SLOVENSKI STANDARD
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Vrednotenje investicij v zvezi z energijo (VALERI)

Valuation of Energy Related Investments (VALERI)

Bewertung von energiebezogenen Investitionen (VALERI)

Évaluation des investissements liés à l'énergie (VALERI)

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Valuation of Energy Related Investments (VALERI)

Évaluation des investissements liés à l'énergie (VALERI)

Bewertung von energiebezogenen Investitionen (VALERI)

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European foreword

This document (EN 17463:2021) has been prepared by Technical Committee CEN/CLC/JTC 14 “Energy efficiency and energy management in the framework of energy transition”, the secretariat of which is held by UNI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2022, and conflicting national standards shall be withdrawn at the latest by April 2022.

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Introduction

In order to reach the energy related targets of the EU and its member states, energy related investments (ERIs) have to increase. A possible lack of investments could not only result from a lack of the available capital, but also from a lack of reliable financial evaluations of the benefits of ERIs.

Different investment ideas often compete for the available money within organisations. Therefore, enhancement of the financeability of ERIs can be achieved by showing the full economical value that they are able to generate. When this is done properly, priorities for budgets of ERIs should rise automatically and thus more investments will be undertaken.

The state of the art of today's energy related project valuation in practise reveals that in order to help the user to undertake a firm and correct valuation it is necessary to avoid:

— incorrect results which are caused by neglecting relevant parameters and cash flows;

— unclear calculation models which are difficult to understand;

— models containing errors or models that are incomplete;

— use of calculated costs instead of cash flows;

— time value of money not being considered;

— discount rate being used in an unreflected manner;

— risks not being properly considered;

— missing sensitivity and scenario analyses;

— missing traceability;

— missing interpretation of results;

— price variation rates (very important for energy project valuation) not being appropriately considered.

The objectives of this document are:

— to help proposers of energy related investments (ERIs) to evaluate their ideas economically and qualitatively in a uniform, transparent and understandable way by generating all material information that is relevant for a decision,

— to generate comparable results (for this it is important to ensure that the estimation of the cash flows is done in a comparable way by using correct price variations, the use of marginal prices for all cash flows etc.),

— to help the valuator to generate valuation results that can be easily understood by those who decide upon them,

— to help the decision maker and possible financial institutions who decide on the basis of the valuation results and expect the results to be correct and complete but also easy to understand, retraceable and explicit (material),

— to complement other standards or protocols that focus on the technical determination of energy savings and

— to help those persons that decide upon ERIs.

In order to accomplish these objectives this document offers a valuation procedure, a calculation methodology (just one), and a documentation structure that covers the following features:

— application of one calculation method only;

— correct and complete results (Net Present Value considering among other things also, all relevant cash flows and their price variation rates over the whole project lifetime);

— unequivocal (one indicator at the end which can be directly used for decision-making);

— uniform (a standard);

— easy to use (table based, one uniform calculation table);

— retraceable and easy to reproduce (calculations are transparent and the assumptions made are explained);

— as simple as possible;

— flexible (the user can adjust parameters and can customise the calculation table);

— undertaking of sensitivity and scenario analyses;

— the standard contains templates for reporting the calculation results and all additional qualitative effects.

Transparent calculations including retraceable assumptions that show the full value of ERIs will help organisations as well as households to identify the added value resulting from such ERIs. The proposed methodology could also be used in energy reviews or audits (using EN 16247-1), when prioritising energy performance improvement potentials.

An easy to use and standardized procedure would be helpful as energy management teams might not always include personnel that are equipped to translate technical ideas into conclusive economical results in order to ensure a solid basis for decision-making.

This document relates to standards regarding energy management and energy savings in general. It proposes the use of “Net Present Value” (NPV) calculations and its result as a basis for decision-making (see Annex C).

1 Scope

This document specifies requirements for a valuation of energy related investments (VALERI). It provides a description on how to gather, calculate, evaluate and document information in order to create solid business cases based on Net Present Value calculations for ERIs. The standard is applicable for the valuation of any kind of energy related investment.

The document focusses mainly on the valuation and documentation of the economic impacts of ERIs. However, non-economic effects (e.g. noise reduction) that can occur through undertaking an investment are also considered. Thus, qualitative effects (e.g. impact on the environment) – even if they are non-monetisable – are taken into consideration.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
adjustment parameter
quantifiable parameter affecting the results of the valuation process

EXAMPLE energy savings (kWh), discount rate, project lifetime, energy price variation rates etc.

3.2
degradation
decrease in the performance characteristics or service life of a product

Note 1 to entry: The degradation rate is measured as performance decline per year (e.g. 1 %/a).

Note 2 to entry: For the purpose of this document deterioration (decline in the performance of an energy performance improvement action) is included in the concept of degradation.

[SOURCE: EN 60194:2007-03, modified — Note 1 and Note 2 to entry added]

3.3
benefit
positive effect resulting from an investment

Note 1 to entry: A benefit can have a qualitative, quantitative, financial or fiscal nature.

Note 2 to entry: A benefit can be a direct or indirect effect.

3.4
cash flow
movement of money

EXAMPLE Initial payment of an investment.

Note 1 to entry: Depreciation is not a cash flow.

Note 2 to entry: In this document cash flow is also referred to as payment (P).

Note 3 to entry: Energy savings are considered as cash flows into a business or project as they reduce the payments for energy consumption.

3.5
discount factor q
multiplier (1+*r*) of a cash flow to calculate the Present Value (*PV*) depending on the discount rate (*r*) and the period (*t*)

Note 1 to entry: For each period (*t*) the cumulated discount factor is calculated with $(1+r)^t$ *or* q^t.

3.6
discount rate *r*
interest rate that reflects the time value of money

Note 1 to entry: Abbreviated by *r* (*r* for required rate of return).

Note 2 to entry: The risk can also be taken into account when setting the value of the discount rate.

3.7
effort
negative effect resulting from an investment

Note 1 to entry: An effort can have a qualitative, quantitative, financial or fiscal nature.

Note 2 to entry: The negative effects occur in a direct or indirect way.

3.8
energy related investment (ERI)
any kind of investment in which energy consumption or energy generation plays a role irrespective whether it is an energy performance improvement action or an energy supply system project

3.9
internal rate of return (IRR)
discount rate at which the Net Present Value (NPV) of all cash flows of a project equals zero for the lifetime of the project

3.10
investment risk
volatility of the return of an investment, particularly the likelihood of occurrence of losses relative to the expected return on any particular investment

Note 1 to entry: Investment risks can derive from credit risk, construction risks, operational and maintenance risks, performance risks etc.

3.11
lifetime of an investment
period during which the investment causes cash flows

Note 1 to entry: Guidance for the lifetime of energy related investments with regard to buildings can be found in EN 15459-1.

3.12
monetisation
transformation of benefits and efforts into cash flows

Note 1 to entry: This is usually done by multiplying the quantified benefits and efforts with the specific monetary value per unit.

3.13
Net Present Value
(NPV)
sum of discounted cash flows over the whole lifetime of an investment

3.14
non-energy effect
effect that results from an ERI but is not directly related to the energy consumption or generation

EXAMPLE motivation of employees, increased production capacity, less noise, better working conditions etc.

3.15
payback period
time required to recover the payments out of an investment

3.16
risk premium
compensation for investors accounting for the given risk compared to that of a risk-free asset

Note 1 to entry: Risk premium can be included in the interest rate or defined as an additional cash flow.

3.17
scenario analysis
procedure to calculate extreme but still realistic results

3.18
sensitivity analysis
procedure to assess the impact of changes of adjustment parameter settings on the NPV

3.19
valuation of energy related investments
(VALERI)
procedure of assessing and reporting financial and non-financial effects of an ERI in order to lay a foundation for decision-making

4 Symbols, abbreviations and subscripts

For the purposes of this document, the specific symbols, abbreviations and subscripts listed in Table 1 apply.

Table 1 — Symbols, abbreviations and subscripts

Symbol	Name of quantity	Unit
CAPEX	Capital Expenditure	€
C_{debt}	Debt capital	€
C_{eq}	Equity capital	€
C_{invest}	Total investment capital	€
CHP	Combined Heat and Power system	
$ded_{\text{risk, t}}$	Deduction to account for risk in period t (= $\sum P_{\text{t}} \cdot f_{\text{ded\_risk}}$)	€
degrad	Annual degradation	
DPB or *DPP*	Discounted Payback Period	years
epr	Annual price variation energy	
$E_{\text{savings, A}}$	Annual energy savings for energy carrier "A" without considering degradation	kWh/year
$f_{\text{ded\_risk}}$	Risk deduction factor (= $p_{\text{loss}} \cdot R_{\text{loss}}$)	
IRR	Internal Rate of Return	
it	Income tax rate	
NPV	Net Present Value	€
OPEX	Operational Expenditure	€
P	Payment (payment in or payment out)	€
p_{loss}	Probability of the occurrence of net return loss	
pr	Annual price variation not energy	
PV	Present Value	
q	Discounting factor (= 1+r)	
r_{debt}	Interest rate for debt capital	
$r_{\text{debt}}^{\text{bt}}$	Interest rate for debt capital (before taxes)	
$r_{\text{debt}}^{\text{at}}$	Interest rate for debt capital after taxes (= $r_{\text{debt}}^{\text{bt}} \cdot [1-it]$)	
r_{eq}	Interest rate for equity capital	
$r_{\text{eq}}^{\text{at}}$	Expected return on equity after taxes (= $r_{\text{eq}}^{\text{at}} \cdot [1-it]$)	
$r_{\text{eq}}^{\text{bt}}$	Expected return on equity before taxes (= $r_{\text{f}} + \beta \cdot [r_{\text{m}} - r_{\text{f}}]$)	
r_{f}	Interest rate for a risk-free investment	
R_{loss}	Risk expressed in a quantified return loss	
r_{nominal}	Nominal discount rate	

Symbol	Name of quantity	Unit
r_{real}	Real discount rate	
r_t	discount rate in period t	
S_{debt}	Share of debt capital (= C_{debt}/C_{invest})	
S_{eq}	Share of equity capital (= C_{eq}/C_{invest})	
$SpecPrice_{energy\_A,\, t}$	Specific energy price (energy carrier A) in period t	€/kWh
SPP or *SPB*	Simple Payback Period	years
t	period	year
T	Lifetime of the investment	years
T_{tax}	Depreciation period (only relevant if taxes are considered)	years
VAT	Value Added Tax	
$WACC_{at}$	Weighted Average Cost of Capital after taxes in first year (= $S_{eq} \cdot r_{eq}^{at} + S_{debt} \cdot r_{debt}^{at}$)	
$WACC_{bt}$	Weighted Average Cost of Capital before taxes in first year (= $S_{eq} \cdot r_{eq}^{bt} + S_{debt} \cdot r_{debt}^{bt}$)	

5 Valuation procedure

For the valuation of an ERI the organization shall (as shown in Figure 1) complete the following tasks:

A. Setting up the model:

1. determine all benefits and efforts that result from the given ERI (including all relevant energy flows);

2a. quantify the benefits and efforts of the potential investment;

2b. describe in a qualitative manner all those effects that can't be quantified;

3a. monetise the benefits and efforts to payments out and payments in (the relevant cash flows) taking into account the expected price variations for each cash flow, and estimated degradation;

3b. specify non-monetisable effects;

4. determine the number of periods that should be considered (regularly the lifetime of an investment) and specify the points in time when the cash flows occur;

5. estimate all relevant risk factors, as appropriate;

6. determine the appropriate discount rate for discounting the cash flows;

B. Calculation:

7. calculate the Net Present Value of the ERI using the most-likely parameter settings, which will result in the most-likely-case scenario;

8. perform a sensitivity analysis under variation of all adjustment parameters that are liable to uncertainty, as appropriate;

9. perform a scenario analysis including at a minimum a worst-case, and best-case scenario;

C. Assessment:

10. interpret the quantitative and the qualitative results;

D. Reporting:

11. present the calculation and its results in a transparent and retraceable manner.

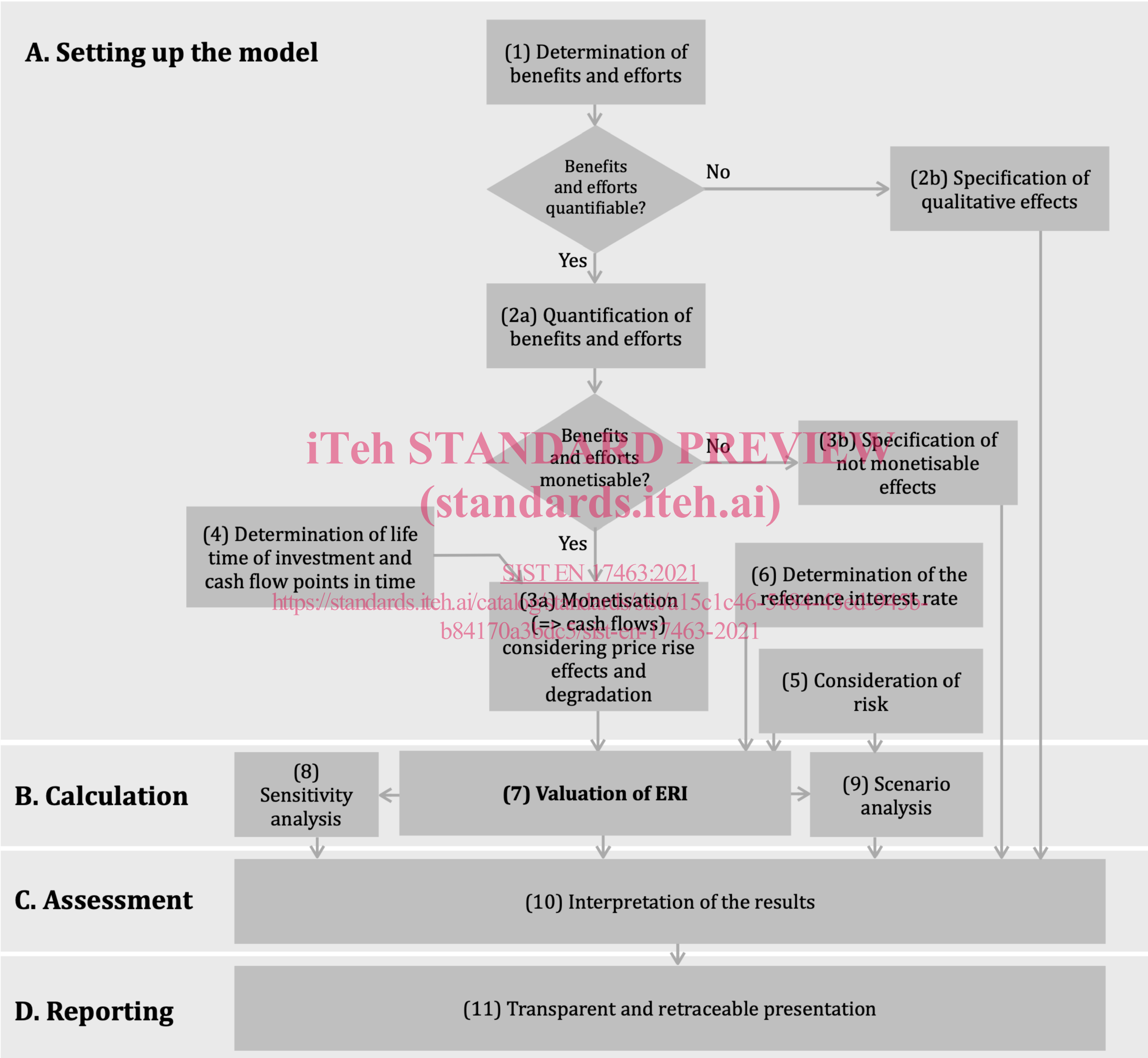

Figure 1 — Valuation procedure

For explanation purposes the valuation procedure is outlined by using an example for an ERI (here: exchange pumps for a cooling system).

6 Setting up a model (phase A)

6.1 Determination and qualitative description of benefits and efforts

Initially, all benefits and efforts that result from an ERI shall be described as qualitative data. This process requires thinking beyond the obvious financial effects in order to account for all benefits and efforts which might be relevant for the investment decision.

The organization shall divide “benefits and efforts” into the sub-categories

— “energy flow effects” (expressed as energy and financial effects),

— “additional financial effects” (that go beyond the energy flow effects), and

— “miscellaneous effects”, if applicable,

as shown in Table 2.

Visualization of energy flow effects might improve the overall understanding. This could be done by setting up an energy flow chart (see example in Annex D).

“Additional financial effects” and “miscellaneous effects” are considered as “non-energy effects” which can have a strong influence on the profitability of an investment (e.g. subsidies, increase in productivity, marketing effects etc.) and should therefore be included in the valuation.

Qualitative effects such as noise reduction, cleaner air, less pollution, less GHG emission etc. shall be checked. All effects shall be listed and will be included later in the valuation report to show all financial and other impacts of the investment.

When determining the benefits and efforts of the ERI indirect effects can occur that result from the investment, including:

— cost reduction resulting from lower CO_2 taxes and GHG emission allowances,

— other tax related incentives connected with energy related investments.

EXAMPLE An energy performance improvement action leads to a reduction in electricity use of 150 000 kWh per year. Assuming an individual CO_2 factor for electricity of 486 g/kWh the action leads to a CO_2 reduction of 72,9 tons per year. Should the CO_2-tax amount to 80 € per ton this would lead to an additional financial benefit of 5 832 € per year.

At this stage benefits and efforts are listed, but they are not quantified or monetised. At the end of this step the results could look like Table 2.