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# Potential for energy efficiency measures and integration of renewable energy in the European food and beverage industry based on the results of implemented projects

Juergen Fluch\*, Christoph Brunner, Anna Grubbauer

*AEE INTEC, Feldgasse 19, 8200 Gleisdorf, Austria*

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## Abstract

In GREENFOODS existing funding programs were mapped and evaluated concerning their acceptance and suitability in the food and beverage industry. The analysis has shown that most funding instruments were considered not easily available due, on the one hand, to limited budgets for the programs, and/or limits for eligible cost of individual measures and, on the other hand, to the complex and demanding application procedures. Based on this, recommendations were made for future development of programs. A follow-up is the H2020 project TrustEE focusing on innovative financing schemes (e.g. market oriented funds) for EE and RE implementations.

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*Keywords:* Energy efficiency; Renewable energies; Food and beverage industry; Funding and financing

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## 1. Introduction

To limit global warming to below 2 °C, more than 190 countries signed the Paris agreement in 2015 to take action. The European Union (EU) itself set the target to reduce greenhouse gas emissions by 40 % and to increase energy efficiency and renewable energy by 27 % until 2030. [1] In 2015 the food and beverage (F&B) industry

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\* Corresponding author. Tel.: +43-3112-5886-450; fax: +43-3112-5886-18.

*E-mail address:* [j.fluch@aee.at](mailto:j.fluch@aee.at)

consumed 11 % of the final energy demand of the industry in the EU. [2] With a turnover of 1,089 billion Euros the F&B industry is the largest manufacturing sector in the EU and consists of more than 289,000 companies of which 99.1 % are small and medium-sized enterprises (SMEs) which contribute to 49.5 % of the sectors turnover. [3]

SMEs suffer from a huge lack of information about their energy consumption pattern, energy management and opportunities for increasing their energy efficiency and integrating sustainable technologies into their production process. In addition, due to the size of the companies and the low financial flexibility that comes with it, SMEs often cannot afford to invest in the area of energy efficiency (EE) as well as renewable energy (RES) integration. Many technical and economic feasible projects are not realized due to missing and inappropriate funding and financing mechanisms. Furthermore frontrunners are needed to reduce the mentioned barriers and resentments and act as lighthouses for other companies to follow.

This paper focuses on demonstrating the potential for EE measures and integration of RES in the European F&B industry based on implemented projects and best-practice-examples as the “green” brewery Goess in Austria. A further focus will be on funding and financing programs relevant for EE and the supply of energy based on RES.

## 2. Methodology

In 2012 the IEE project GREENFOODS (GF) was started in order to lead the European F&B industry to optimized EE and integration of RES and following reduction of fossil carbon emissions with the help of 14 partners in Austria, Germany, Poland, Spain and the UK. To evaluate the potential for EE measures and integration of RES in the F&B industry, 204 basic audits were performed in which the current energy situation and the main processes were surveyed. For the performance of the energy audits the European standard EN 16247 was applied which was developed in the previous IEE projects EINSTEIN I & II. Based on the basic audits 46 detailed audits were performed. Following 7 companies were accompanied through an implementation phase, covering all selected sub-sectors and company sizes from medium to micro-enterprises. EE measures were implemented both at the process level (e.g. optimization of heating and cooling rate of the process) and the system level (e.g. heat recovery from process and chiller). Innovative cooling systems, switchover from steam to hot water distribution, CHP systems, solar thermal and photovoltaic or replacement of coal burner were also implemented. Based on the results of the audits the GREENFOODS branch concept was developed. Special emphasis was also put on barriers especially concerning existing funding and financing programs relevant for EE and the supply of energy based on RES. Within GREENFOODS the existing programs were evaluated concerning their acceptance and suitability in the F&B industry and recommendations for tailor-made future funding and financing programs were made. Building on this results and recommendations the Horizon 2020 project TrustEE was launched in 2016 focusing on developing innovative financing schemes for EE and RE implementations in companies.

## 3. GREENFOODS Branch concept and the identified potentials

Here introduce the paper, and put a nomenclature if necessary, in a box with the same font size as the rest of the paper. The paragraphs continue from here and are only separated by headings, subheadings, images and formulae. The section headings are arranged by numbers, bold and 10 pt. Here follows further instructions for authors.

### 3.1. GF branch concept and WikiWeb as methodology to identify and evaluate the potential

The GREENFOODS branch concept is a tool that guides the user to identify tailor-made solutions for an energy efficient production and integration of RES in five different sub-sectors in the F&B industry (bakeries, breweries, dairies, fruit and vegetable processing and meat processing). In order to obtain suggestions for improving the EE of the investigated company the user must define the status quo of the energy flows within the company. The branch concept includes the whole energy system and energy conversion in an industrial application as the input (e.g. natural gas), the utilities (e.g. boilers and chiller), the distribution and the process (definition of the energy demand of the most relevant process). (Fig. 1) [4]

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