,52	0,00	1.154.391,68	977.036,27	808.074,18	346.317,51	-168.962,09	-1.079.256,82

7	1.183.542,99	11.835,43	0,00	1.171.707,56	977.036,27	820.195,29	351.512,27	-156.840,98	-727.744,55
8	1.201.296,13	12.012,96	0,00	1.189.283,17	977.036,27	832.498,22	356.784,95	-144.538,05	-370.959,60
9	1.219.315,58	12.193,16	0,00	1.207.122,42	977.036,27	844.985,69	362.136,73	-132.050,58	-8.822,87
10	1.237.605,31	12.376,05	0,00	1.225.229,26	977.036,27	857.660,48	367.568,78	-119.375,79	358.745,90
11	1.256.169,39	12.561,69	0,00	1.243.607,70		621.803,85	621.803,85	621.803,85	980.549,75
12	1.275.011,93	12.750,12	0,00	1.262.261,81		631.130,91	631.130,91	631.130,91	1.611.680,66
13	1.294.137,11	12.941,37	0,00	1.281.195,74		640.597,87	640.597,87	640.597,87	2.252.278,52
14	1.313.549,17	13.135,49	0,00	1.300.413,67		650.206,84	650.206,84	650.206,84	2.902.485,36
15	1.333.252,40	13.332,52	0,00	1.319.919,88		659.959,94	659.959,94	659.959,94	3.562.445,30
16	1.353.251,19	13.532,51	0,00	1.339.718,68		669.859,34	669.859,34	669.859,34	4.232.304,64
17	1.373.549,96	13.735,50	0,00	1.359.814,46		679.907,23	679.907,23	679.907,23	4.912.211,87
18	1.394.153,21	13.941,53	0,00	1.380.211,67		690.105,84	690.105,84	690.105,84	5.602.317,70
19	1.415.065,50	14.150,66	0,00	1.400.914,85		700.457,42	700.457,42	700.457,42	6.302.775,13
20	1.436.291,49	14.362,91	0,00	1.421.928,57		710.964,29	710.964,29	710.964,29	7.013.739,42
Total	**25.029.057,27**	**250.290,57**	**0,00**	**24.778.766,70**	**9.770.362,70**		**7.013.739,42**	**4.912.776,58**	

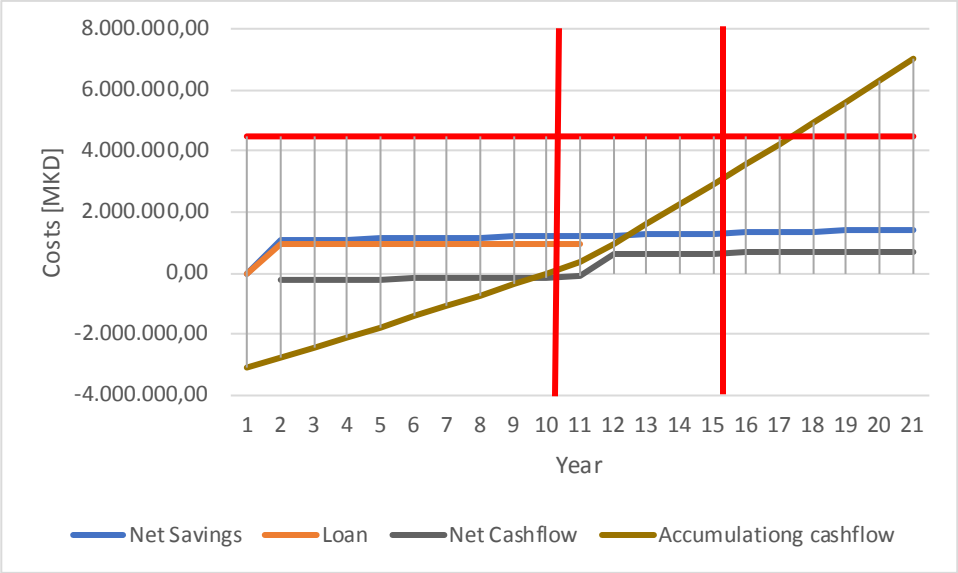


Figure 66. Cashflow chart

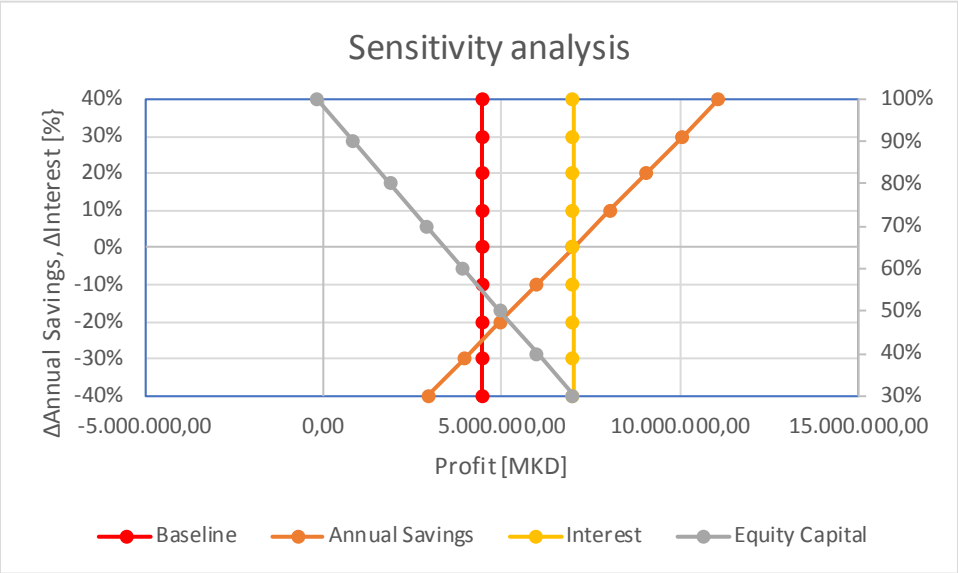
According to the above table and chart for the cashflow in the case of guaranteed savings ESCO model, this project has potential.

The chart shows that the payoff for the project is in the 10th year and at the end of the 3 durations of the contracts (10, 15 and 20 years), the project will be with positive balance.

The vertical red lines of the chart show the results in the case of 10, 15 and 20-year contract between the user and the ESCO. The red horizontal line shows the defined baseline as explained in the methodology. According to this chart, the profit is significantly below the determined baseline for a

contract of 10 and 15 years. That is not the case if the contract length is longer - 20 years, since the accumulating cashflow passes the baseline after the 17th year.

13.8.2 Sensitivity Analysis



5.1.2.

Figure 67. Sensitivity analysis for the Shared Savings Model

As it can be seen, the initial solution for a contract with period of 20 years is above the baseline. But all cases with lower electricity price or if the technology is underachieving, as well as bigger equity capital, is below the baseline. So, this project has no potential for ESCO contract.

13.9 Conclusions

The above analysis shows that in this concrete case, all four models can be successfully implemented in Macedonia only for extremely long contracts. But since the economic lifetime of the equipment is significantly shorter, this project has no potential with the current market options.

14 Conclusions

The following table shows the profits for all considered projects and contract lengths. The highlighted fields with green are the best options for all case studies, while the highlighted fields with red are the worst cases for a given case study. Since some of the cases are mostly positive, this is just a relative comparison.

Table 25. Conclusion

Model	Baseline	10 yrs. EPC	15 yrs. EPC	20 yrs. EPC
Envelope and Preparation of Domestic Hot Water in Residential Building PB: 5.34 yr.				
Shared Savings Model	181.414,86	63.408,15	297.636,83	549.967,64
Guaranteed Savings Model	181.414,86	126.008,62	360.237,30	612.568,10
ESCO Supplier Model	181.414,86	296.936,19	755.324,21	1.249.138,29
Development Finance ESCO Model	145.131,89	151.117,18	385.345,86	637.676,66
Envelope and Heating Control in School PB: 6.85 yr.				
Shared Savings Model	1.968.995,20	-717.763,65	2.055.845,61	5.043.810,51
Guaranteed Savings Model	1.968.995,20	765.083,42	2.746.232,90	4.880.493,54
ESCO Supplier Model	1.968.995,20	101.449,15	3.332.737,73	6.813.753,22
Development Finance ESCO Model	1.575.196,16	1.037.600,42	3.018.749,90	5.153.010,54
Solar Thermal Collectors for multifamily building PB: 11.12 yr.				
Shared Savings Model	2.392.992,77	-3.187.506,09	-1.110.085,80	1.127.885,85
Guaranteed Savings Model	2.392.992,77	-62.386,36	1.421.485,27	3.020.036,45
ESCO Supplier Model	2.392.992,77	-2.285.428,69	295.965,85	3.076.860,89
Development Finance ESCO Model	1.914.394,22	268.813,64	1.752.685,27	3.351.236,45
Change of fuel in industry PB: 0.11 yr.				
Shared Savings Model	106.644,24	16.549.621,36	25.967.536,57	36.113.305,99
Guaranteed Savings Model	106.644,24	7.150.793,99	13.877.876,29	21.124.854,44
Development Finance ESCO Model	85.315,39	7.165.553,99	13.892.636,29	21.139.614,44
Public Lighting – Installing of Sodium Lighting PB: 2.21 yr.				
Shared Savings Model	16.229.789,90	56.615.775,42	96.818.705,40	143.606.768,09
Guaranteed Savings Model	16.229.789,90	72.221.284,60	100.251.796,02	133.926.706,90
ESCO Supplier Model	16.229.789,90	30.798.379,70	56.577.599,84	87.827.230,65
Development Finance ESCO Model	12.983.831,92	74.921.524,60	102.952.036,02	136.626.946,90
Public Lighting – LED PB: 11.98 yr.				
Shared Savings Model	5.566.829,48	-8.037.167,60	-3.551.988,45	1.279.823,31
Guaranteed Savings Model	5.566.829,48	-411.726,10	2.791.973,30	6.243.267,42
ESCO Supplier Model	5.566.829,48	-5.088.002,68	1.044.821,33	7.651.614,53

Development Finance ESCO Model	4.453.463,59	358.745,90	3.562.445,30	7.013.739,42

The values of the profit for all models are colored according to their comparison with the baseline. The green numbers are above the baseline, while the red numbers are below the baseline and are considered undesirable.

The first conclusion that can be gained from the above table is about the profitable projects according to the simple payback. It can be seen that the upper value for the simple payback in the analyzed case studies is 10 years.

The projects with simple payback below 5 years are extremely positive and promising and the EPS can be created for relatively shorter periods (5-10 years contracts are economically justified).

Projects with simple payback periods from 5 to 10 years are showing also considerable potential for ESCOs. In these cases, almost all models for ESCO can be used and the contracts can be still relatively short (10+ years). There are exceptions in some of the models but if the contracts are 15 years, still the project has significant potential.

Projects with simple payback period above 10 years showed that even though they can be implemented successfully, it can be done only with contracts that have lengths of 20 years, which is a risk to the ESCO and the user.

If the models themselves are analyzed, the ESCO as a Supplier model showed the most promising results, even though that is strictly case by case analysis. The Shared Savings and Guaranteed Savings Models have also shown significant potential, that can be even bigger if there is a possibility for improving them with the Development Finance Model and if the loan can include some grant element in the market.