

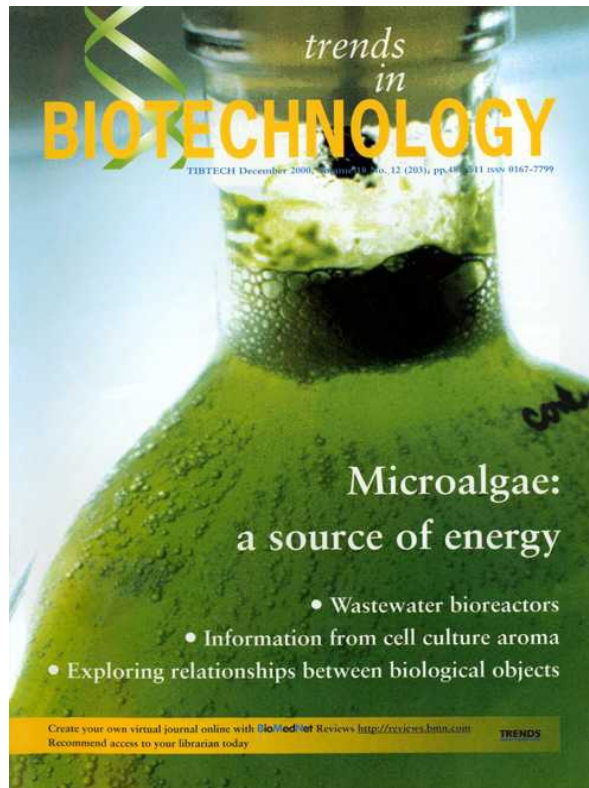
# Industrial Biotech – From the point of a researcher



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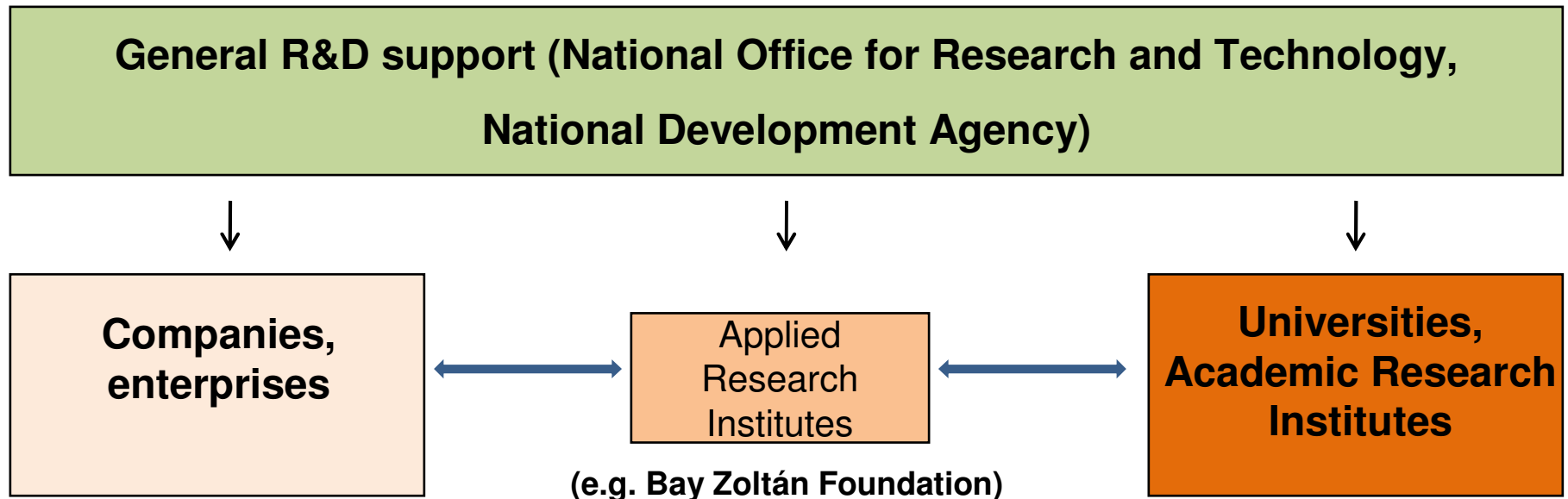
# White biotechnology



**BioEnergy**  
**BioMaterials**  
**BioRefinery**  
**etc.**



# General R&D situation in Hungary



The structure seems to be working well in engineering, logistics etc. (traditional industry)

Situation of Biotechnology is very complex

Specific features of Biotech Industry: Huge capital demand  
Higher risk  
Novel technologies

# Biotech specialties

Hungary is small: - as capital source for biotech investments  
- as a market for products



**White Biotech, Green Biotech**

**Red Biotech**

Local and global industry

More shifted to global industry

**Conclusion: Multi-year plans and multi-level programs  
are needed**

**(White Biotech can be part of various programs)**

- At national level (there are good initiations – NTP (Technology))
- At European level (FP7 is organized along these principles)
- Even for local industry implementations
- Well defined multi-level programs (e.g. Hydrogen Economy)

These novel industries are top-down organized even in highly-developed countries

# Prospects of BioEnergy

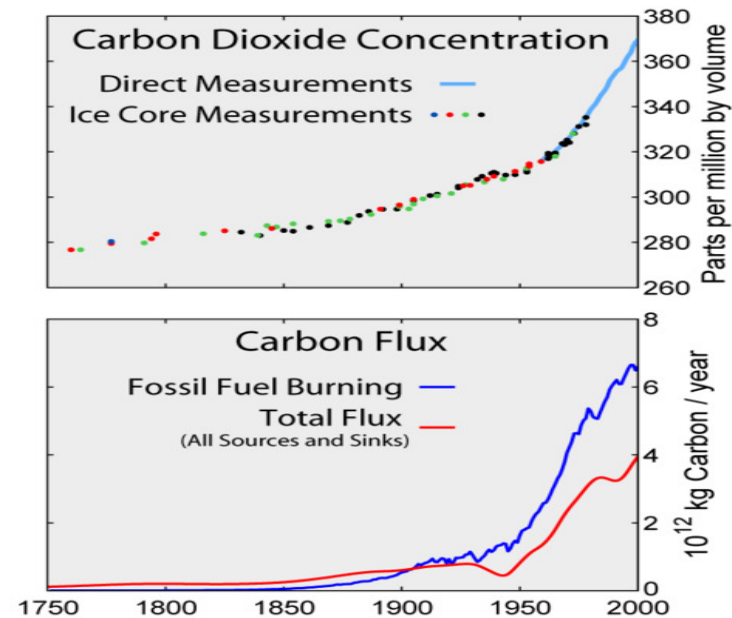
Fossil fuel' burning impacts on Earth



Permanent seeking for clean energy carriers



Bioenergy is one candidate



**BioEnergy** is one kind of Renewable energies (wind, hydro, solar, etc. )

**BioEnergy**: Any kind of energy produced from biomass (can be electricity, heat, cooling, etc.)

Solar Energy is expensive to harvest directly, it is often converted to **BioEnergy** first

**Bioenergy types:**

- Bioethanol** (potato, corn, sugar cane) - solar based
- Biodiesel** (soybean, oilseed-rape) - solar based
- Biohydrogen** (direct, indirect) – solar based
- Biogas** (landfill waste, wastewater, manure) – indirectly solar based
- Others** (wood combustion, biobutanol, biomethanol, algae-fuel, etc.)

# Multi-level organisation through an example (US DOE)

**1. Aim:** *Fuel Cell Vehicles in the Showroom and Hydrogen at Fueling Stations by 2020*

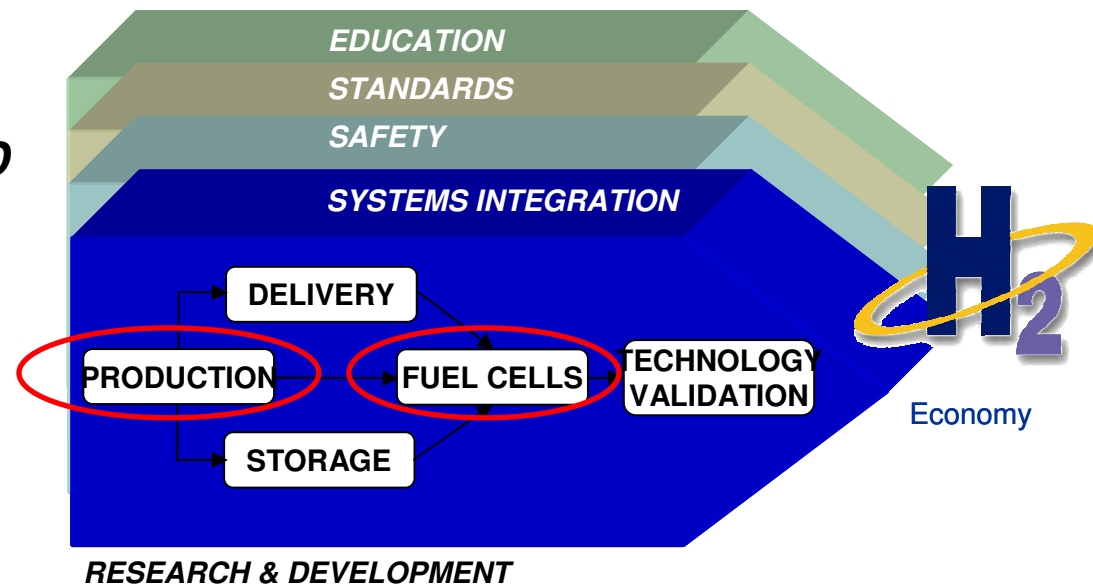
## **2. Drivers**

- Energy Security
- Environment (Reduced carbon emissions)
- Improved Energy Efficiency
- Economic Competitiveness

# Multi-level organisation through an example (US DOE)

## 3. Policy making and RD&D Planning

*Purpose of multi-year RD&D Plans*



## 4. Identification of Barriers

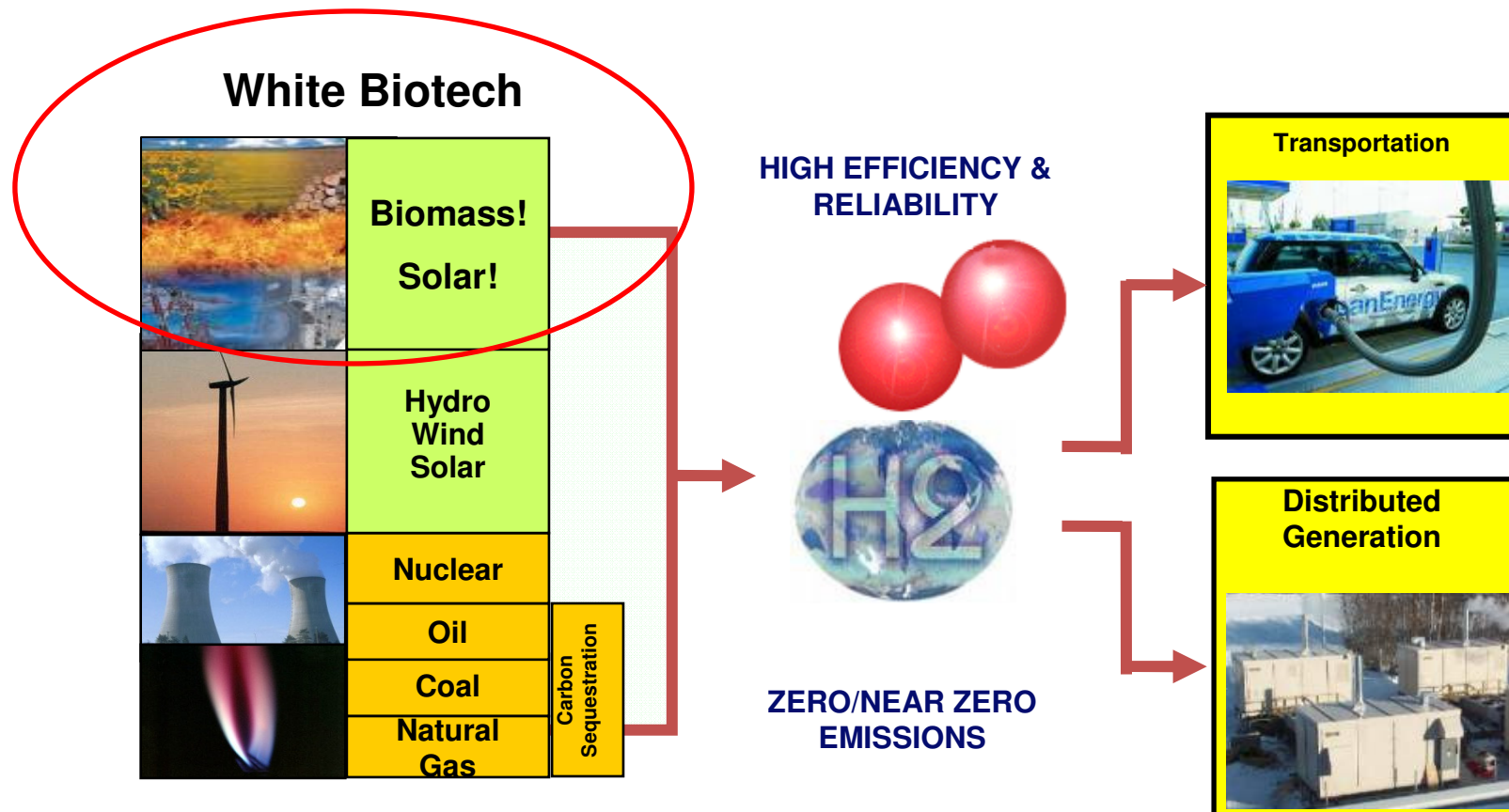
*Technology Barriers (hydrogen storage, fuel cell price, etc.)*

*Economic and Institutional Barriers (investment risk, lack of standards, etc.)*

# Multi-level organisation through an example (US DOE)

## 5. Addressing Barriers

Mission: Research, develop and validate fuel cell and hydrogen production, delivery and storage technologies for transportation and stationary applications.



# Multi-level organisation through an example (US DOE)

## 6. Target Definition

- Establish **time-phased technical targets** that measure progress against barriers
- Establish **performance-based milestones**
- Establish **deliverables** in implementation mechanisms (Lab Annual Operating Plans, Industry Cooperative Agreements, etc)

**Participants in implementation: National Labs, contractors, universities, companies**

## 7. Success Defined

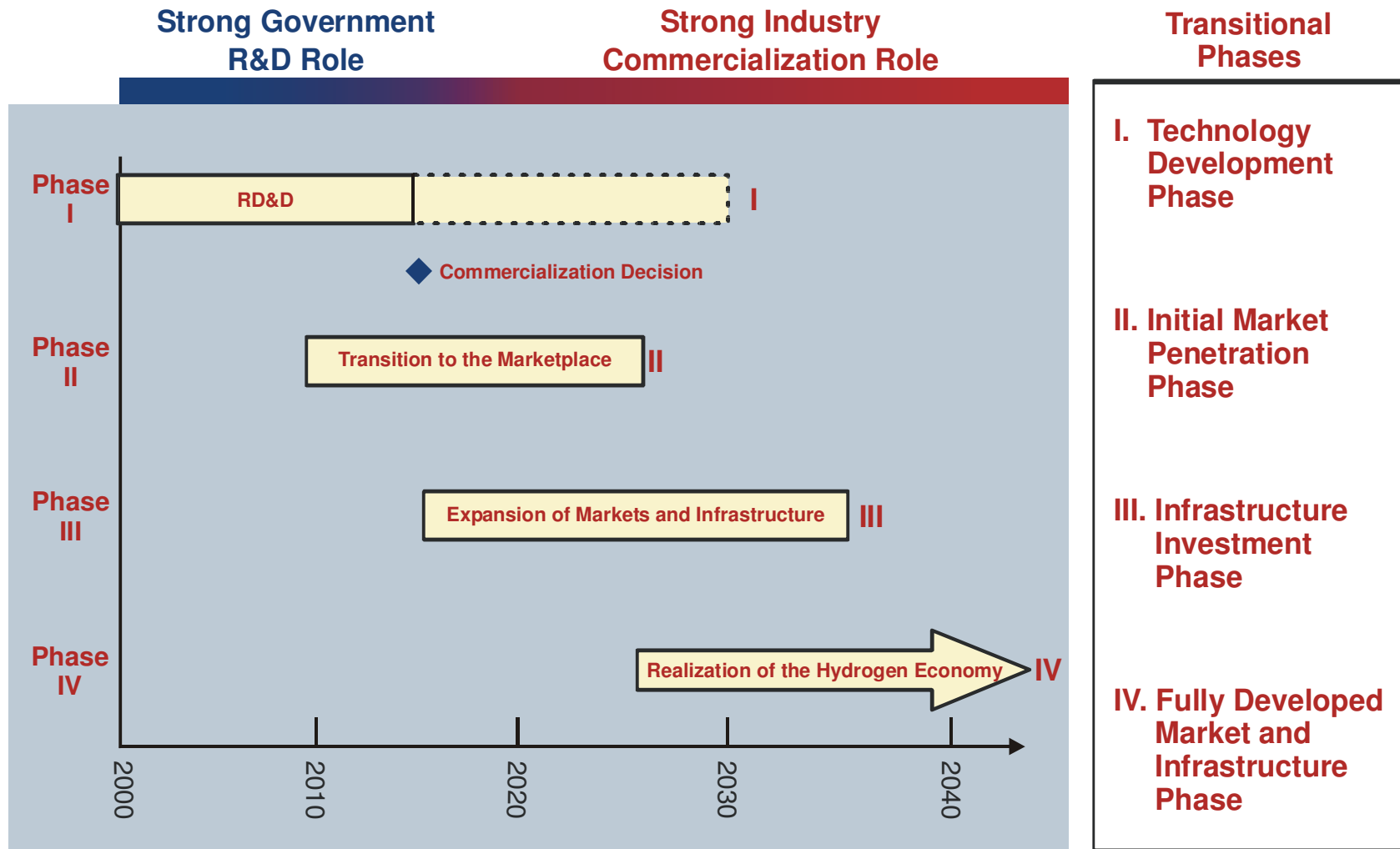
- Hydrogen storage systems enabling minimum 300-mile vehicle range
- Hydrogen production to safely and efficiently deliver hydrogen to consumers
- Fuel cells to enable engine costs of less than \$50/kW (in high volume production)

## **Emphasis on Alternative Strategies**

- Hybrid vehicles, including **bio-derived hydrogen, liquid fuels**
- Policies related to fuel economy, incentives for emerging technologies

# Multi-level organisation through an example (US DOE)

## Timeline for Hydrogen Economy



# Multi-level organisation through an example (US DOE)

## - Budget Priorities (Align with Key Activities)

*Budget priorities to be updated annually based on System Analyses and Evaluation activities*

e.g.: Biomass: Key Technology Areas (Related to Hydrogen Economy)

### **Biomass Feedstock**

- Trees
- Grasses
- Agricultural Crops
- Agricultural Residues
- Animal Wastes
- Municipal Solid Waste



### **Conversion Processes**

- Enzymatic Fermentation
- Gas/liquid Fermentation
- Acid Hydrolysis/Fermentation
- Gasification
- Combustion
- Co-firing



### **Uses**

- Fuels
  - Ethanol
  - Renewable Diesel
  - **Hydrogen**
- Electricity
- Heat
- Chemicals

## - Program Execution

## - Program Analysis and Evaluation

# Conclusions

## **Multi-level program organization**

## **Program Implementation Emphasizes Collaborative Partnerships**

- Central and Local Governments
  - Codes and standards, education, and field validation
- National, international R&D
  - R&D through Partnership
  - Industrial
  - Collaborations are motivated by joint calls

## **Regular meetings, reports (importance of personal contact)**

## **Interdisciplinarity**

## **Permanent information flow**

## **Partnership vs. competition**

# Conclusions

## What to change in the Hungarian system?

**Present system is too fragmented, Hungary is too small for that**

**Good ideas – no (a few) product in the market**

- Dedicate calls for comprehensive competitive areas (5+ years)
  - multidisciplinary (biotech, engineering, chemical, physical sciences, etc.)
  - large number of participants (20+ research groups, companies), critical mass
  - open access (with limitations)
- Top-down management organization for the dedicated areas, multi-level programmes, follow-up the running projects, represent the participants in international organizations, help companies in market expansion, partner finding
- Further enhance cooperations
  - e.g. regular (yearly) meetings for supported collaborations, companies of the comprehensive areas (presentations, reports, personal communication, networking)
  - more efficient involvement of industrial partners
  - improved information flow between industry and research

**Thank you for the attention!**



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