Bay Zoltán Alkalmazott Kutatási Közhasznú Nonprofit Kft.
Bay Zoltán Nonprofit Ltd. for Applied Research
www.bayzoltan.hu

Hungarian Experiences from the first wave of KICs: KIC InnoEnergy

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BAY-LOGI institute

KIC InnoEnergy

Who we are…?

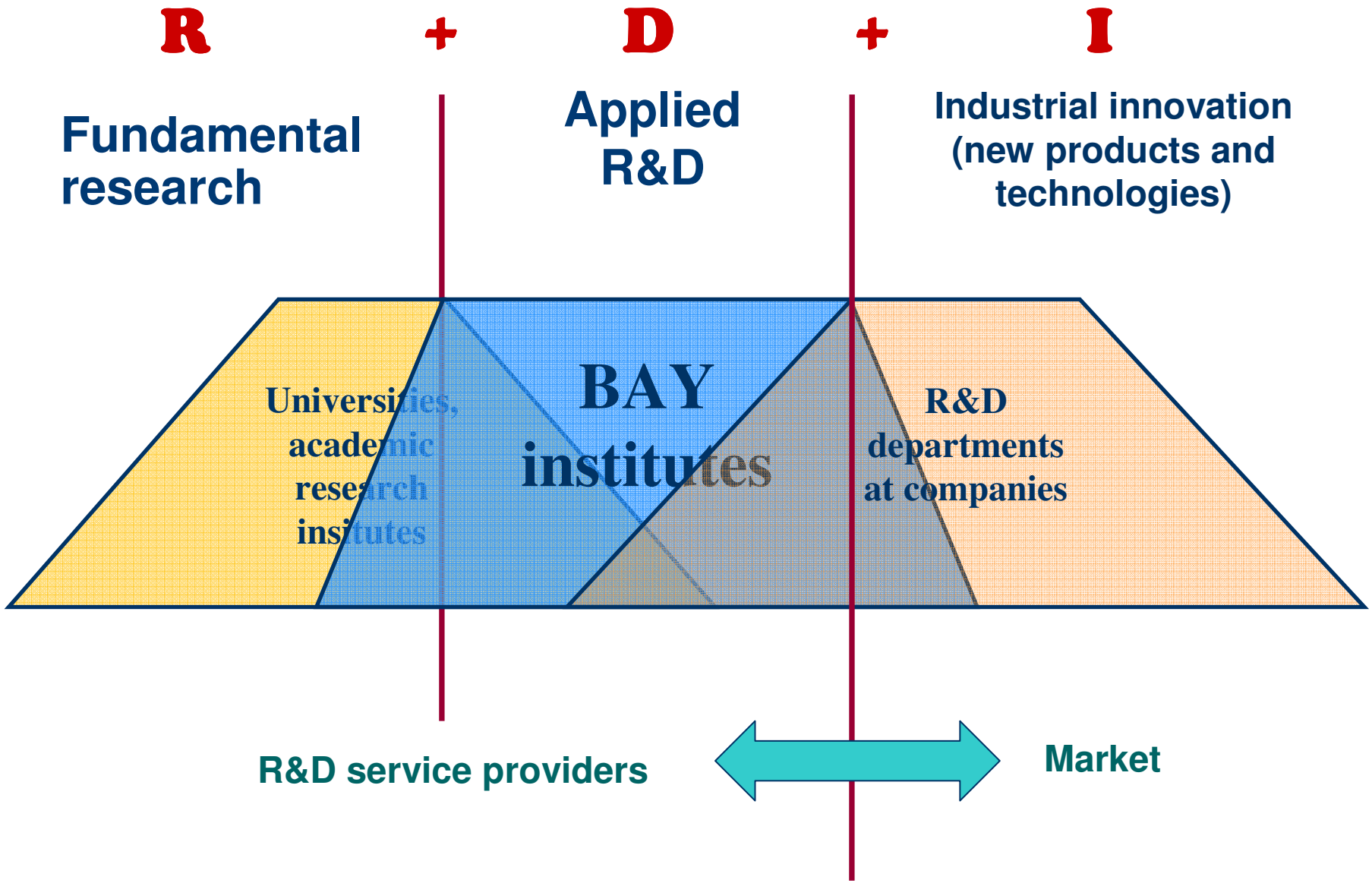
Bay Zoltán Nonprofit Ltd. for Applied Research

History

- Established in 1993
  - Operating as a Foundation for 18 years
  - Founder: Government
  - Owned by the Government, but not state funded
- Mission:
  - Applied research to support the improvement of industrial competitiveness
  - Co-operation with companies, SME-s and academic research institutions, universities
  - Supporting PhD programs – young researchers

KNOWLEDGE TRIANGLE

- Operating as Nonprofit Ltd. since December 2011.
- Largest public applied research institution in Hungary.


R
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D
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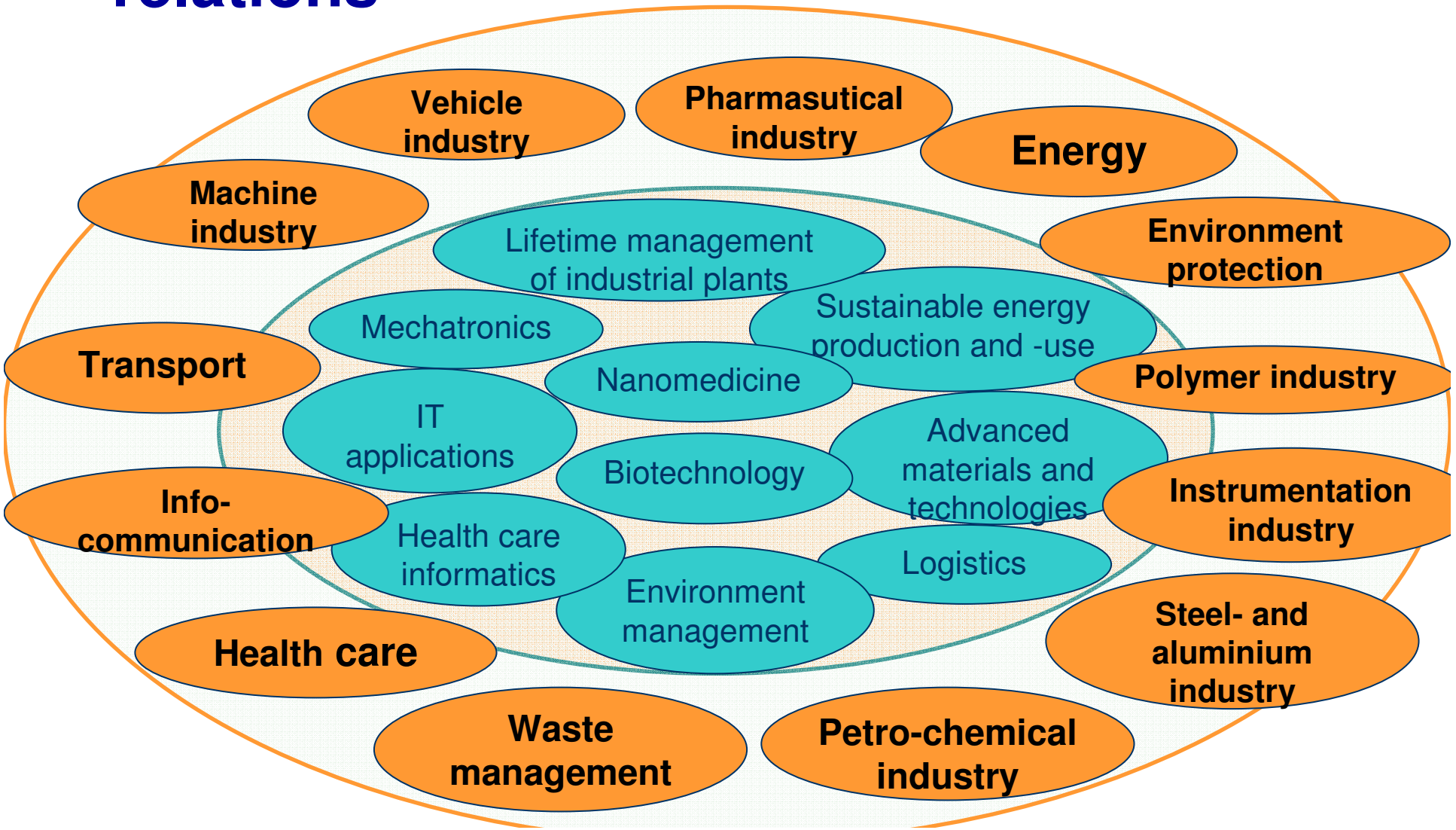
I
Fundamental research
Applied R&D
Industrial innovation (new products and technologies)
Universities, academic research institutes
BAY institutes
R&D departments at companies
R&D service providers
Market

Institutes

- Institute for Materials Science and Technology (BAY-ATI) - Budapest
- Institute for Logistics and Production Engineering (BAY-LOGI) - Miskolc
- Institute for Biotechnology (BAY-BIO) –Szeged
- Institute for Infocommunication Technologies (BAY-IKTI) – Budapest
- Directorate for International Relations (BAY-KKI) - Budapest

App. 180 employees and PhD students.

BZN main competencies and industrial relations



Departments of the R&D institutes (16)

- Mechanical Characterisation
- **Nanomaterials**
- **Advanced materials and processes**
- Laser technology
- Information technology
- Hardware and sensor systems
- Healthcare and industrial communication technology
- Mechatronics
- **Energy management**
- **Environment management** and logistics
- **Structural integrity**
- Applied microbiology
- Industrial microbiology
- Microbial genetics
- Analytics
- Nanomedicine

Our motivation to be active partner in Inno Energy KIC

- Sustainable production and use of energy is one of the most critical challange of the XXI. Century
- BZN Ltd. and BAY-LOGI have several competences related to this field, we are cooperating several companies from energy industry (Paks NPP, power plants, MOL, gas transmission company, SMEs)
- Our main mission is to support the improvement of industrial competitiveness, also with development of new industrial technologies, products and systems
- We are very active in international co-operation programs: during 19 years app. 80-90 international co-operation projects - only at BAY-LOGI (EU FP, CBC, CIP, IEE, SEE, bi-lateral co-operation programs)
- We see EIT KIC as an opportunity to extend our activites in the international market

How got we involved in KIC InnoEnergy?

- We had to find our way alone - we were looking for potential partners and consortium in the application phase
- We found CC Poland Plus in InnoENergy KIC – they were very positive to accept us as potential partner already in the application phase, then during the first project preparations
- Finally we became networking partner after negotiation, actually involved in 3 running projects:
  - Multi-fuel energy generation for Sustainable and Efficient use of Coal (SECoal) – 201-2013
  - Advanced near zero emission Coal fired Power Plant (ACoPP) – 2010-2013
  - New Materials for Energy Systems (NewMat) – 2011-2015

Our strategy for participating in the first projects – How to provide own contribution?

- We had several national and international grant application projects, as well as industrial projects
- We tried to find connection points between the new project ideas of CC-Poland plus and our running projects
- To use the additional KIC fund for exploiting more our R&D results

Multi-fuel energy generation for Sustainable and Efficient use of Coal (SECoal)

- Our tasks:

WP	Task	Name	Results up to now	Related projects
WP3: Modelling tools, monitoring and control of multi-fuel power generation	Task 3.4	Development of risk based on-line monitoring methodology and system	Methodology development for risk based monitoring and implementation for power plants	iNTegRisk FP7 R&D project; OLMOST EUREKA project
WP4: Advanced concepts of integrated multi-fuel, low-emission power generation	Task 4.2	Development of biomass database, optimising method/software, fuel characteristics	Combustion experiments on different biomasses for the database. System plan for the database.	BIOFINOM R&D project; national fund within Jedlik Programme
WP5:¨ Social impacts, public perception and educational programmes	Task 5.1	Comparative LCA analysis Optimizing the multi-fuel co-utilization and clean coal technologies from environmental loading point of view	LCA analyses of different biomasses.	BIOFINOM R&D project; national fund within Jedlik Programme

KIC added value activities in SeCoal

- **Risk based monitoring:** A market demand has been identified for this application at power plants. A similar method/application already developed (for petrochemical industry) but needs a special modification. Also the developed technology will be tested on a demo site.
- **Biomass database:** it supports the industrial application of R&D results
- **Comparative LCA analysis:** it supports the industrial application of R&D results, taking into account environmental aspects

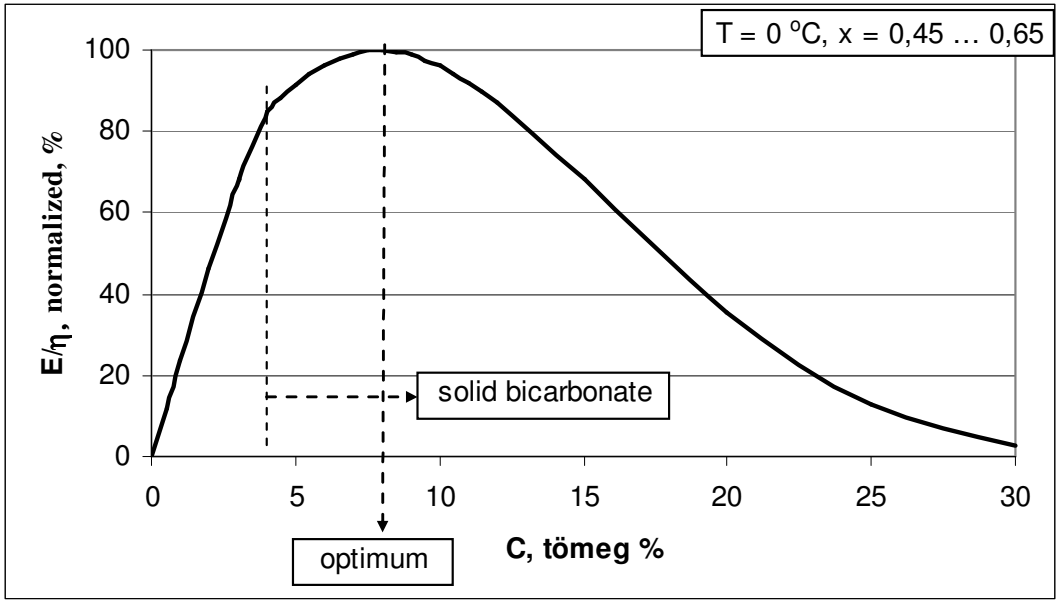
Advanced near zero emission Coal fired Power Plant (ACoPP)

- Our tasks:

WP	Task	Name	Results up to now	Related projects
WP3: Materials and plant reliability for USC and oxyfuel conditions	Task 3.5	Justification of the required performance and lifetime assessment of the materials under USC conditions with up-to-date numerical analyses	Database development for materials operating at high temperature	OLMOST EUREKA project
WP4: Novel, integrated CO2, NOx and SOx removal technologies	Task 4.7.3	Optimization of the chilled ammonia process for CO2 capture	Market analyses concerning the chilled ammonia process. Theoretical analyses and optimisation of the process	Industrial project for Stirling Ltd.

KIC added value activities in SeCoal

- **Lifetime assessment of new materials for USC (Ultra Severe Conditions):** it supports the industrial application of R&D results
- **Chilled ammonia process:** the new optimised technology could be an incremental innovation vs. state of the art

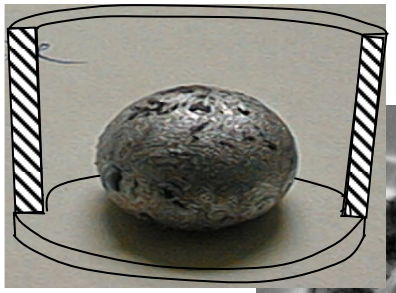


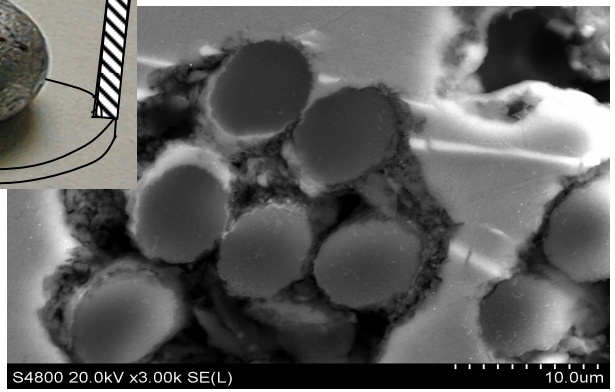
The CAP process efficiency, taking into account the suspension viscosity

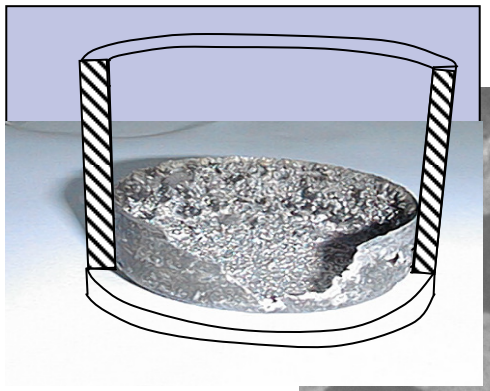
New Materials for Energy Systems (NewMat)

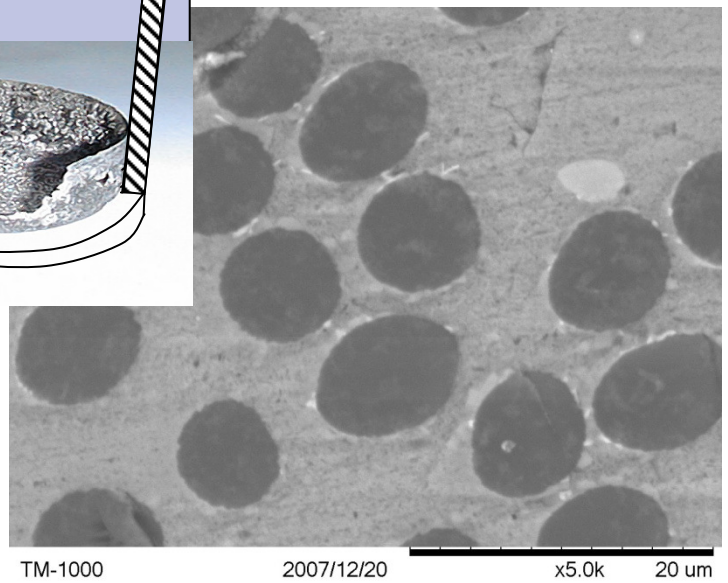
- We are WP6 leaders: Smart grids and energy storage materials
- Our task: Development of carbon fiber reinforced Al-matrix composites for electric cables
- Basic scientific problem: to develop new technology in which the Al can properly wet the carbon fibres – this can be considered as incremental innovation vs. state of the art
- Own contribution is financed from national OTKA fund
- KIC added value activities:
  - To further develop the technology toward industrialisation, based on industry and market requirements

Basic technology development – static condition

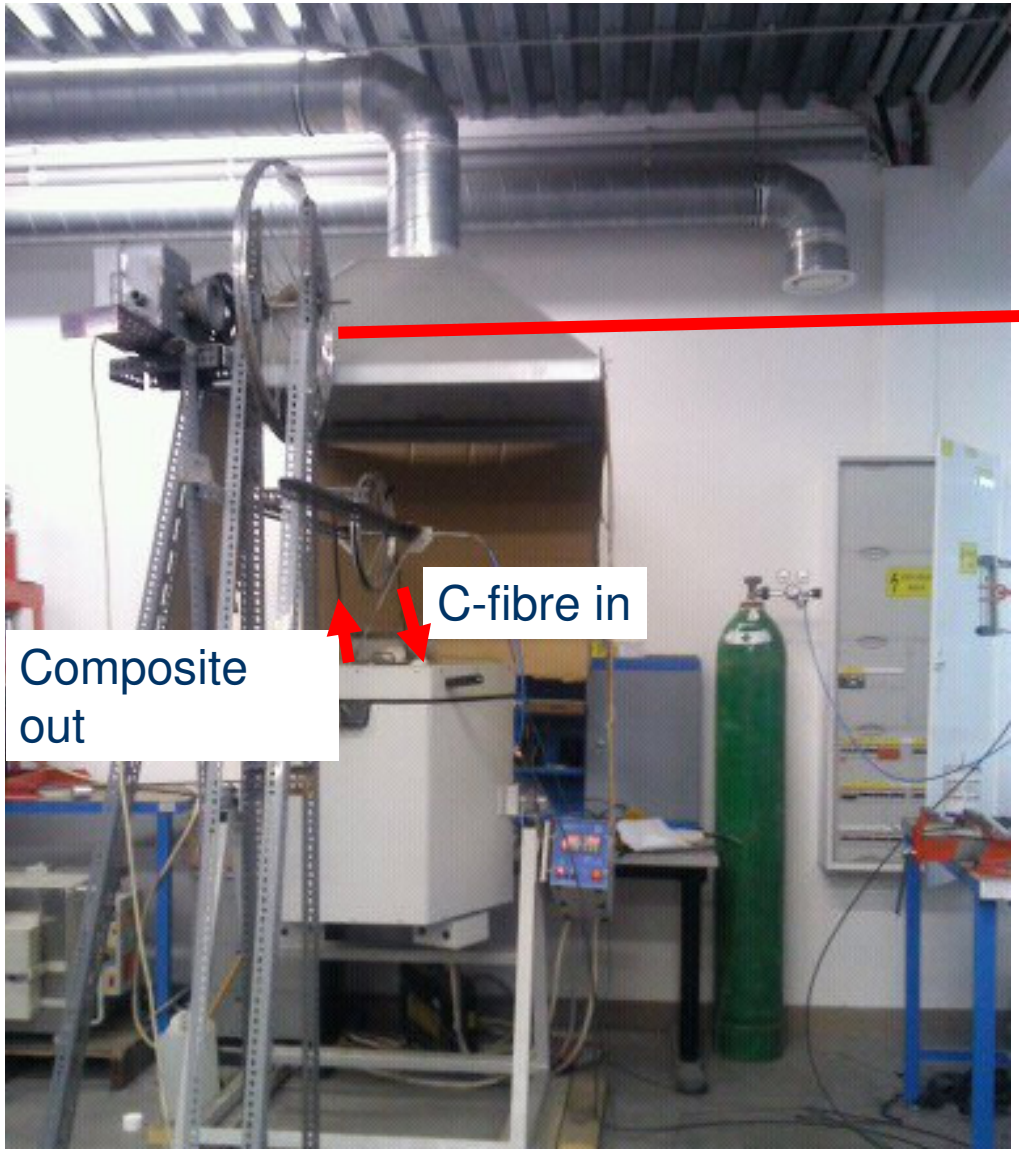


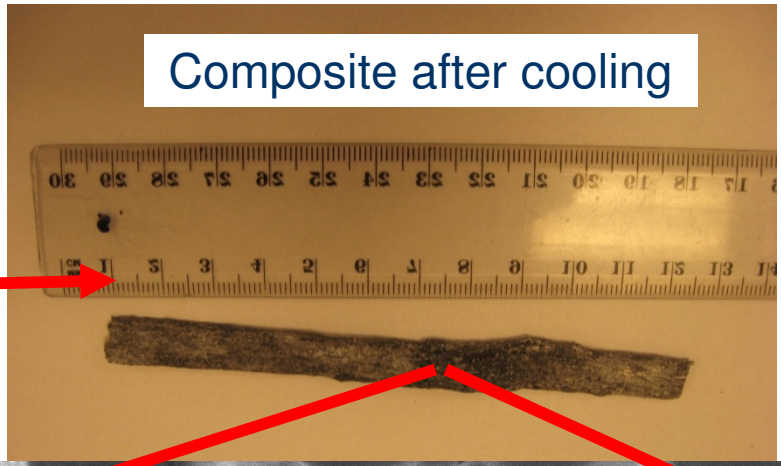


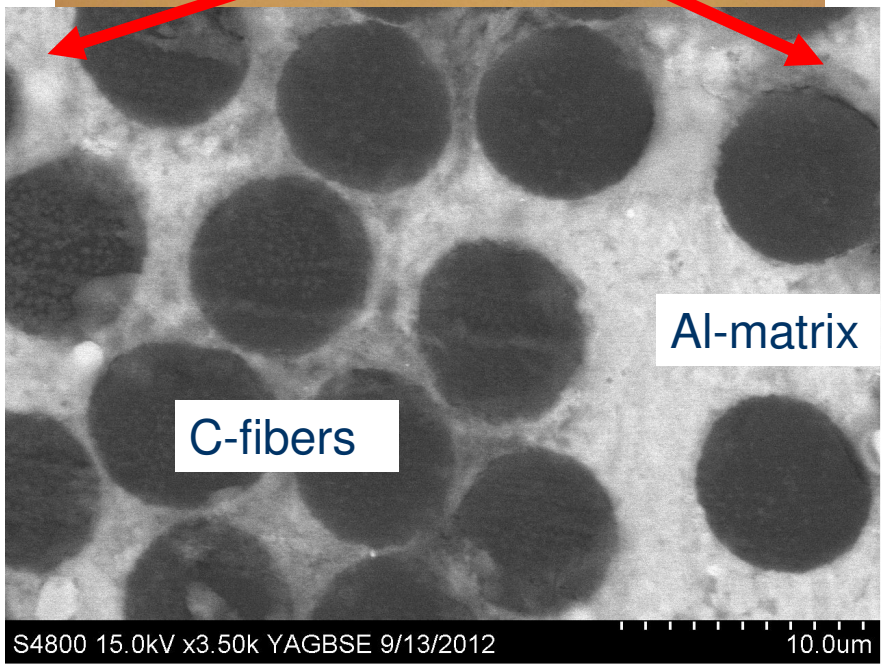




Development of laboratory technology – dynamic condition







Our initial experiences in KIC co-operation

- Our possibilities were limited due to limited financial resources – without any sepcific fund
- It was not easy at the beginning to understand the EIT KIC rules – e.g. to identify and find KIC added value activities related to our existing projects, that were the background for our own contributions
- Our participation so far was limited to projects co-ordinated by CC-Poland plus – however we would like to be involved in other thematic areas as well
- It would be important to be more actively involved in the new projects' preparation phase

New topics for new projects – specific national grant application for co-funding

1. Development of Virtual immersion based power plant simulation training platform – CC Alp Valleys (Sustainable Nuclear & Renewable Energy Convergence)
2. Development of Algae systems for biomass production – CC Iberia (Renewables)
3. Development of Logistic system of biomass fuel supply – CC Iberia (Renewables)
4. Development of Production technology for solar grade Silicon – CC Iberia (Renewables)
5. Development of Microbial Fuel Cells – CC Sweden (European Smart Electric Grid & Storage)
6. Development and test of different carbonic salt-matrices – CC Sweden (European Smart Electric Grid & Storage)
7. Development of mobile equipment of measurement and analysis for optimization of industrial and public energy systems connected to Smart Grids - CC Sweden (European Smart Electric Grid & Storage) or CC Benelux (Intelligent, Energy-efficient Buildings and Cities)

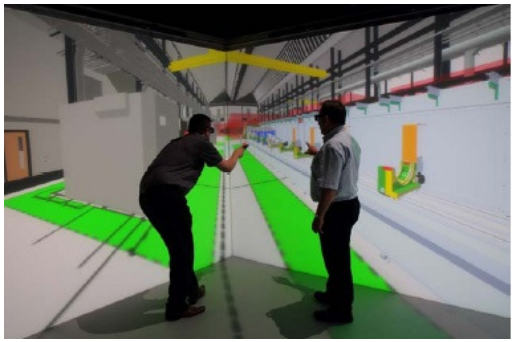
Development of virtual immersion based power plant simulation training platform

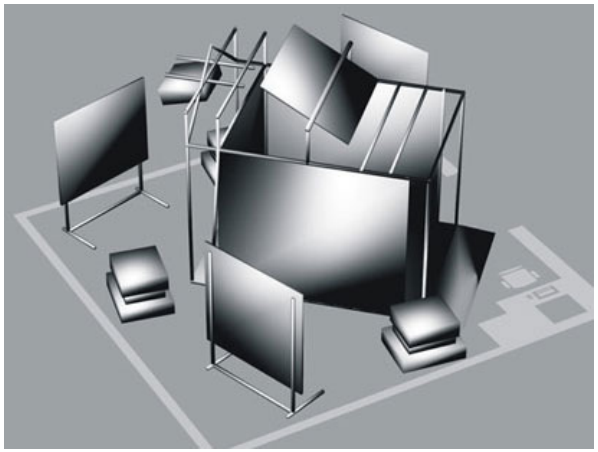
The objective of the proposed action is to ***increase the safety of the power plant by training of operators and maintainers*** in immersive ***3D virtual space.***

In the platform training activities can be made in a virtual space, even plants/units/equipment that don't even exist or only exist as an imaginary model.

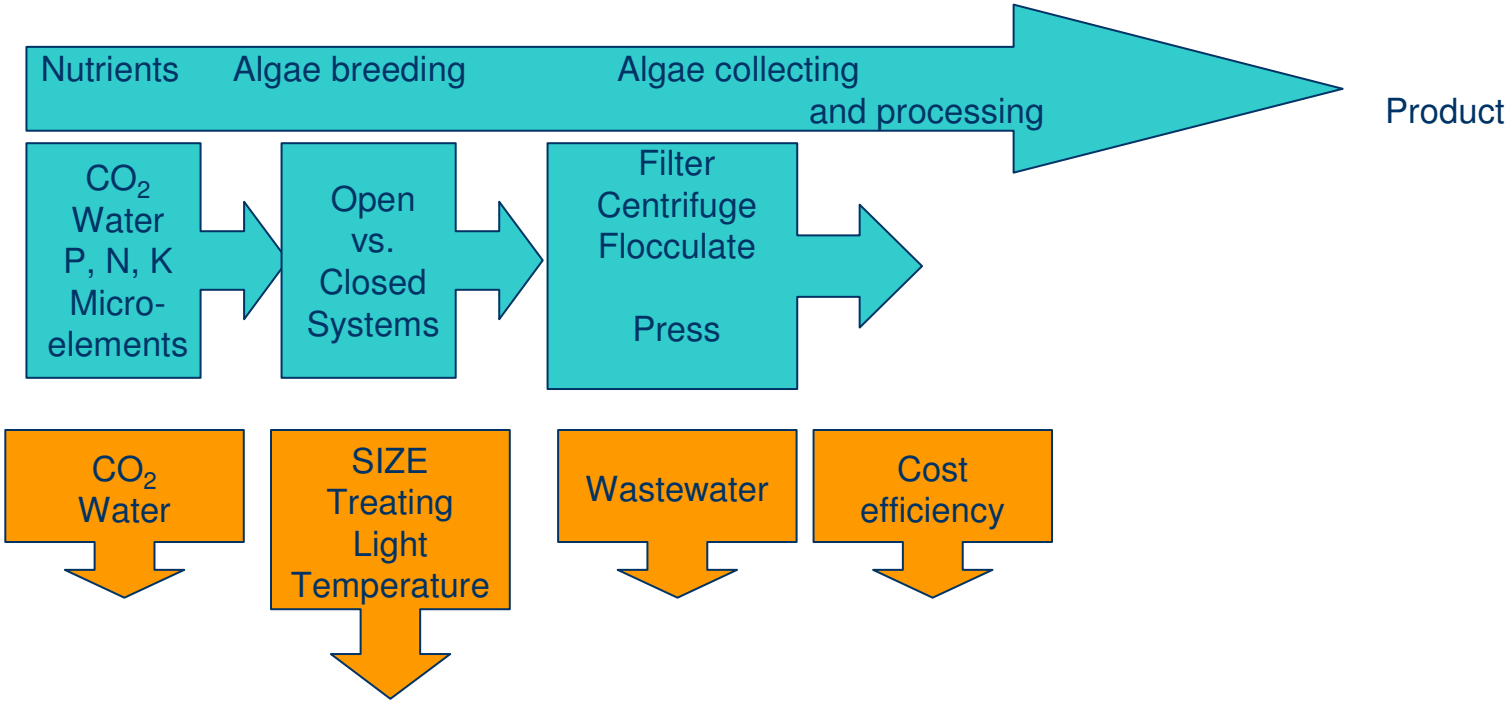
In this virtual space we can test actions and simulate events that could be dangerous to the employers and habitants or environment.

The training platform integrates the modern computer, vizualization and information technology such as Wii, Leonar3Do or LEAP.





CO_2 emission with algae technology – biomass production



Further improvements required, and the smart combinations of the existing technologies

Development of logistic system of biomass fuel supply

Problem:

- One of the most important task to ensure the adequate biomass quantity to power station.
- Due to the seasonal harvests of biomass it can easily cause capacity problems.

Therefore, aim of the project is:

Develop a new general software which can determine the location of biomass power stations and minimize the problem. An up-to-date GIS background can help for this process.

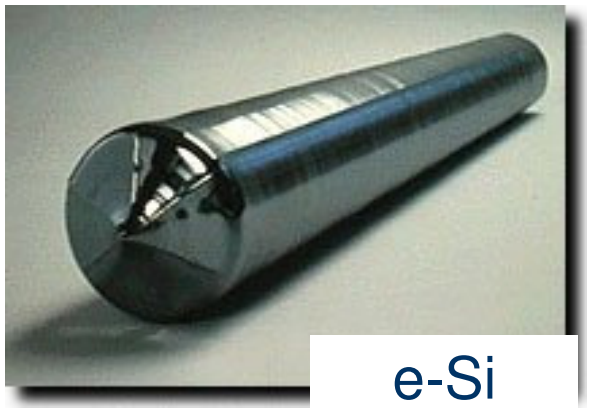
We have to consider the following parameters:

- Quantity, quality and seasonality of biomass
- local storage capacity, transport period, transport unit
- requirements of transport unit
- potential transfer stations
- cost demand of transport

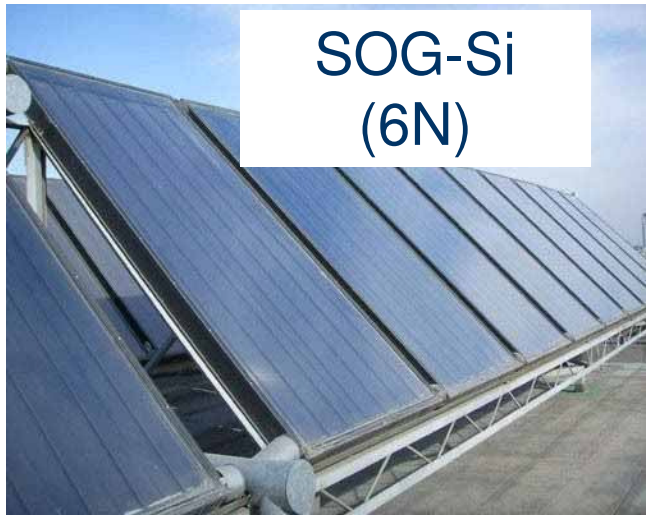
Development of a new, more economic production technology of solar grade silicon

Silica sand

MG-Si (2N)



e-Si (10N)

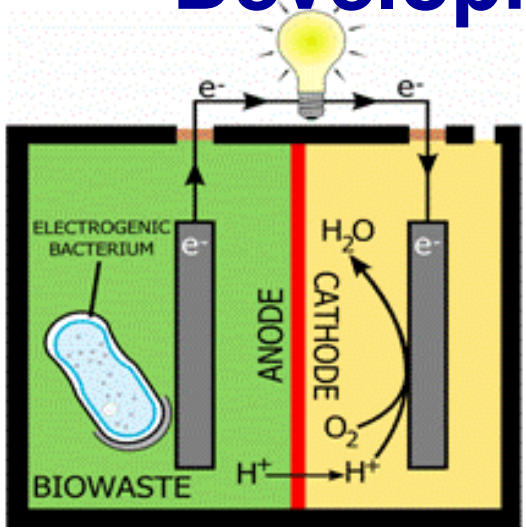


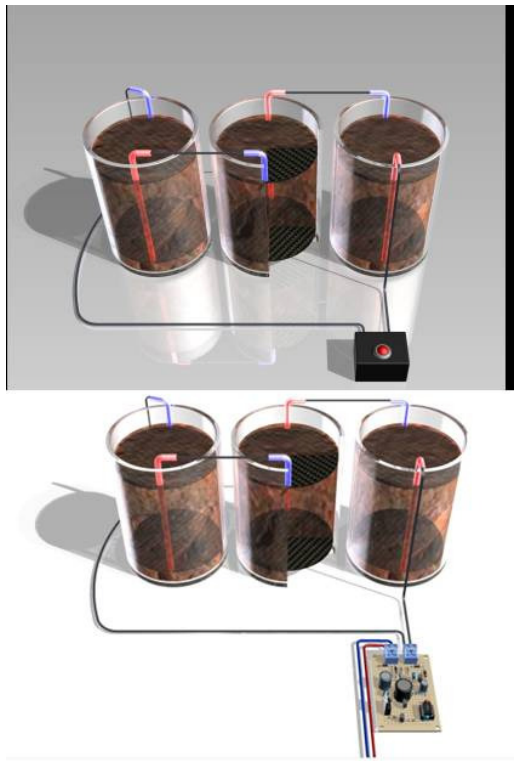
SOG-Si (6N)

A new technology is needed towards affordable SOG-Si = towards affordable electricity from solar energy.

The new technology should avoid high-cost of e-Si, it would apply new metallurgical cleaning process.

Development of Microbial Fuel Cells





- Microbial Fuel Cells are bio-electrochemical devices, that can produce electric current by oxidation of organic matter (substrate) in the anode compartment.
- Objective is to develop a bioelectric system that is able to supply or recharge some small electric devices like mobile phone.

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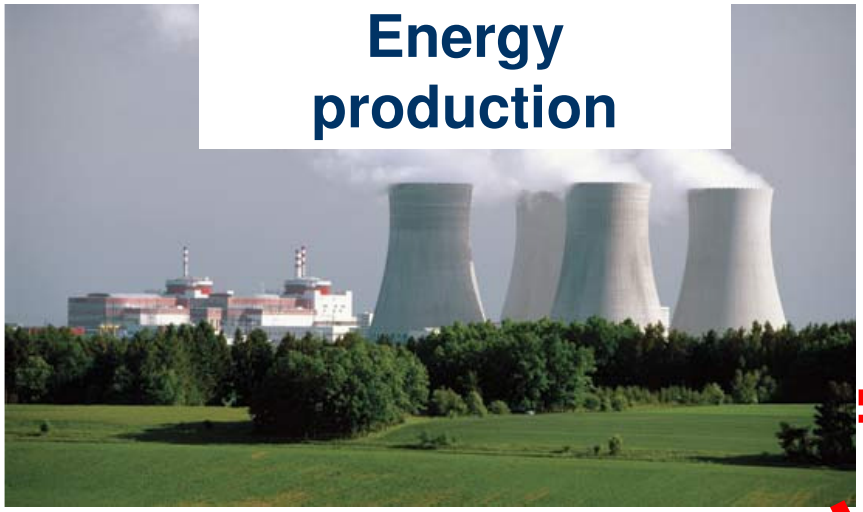
Development of carbon reinforced molten salt for energy storage

Energy production



Day-time

Night-time

Energy consumption

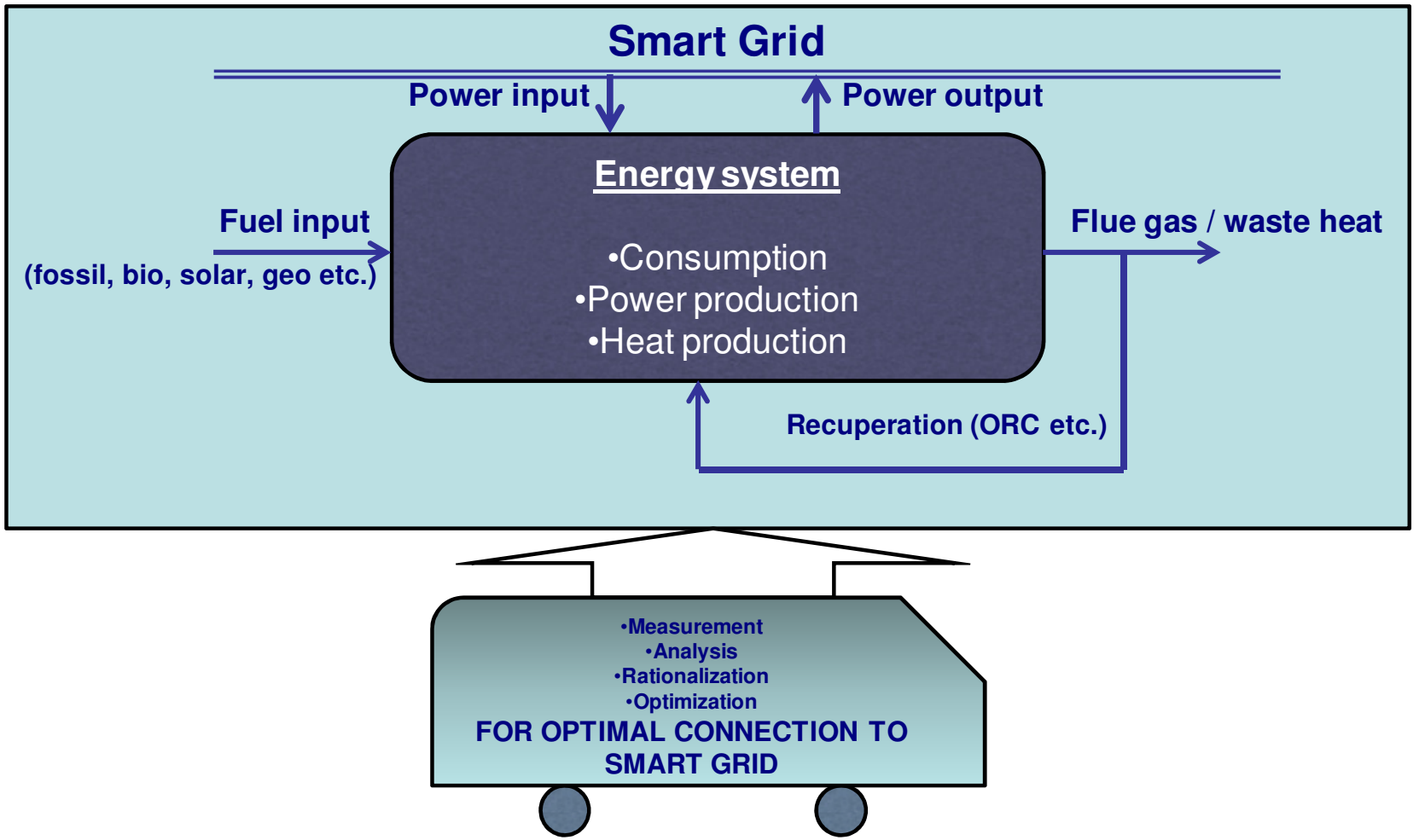
Night-time

Day-time

Energy storage

A new generation of energy storage materials should be developed with high capacity and fast energy take-up and fast energy release.
A combination of carbon micro-nano-fibres (for conductivity) and molten salts (for energy storage due melting / solidification cyles) is envisoned.

Development of mobile equipment for optimization of industrial and public energy systems connected to Smart Grids



We are looking forward the call for new KIC projects…

and the results of our application for the specific national grant…

to extend our participation in InnoEnergy KIC, attracting further Hungarian partners into InnoEnergy KIC

Thank you for your attention!

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