Energy Flexibility
A solution for the European Energy Transition

SynErgie
Synchronized and energy-adaptive Production Technology for the flexible Adjustment of Manufacturing Processes to a volatile Energy Supply.

Stefan M. Buettner
Geneva, 31 October 2017
Agenda

1. The German Energy Transition
2. The Four Kopernikus Projects
3. The SynErgie Project - Overview
4. The SynErgie Project - Flexibility Measures and their Implementation
5. Vision
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Goals of the Energy Transition by 2050

Increase in renewable energies to 80% of gross electric power consumption and to 60% of gross final energy consumption (2020: 35% and 18%).

Reduction of primary energy consumption by 50% referring to 2008 (2020: 20%)

Reduction of emissions of greenhouse gases by min. 80% referring to 1990 (2020: 40%)
Challenges of the Energy Transition

- Costs
- Grid Stability
- Social Aspects

Energy Transition at the expense of the general public

Practicability of Measures in everyday life
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4 Kopernikus-Projects for the Energy Transition in Germany

- New Net Structures „ENSURE“
  How can the grid be adapted to a volatile power supply?

- „Power-to-X“
  How can surplus power be stored efficiently?

- Industrial Processes „SynErgie“
  Which technologies are important to adapt industrial processes to a new power supply?

- Systems Integration „ENavi“
  How can power, gas & heat be coordinated to ensure continuous energy supply to private & industrial customers?

Source: The SynErgie Project

- 400 million Euros in 10 years
- development & launch of 4 new energy concepts
- appliable in large-scale
- socially acceptable
The Energy Efficiency Barometer of Industry (#EEBarometer)

Do you believe that making the energy demand flexible in your company will become relevant in the future?  ? (n=599, n'=451)

<table>
<thead>
<tr>
<th>Industry</th>
<th>Yes (%)</th>
<th>No (%)</th>
</tr>
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<tbody>
<tr>
<td>Manufacture of motor vehicles, trailers and...</td>
<td>74%</td>
<td>26%</td>
</tr>
<tr>
<td>Manufacture of rubber and plastics products</td>
<td>72%</td>
<td>28%</td>
</tr>
<tr>
<td>Manufacture of chemicals and chemical products</td>
<td>60%</td>
<td>40%</td>
</tr>
<tr>
<td>Manufacture of basic metals</td>
<td>59%</td>
<td>41%</td>
</tr>
<tr>
<td>Manufacture of machinery and equipment n.e.c.</td>
<td>56%</td>
<td>44%</td>
</tr>
<tr>
<td>Manufacture of electrical equipment</td>
<td>53%</td>
<td>47%</td>
</tr>
<tr>
<td>Manufacture of paper and paper products</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>Manufacture of fabricated metal products,...</td>
<td>49%</td>
<td>51%</td>
</tr>
<tr>
<td>Manufacture of other non-metallic mineral...</td>
<td>30%</td>
<td>70%</td>
</tr>
<tr>
<td>Manufacture of leather and related products</td>
<td>24%</td>
<td>76%</td>
</tr>
<tr>
<td>Other mining and quarrying</td>
<td>21%</td>
<td>79%</td>
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Are you planning to purchase energy via the electricity exchange (spot market)?

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The Energy Efficiency Barometer of Industry (#EEBarometer)

Open until 31 December: www.eep.uni-stuttgart.de/eeei

- Reduce **unknowns, risks and uncertainties**
- informs **decision makers** about actual situation and **needs of the economy**
- analyses the impact and effectivity of **pilot and development schemes**
- informs **finance sector** and services about feasible approaches and mechanisms
- shows were **companies** stand in relation to others
- delivers evidence on where and how to act to increase energy productivity
- allows, in the medium-term, cross-country, sector-specific analyses -> **TOP-Runner**
The #EEBarometer is covering 88 countries in their 10 native languages.

- **Germany:**
  - University of Stuttgart Institute for Energy Efficiency in Production EEP
  - Fraunhofer IPA
  - dena German Energy Agency
  - REZ Diezentrale Energiesysteme und Energiewirtschaft
  - TÜVRheinland Precisely Right.
  - THE-C FIRM

- **United States:**
  - ALLIANCE TO SAVE ENERGY

- **Canada:**
  - Expense Reduction Analysts

- **United Kingdom:**
  - SCOTTISH CLIMATE GROUP

- **Sweden:**
  - LINKÖPING UNIVERSITY

- **Latvia:**
  - LABEEF

- **Poland:**
  - Expense Reduction Analysts

- **Mexico:**
  - Expense Reduction Analysts

- **Spain:**
  - Expense Reduction Analysts

- **World:**
  - University of Stuttgart Institute for Energy Efficiency in Production EEP
  - Fraunhofer IPA

Languages covered:
- English
- Spanish
- French
- Russian
- German

**Target country group A (G20+EEA):**
- Scotland's Climate Group

**Target country group B:**
- 2020

**Country partners:**
- Scottish Government
- European Commission
- United Nations

**Language partners:**
- English
- Spanish
- French
- Russian
- German

**Partnership under investigation:**
- Scotland's Climate Group

**Barometer established:**
- 2020

**10 native languages:**
- English
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- French
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**Coverage:**
- 88 countries
- 10 native languages
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Synchronized and energy-adaptive Production Technology for the flexible Adjustment of Manufacturing Processes to a volatile Energy Supply.
More than 90 partners: Industry, Science, NGOs
Vision of the consortium:
Supply of full flexibility of industrial companies

Vision
In return for an incentive compatible renumeration, Industrial companies supply maximal flexibility

Companies are proactive on the energy market „selling flexibility“

New / adjusted technologies enable energy flexibility

Cross cutting technologies are adjusted to energy flexible operations

Energy data management from market estimation, via PPCS* to MT*

state of today
Industrial companies hardly only act as consumers

MT = machine tool
PPCS = Production planning and control system

Source: The SynErgie Project
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Categories of flexibility arrangement

- Change source of energy
- Storage energy
- Pause process
- Adapt process parameter
- Reorder production sequence
- Adapt time of shifts
- Reschedule production start
- Shift idle times
- Reorder machine loading

[Gräßl 2014]
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Since more than 30 years TRIMET is an independent family business:

- Founded: 1985
- Locations: 8
- Employees: 3000
- Apprentices: 150
- Sales volume: 1,7 bn. € (*)
- Investments: 104 mn. € (*)
- Equity: 60% (*)

*) fiscal year 2016/2017

Core Competence:

Production: 770 kt/a

- Aluminium for the production of:
  e.g. slabs, extrusion billets, foundry alloys, wire rod …

- Material for a variety of applications:
  e.g. automobile, package, electronics, engineering,…
Basic principle: Electro-intensive industry processes as a buffer between Renewable Energy, Virtual battery, and Demand side.

The use of a virtual battery to balance between volatile power production and demand oriented consumption.
Virtual Battery

Load range = 90 MW (base load) +/- 22 MW

This capacity is comparable to an average size pump storage hydro power station

22 MW x 48h = 1.06 GWh
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## Overall Overview

**C&C Bark is a typical SME**

- Employees < 100
- Sales volume < 15 Mio. €
- Family enterprise in third generation with proprietor-director

## Core Competence:

**C&C Bark is quality leader in the field of magnesium pressure die casting**

- Mold and tool design and construction
- Magnesium pressure die casting mold in hot and cold chamber procedure; part weights between 1g – 5.000g
- CNC-processing
- Coating
- Assembling fabrication
Energy-Flexible magnesium casting machine

Determination of potentials of different arrangement for the dual fuel casting machine

flexible planning of production

peak load grading

flexible magnesium melt

energy-flexible power supply

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Identification of economic benefits

Potential surface $f(\Delta P, \Delta t, \Delta K)$

tecnical potencial

Visualizing of economic potential through combining of cost and proceed surfaces

Exemplary data
Establishing a Network on Energy Flexibility

Interested to join (no obligations) the SynErgie Network?
→ Give me a business card marked with „SynErgie“
We are grateful for the outstanding support by the Federal Ministry of Education and Research and the project management organization Projektträger Jülich (PtJ).
Thank you!

We are happy to respond to your questions.

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