

Catalogue of evaluation mechanisms for investments in energy efficiency (D2.1)

April 2019



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 785081. Disclaimer: The content of this material does not reflect the official opinion of the European Union. Responsibility for the information and views expressed lies entirely with the author(s).



Before we get started – what this catalogue is (... and what it is not)

This catalogue is ...

- an energy technology-specific **compilation of evaluation and feasibility criteria** for energy investments
- a tool to enable **standardised and systematic evaluation** of potential energy projects
- able to **consider territorial differences** in investment cost, energy prices, capital cost and influence on financing options
- hands-on and suitable for **capacity-building** initiatives

This catalogue is not ...

- an **exhaustive and complete** list including all existing evaluation methods
- a **scientific study** comparing different evaluation methods and proposing “one best” criterion
- **applicable to all countries** without reflection of local framework conditions
- a **blueprint** for analysing EE projects

The following section presents an overview of some evaluation mechanisms

1 Introduction: why need for evaluation of EE investments?

2 Setting the baseline: prerequisites for correct evaluation of EE investments

3 Overview of different types of evaluation mechanisms and criteria

3A Deep-dive 1: Payback period

3B Deep-dive 2: NPV

3C Deep-dive 3: IRR

3D Deep-dive 4: Emission reduction

3E Deep-dive 5: LCOE

4 Country-specific differences and particularities

5 Real-life computation examples

6 Helpful resources

6A Project benchmarks



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All stakeholders benefit from a correct and structured EE project evaluation

Stakeholder

Correct EE project evaluation helps ...

Investing businesses

- **assess** value creation potential of investment in EE project and prioritize versus other investment opportunities requiring capital
- **determine** effect of EE project on credit line and creditworthiness
- **improve** understanding of maximum feasible investment cost
- **optimize** benefits from investment by improving configuration
- better **understand** sensitivities and manage risks
- **provide** benchmark for post-investment performance reviews

Financing institutions

- **evaluate** quality and creditworthiness of EE project to be financed

Equipment providers / suppliers

- **identify** equipment needed to maximize value creation for investing company and financing institutions

General public

- **assess** EE project potential for reduction of emission and energy consumption



To achieve all this, it is important to use appropriate evaluation mechanisms!



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Garbage in, garbage out – a correct evaluation of EE investments requires certain prerequisites

Prerequisites

Data

- Availability of the detailed feasibility study, including information on CAPEX, O&M expenses, savings, life-time of the projects, financial information (capital structure, cost and maturity of lending)
- Availability of environmental and social impact analysis if required by legislation
- Availability of reliable financing information
- Availability of correct, detailed and reliable energy price forecasts
- Availability of complete summarized technical-legislation conditions
- Availability of complete data on parameters of consumption (amount, development/shape)

Processes

- Availability of analysis of alternative technologies (comparison of different accesses, technologies, financing solutions)
- Establishment of transparent and standardized evaluation process and methodology

Supporting resources and factors

- Availability of experienced staff for the successful execution of the project and its evaluation
- Predictability of stable regulatory environment



These factors need to be in place to allow correct use of evaluation methods described



Several points need to be considered when evaluating EE projects

- **Interaction effects:** Some EE improvement measures interact with other EE projects and can lead to a multiplication of the effect and make it difficult to attribute benefits to a specific project
- **Project lifetime:** Assumed lifetime has a large effect on most evaluation mechanisms; there are different approaches (economic life, physical life, technological life)
- **Additional benefits:** In addition to energy savings, new EE technology often also leads to savings in maintenance etc., which need to be accounted for
- **Rebound effects:** some of the energy savings resulting from energy efficient technologies is offset by behaviors.
- **Lifecycle cost:** Includes environmental impact of measure “from cradle to grave” and allows for full assessment



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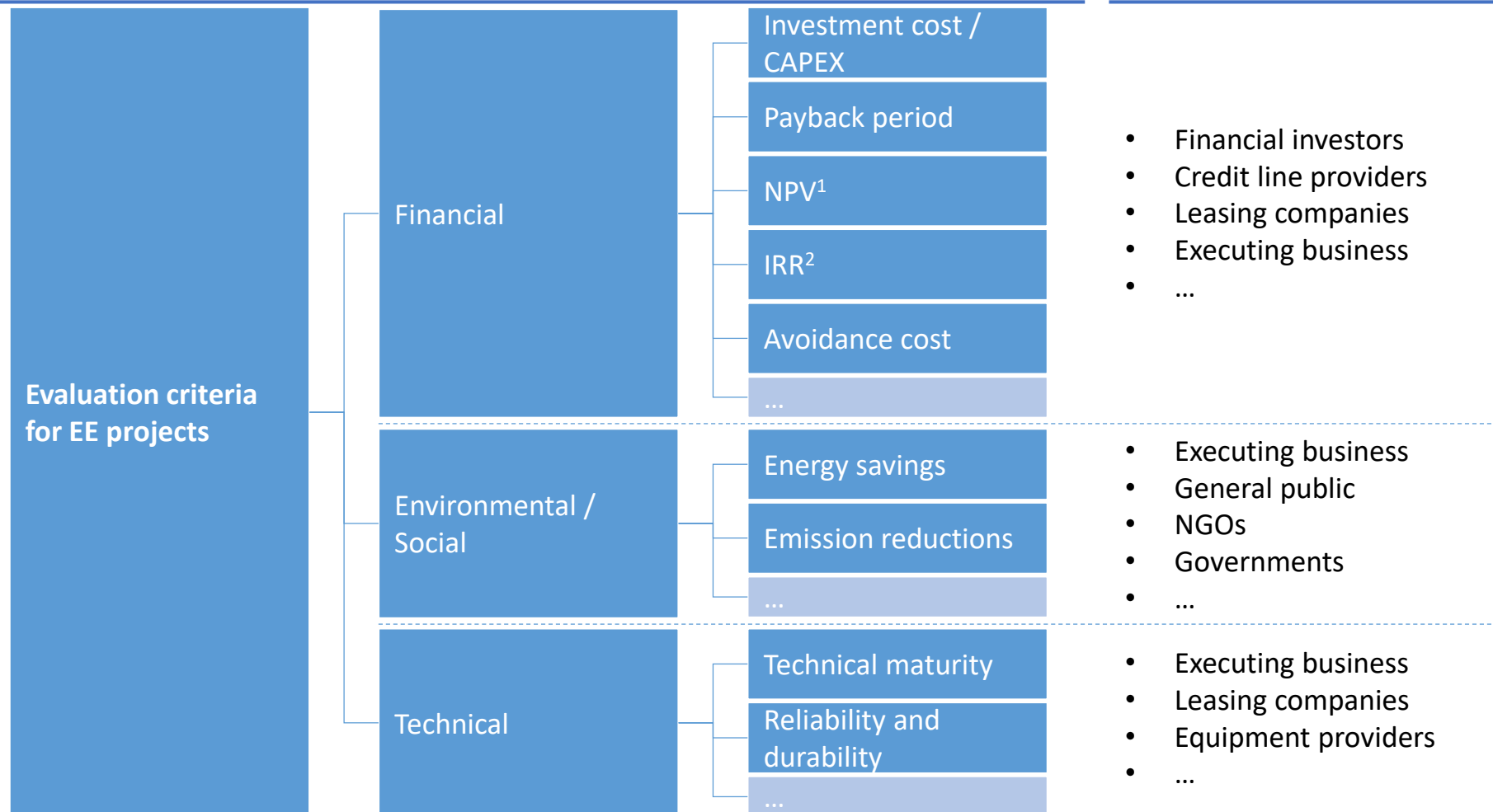


EE investment projects can be evaluated from many different perspectives

NOT EXHAUSTIVE

Types of criteria for EE investments

Relevant stakeholder



SOURCES: Demirtas (2013)

[1] Net Present Value [2] Internal Rate of Return



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Payback period is a simple and easy-to-understand evaluation method

Description

- The most simple way to evaluate EE investment projects
- Considers capital cost and (average) annual savings, but no interest rate and time effects

Assessment

- + **Simple** to compute and understand
- + Expressed in **tangible** terms (years)+
- + Does not require **assumptions** about project life cycle and interest rates
- Does not consider **savings after payback** period and residual value
- Does not consider **time value** of money

Computation

$$\text{payback}(\text{years}) = \frac{\text{capital cost}}{\text{annual savings}}$$

Example

- **Project data:** investment cost = EUR 1,000; annual savings = EUR 500
- **Payback period:** 1000 / 500 = 2 years



NPV of EE projects shows how much economic value they create

Description

- Discount rate is the cost of financing
- If positive, EE project creates value
- For selection between different EE projects, choose project with highest NPV

Computation

$$NPV = yr_0 \text{ cashflow} + \frac{yr_1 \text{ cashflow}}{(1+r)^1} + \frac{yr_2 \text{ cashflow}}{(1+r)^2} + \dots + \frac{yr_n \text{ cashflow}}{(1+r)^n}$$

Assessment

- + Considers **time value** of money
- + Allows to **disaggregate** and optimize value drivers
- + **Widely used** measure by financial decision makers
- Difficult to anticipate long-term **lifetime** of EE improvement asset
- Requires **assumptions** about long-term financing costs etc.

Example

- Project data:** capital expenditure = EUR 1,000; annual savings = EUR 500; cost of capital = 10%; lifetime = 3 years
- Computation: $NPV = -1000 + 500 * 1.1^{-1} + 500 * 1.1^{-2} + 500 * 1.1^{-3} = 243$



Description

- Interest rate that equates the NPV of expected future cash flows to the initial cost of the project present value
- Often used in conjunction with the NPV
- Computer software or financial calculators are recommended

Computation

Set NPV (in NPV equation) to 0 and solve for r .

$$0 = yr_0 \text{ cashflow} + \frac{yr_1 \text{ cashflow}}{(1+r)^1} + \frac{yr_2 \text{ cashflow}}{(1+r)^2} + \dots + \frac{yr_n \text{ cashflow}}{(1+r)^n}$$

Assessment

Similar pros and cons to NPV since equation is derived from NPV but...

- +** Provides **direct comparison** to leaving money in the bank and collecting compound interest, or alternative means of financing (different costs of capital)
- +** IRR can be used to indicate a “go” or “no go”

- Does not account for the **relative size** of savings
- **Cannot** be used to compare or **prioritize** options (can lead to minimizing upfront costs regardless of long term savings)

Example

- Project data:** capital expenditure = EUR 1,000; annual savings = EUR 500; cost of capital = 10%; lifetime = 3 years

$$0 = -1000 + \frac{500}{(1+r)^1} + \frac{500}{(1+r)^2} + \frac{500}{(1+r)^3}$$

$$IRR = 23.375\% \quad \text{Note: } IRR > \text{cost of capital}$$







Emission reduction is a non-financial indicator for the environmental value of an EE project

Description

- Non-financial indicator of environmental impact of EE measure
- Describes emissions saved or energy consumption reduced over time or per year by EE measure

Assessment

-  Often used to qualify initiative for **government support**
-  Can be used for **marketing purposes**
-  **Complements** financial evaluation perspective

-  Often **difficult to anticipate** energy savings or emission reductions ex-ante

Example

Efficient refrigeration project in Georgia

- EE initiatives: efficient refrigerating equipment, thermal insulation
- Investment cost: USD 394,000
- Effect: 85% of current energy consumption saved; 600t of CO2 saved per year



Levelized Cost of Energy LCOE

Description

- Estimates the average lifetime cost of power production per energy unit
- A simple LCOE will consider investment costs, fuel costs and maintenance costs, while a more **complex one will also consider environmental externalities, system costs and heat revenue**

Assessment

- +** Can reflect socioeconomic costs (**not purely financial**).
- +** Allows **comparison of different technologies** with different characteristics (life spans, project size, cost of capital, etc.) and **detailed country-specific analysis**
- Considers a relatively high number of full load hours, constant over lifetime
- Only considers costs, not revenues
- Needs more complex inputs than financial calculations

Computation (simple – undiscounted LCOE)

$$\frac{\text{sum of costs} - \text{incentives}}{\text{yearly energy output} * \text{lifetime}}$$

Note: Several, more complex, LCOE (country-specific) calculating tools are available online

Example

Project data: capital expenditure = EUR 100,000; yearly maintenance costs = EUR 2,500; yearly interest payment = 800; tax incentive = 17,000; energy production = 62,500 kWh / Year; Lifetime = 20 years

$$LCOE = \frac{(100,000 + 20 * (2,500 + 800)) - 17,000 \text{ EUR}}{20 * 62,500 \text{ kWh}} = 0.1192 \text{ EUR/kWh}$$



SOURCES:

https://ens.dk/sites/ens.dk/files/contents/material/file/vejledning_lcoe_calculat_or.pdf and <https://www.energy.gov/sites/prod/files/2015/08/f25/LCOE.pdf>

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Countries vary greatly regarding their EE investment framework conditions

	AM	AT	CZ (1 CZK=0.039 EUR)	GE (1 GEL=0.033 EUR)	PL (1 PLN=0.023 EUR)	HR
<i>Average electricity cost for households [per kWh, in euro] Exchange rate 25.02.2019</i>	0.081 EUR (day) 0.063 EUR (night)	0.2 EUR	0.16 EUR	<u>in Tbilisi:</u> <ul style="list-style-type: none"> up to 101 kWh/month - 0.048 EUR from 101-301 kWh - 0.061 EUR 301 kWh/month and above - 0.076 EUR <u>In country, except Tbilisi:</u> <ul style="list-style-type: none"> up to 101 kWh/month - 0.047 EUR from 101-301 kWh - 0.06 EUR 	0.13 EUR	0.12 EUR (day) 0.07 EUR (night)
<i>Development of electricity cost for households over next years [in % p.a.]</i>	3%	2-3% (but much higher in last years)	5%	NA	about 10%	5%
<i>Average electricity cost for industry [per kWh, in euro] Exchange rate 25.02.2019</i>	0.076 EUR 0.058 EUR	0.107 EUR	0.058-0.18 EUR	<u>in Tbilisi</u> <ul style="list-style-type: none"> up to 220/380 volt - 0.07 EUR from 3.3-6-10 kV - 0.056 EUR 35-110 kV - 0.053 EUR <u>In country, except Tbilisi</u> <ul style="list-style-type: none"> 0.4 kV - 0.07 EUR from 3.3-6-10 kV - 0.054 EUR 35-110 kV - 0.049 EUR 	0.12-0.14 EUR	0.14 EUR (day) 0.08 EUR (night)
<i>Development of electricity cost for industry over next years [in % p.a.]</i>	3%	2-3% (but much higher in last years)	3-4%	NA	Up to 30-70%	5%





Countries vary greatly regarding their EE investment framework conditions

	AM	AT	CZ (1 CZK=0.039 EUR)	GE (1 GEL=0.033 EUR)	PL (1 PLN=0.023 EUR)	HR
<i>Inflation rate [in %]</i>	3-4%	2%	2.2% (growing)	NA	1.80%	2-3%
<i>Interest rate used to discount future financial flows [in %]</i>	8.5-9.5% in USD	NA	3.5% (growing)	NA	Varies	5-7%
<i>Fuel prices for gasoline [per kWh, in euro] Exchange rate 25.02.2019</i>	0.87 EUR	1.3 EUR	1.31 EUR	0.83 EUR	1.17 EUR	1.3 EUR
<i>Heating costs for households [per kWh, in euro] Exchange rate 25.02.2019</i>	0.045 EUR	0.065 EUR (natural gas)	0.055– 0.11 EUR	NA	<ul style="list-style-type: none"> • 0.039 EUR (coal) • 0.046 EUR (gas) • 0.13 EUR (electricity) 	<ul style="list-style-type: none"> • 0.065 EUR (VAT excl.) for district heating • 0.05 EUR (VAT excl.) for gas boilers • 0.06 EUR (VAT excl.) for fuel oil
<i>Heating costs for industry [per kWh, in euro] Exchange rate 25.02.2019</i>	0.018 EUR	0.035 EUR (natural gas)	0.041 – 0.086 EUR	NA	Varies	<ul style="list-style-type: none"> • 0.12 EUR (VAT excl.) for district heating • 0.06 EUR (VAT excl.) for gas boilers • 0.06 (VAT excl.) for fuel oil



Depending on country characteristics, different evaluation mechanisms are relevant

Evaluation mechanism	Description	Relevance					GE	
		AM	AT	CZ	PL	HR	(leasing)	GE
CAPEX (investment cost)	Initial cost to deploy an EE project	5	5	5	5	5	5	5
Payback period (years)	Investment cost divided by the difference between annual savings minus annual running cost	5	5	5	4	4	1	3
NPV (net present value)	The discounted future annual savings minus the investment cost	4	4	3	4	4	1	4
IRR (internal rate of return)	Similar to NPV. The IRR is the discount rate when the NPV is zero	4	4	4	4	4	1	4
Avoidance cost	Average cost of each kWh energy saved over the lifetime of the projected measure	4	2	2	2	4	1	3
Qualification for financial support	Does the project qualify for preferential credit lines etc.?	4	NA	3	4	5	4	4
Source of funding	Is the project financed through equity, loan, subsidies, cash-flows, etc.?	4	5	5	5	4	4	4
Type of energy supplier concerned	Which type of energy supplier does the EE project affect (e.g. district heating provider, wholesale electricity utility)?	2	5	2	2	2	1	3
Terms of the loan	Cost and maturity of debt	5	3	3	NA	5	NA	NA
Total amount saved	How much can be saved during the lifetime of the measure	NA	2	4	NA	NA	NA	NA
Interest	Cost of money from external sources	NA	5	5	NA	NA	NA	NA
Rate of potential subsidies	Ease of obtaining and size of subsidies	NA	3	5	NA	NA	NA	NA
Collateral required by financing institution	Amount of collateral required	NA	3	3	2	NA	NA	NA

 Low relevance
 High relevance

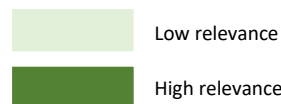
SOURCES: Questionnaires provided by PP countries



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Depending on country characteristics, different evaluation mechanisms are relevant

Evaluation mechanism	Description	AM	AT	CZ	PL	HR	GE (leasing)	GE
Environmental/Social	Primary energy savings	5	3	5	3	5	1	3
	Emission reductions	1	2	3	2	4	1	2
	Creation of new work places	NA	1	1	3	NA	NA	NA
	Reduction of air pollution	NA	3	3	4	NA	NA	NA
	Maturity of technology	4	4	4	3	4	5	5
Technical	Reliability and durability of technology	4	3	4	4	4	5	5
	Regulatory feasibility	4	2	3	4	NA	1	3
	Degree of self-sufficiency	4	3	2	3	4	1	4



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Computational Examples – Undiscounted Methods

Using a [case study](#) from the EBRD for the Russian shipbuilding company

“The investment of €620,000 allowed the company to reduce its energy consumption by 900 MWh per year, resulting in the cost savings of €155,000 per year.”

What would be the household’s payback period (in years)?

$$\text{Payback Period} = \frac{620,000}{155,000}$$

$$\text{Payback Period} = 4 \text{ years}$$



Computational Examples – Discounted Methods

Using a case study from the [EBRD](#) for Outstanding electricity savings in Georgian deep freeze production for inspiration.

“A \$394,000 investment allowed to decrease the company’s existing electricity consumption by 85%, leading to \$116,000 cost savings each year...” “A successful Georgian refrigeration company constructed a cold storage facility in 2012. To further boost the own performance, the company planned a new deep freeze facility and addressed Energocredit for a loan”.

Assuming the new deep freeze facility will last for 10 years and you must pay a 13% interest on the loan. **What is the NPV?**



Computational Examples – Discounted Methods

First step: Map the cash flows

Year	Capital expenditure	Savings	Cashflow	Cumulative Cashflow
0	-394,000		-394,000	-394,000
1		116,000	116,000	-278,000
2		116,000	116,000	-162,000
3		116,000	116,000	-46,000
4		116,000	116,000	70,000
5		116,000	116,000	186,000
6		116,000	116,000	302,000
7		116,000	116,000	418,000
8		116,000	116,000	534,000
9		116,000	116,000	650,000
10		116,000	116,000	766,000



Computational Examples – Discounted Methods

Remember: NPV is the sum of the **discounted cash flows**. We can now use the 13% interest of the loan as a discount factor.

Year	Capital expenditure	Savings	Cashflow	PV of discounted Cashflows	Cumulative Cashflow at PV
0	-394,000		-394,000	-394,000	-394,000
1		116,000	116,000	102,655	-291,345
2		116,000	116,000	90,845	-200,500
3		116,000	116,000	80,394	-120,106
4		116,000	116,000	71,145	-48,961
5		116,000	116,000	62,960	13,999
6		116,000	116,000	55,717	69,716
7		116,000	116,000	49,307	119,023
8		116,000	116,000	43,635	162,657
9		116,000	116,000	38,615	201,272
10		116,000	116,000	34,172	235,444

NPV = \$235 444



Computational Examples – Discounted Methods

What is the IRR?

Using an online calculator, we obtain the IRR

IRR = 26.67%

Internal Rate of Return (IRR) Calculator

[Add this calcul](#)

Initial Investment

Cash Flow

Year 1: \$	<input type="text" value="116000"/>	<input type="button" value="↕"/>	<input type="button" value="✖"/>
Year 2: \$	<input type="text" value="116000"/>	<input type="button" value="↕"/>	<input type="button" value="✖"/>
Year 3: \$	<input type="text" value="116000"/>	<input type="button" value="↕"/>	<input type="button" value="✖"/>
Year 4: \$	<input type="text" value="116000"/>	<input type="button" value="↕"/>	<input type="button" value="✖"/>
Year 5: \$	<input type="text" value="116000"/>	<input type="button" value="↕"/>	<input type="button" value="✖"/>
Year 6: \$	<input type="text" value="116000"/>	<input type="button" value="↕"/>	<input type="button" value="✖"/>
Year 7: \$	<input type="text" value="116000"/>	<input type="button" value="↕"/>	<input type="button" value="✖"/>
Year 8: \$	<input type="text" value="116000"/>	<input type="button" value="↕"/>	<input type="button" value="✖"/>
Year 9: \$	<input type="text" value="116000"/>	<input type="button" value="↕"/>	<input type="button" value="✖"/>
Year 10: \$	<input type="text" value="116000"/>	<input type="button" value="↕"/>	<input type="button" value="✖"/>

Guess %

26.674%

Internal Rate of Return



Computational Examples – Discounted Methods

To compare projects → Let's assume same company has the opportunity to change to more efficient lighting and better insulation.

This new project requires an initial investment of \$230,000 investment and allows to decrease the company's existing electricity consumption by \$76,000 each year. Assuming the project will last for 15 years and you must pay 15% discount rate.

What is the NPV? What is the IRR ?



Computational Examples – Discounted Methods

Note: this project also has period and a different discount factor

Year	Capital expenditure	Savings	Cash flow	PV of discounted Cash flows	Cumulative Cash flow at PV
0	-230,000		-230,000	-230,000	-230,000
1		76,000	76,000	66,087	-163,913
2		76,000	76,000	57,467	-106,446
3		76,000	76,000	49,971	-56,475
4		76,000	76,000	43,453	-13,022
5		76,000	76,000	37,785	24,764
6		76,000	76,000	32,857	57,621
7		76,000	76,000	28,571	86,192
8		76,000	76,000	24,845	111,036
9		76,000	76,000	21,604	132,640
10		76,000	76,000	18,786	151,426
11		76,000	76,000	16,336	167,762
12		76,000	76,000	14,205	181,967
13		76,000	76,000	12,352	194,319
14		76,000	76,000	10,741	205,060
15		76,000	76,000	9,340	214,400

NPV = \$214,400



Computational Examples – Discounted Methods

Comparing the financial indicators

	IRR	NPV
Refrigeration	26.67	235,444
Insulation and Lighting	32.56	214,400

Prioritize the project with **higher NPV**

Note: the “Refrigeration” project has a **higher NPV**, but **lower IRR** than the “Insulation and Lighting” project. When comparing between projects you must look at the NPV. The IRR can be compared to the discount factors. Both projects have a higher Internal Rate of Return than their discount factor (cost of the loan). These means both projects are a “GO”.



Computational Examples – Discounted Methods

You can also include more factors into your NPV calculation. Some of these can be maintenance costs or inflation costs. Below is an example including an increasing maintenance cost.

Adding maintenance costs to the calculation. Let's assume the anticipated maintenance for the first project is anticipated to a flat \$450 per year, and you anticipate it to increase at 3% each year.

How does the NPV look like now?



Computational Examples – Discounted Methods

Year	Capital expenditure	Savings	Maintenance cost	Cash flow	PV of discounted Cash flows	Cumulative Cash flow at PV
0	-394,000			-394,000	-394,000	-394,000
1		116,000	-450	115,550	102,257	-291,743
2		116,000	-464	115,537	90,482	-201,261
3		116,000	-477	115,523	80,063	-121,198
4		116,000	-492	115,508	70,843	-50,355
5		116,000	-506	115,494	62,685	12,330
6		116,000	-522	115,478	55,466	67,797
7		116,000	-537	115,463	49,079	116,875
8		116,000	-553	115,447	43,426	160,302
9		116,000	-570	115,430	38,425	198,727
10		116,000	-587	115,413	33,999	232,726

NPV = \$232 726

As you can see, the NPV dropped from \$235 444 to \$232 726



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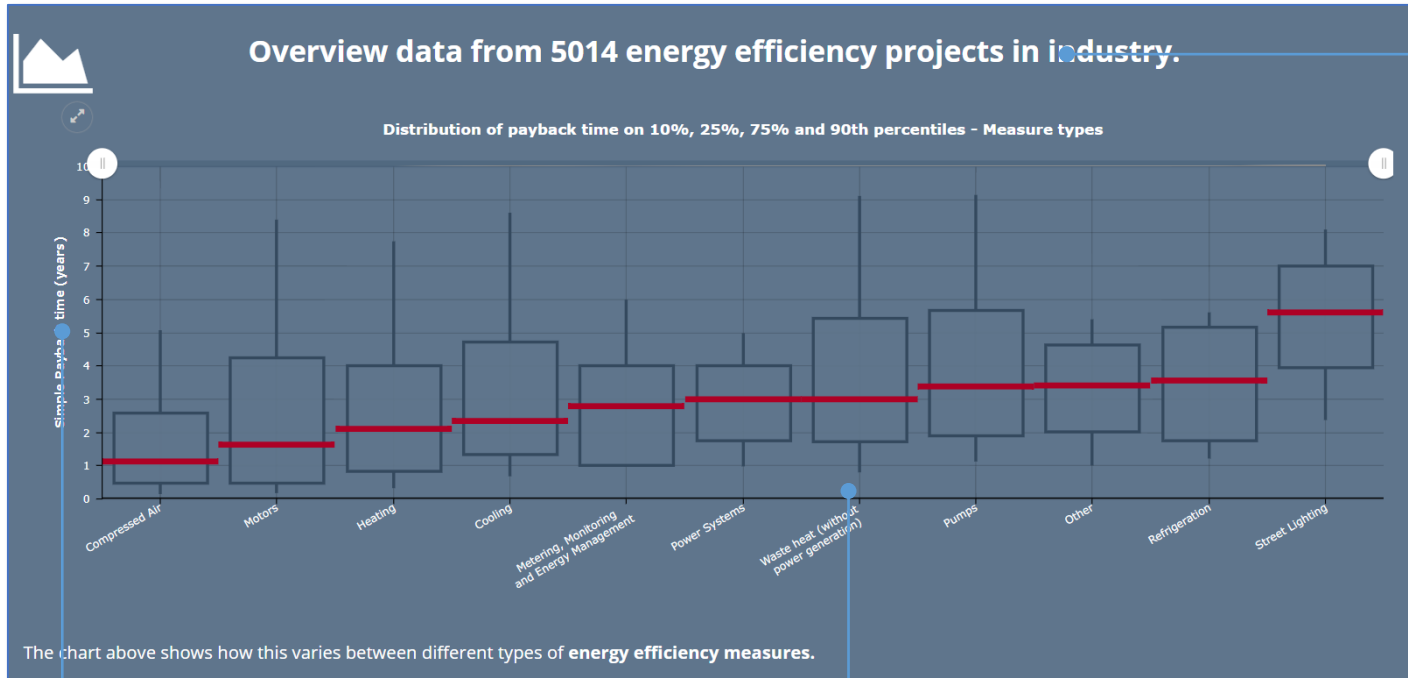
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The DEEP (“De-risk Energy Efficiency Platform”) allows to benchmark EE projects



- Contains data from 5014 EE projects in **industry** and 5152 EE projects in **building** (as of 10/2018)

- Allows to statistically analyse EE projects by **payback period** and **avoidance cost**
- Segments** projects into HVAC, lighting, building fabric, integrated renovation (for **buildings**) and compressed air, motors, heating, cooling, energy management, power systems, waste heat, pumps, refrigeration, street lighting (for **industry**)

Also offers a tool specifically for benchmarking own energy efficiency projects (<https://deep.eefig.eu/benchmark/>)



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SOURCES: <https://deep.eefig.eu>

For most project partner countries, EBRD shows criteria of real projects

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CASE STUDY

Outstanding electricity savings in Georgian deep freeze production

At a glance

- Company
Refrigeration company
- Region
Poti, Georgia
- Key goals
To reduce energy costs
- Investment size
\$394,000
- Main investments
• Energy efficient refrigerating



Electricity consumption decreased by 85% in the energy intensive deep-freeze process

[PRINT ARTICLE](#)

In the port city Poti at the Black Sea coast of Georgia, the service and food industry are the most important sectors of the economy. Here, a successful Georgian refrigeration company constructed a cold storage facility in 2012.

- Contains data from project in all major EBRD project countries (e.g. Georgia, Armenia, Croatia)

- Provides short project summaries outlining how they were financed (including credit lines etc.)

- Lists for each project important evaluation criteria (e.g., payback period, energy savings, cost savings, emission reductions, investment size)

SOURCES: <https://seff.ebrd.com>



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Example benchmarks for EE improvement projects

Measure	Typical energy savings [%]	Typical payback time [years]
• Automatic lighting controls	20-50	2-10
• Task lighting	30-70	4-8
• Time controls on office equipment	20-60	0.5-3
• High-efficiency motors	3-6	0.5-3
• High-efficiency boilers	5-7	2-3
• Building energy management system	5-10	3-6
• External insulation	10-20	25-35
• High-efficiency refrigeration	~85	4
• Energy-efficient production equipment (textiles)	~72	6



BACK-UP



Countries vary greatly regarding their EE investment framework conditions

		AM	AT	CZ	GE	PL	HR
Average electricity cost for households	[per kWh, in local currency]	44.98 AMD (day) 34.98 AMD (night)	0.2 EUR	4.1 CZK	in Tbilisi up to 101 kWh/month – 0.1454 GEL from 101-301 kWh/month – 0.1855 GEL 301 kWh/month and above – 0.2304 GEL In country, except Tbilisi up to 101 kWh/month – 0.1423 GEL from 101-301 kWh/month – 0.1821 GEL	0.55 PLN	0.12 EUR (day) 0.07 EUR (night)
Development of electricity cost for households over next years	[in % p.a.]	3%	2-3% (but much higher in last years)	5%	NA	about 10%	5%
Average electricity cost for industry	[per kWh, in local currency]	41.98 AMD (day) 31.98 AMD (night)	0.107 EUR	1.5-4.5 CZK	in Tbilisi 220/380 volt – 0.2131 GEL 3.3-6-10 kV – 0.1688 GEL 35-110 kV – 0.1611 GEL In country, except Tbilisi 0.4 kV – 0.2108 GEL 3.3-6-10 kV – 0.1625 GEL 35-110 kV – 0.1486 GEL	0.5-0.6 PLN (depending on size and type of company)	0.14 EUR (day) 0.08 EUR (night)
Development of electricity cost for industry over next years	[in % p.a.]	3%	2-3% (but much higher in last years)	3-4%	NA	Up to 30-70%	5%
Inflation rate	[in %]	3-4%	2%	2.2% (growing)	NA	1.8%	2-3%
Interest rate used to discount future financial flows	[in %]	8.5-9.5% in USD; 10-11% in local currency	NA	3.5% (growing)	NA	Varies	5-7%
Fuel prices for gasoline	[per liter, in local currency]	480 AMD	1.3 EUR	33.5 CZK	2.5 GEL	5.06 PLN	1.3 EUR
Heating costs for households	[per kWh, in local currency]	25 AMD (VAT included) - NG based individual boilers	0.065 EUR (natural gas)	1.4-2.95 CZK	NA	0.17 PLN (coal); 0.20 PLN (gas); 0.57 PLN (electricity)	0.065 EUR (VAT incl.) for district heating; 0.05 EUR (VAT incl.) for gas boilers; 0.06 EUR (VAT incl.) for fuel oil
Heating costs for industry	[per kWh, in local currency]	10 AMD (net of VAT) - NG based individual boilers	0.035 EUR (natural gas)	1.05-2.2 CZK (without VAT 21%)	NA	Varies	0.12 EUR (VAT excl.) for district heating; 0.06 EUR (VAT excl.) for gas boilers; 0.06 EUR (VAT excl.) for fuel oil

SOURCES: Questionnaires provided by PP countries



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	AM	AT	CZ .039 exchange rate	GE 0.33	PL 0.23	HR
Average electricity cost for households [per kWh, in local currency]	44.98 AMD (day) 34.98 AMD (night)	0.2 EUR	4.1 CZK	in Tbilisi: <ul style="list-style-type: none"> • up to 101 kWh/month - 0.1454 GEL • from 101-301 kWh - 0.1855 GEL • 301 kWh/month and above - 0.2304 GEL In country, except Tbilisi: <ul style="list-style-type: none"> • up to 101 kWh/month - 0.1423 GEL • from 101-301 kWh - 0.1821 GEL 	0.55 PLN	0.12 (day) 0.07 (night)
Average electricity cost for households [per kWh, in euro] Exchange rate 25.02.2019	0.081 EUR (day) 0.063 EUR (night)	0.2 EUR	0.16 EUR	in Tbilisi: <ul style="list-style-type: none"> • up to 101 kWh/month - 0.048 EUR • from 101-301 kWh - 0.061 EUR • 301 kWh/month and above - 0.076 EUR In country, except Tbilisi: <ul style="list-style-type: none"> • up to 101 kWh/month - 0.047 EUR • from 101-301 kWh - 0.06 EUR 	0.13 EUR	0.12 EUR (day) 0.07 EUR (night)
Development of electricity cost for households over next years [in % p.a.]	3%	2-3% (but much higher in last years)	5%	NA	about 10%	5%
Average electricity cost for industry [per kWh, in local currency]	41.98 AMD (day) 31.98 AMD (night)	0.107 EUR	1.5-4.5 CZK	in Tbilisi: <ul style="list-style-type: none"> • up to 220/380 volt - 0.2131 GEL • from 3.3-6-10 kV - 0.1688 GEL • 35-110 kV - 0.1611 GEL In country, except Tbilisi: <ul style="list-style-type: none"> • 0.4 kV - 0.2108 GEL • from 3.3-6-10 kV - 0.1625 GEL • 35-110 kV - 0.1486 GEL 	0.5-0.6 PLN (depending on size and type of company)	0.14 EUR (day) 0.08 EUR (night)
Average electricity cost for industry [per kWh, in euro] Exchange rate 25.02.2019	0.076 0.058	0.107 EUR	0.058-0.18 EUR	in Tbilisi: <ul style="list-style-type: none"> • up to 220/380 volt - 0.07 EUR • from 3.3-6-10 kV - 0.056 EUR • 35-110 kV - 0.053 EUR In country, except Tbilisi: <ul style="list-style-type: none"> • 0.4 kV - 0.07 EUR • from 3.3-6-10 kV - 0.054 EUR • 35-110 kV - 0.049 EUR 	0.12-0.14 EUR	0.14 EUR (day) 0.08 EUR (night)
Development of electricity cost for industry over next years [in % p.a.]	3%	2-3% (but much higher in last years)	3-4%	NA	Up to 30-70%	5%
Inflation rate [in %]	3-4%	2%	2.2% (growing)	NA	1.80%	2-3%
Interest rate used to discount future financial flows [in %]	8.5-9.5% in USD	NA	3.5% (growing)	NA	Varies	5-7%
Fuel prices for gasoline [per liter, in local currency]	480 AMD	1.3 EUR	33.5 CZK	2.5 GEL	5.06 PLN	1.3 EUR
Fuel prices for gasoline [per kWh, in euro] Exchange rate 25.02.2019	0.87 EUR	1.3 EUR	1.31 EUR	0.83 EUR	1.17 EUR	1.3 EUR
Heating costs for households [per kWh, in local currency]	25 AMD (VAT included) - NG based individual boilers	0.065 EUR (natural gas)	1.4 - 2.95 CZK	NA	0.17 PLN (coal); 0.20 PLN (gas); 0.57 PLN (electricity)	0.065 EUR (VAT excl.) for district heating; 0.05 EUR (VAT excl.) for gas boilers; 0.06 EUR (VAT excl.) for fuel oil
Heating costs for households [per kWh, in euro] Exchange rate 25.02.2019	0.045 EUR	0.065 EUR (natural gas)	0.055- 0.11 EUR	NA	0.039 EUR (coal) 0.046 EUR (gas) 0.13 EUR (electricity)	0.065 EUR (VAT excl.) for district heating 0.05 EUR (VAT excl.) for gas boilers 0.06 EUR (VAT excl.) for fuel oil
Heating costs for industry [per kWh, in local currency]	10 AMD (VAT included) - NG based individual boilers	0.035 EUR (natural gas)	1.05 - 2.2 CZK (without VAT 21%)	NA	Varies	0.12 EUR (VAT excl.) for district heating; 0.06 EUR (VAT excl.) for gas boilers; 0.06 EUR (VAT excl.) for fuel oil
Heating costs for industry [per kWh, in euro] Exchange rate 25.02.2019	0.018 EUR	0.035 EUR (natural gas)	0.041 - 0.086 EUR	NA	Varies	