

## New Links between Basic Research and Applied Energy R&D

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# Welcome to Berlin!

- New connection between IEA and BMBWF after a longer period of silence
- We are willing to co-operate further on the general subject of this workshop
- Some general observations are offered

# Two Different Goals for Energy R&D

1. New technologies for our energy systems (e.g. power plants)
2. Energy-technologies
  - as high-tech products (e.g. furnaces) and
  - for high-tech products (e.g. solar powered radios)

# Two Different Goals for Energy R&D

**1. Energy-Policy**

**2. Technology-Policy**

**=> Different political cliental!**

**=> Different customers for  
public R&D funds!**

**I will concentrate on No.1**



## Personal observation:

- Over the last 25 years the focus of political interest has moved away more and more from science and research towards application and market penetration.
- There is an unhealthy mismatch in public funding between basic sciences and energy technologies.
- **Energy technology policy has neglected the roots of this field for too long!**

# Technologies for the Energy Economy

- **Is that a substantial problem?**

- Not at a first glance!

- Why not?

- Fortunately, energy technologies as other technologies are in general benefiting from developments in all fields of engineering and basic sciences.

Many of them are kind of parasitic technologies.

**=> There is sort of a natural technological progress**



# Technologies for the Energy Economy

- However, is this an appropriate situation?
- I am of the opinion: **NO!**

**Why?**

# Technologies for the Energy Economy

- If the CO<sub>2</sub>-problem is as severe as it seems to us to today than we have to look for more efficient, new technologies than we get under normal technological progress.
- The usual way out of this dilemma is the current r&d-policy governed by day-to-day policy with all the key-words we are listening to over the last 20 years.



# Technologies for the Energy Economy

- In short this was and is:
  - Save energy to a very substantial extend
  - And for the rest-energy supply:  
Renewables to the front!
- Experience over at least 20 years has shown, however: This is more or less wishful thinking.
- Most likely, it does not solve our long-term problems.



**We need new visions and  
new approaches for our  
energy-technology future!**

# Technologies for the Energy Economy

- To achieve this we have to do more for **strengthening the roots** for developing energy technologies, i.e. pertinent basic sciences.
- There is great potential for new long-term horizons.
- That has to be systematically probed not only on a national basis but on the IEA-scale.
- Therefore, the new IEA initiative is very welcome!



# What could be done???



# One Example: German Strategy

1. Explore what energy-technologists need from basic scientists: **Ask the Engineer!**
2. Explore what basic scientists believe to be able to offer to energy-technologists: **Ask the Scientist!**
  - => **Two different kinds of workshops**
  - Should one focus?  
To energy conservation and conversion processes?
  - No conclusion yet.

# Technology-Fields Which Came Up

1. **New mathematics:** The focus of this workshop

*The crucial role of  
Mathematics:  
That is one purpose  
of mathematics for energy  
r&d was not sufficiently  
acknowledged so far!*



# Technology-Fields Which Came Up

## !!! Some Other Examples !!!

2. **Turbulence** in a variety of processes.
3. **Combustion:** Is our present knowledge of physics sufficient to really understand the processes and thus master them?
4. **Membranes:** Neutron scattering, polymer research, bio-systems.
5. **Surface Coating:** Transparent heat insulation, turbines, tubes, etc.



# Other fields of Science to be Explored

- Solid state physics of all kinds
- Material-sciences
- Nano-Physics
- Complexity, Non-linear Dynamics
- Geophysics (Fossil Fuels)
- Information-Technologies



# Other fields of Science to be Explored

- Biotechnology
- Functional and structural biology
- Optics and lasers
- Does quantum mechanics have something new for us?



# Further Keyword

- Grid computing
- Friction
- Magneto-Hydro-Dynamics
- **Human behaviour, Psychology:  
Mobility, Need for Energy  
Services, Life-Style, etc.**
- Data sharing

# One Warning at the End

**The dialog between basic scientists and applied engineers is not an easy one!**

*Example...*



TELL US, IN LAYMAN'S  
TERMS, WHAT YOUR  
BREAKTHROUGH MEANS.



**Answer of  
the Scientist**

**Many thanks for your  
attention!**

