Financing in building renovation: ESCO models

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Aleksandar Dukovski
Senior Energy Expert
Chair of the UNECE Group of Experts on Energy Efficiency
WHAT IS AN ENERGY SERVICE?

“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.
WHAT IS AN ESCO AND A EPC

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.

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.
TYPICAL PROCESS FOR ESCO

1. Preliminary Study
   - Preliminary audit
2. Detailed Analysis
   - Detailed engineering design
3. Implementation
   - Planning, installation, project management
4. Guarantee Phase
   - Changes in energy use accounting
   - Energy Saving Guarantee measurement & verification service (IPMVP)
TYPICAL PROCESS FOR EPC

BEFORE

Utility charge payment

AFTER

Customer gain
ESCO's fee
Investment Repayment
Utility charge payment
Utility charge payment

Energy saving
TYPICAL EXAMPLES FOR ESCO CONTRACTING

Shared Savings model
TYPICAL EXAMPLES FOR ESCO CONTRACTING

Guaranteed Savings Model

User

ESCO

Financial institution

Contract
TYPICAL EXAMPLES FOR ESCO CONTRACTING

ESCO Provider Model
TYPICAL EXAMPLES FOR ESCO CONTRACTING

Development Finance ESCO Model

- **Government**
  - Guarantee to Development banks

- **Development banks**
  - Soft loan to ESCO
  - Repayment from ESCO

- **Refinancing institutions**
  - Secured sub-loan at favorable terms

- **User**
  - Fee and Service payments to ESCO
  - Repayment to refinancing institutions

- **ESCO**
ARTICLE 18 EED

1. Member States shall promote the energy services market and access for SMEs to this market by:

- (a) disseminating clear and easily accessible information
- (b) encouraging the development of quality labels, inter alia, by trade associations;
- (c) making publicly available and regularly updating a list of available energy service providers
- (d) supporting the public sector in taking up energy service offers, in particular for building refurbishment, by:
  - (i) providing model contracts for energy performance contracting which include at least the items listed in Annex XIII;
  - (ii) providing information on best practices for energy performance contracting
2. Member States shall support the proper functioning of the energy services market, where appropriate, by:

(b) taking, if necessary, measures to remove the regulatory and non-regulatory barriers that impede the uptake of energy performance contracting and other energy efficiency service models for the identification and/or implementation of energy saving measures;

(c) considering putting in place or assigning the role of an independent mechanism, such as an ombudsman, to ensure the efficient handling of complaints and out-of-court settlement of disputes arising from energy service contracts; (d) enabling independent market intermediaries to play a role in stimulating market development on the demand and supply sides.
3. Member States shall ensure that energy distributors, distribution system operators and retail energy sales companies refrain from any activities that may impede the demand for and delivery of energy services or other energy efficiency improvement measures, or hinder the development of markets for such services or measures, including foreclosing the market for competitors or abusing dominant positions.
TYPICAL ESCO PROJECTS

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. 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
TYPICAL ESCO PROJECTS

RESIDENTIAL BUILDING ENVELOPE AND DOMESTIC HOT WATER

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.

<table>
<thead>
<tr>
<th>Old U-value</th>
<th>New U-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.57 W/m²K</td>
<td>0.27 W/m²K</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Old U-value</th>
<th>New U-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.39 W/m²K</td>
<td>0.25 W/m²K</td>
</tr>
<tr>
<td>0.35 W/m²K</td>
<td>0.17 W/m²K</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Old U-value</th>
<th>New U-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.65 W/m²K</td>
<td>1.85 W/m²K</td>
</tr>
</tbody>
</table>

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.
## TYPICAL ESCO PROJECTS

**RESIDENTIAL BUILDING ENVELOPE AND DOMESTIC HOT WATER**

### 1.1 Profitability Calculations

<table>
<thead>
<tr>
<th>Name</th>
<th>Residential Envelope + DHW</th>
<th>Payback</th>
<th>Pay-off</th>
<th>Internal Rate of Return</th>
<th>Net Present Value</th>
<th>Net Present Value Quotient</th>
<th>Maximum Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Investment</td>
<td>418476 MKD</td>
<td>5,34 yr</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1254657</td>
</tr>
<tr>
<td>Annual Savings</td>
<td>79762 MKD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual O&amp;M Cost</td>
<td>1417 MKD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net Savings</td>
<td>78345 MKD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economic Lifetime</td>
<td>20 yr</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum Pay-Off</td>
<td>20 yr</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

### 1.1 Cashflow input data

- **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
- **Amount**: 292933 MKD
- **Interest**: 6%
- **Years**: 10 yr
- **Term**: 1 month/month/yr
- **Grace Period**: 0 month/yr
- **Total Investment**: 418476 MKD
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. 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.
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. 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.
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. 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 chart shows that the payoff for the project is in the 5\textsuperscript{th} 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.
## ESCO PROJECTS RESULTS

<table>
<thead>
<tr>
<th>Model</th>
<th>Baseline</th>
<th>10 yrs. EPC</th>
<th>15 yrs. EPC</th>
<th>20 yrs. EPC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Envelope and Preparation of Domestic Hot Water in Residential Building PB: 5.34 yr.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shared Savings Model</td>
<td>181.414,86</td>
<td>63.408,15</td>
<td>297.636,83</td>
<td>549.967,64</td>
</tr>
<tr>
<td>Guaranteed Savings Model</td>
<td>181.414,86</td>
<td>126.008,62</td>
<td>360.237,30</td>
<td>612.568,10</td>
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<tr>
<td><strong>ESCO Provider Model</strong></td>
<td>181.414,86</td>
<td>296.936,19</td>
<td>755.324,21</td>
<td>1.249.138,29</td>
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<tr>
<td>Development Finance ESCO Model</td>
<td>145.131,89</td>
<td>151.117,18</td>
<td>385.345,86</td>
<td>637.676,66</td>
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<tr>
<td><strong>Envelope and Heating Control in School PB: 6.85 yr.</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Shared Savings Model</td>
<td>1.968.995,20</td>
<td>-717.763,65</td>
<td>2.055.845,61</td>
<td>5.043.810,51</td>
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<tr>
<td>Guaranteed Savings Model</td>
<td>1.968.995,20</td>
<td>765.083,42</td>
<td>2.746.232,90</td>
<td>4.880.493,54</td>
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<tr>
<td><strong>ESCO Provider Model</strong></td>
<td>1.968.995,20</td>
<td>101.449,15</td>
<td>3.332.737,73</td>
<td>6.813.753,22</td>
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<tr>
<td>Development Finance ESCO Model</td>
<td>1.575.196,16</td>
<td>1.037.600,42</td>
<td>3.018.749,90</td>
<td>5.153.010,54</td>
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<tr>
<td><strong>Solar Thermal Collectors for multifamily building PB: 11.12 yr.</strong></td>
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<tr>
<td>Shared Savings Model</td>
<td>2.392.992,77</td>
<td>-3.187.506,09</td>
<td>-1.110.085,80</td>
<td>1.127.885,85</td>
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<td>Development Finance ESCO Model</td>
<td>1.914.394,22</td>
<td>268.813,64</td>
<td>1.752.685,27</td>
<td>3.351.236,45</td>
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<tr>
<td>Model</td>
<td>Baseline</td>
<td>10 yrs. EPC</td>
<td>15 yrs. EPC</td>
<td>20 yrs. EPC</td>
</tr>
<tr>
<td>------------------------------------</td>
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<td>------------------</td>
</tr>
<tr>
<td>Change of fuel in industry PB: 0.11 yr.</td>
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<tr>
<td>Public Lighting – Installing of Sodium Lighting PB: 2.21 yr.</td>
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<tr>
<td>Shared Savings Model</td>
<td>16.229.789,90</td>
<td>56.615.775,42</td>
<td>96.818.705,40</td>
<td>143.606.768,09</td>
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<td>Guaranteed Savings Model</td>
<td>16.229.789,90</td>
<td>72.221.284,60</td>
<td>100.251.796,02</td>
<td>133.926.706,90</td>
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<tr>
<td>ESCO Provider Model</td>
<td>16.229.789,90</td>
<td>30.798.379,70</td>
<td>56.577.599,84</td>
<td>87.827.230,65</td>
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<td>Development Finance ESCO Model</td>
<td>12.983.831,92</td>
<td>74.921.524,60</td>
<td>102.952.036,02</td>
<td>136.626.946,90</td>
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<td>Public Lighting – LED PB: 11.98 yr.</td>
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<td>Shared Savings Model</td>
<td>5.566.829,48</td>
<td>-8.037.167,60</td>
<td>-3.551.988,45</td>
<td>1.279.823,31</td>
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<tr>
<td>Guaranteed Savings Model</td>
<td>5.566.829,48</td>
<td>-411.726,10</td>
<td>2.791.973,30</td>
<td>6.243.267,42</td>
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<tr>
<td>ESCO Provider Model</td>
<td>5.566.829,48</td>
<td>-5.088.002,68</td>
<td>1.044.821,33</td>
<td>7.651.614,53</td>
</tr>
</tbody>
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THANK YOU

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e-mail: a.dukovski@gmail.com
+389 77 72 07 89