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GREENFOODS Branch Concept for enhancing energy efficiency in the Food and Drink industry

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Challenges for energy audits in industry

- **Optimization of the thermal energy supply is very complex:**
  - ⇨ Grown company and infrastructure with unreliable data of the status quo (especially for SMEs)
  - ⇨ Only average data available
  - ⇨ Measurements which are cost and time consuming necessary
  - ⇨ Processes at different temperature levels and operating times have to be integrated
  - ⇨ Combination of different heat supply technologies for optimized energy production have to be considered
  - ⇨ Difficult to estimate a-priori the benefit of an energy audit

GREENFOODS

- Zero fossile CO_2-Emissions in the European Food and Beverage Industry, Duration: 28 months (04/2013 – 07/2015)
- Participating countries: Germany, Spain, UK, France, Poland, Austria
- Adressed sectors: meat, beverage, dairy, bakery, cereals, baby food, animal feeds, fish

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GREENFOODS - Background

Identified Challenges and solutions

- ⇨ Low energy efficiency, high energy costs and large dependency on fossil fuels
- ⇨ Missing awareness and knowledge about potential
  - **Efficient process technologies**
  - **Heat integration**
  - **Integration of renewable energy**

Challenges

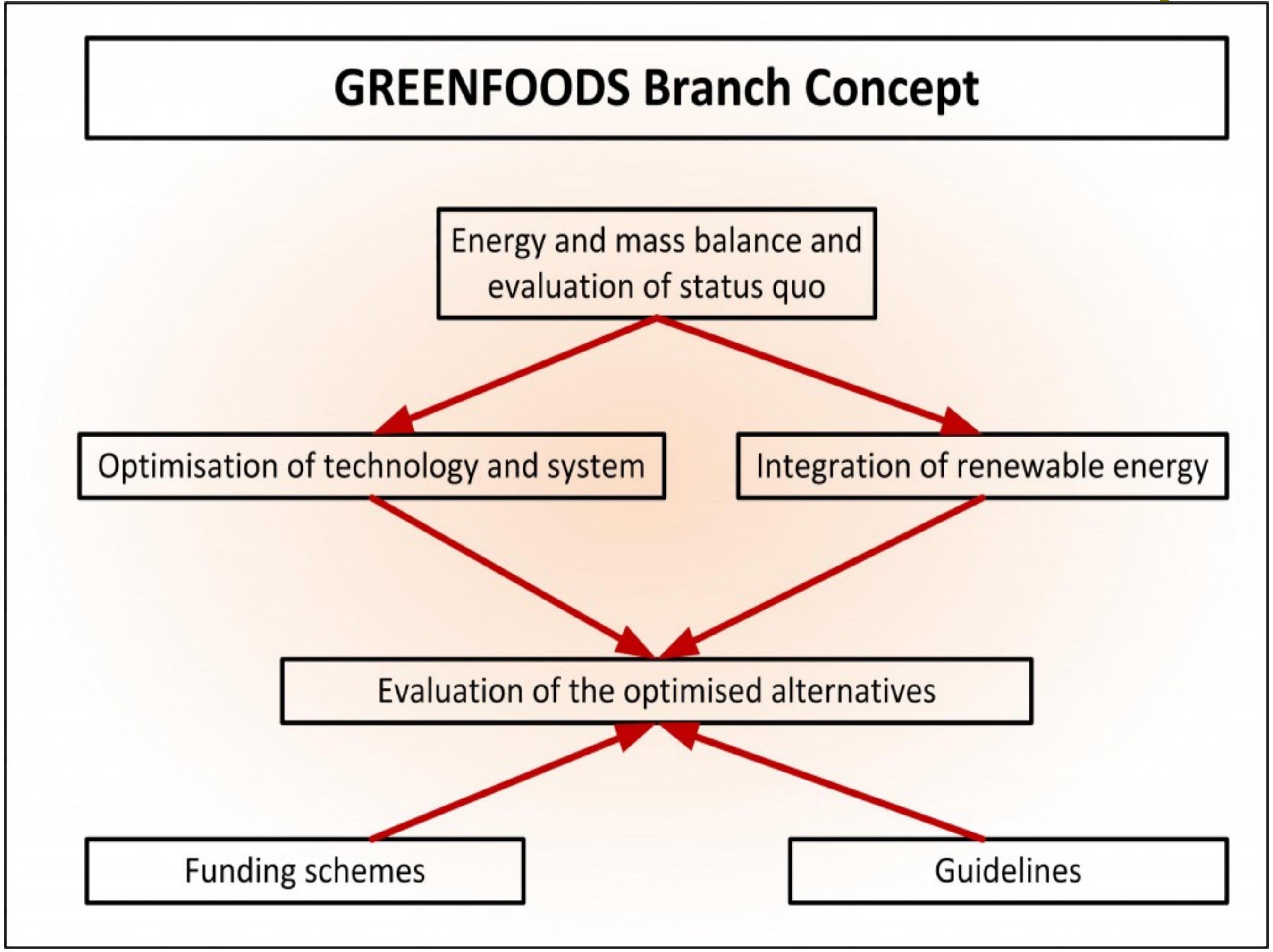
- **Identified challenges and solutions**
  - ⇨ Ineffective and missing funding and financing systems
  - ⇨ Missing best practice examples in different sub sectors
  - ⇨ Missing contact and information points
  - ⇨ Missing Know-how-transfer of identified solutions

→ Need of a branch concept with tailor-made solutions

Objectives of Programme

- **Development of the GREENFOODS branch concept**
  - ⇨ Guideline for the user to identify tailor-made solutions for "green production" for SMEs in the food and beverage industry
- **GREENFOODS training module**
  - ⇨ Knowledge about smart and green technologies in the food and beverage sector will be trained by introducing participants into the use of the GREENFOODS branch concept
- **Special funding schemes**
  - ⇨ Facilitate the implementation of identified energy efficiency potentials and renewable energy sources in SMEs
- **Virtual Energy Competence Centres**
  - ⇨ Contact points within a European network
- **Performance of energy audits as basis for the branch concept**

Overview of GREENFOODS Branch Concept



Mass Flow Balance

- Generation of **energy and mass flow balance** of the status quo
  - ⇨ The *basic version* will roughly calculate the energy consumption of the processes and the efficiencies while
  - ⇨ in the *detailed version* the information input over predefined shapes that represent the typical unit operations in the respective branch will generate more significant results.

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General Data Input

GREENFOODS - Bakery Branch Concept - Step 1: General Data

Overview

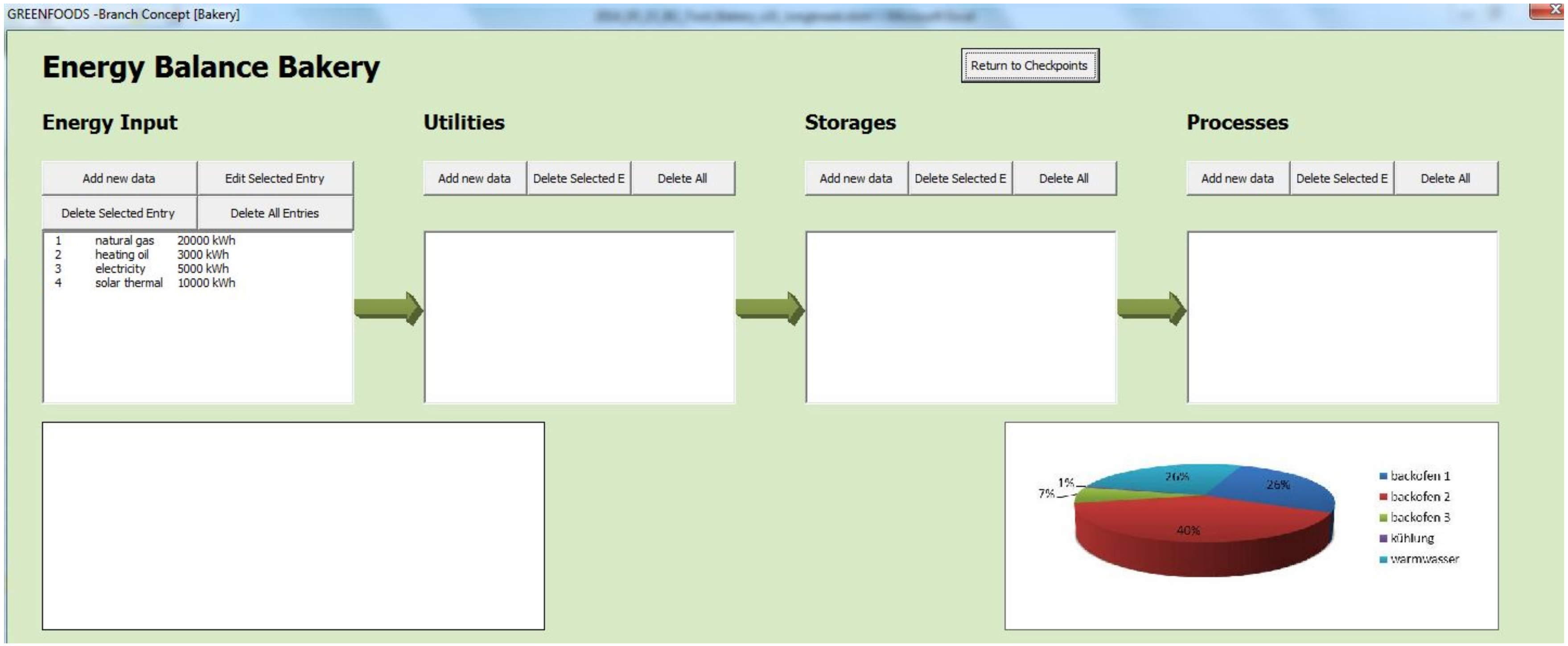
Welcome to the GREENFOODS Bakery Branch Concept!
Enter your individual data to access energy optimization suggestions.

	Baking Loss *[%]*	**Flour** *[t/a]*	**Water** *[t/a]*
Bread	0,1	20	48
Small Pastry	0,12	40	48
Fine Pastry	0,1	80	96
Other baked goods	0,23	160	192

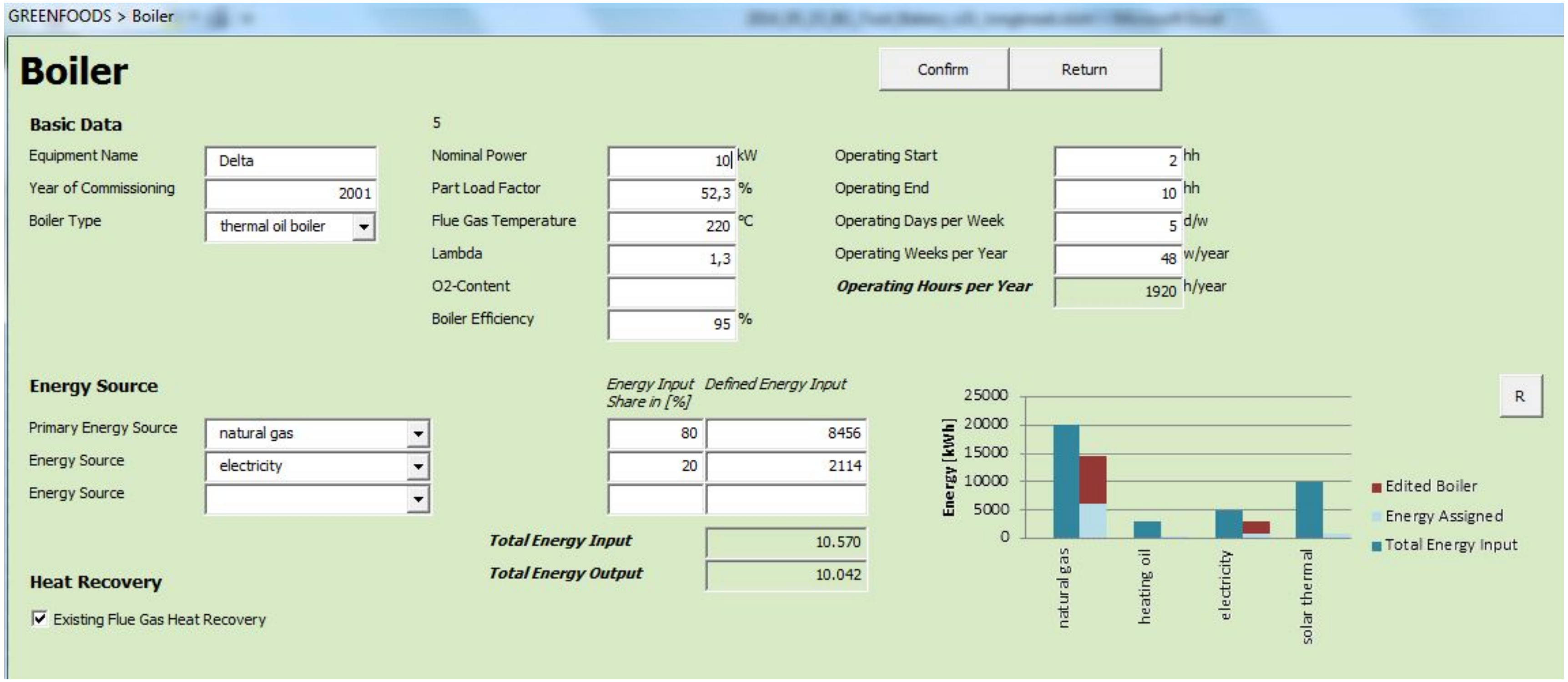
Total Water Demand 200 *[m³/a]*

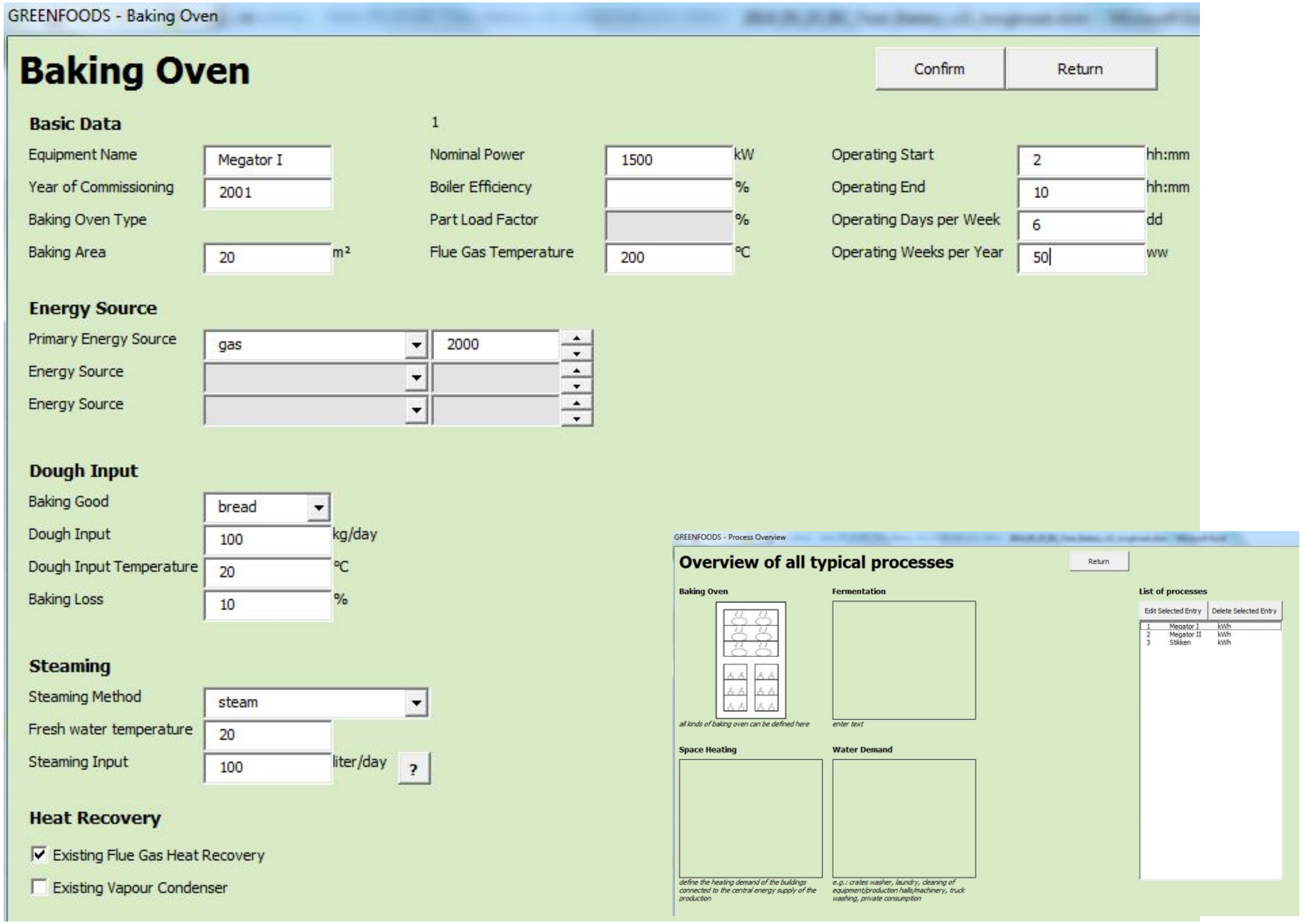
Step 2: Energy Flow

Energy Balance of Status Quo



Utility and Process Definition




GREENFOODS - Baking Oven
Baking Oven
Confirm
Return
Basic Data
1
Equipment Name
Megator I
Year of Commissioning
2001
Baking Oven Type
Baking Area
20
m²
Nominal Power
1500
kW
Boiler Efficiency
%
Part Load Factor
%
Flue Gas Temperature
200
°C
Operating Start
2
hh:mm
Operating End
10
hh:mm
Operating Days per Week
6
dd
Operating Weeks per Year
50
ww
Energy Source
Primary Energy Source
gas
2000
Energy Source
Energy Source
Dough Input
Baking Good
bread
Dough Input
100
kg/day
Dough Input Temperature
20
°C
Baking Loss
10
%
Steaming
Steaming Method
steam
Fresh water temperature
20
Steaming Input
100
liter/day
?
Heat Recovery
Existing Flue Gas Heat Recovery
Existing Vapour Condenser
GREENFOODS - Process Overview
Overview of all typical processes
Return
Baking Oven
Fermentation
List of processes
Edit Selected Entry
Delete Selected Entry
1 Megator I kWh
2 Megator II kWh
3 Stikken kWh
all kinds of baking oven can be defined here
enter text
Space Heating
Water Demand
define the heating demand of the buildings connected to the central energy supply of the production
e.g.: crates washer, laundry, cleaning of equipment/production halls/machinery, truck washing, private consumption

Benchmarking, Optimization of Production

- Over **benchmark comparisons** the user will get as a result how efficient the whole production as well as several processes are operated and at the same time suggestions how these can be optimized on which level.
- For the **optimization of production and processes** different alternatives are suggested based on the status quo. These alternatives may refer to one of the following 3 areas:
  - ⇨ Technology optimization
  - ⇨ System optimization
  - ⇨ Integration of renewable energy sources

Technology Optimization

- Technology optimization will be suggested if key figures of the status quo suggest a **potential technology upgrade**. This step is based on a documentation of guidelines for the implementation of best available technologies (BATs)

- http://www.green-foods.eu/wiki/
- http://wiki.zero-emissions.at/index.php?title=Subsection_DA_food

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http://www.green-foods.eu/wiki/

Datei Bearbeiten Ansicht Chronik Lesezeichen Extras Hilfe

Wiki | GREENFOODS | Subsection DA food - Efficienc...

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		milk products	fruits/ vegetables/ herbs	sugar	beer	fats/ oils	chocolate/ cacao/ coffee	starch/ potatoes/ grain mill products	bread/ biscuits/ cakes	wine/ beverage	meat	fish	aroma	baby food	others	solar integration	emerging technologies	proces intensification
Unit Operations	Typical processes	INFO	INFO	INFO	INFO	INFO	INFO	INFO	INFO	INFO	INFO	INFO	INFO	INFO	INFO	INFO	INFO	INFO
CLEANING	Cleaning of bottles and cases	x	x		x	x				0	0	0						
	Washing products		x	x		x		x		x	x	0						
	Cleaning of production halls and equipment	x	x	x	x	x	x	x		x	x	0	0					
DRYING	Drying	x	x	x		x	x	x	x		x							
EVAPORATION AND DISTILLATION	Evaporation	x	x	x		x	x	0		0	0	0						
	Distillation					x		0		0			x					
	Deodorization					x	x											
BLANCHING	Blanching		x					x										
PASTEURIZATION	Pasteurization	x	x		x					0	0	0						
STERILIZATION	Sterilization	x	x					0		x	0	0						
COOKING	Cooking and		x		x		x	x		0	0	0						

System Optimization

- System optimization concerns to the areas of **heat integration**, either directly via heat exchangers or indirectly via heat storage units.
- Therefore, advanced **Pinch analysis algorithms** (developed within the GREENFOODS consortium) will be executed to identify the heat integration potentials.
- In addition, **the efficiency of heat and cold supply**, as well as optimization approaches for the reduction of electricity consumption, e.g. by electric motor system optimization (e.g. compressed air systems) will be accounted for.

Integration of Renewable Energy

- The **biogas potential** is evaluated based on the previously identified typical waste streams of the respective branches (e.g. spent grain in breweries).
- A **solar thermal simulation tool** has been implemented that allows the definition of a variable heat load that can be linked to a previously defined heat sink of the Pinch analysis. The solar tool considers collector efficiency of different technologies as well as storage and heat exchanger performances and allows a quick but detailed analysis of the collector field size.
- **CHP (Combined Heat and Power), ACM (Absorption Cooling machines) and heat pumps** are proposed and sized if key energy figures after status quo and the first two optimization steps (technology and system optimization) suggest a practical implementation.

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Best Case Example

Gösser

BRAUUNION ÖSTERREICH

SEVENTH FRAMEWORK PROGRAMME

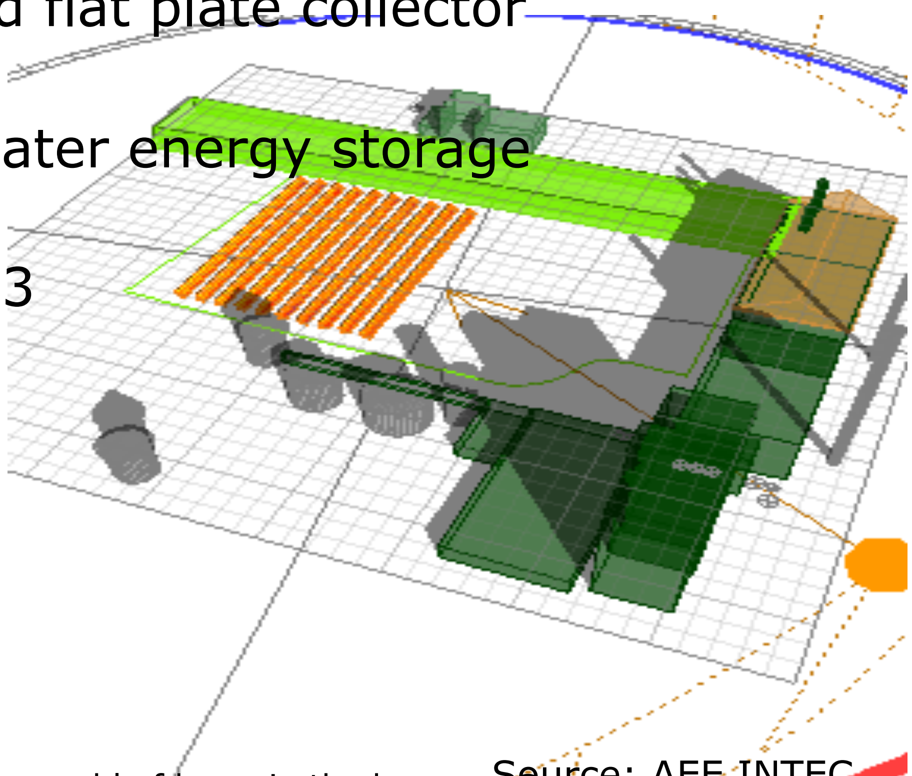
klima+ energie fonds

Heineken

GEA

SUNMARK

- BREWERY GOESS
  - Solar assisted mashing process
  - 1.500m² ground mounted flat plate collector field
  - 200m³ pressurized hot water energy storage tank
  - Commissioned: June 2013



  - 4.6 million pints of beer per year brewed with the power from the sun*

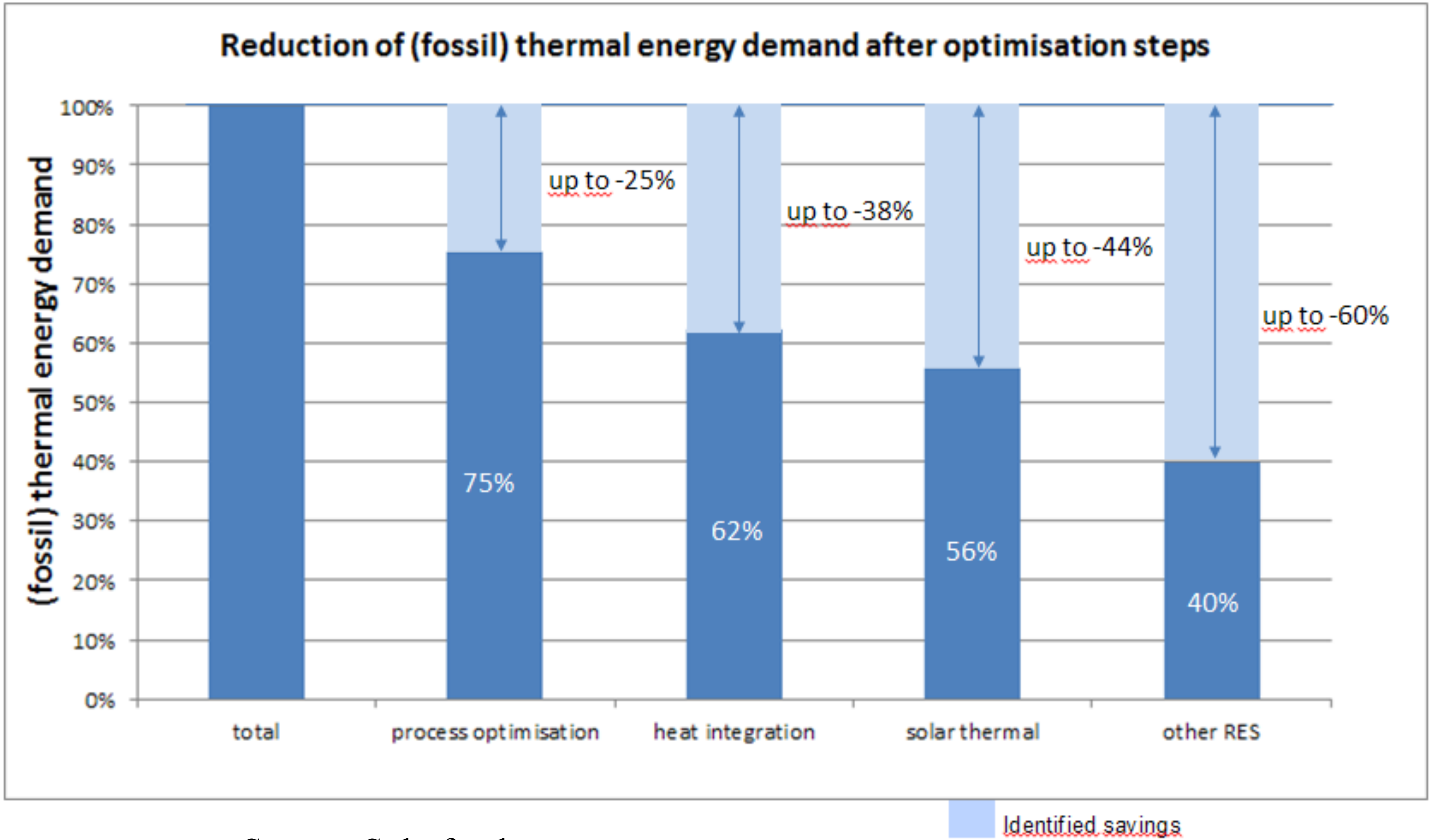
Source: AEE INTEC

* assuming 60 MJ thermal energy consumption per hl of beer in the brewery Goess

Göss – erection of the collector field

Source: AEE INTEC

Saving potentials from different case studies



Source: Solarfoods

Conclusion

- **Big potential for energy efficiency – support of a standardized optimization procedure – branch concept**
- **Technologies do influence overall heat management to a great extent**
- **High potential for intensification in the food industry – heat exchanger improvement, but also new process design**
- **Need for evaluating new technology concepts / new engineering concepts for**
  - ⇨ Higher energy efficiency
  - ⇨ Better integration of renewable energy / solar process heat
- **Increasing number of solar process heat**
- **Need for detailed thermal storage planning for**
  - ⇨ Efficient heat recovery
  - ⇨ Better integration of renewable energy / solar process heat
- **Continuous processes and new engineering concepts will enhance efficiency & solar potential for the food industry in general**

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Contact Information

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