

Value multiple benefits - Improve energy efficiency!

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ABSTRACT

Why don't companies invest more in energy efficiency? One answer is that energy savings alone are often insufficient to compel investment.

However, by valuing and communicating multiple benefits - such as improved product quality, enhanced employee productivity, better indoor air quality, reduced costs and risks - project proposals for energy-efficiency projects demonstrate how efficiency benefits a company's core business.

The team of the multiple benefits project (M-Benefits) is developing an approach to identify, value and communicate the strategic impacts of investments that improve energy performance. By strategic, we mean showing how an energy-efficiency project contributes to an organization's competitiveness in performing their core business. Helping companies improve their competitive advantage and energy performance is the goal of the multiple benefits research project. Therefore, we follow a multi-step approach:

- The development of the evaluation toolkit, including training materials and a serious game.
- The training of energy consultants to implement the methodology.
- The implementation of the methodology to test it in a real-life environment.
- A continuous evaluation of the process.
- The compiling of an evidence base with good practices of the use of multiple benefits in companies' decision-making processes.
- A broad communication and dissemination strategy to reach beyond the audience directly targeted by the trainings and pilot projects.

In this paper, we will present the underlying methodology and the developed toolkit as well as the concept for the pilot phase of the M-Benefits project.

Introduction

In the last decade, energy-efficiency became an increasingly relevant topic. Today demand-side energy-efficiency is commonly seen as essential to meet all of the major objectives of climate and energy policies. Energy-efficiency is denoted as the “first fuel” in the EU 2030 climate and energy policy framework (Saheb, Ossenbrink 2015) and by the International Energy Agency as well (IEA 2013).

Research suggests that the industrial and service sectors, which accounted for about 39% of final energy consumption in 2015 in the EU, offer substantial potential for cost-effective energy savings. However, an under-investment in energy-efficiency (otherwise described as an “energy-efficiency gap”) is observable across all countries and business activities, including energy-intensive industries. Multiple researchers describe the existence of this energy-efficiency gap: for instance in the European cement industry (Moya et al.; 2010, 2011); the US economy (DeCanio, 1998; Granade et al., 2009); in the German commercial and services sector (Schleich, 2009); in the German iron and steel industry (Brunke and Blesl, 2014); in the Swedish pulp and paper industry (Thollander and Ottosson, 2008); in the Swedish steel industry (Johansson and Söderström, 2011); in the Belgian cement, ceramic and lime industries (Venmans, 2014).

Public policy efforts to curb energy consumption and greenhouse gas emissions have often obtained insufficient results. Since 2012, the energy-efficiency index (ODEX) for industry calculated in the ODYSSEE database¹ only showed a rather weak improvement compared to the years before. According to the International Energy Agency (IEA), if current trends continue, two-thirds of the economic potential to improve energy-efficiency will remain untapped until 2035, including 55 percent of the energy-efficiency opportunities in the industrial sector (Benoît et al. 2014). The IEA (2016) notes that while the 2015 global intensity improvement of 1.8% in 2015 was three times greater than the decadal annual average of 0.6% between 2003-13, this improvement needs to increase to 2.6% immediately and endure until 2030. According to the G20 Energy-Efficiency Investment Toolkit (2017), the "energy-efficiency investment challenge transcends individual domains and sectors and it is clear that the world needs to significantly step-up the rate of energy-efficiency improvement". (G20 2017:20). The M-Benefits project has the potential to contribute to the achievement of this target.

A large share of energy-efficiency is not considered cost-effective when the analysis accounts for only energy savings as benefits. The same can be said of climate change mitigation, which can impede economic growth if it results in increased energy prices. However, many co-benefits, ancillary benefits, non-energy benefits (NEB), multiple benefits or impacts² accrue because of energy-efficiency projects. Co-benefits such as reduction of emissions, health and macro and micro-economic benefits are significantly higher than the cost of energy measures (Zhang et al. 2016). The environmental impacts of energy-efficiency on primary and final energy consumption as well as emissions related to energy conversion are evident. In addition, macro-economic impacts have been well studied in recent years. To unify different aspects and give a more holistic view on the benefits of energy-efficiency in a single framework Ryan Campbell (2012) presented the multiple benefits approach, which was further refined by IEA (2014). Ürgen-Vorsatz et al. (2016) proposed several methods for the quantification of multiple benefits or ‘multiple impacts’ of energy-efficiency in a green economy context, developed as part of the COMBI project³.

¹ www.odyssee-mure.eu

² Various terms have been developed and used to describe the concept over the years.

³ <http://combi-project.eu/>

Until today, most research on multiple benefits has focused on the public benefits of energy-efficiency, i.e. benefits at societal or macro-economic levels. These societal benefits include impacts on public health, job creation, poverty alleviation, energy security, public budget or climate change mitigation, as opposed to private benefits, which are benefits that accrue to individuals or companies. Most of this research was funded or supported by public bodies as the IEA or the European Commission, which explains the strong societal focus of this research area.

At company level, multiple benefits of energy-efficiency investments include improved product quality, higher flexibility or reduced time of production, reduced production loss, and reduced risks (Cooremans, 2015). Often-observed examples of multiple benefits include reductions of maintenance cost, increases in workplace comfort or safety (for instance when an old oven is replaced by a new, better insulated one) and increases in industrial productivity (due to lower production time or a reduction of the rejection rate). A reduction in GHG emissions is another frequently observed benefit of energy-efficiency projects. This kind of research on company level has received more attention recently. As for the M-Benefits project, most of the research is also funded by public institutions. This shows the increasing awareness of this topic also among the public funding bodies.

As emphasized by the IEA report (2014), “identifying the multiple benefits that may be linked to energy-efficiency measures in industry could enhance the business case for action”. A similar statement is made in the G20 report (2017): “Integrating the multiple benefits of energy-efficiency into real estate, consumer and corporate lending products can drive customer demand and improve creditworthiness”.

Unfortunately, multiple benefits are generally not taken into account in energy-efficiency investment appraisals, neither by ESCOs nor by companies themselves, even energy-intensive or large companies. The Swiss research project “M_KEY”⁴, which studies the energy-efficiency investment practices of Swiss large-scale energy consumers, provided interesting insights into companies’ decision making routines (Iten et al., 2017). M_KEY's questionnaire was completed and validated by 301⁵ large-scale energy users companies⁶, of which 279 answer the questions on multiple benefits. About 51 firms (18%) do not, or only rarely, consider multiple benefits in their investment decision-making process, 104 sometimes (37%), 81 (29%) very often and a minority of 43 firms (16%) nearly every time. Thus, more than half of companies never or rarely include multiple benefits in their investment evaluations.⁷

⁴ M_KEY -Management as a Key Driver of Energy Performance -Determinants of energy-efficiency investments- is a project of the Swiss National Research Project NRP71 “Managing Energy Consumption”. NRP 71 studies the social, economic and regulatory aspects of the change in energy strategy, thereby examining how private and public actors could be prompted to use energy efficiently. M_Key research project is part of theme 2: Economy and enterprises.

⁵ Out of a sample of about 3,000 Swiss large-scale energy consumers contacted.

⁶ Defined by the Swiss Federal energy law as companies consuming yearly more than 0.5 GWh electrical energy or 5 GWh thermal energy in at least one tertiary building or industrial facilities.

⁷ This result is slightly different from the one presented in figure 1, which was not yet final.

At present, there is no common methodology available to the energy experts to categorize and evaluate the multiple benefits of energy efficiency projects in a systematic way. Nor is there a credible evidence base these experts can draw upon to support their evaluations with proven figures when projects are presented in front of corporate financial and investment decision-makers. These twin foundations – a common and consistent method for energy managers and project developers to quantify multiple benefits and a compelling evidence base for investors to use when considering investment in energy projects – are lacking and have to be developed.

If such common methods are not pursued, the impacts of energy-efficiency investments on industrial productivity cannot be analyzed systematically. Further, without a compelling multiple benefits evidence base, energy-efficiency projects will continue to be analyzed based on energy benefits (i.e. energy-savings) only. Energy and associated cost savings arguments generally are not reflective of the competitive needs and interests of firms, thus many energy projects lack appeal with companies' top management (Cooremans, 2011, 2012). Contacts for energy-efficiency projects decision-making in companies are mainly the managers in charge of energy issues, and of technical functions. Therefore, their focus and “pitch” to upper management is focused on technical aspects.

The context of our Multiple Benefits Project

The M-Benefits project presented in this paper is funded by the European Union in the Horizon 2020 Program as a coordination and support action. The main purpose of this kind of grant is capacity building among the relevant actors. To achieve this target, a consortium of various partners from the EU and Switzerland have joined forces within this project.

To target the challenges in the development and implementation of a new methodology, the consortium consists of partners with a strong academic background as well as implementation-oriented partners. They are supported by two partners responsible for the stakeholder dialogue and the dissemination activities. Our implementing partners are from Austria, Germany, Greece, Italy, Poland, Portugal and Switzerland. These countries cover the broad variety of the industrial landscape within Europe.

The project started in March 2018 with a duration of three years. After the completion of the first phase dedicated to the elaboration of the methodological basis, the implementation phase starts in autumn 2019.

The objectives of the Multiple Benefits Project

The first goal of the M-Benefits project is to propose a harmonized approach and methodology to include the multiple benefits (defined as including energy and non-energy benefits) of energy efficiency in project analysis in technical, operational, strategic and financial terms. The second goal of the project is to train and build the capacity of energy-efficiency experts to apply the M-Benefits methodology in order to evaluate all benefits (i.e. not only the energy-savings benefits) of energy-efficiency projects in industrial production sites as well as residential, administrative and commercial buildings. The target group includes energy managers

in companies as well as energy auditors or consultants from the variety of energy service companies. Depending on the national context, the trainings will also be used for the continuous education needed for the accreditation and certification of energy auditors (e.g. in Germany and Austria). People working in the energy-efficiency domain usually have a focus on energy savings and the resulting monetary savings. To enable these energy professionals to communicate projects in strategic terms to companies' top management, a radically new thinking about energy-efficiency projects has to be established.

Figure 1 illustrates the multiple benefits approach needed to sell energy-efficiency projects in companies successfully. This approach takes into account three pillars that are critical to upper managers when considering project investment: 1) the impact and improvement to **value proposition**, 2) contribution of energy-efficiency projects to **cost reductions** (apart from the energy cost) and 3) **risk reduction**. Projects that contribute positively to value proposition, risk reduction and cost reduction align with top management's interest.

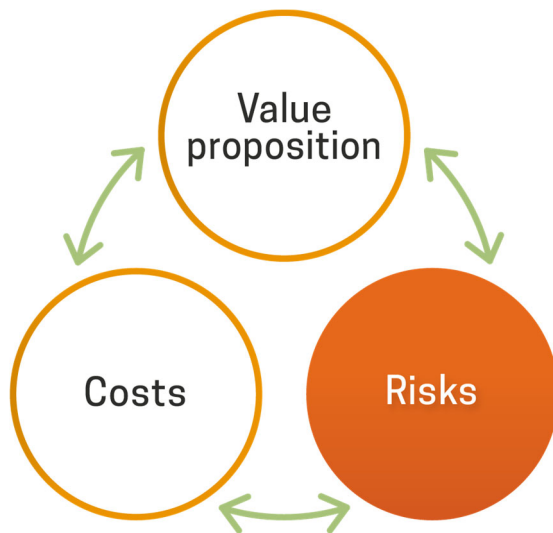


Figure 1: The multiple benefits approach to energy-efficiency measures (Cooremans, 2011, modified)

The overarching objective of the M-Benefits project is therefore to provide energy experts with a set of tools to enable them to apply the multiple benefits approach to evaluate and communicate the benefits of energy-efficiency in a way that resonates with companies' needs and practices. Such tools allow energy managers and practitioners to improve the business case of energy-efficiency projects. Thanks to this broader approach, the contacts and champions of projects in companies will cut across all company functions, including top management.

The M-Benefits project pursues the following main objectives:

- To provide a robust, conceptual base for the development of tools related to multiple benefits evaluation and communication, customized to the needs and practices of energy-user companies on the demand side.

- To create a harmonized approach and methodology for energy managers and project developers to include multiple benefits in project analysis, to identify, categorize and assess them *ex ante* (i.e., at the conception/beginning of projects), and to communicate project proposals in technical, operational, strategic and financial terms.
- To collect energy-efficiency measure and business activity data and to develop case studies such that business decision-makers across sectors can account for multiple benefits in investment and business activities based on a consistent and harmonized methodology enabling to compare projects evaluations (*ex-ante*) and results (*ex-post*).
- To develop customized approaches to communicate about multiple benefits to relevant stakeholders. This implies considering the different perspectives and incentives of different key actors and organizations, and communicating multiple benefits in strategic terms to companies' upper management.
- To train the "efficiency providers" inside and outside of companies, including energy-efficiency engineers in charge of conceiving, selling and managing energy performance projects.

Our Plan to deliver

The Evidence Base

The evidence base of the M-Benefits project will rely on two major data sources. The first source is a survey, which has been started in early 2019. This survey will help to show companies' experiences with multiple benefits in energy-efficiency project evaluations. The outcome of this survey will help to build evidence on the following topics:

- Supporting factors for the application of a multiple benefits approach within a company.
- Technologies where the application of a multiple benefits approach has potential for the improvement of the project evaluation.

The second major source will be the pilot projects. From this pilot projects we will draw real life evidence as the M-Benefits methodology will be applied on real cases. This data will be used to build fact-sheets for the successful use of the M-Benefits approach.

Development of the Toolkit

The basis for the toolkit development was an intensive literature review, which has been recently presented in a conference paper. Within this review, the different types of multiple benefits as well as potential ways to value them in a project devaluation have been identified (Killip 2019). The insights from the literature review as well as the experience of the project partners from previous projects were the basis for the development of the multiple benefits toolkit.

The **multiple benefits evaluation toolkit** includes analytical tools enabling energy-efficiency professionals to identify, categorize, evaluate and quantify the multiple benefits of energy-efficiency projects. The evaluation toolkit will be used *ex ante*, i.e., in the first

identification and planning stage of energy-efficiency investment projects. It will be made available in the form of a software that integrates multiple benefits categorization and the various analysis to be made in a systematic and easy way, including a financial spreadsheet to include both, energy benefits and multiple benefits in investment appraisal. The evaluation toolkit will not provide concrete values for the multiple benefits assessment, as they are highly dependent on the individual context of the company. Instead, a straightforward methodological framework – including suggested measurement indicators and data sources – is provided to gather all relevant information within the company.

The evaluation toolkit also includes a monitoring and control tool to check multiple benefits ex-post, i.e., after the implementation of the projects, to verify results and keep track of projects.

Based on the evaluation toolkit, several **communication tools** have been developed. They provide effective tips and solutions to energy experts to help them better communicate projects to different decision-makers, in two directions:

- A “decision-making map” enabling energy experts to consider key aspects of the decisional context when conceiving and planning their energy-efficiency projects.
- Influential and motivational techniques to guide organizational behaviour (at corporate level, department level or individual level).

For the use in the training sessions, a user manual to facilitate comprehension and use of the evaluation and communication tools has been prepared.

Serious Game

A serious game is a game designed for a primary purpose other than pure entertainment. Based on a mix of virtual activities (simulation) and real activities (presentations and exchanges), it develops participants’ capacity to take on a complex problem in a global and systemic manner. The serious game is the core training material of the M-Benefits project and has been described in detail in a recent conference paper (Cooremans 2019).

Training activities

Train the trainer – implementation of the training scheme within the consortium

With the elaborated training material, an initial train-the-trainer event has been held in Frankfurt/Germany with participation of all consortium members and for enabling the implementation partners to perform the trainings in their national context. The Serious Game was introduced and practiced at this event.

Rollout of training workshops

Each partner country will commence a training program consisting of at least two trainings organized in locations ensuring a large participation of the stakeholders from the target

audience. The course will be available free of charge and will include interactive elements and group work. The elements of the training program are:

- Business model analysis
- Identification and quantification of the multiple benefits of energy-efficiency projects in the design phase (ex-ante)
- Evaluation of multiple benefits after implementation of energy-efficiency-measures (ex-post)
- Application of the communication toolkit
- Playing the serious game

The training is designed as a two-day training including an exercise section on the application of the techniques on the first day and a second day for the serious game section. The exercises will preferably be performed on existing project cases of the trainees; alternatively on centrally prepared good practice examples. The trainees receive a certificate for attendance of the course. The trainings will be documented by the consortium members and evaluated by the trainees. For broader outreach, the training will be offered in cooperation with suitable institutions, i.e. industrial associations, chamber of commerce. Furthermore, the announcement and recruitment of participants for the training will consider findings from the stakeholder consultation process to address motivation and opinions of the target group. The stakeholder consultation has been initiated at the beginning of the project. It accompanies the project over its entire duration. A major target of the stakeholder process is to increase the outreach of the project and to engage more people in the trainings and the actual use of the methodology.

Pilot Phase concept

Identification of companies and institutions participating or contributing to the pilot projects.

As a first part of the pilot phase, the project team is currently engaging with companies prepared to get involved in the pilot projects. In parallel, we are reaching out to the stakeholder organizations (such as chambers of commerce and other umbrella organizations) that will support the identification and search of companies who will participate and will provide access to the necessary information.

The incentive for the participating companies and institutions is the free use of the investment decision-making routines (i.e., the complete M-Benefits methodology, for investment evaluation, the multiple benefits identification to monetarization and the training).

These participating companies and institutions will support the respective members of the project consortium for:

- Interviews and discussions with key individuals involved in decision-making routines.
- Assessment and reviews of M-Benefits methodology and of the results from their integration into company's processes and workflows.
- Input data for the company-specific assessment of identified multiple benefits.

- Participation in, co-organizing and evaluating training activities on M-Benefits methodology and the developed toolkit (also using the serious game).

The participating companies and institutions are identified directly by the respective member of the consortium in each implementing country based on the local relevance and representativeness of sectors and companies in industries and services. The purpose is to cover a broad variety of sectors, companies and institutions as well as energy efficiency-projects types, e.g., ranging from implementation of energy-efficiency in industrial manufacturing processes to tendering and evaluation of energy performance contracting projects. Attention is paid towards an equal distribution of pilot projects between companies / the service sector / industries and among large- and small-sized companies. The selection process is expected to be finished by summer 2019.

The M-Benefits methodology will be evaluated in terms of robustness, adaptability, acceptance and usability across the investigated pilot projects. Therefore, an evaluation and validation of the M-Benefits methodology will be carried out across the achieved portfolio of sectors, companies and energy efficiency projects and measures (also as organizational measures) in industry and services having different needs and requirements, processes and workflows, investments strategies and company objectives.

Expected impacts of the project

Current energy-efficiency programs generally entail companies that already have a pre-existing interest in energy-efficiency looking to improve their performance. The M-Benefits approach on the other side envisages appealing to companies without such a strong interest in energy-efficiency by stressing the benefits that go beyond it and are of importance for a company's business model and competitiveness. It can hence be expected that many of the newly targeted companies have not yet implemented many energy-efficiency measures and already small investments can lead to a larger impact. The savings can thereby be expected to be in the upper range or slightly above the savings observed in other conventional energy-efficiency programs.

The project is expected to benefit the implementing companies by providing support in the evaluation of multiple benefits of energy-efficiency measures. Since the majority of companies state they rarely or never include non-energy benefits of energy-efficiency in their investment calculations, such insight will be of great importance for future policy as instruments to incentivize companies to invest in energy-efficiency and particularly convince those companies that hesitate or lack a general interest in energy-efficiency.

Outlook and Conclusions

Energy-efficiency investments themselves are often highly profitable. However, many companies are still hesitating to invest in energy-efficiency due to doubts about its actual cost savings or simply to a lack of information. This is the starting point of the M-Benefits project. By highlighting and valuing the operational, strategic and financial impacts of energy-efficiency

projects, the Multiple Benefits approach will induce companies' top management to invest in energy-efficiency projects.

As part of our project, the Multiple Benefits approach is operationalized in a methodology enabling to identify, categorize and value all benefits of energy-efficiency projects. This methodology will be tested in a real-life environment in 50 companies in seven European countries. To maximize the impact of the developments of our project all tools will be provided on our project website www.m-benefits.eu.

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