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Towards zero fossil CO_2 emission in the European food and beverage industry

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Industry's role in COP21 targets

- **26 % of final energy consumption EU-28 by industry (Source: Eurostat)**
- **Energy efficiency (EE) is part of the whole vision and basis for integration of renewables (RES)**
- **EE + RES have to be**
  - ⇨ Energetic + ecologic + economic feasible
- **Multiplier projects and frontrunners**
  - ⇨ Food and beverage industry with huge share of SMEs
- **Industry needs**
  - ⇨ Tailor-made funding and financing schemes
  - ⇨ Based on implementation concepts

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Food and beverage industry

- **More than 10% of final energy demand in the industry of the EU-27 are consumed in the food, beverage and tobacco industry (Source: Eurostat, 2009)**
- **287,000 companies in the European food and beverage industry**
- **99.1% of these are SMEs accounting for**
  - ⇨ 51.6% of the industry's turnover and
  - ⇨ 64.3% of employment (Source: FoodDrinkEurope, 2011)
- **Meat, beverage, dairy and bakery are 4 of top five sub-sectors regarding energy consumption**

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Challenges

- **Product quality**
- **Grown companies**
  - ⇨ Old structured supply and distribution system (steam) and technologies used
- **Low energy efficiency, high energy costs and large dependency on fossil fuels**
- **Missing**
  - ⇨ Awareness and knowledge
  - ⇨ Know-how-transfer of identified solutions
  - ⇨ Funding and financing systems (inefficient)
  - ⇨ Best practice examples in different sub sectors
  - ⇨ Contact and information points
- **Reservations to be the "first" especially in SMEs**

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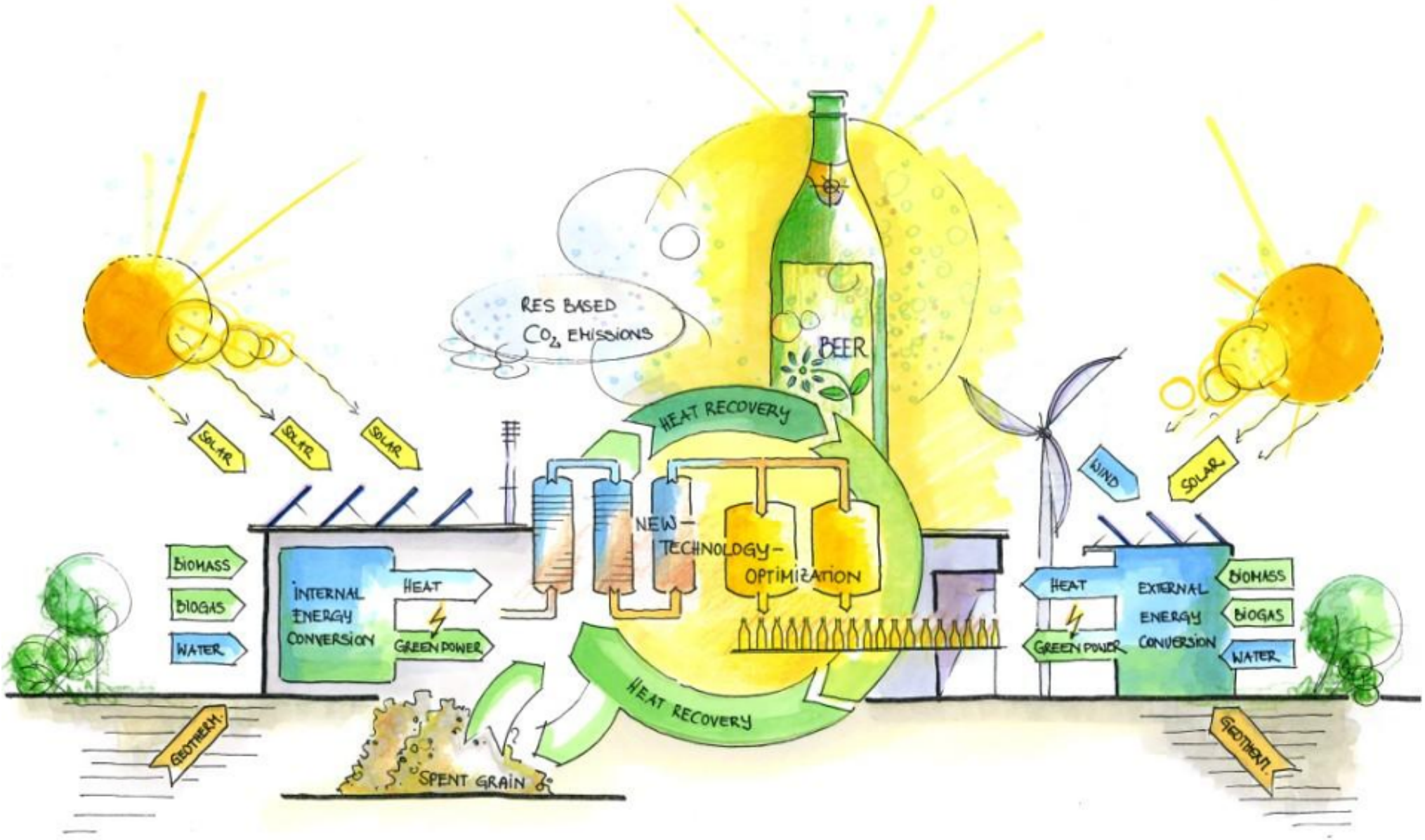
Energy efficiency and renewable energy



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The holistic concept

- **GREENFOODS branch concept**
  - ⇨ Tool – practical, user-friendly, proven
  - ⇨ GREENFOODS WikiWeb
- **Virtual Energy Competence Centres (VECC)**
  - ⇨ National one-stop-shops
- **Training Courses**
  - ⇨ Knowledge transfer and use of tools
- **Energy Audits**
  - ⇨ More than 200 basic, 45 detailed energy audits
  - ⇨ 11 implementations
- **Funding and Financing Schemes**
  - ⇨ Recommendations for tailor-made funding and financing schemes

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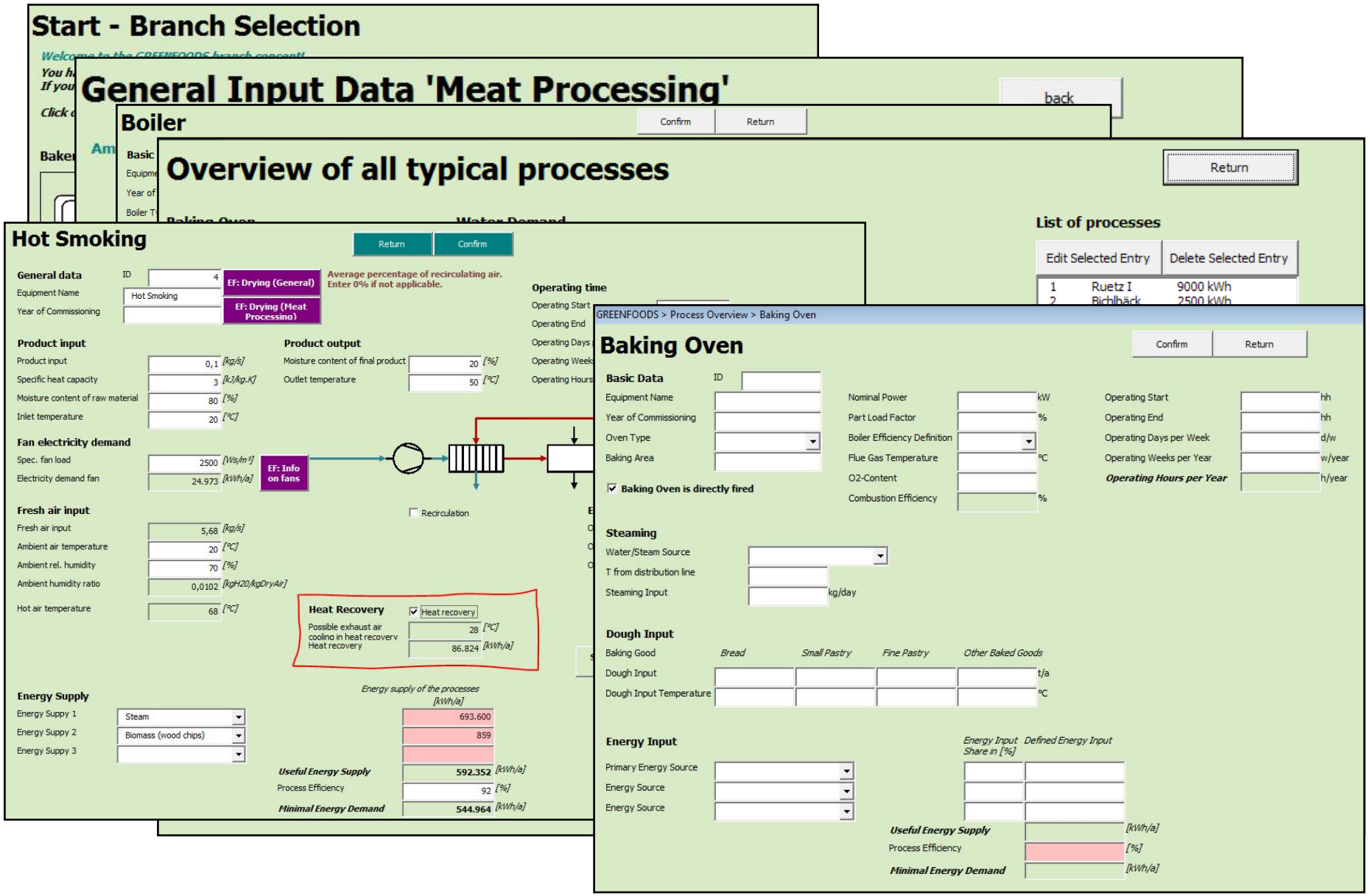
GREENFOODS branch concept (1)



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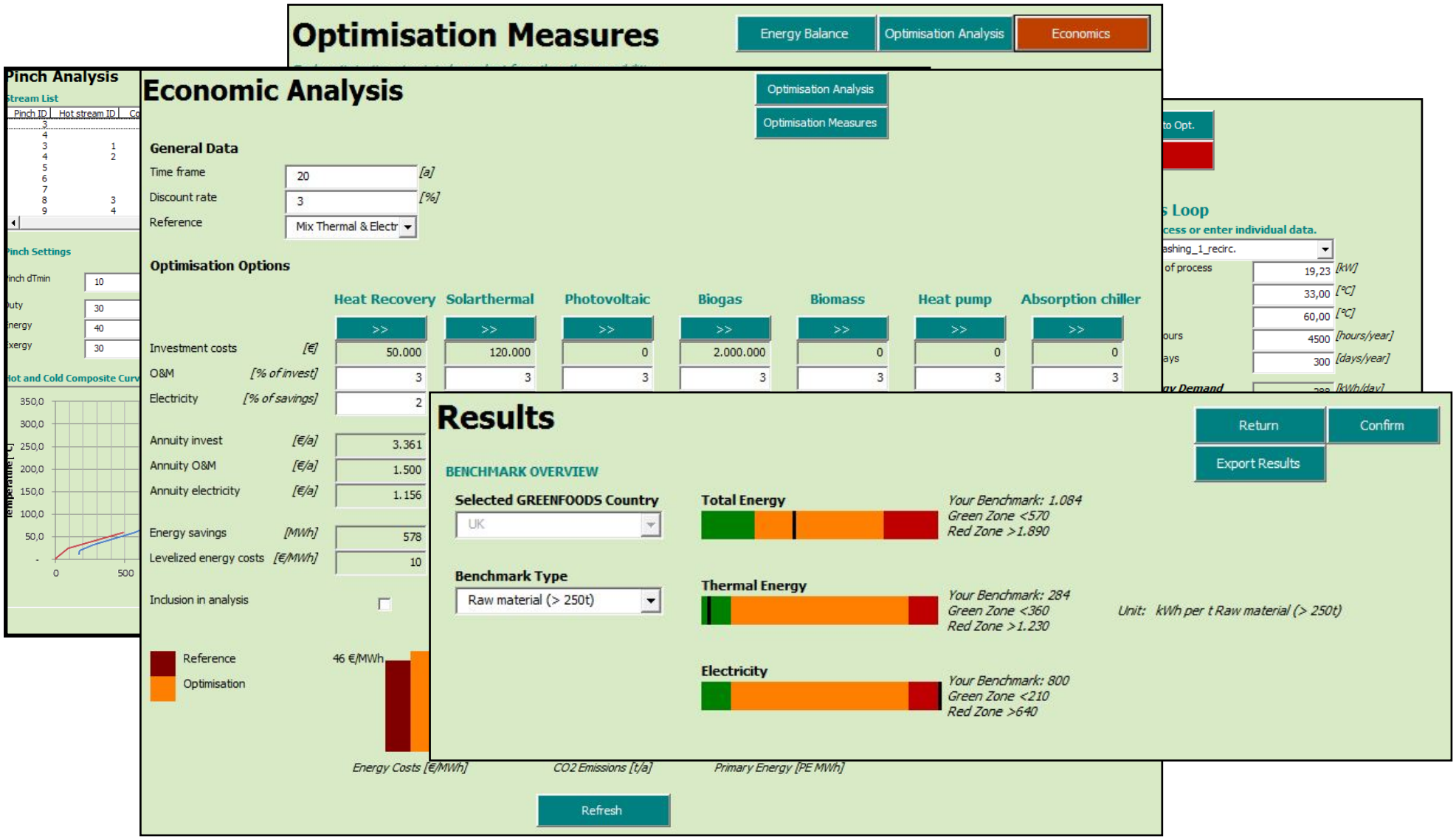
GREENFOODS branch concept (2)



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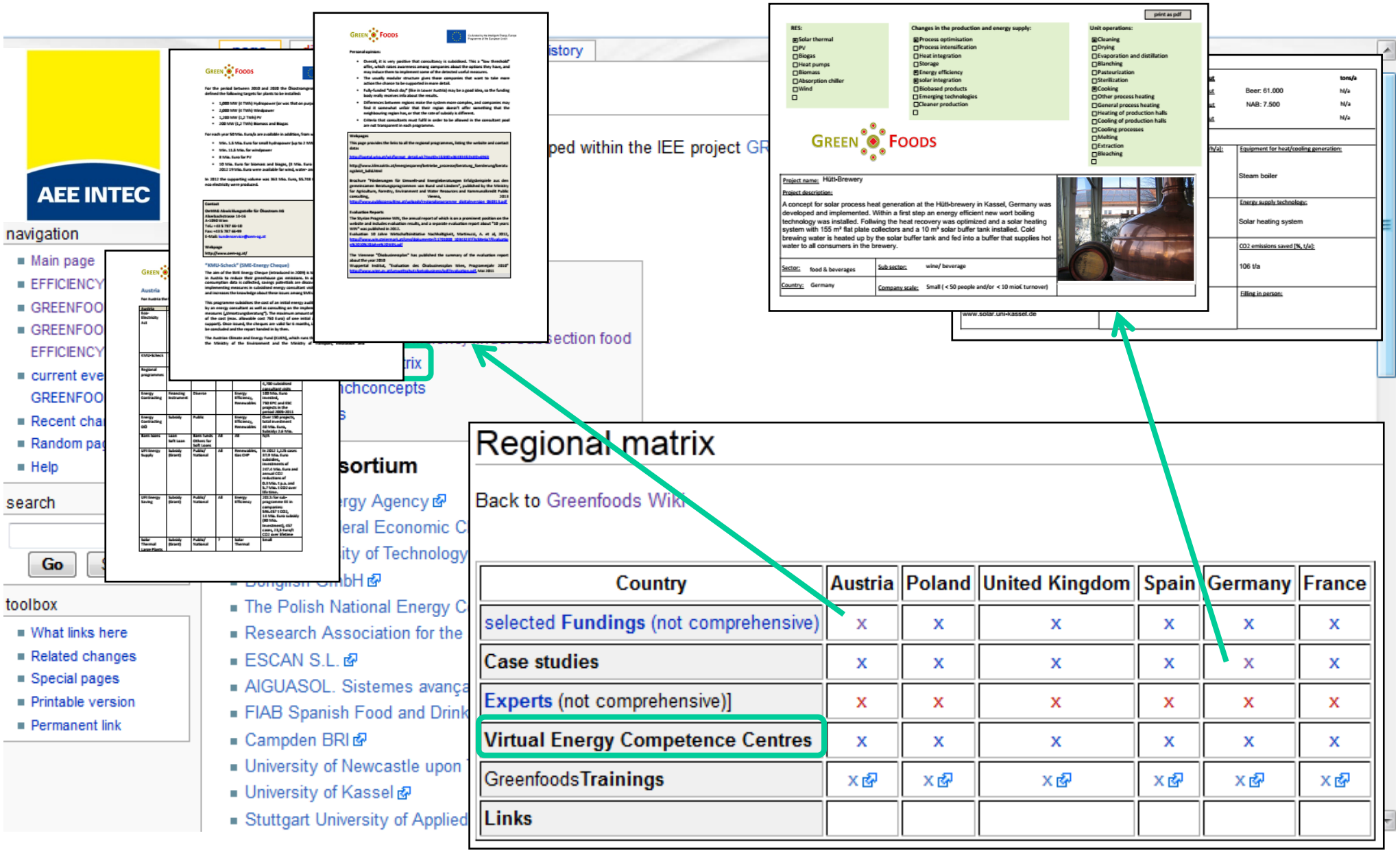
GREENFOODS WikiWeb (1)



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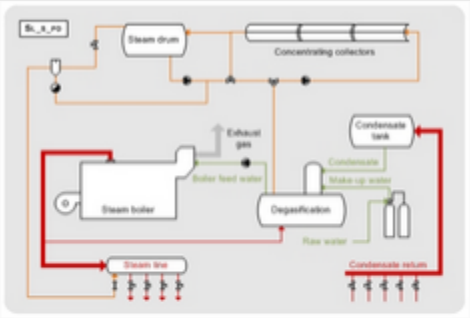
GREENFOODS WikiWeb (2)

		milk products	veg	baby food	solar integration	emerging technologies process intensification	heat integration
Unit Operations	Typical processes	INFO		INFO	INFO	INFO INFO	INFO
CLEANING	Cleaning of bottles and cases	x			x		x
	Washing products	x			x		x
	Cleaning of production halls and equipment	x			x		x
DRYING	Drying	x			x	xx	x
EVAPORATION AND DISTILLATION	Evaporation	x			x		x
	Distillation				x		x
	Deodorization				x		x
BLANCHING	Blanching				x		x
PASTEURIZATION	Pasteurization	x			x	xx	x
STERILIZATION	Sterilization	x			x		x

Solar application for general process heating

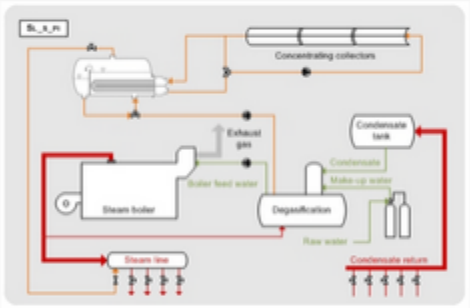
Back to EFFICIENCY FINDER

Most common heat supply technologies in industry are hot water or steam boilers that supply heat at temperatures up to 250 °C. Based on the respective heat transfer medium (steam or hot water) and installation at the company site, different integration concepts for solar heat can be applied.



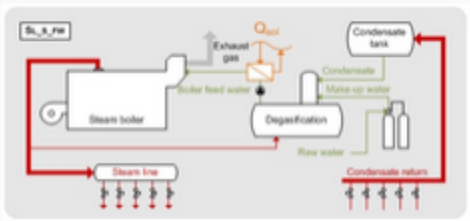
SL_S_PD – direct solar steam generation

For the integration concept of direct solar steam generation a steam drum is required that is fed by concentrating collectors. Boiler feed water is fed to the solar heating system and partially evaporated. The water-steam mixture is fed to the steam drum where it is separated. The accumulated water is fed back to the collector loop. In case of sufficient pressure in the steam drum, the steam is fed into the conventional steam circuit. While solar steam is fed into the existing circuit the conventional steam boiler reduces its steam production similar to operation periods with reduced load. The actual loss of efficiency of the steam boiler caused by the solar heating system is influenced by the ratio of installed solar power to conventional capacity, the typical load, and steam boiler performance (scope of modulation). This integration concept was realized with in several demonstration plants.



SL_S_PI – indirect solar steam generation

Regarding the interaction of the solar heating system with the conventional steam supply system this integration concept is similar to the prior one (SL_S_PD). For this concept concentrating collectors with pressurized water or thermo oil as heat transfer medium are used to feed a special heat exchanger for evaporation (typically kettle type reboiler). The heat exchanger is operated at the same pressure as the conventional steam system.



SL_S_FW –solar heating of boiler feed water

The serial integration of solar heat for heating of boiler feed water takes place after degasification. Usually the degasification is operated around 105 °C. The set temperature of boiler feed water depends on the supply pressure of the steam boiler and is usually in the range of 160...220 °C (equals 6 to 23 bar). Typically boiler feed water is (or should be) preheated by an economizer before entering the steam boiler (by approx. 30 K). The remaining temperature difference can be supplied by solar heat. Based on the dimensioning of economizers, a solar preheating of boiler feed water prior to the economizer is not always possible.

SL_S_MW – solar heating of make-up water

The last integration concept for steam systems is preheating of make-up water which is required to compensate losses of condensate caused by flash evaporation, blow down and direct

Illustration 1: Plate and Plate-Fin heat exchangers [2]

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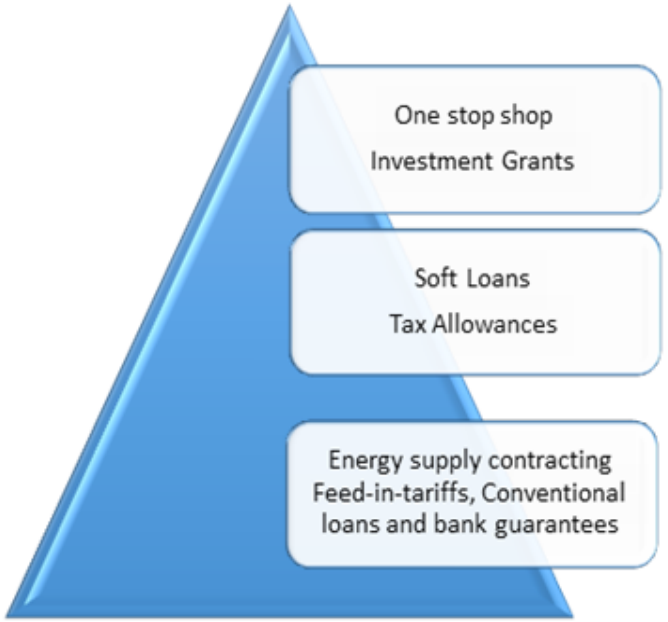
Funding and financing

- **Must have:**
  - ⇨ Technical assistance (e.g. energy audit) as most of the SMEs don't have specialized resources and knowledge of energy efficiency measures
  - ⇨ A special approach for small implementations as "fast track" projects e.g. based on a list of recommended measures, materials, and equipment
  - ⇨ Different application procedure for big projects with wider focus, incl. state-of-the-art and innovative technologies, and a streamlined application process



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GREENFOODS implementations

- **Feasible solutions**
  - ⇨ 11 implementations (instead of 5)
  - ⇨ No investment money from the project
  - ⇨ Supported by the GREENFOODS methodology and consortium
- **Facts**
  - ⇨ All sub-sectors
  - ⇨ All measures covered: EE + RES
  - ⇨ Cumulative investments in concepts > 9 Mio €
- **Huge challenges**
  - ⇨ Limited evaluation based on ROI
  - ⇨ We have to sell our measures
  - ⇨ Close the gap between investors and feasible projects

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TrustEE – H2020 project

- **TrustEE vision**
  - ⇨ Enable and stimulate application of EE and RES in industry
- **Benefits**
  - ⇨ Enhanced guarantees by provided framework agreements
  - ⇨ Marketing assistance: screen, register and identify project developers with preferred access
  - ⇨ Attractive financing options: sructuring, packaging and communicating projects in standardised manner

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ainia centro tecnológico

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Conclusions

- **EE and RES concepts for industry have to contribute significantly to COP21 targets**
- **Challenges**
  - ⇨ Identify optimisation and integration measures
  - ⇨ Engage and support industry
- **Solutions**
  - ⇨ Branch concepts as GREENFOODS, know-how transfer
  - ⇨ Frontrunners, multiplier projects
  - ⇨ Feasible: energetic, ecologic, economic
- **Further extension to other industry sectors**
- **Funding and Financing**
  - ⇨ Tailor-made schemes for food and beverage (SMEs)
  - ⇨ Innovative investment conditions for EE and RES projects

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