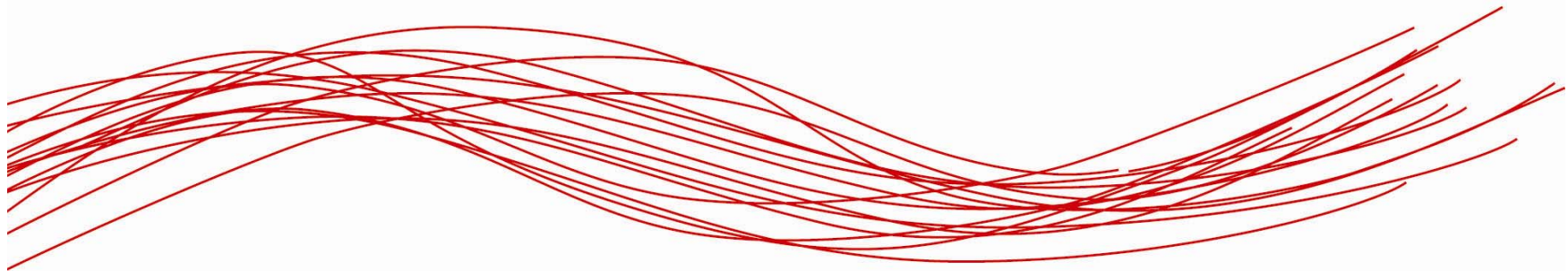


# Strategic Energy Technology Plan

## The Technology and Capacities Maps



*Joint Research Centre  
Institute for Energy  
Institute for Prospective Technological Studies*

- **Technology is vital** to achieve the EU Energy and Climate Change policy objectives
- **But today we are falling short:**
  - Insufficient energy research budgets in the EU
  - Structural weaknesses in technology innovation
  - International competitors are already accelerating their efforts
- **We need to use the ambition and the targets of the EU Energy Package to create a new European policy for energy technology (SET-Plan)**

- ✓ The Technology Map: a brief and comprehensive description of the current status and prospects of key low-carbon energy technologies.
- ✓ The **purpose** of the technology map is to underpin the SET-Plan Communication. Based on it the SET-Plan will propose actions to accelerate low carbon energy technology development and deployment through European technology initiatives.
- ✓ The goal of the technology map **is achieved** by quantifying the contributions of technologies to: Environment - CO2 emission reductions, Security of Energy Supply - fossil fuel savings and Competitiveness - changes in the cost of energy.

- ✓ This is the **First** Technology Map!
- ✓ Focused on energy supply technologies and alternative transport fuels
- ✓ It is planned to be revisited, extended and updated regularly

For each technology the Map describes:

1. The current status and the anticipated developments
2. The current and future share in the European energy demand
3. The quantified impacts of technology penetration on:
  - *Environment - Greenhouse gas emissions*
  - *Security of supply*
  - *Competitiveness*
4. Barriers to penetration in the European energy market
5. Needs to realise its potential
6. Synergies with other technologies and sectors

## **Power and Heat**

- Wind power generation
- Solar photovoltaic power generation
- Concentrated solar power generation
- Solar heating and cooling
- Hydropower generation
- Geothermal
- Ocean wave power generation
- Cogeneration of heat and power
- Zero emission fossil fuel power generation
- Nuclear fission power generation
- Nuclear fusion

## **Energy Infrastructures**

- Electricity networks (Smart Grids)

## **Transport**

- Biofuels
- Hydrogen and fuel cells

## *Striving for an open-access, transparent and objective information system*

A common assessment framework for all technologies

- ✓ Basic principle: Evaluation of the additional impact of the penetration of each technology individually into an established BAU baseline scenario – **not a comparison at system level**
- ✓ Technology penetration: Two scenarios (minimum and maximum increase) for each technology
- ✓ Time horizon: 2030
- ✓ Key assumption: Technologies replace their fossil fuel based conventional counterpart technologies that produce the same energy carrier

- ✓ Reports from 18 SET-Plan Hearings and Workshops held between March and June 2007 – further consultations with technology experts
- ✓ Impact assessments (e.g. RES roadmap, Efficiency Action Plan)
- ✓ Relevant Framework Programme projects
- ✓ JRC in-house data and analysis
- ✓ Comments from the Advisory Group Energy of the Framework Programme

There is a significant potential in low carbon energy supply technologies complementing energy efficiency

- ✓ A broad portfolio of technologies needs to be developed and deployed based on a strategic and inclusive master-plan
- ✓ Energy infrastructure needs to be modernised and become more robust to harness this potential

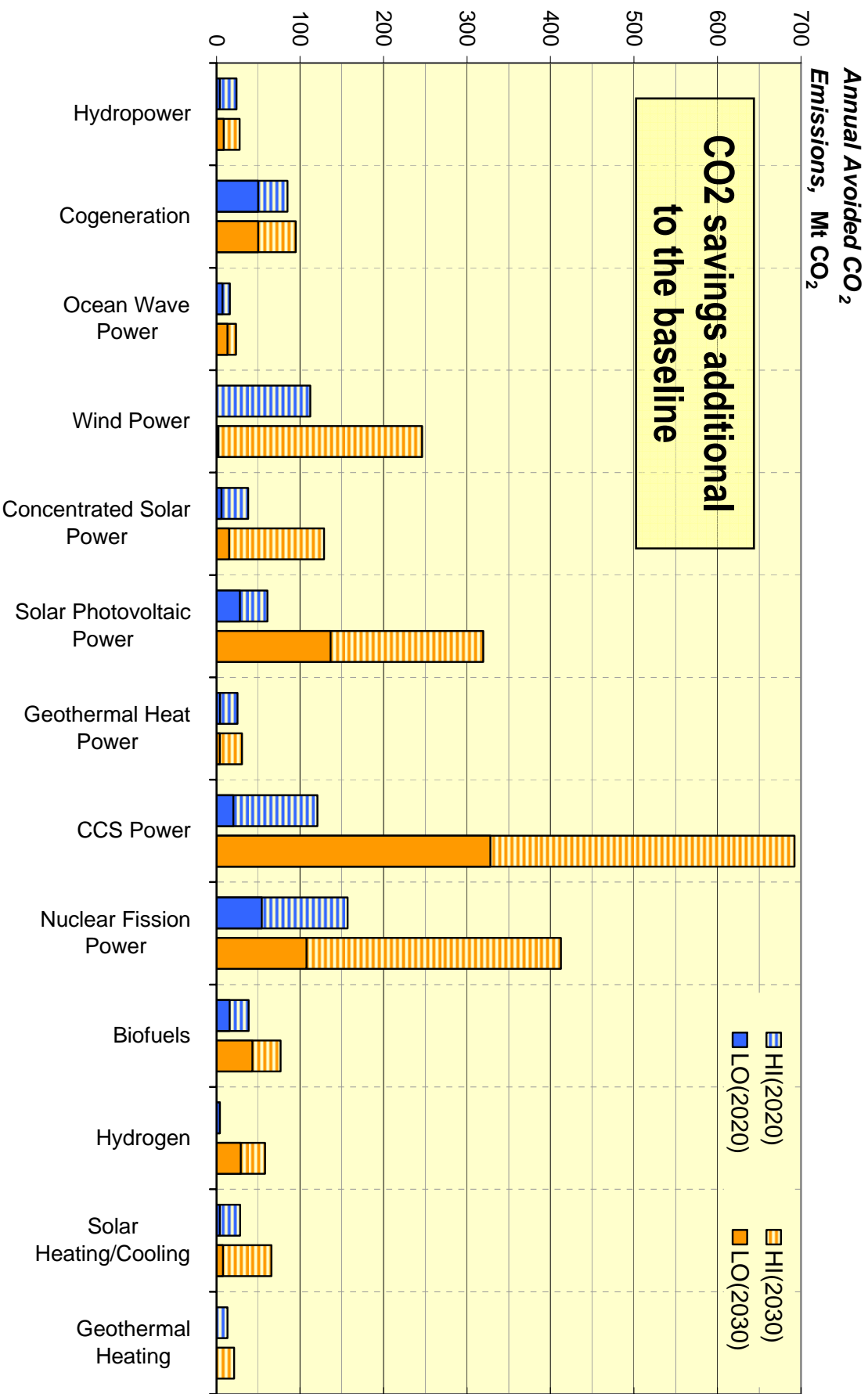
## Medium term

Biofuels  
Carbon Capture and Storage  
Wind energy  
Solar technologies  
A single European electricity grid  
Hydropower  
Cogeneration  
Fission technologies

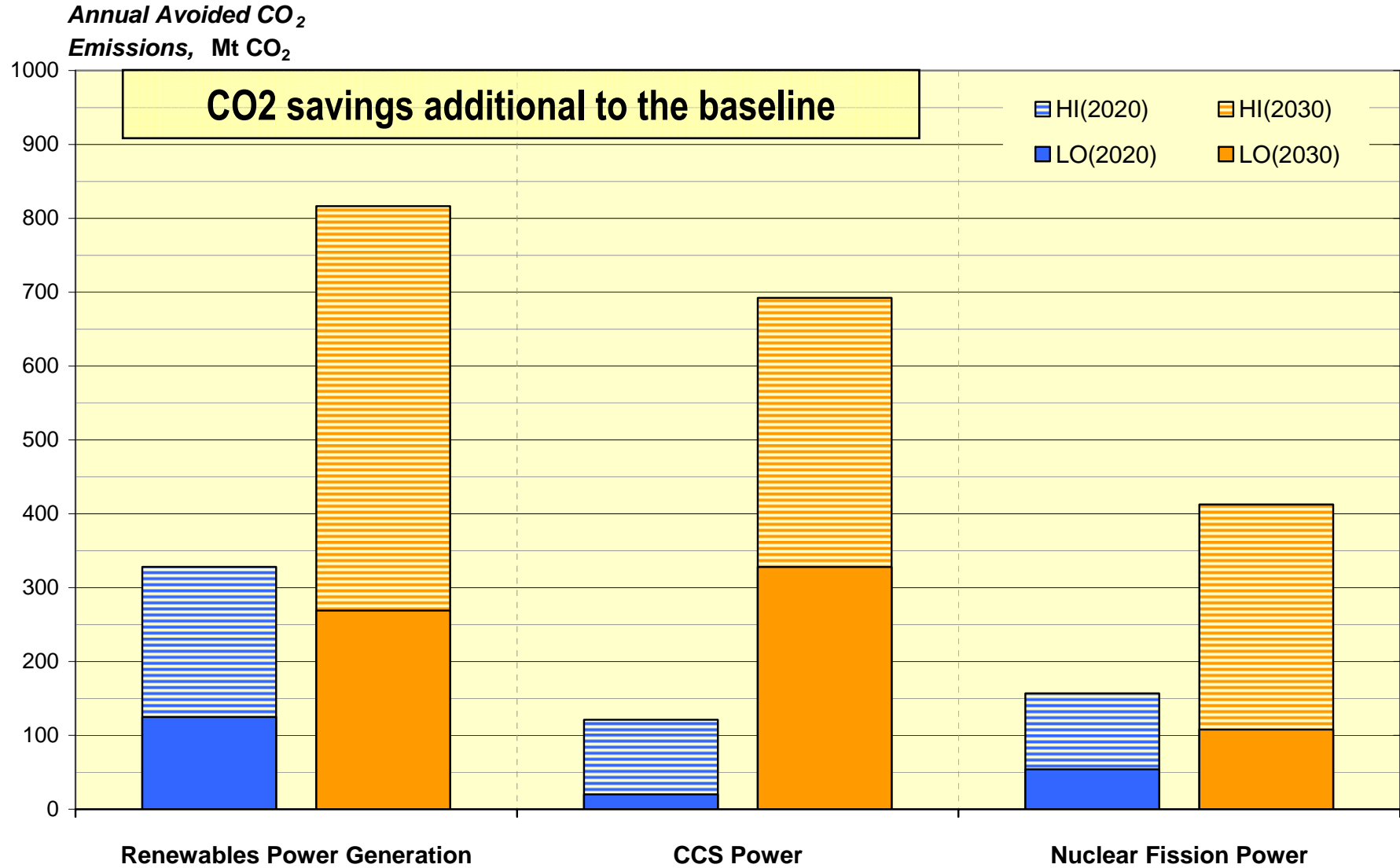
## Long term

Next generation Renewable Energy Sources  
Energy storage technologies  
Hydrogen fuel cell vehicles  
New generation (Gen-IV) of fission reactors  
ITER fusion facility

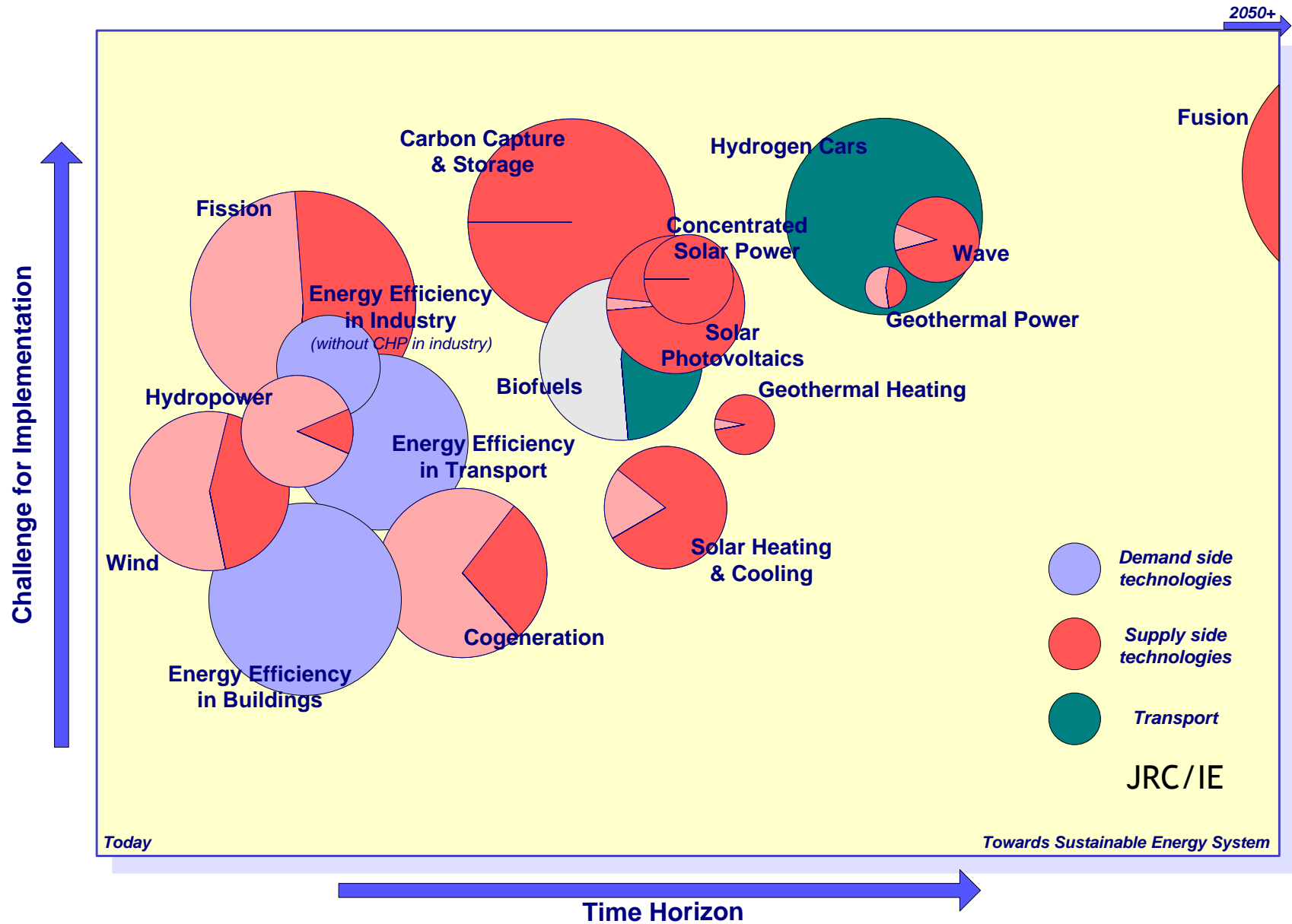
# Example – CO2 emission reductions



# Example – CO<sub>2</sub> reductions in power generation



# A pseudo-quantitative summary of the Technology Map



The Map is planned to be revisited, extended and updated regularly:

- Extending the horizon from 2030 to 2050
- Expanding the technological portfolio (e.g. end-use energy efficiency, energy intensive industry)
- Considering a systemic analysis
- Evaluating additional impact indicators
- Broadening the expert consultation process

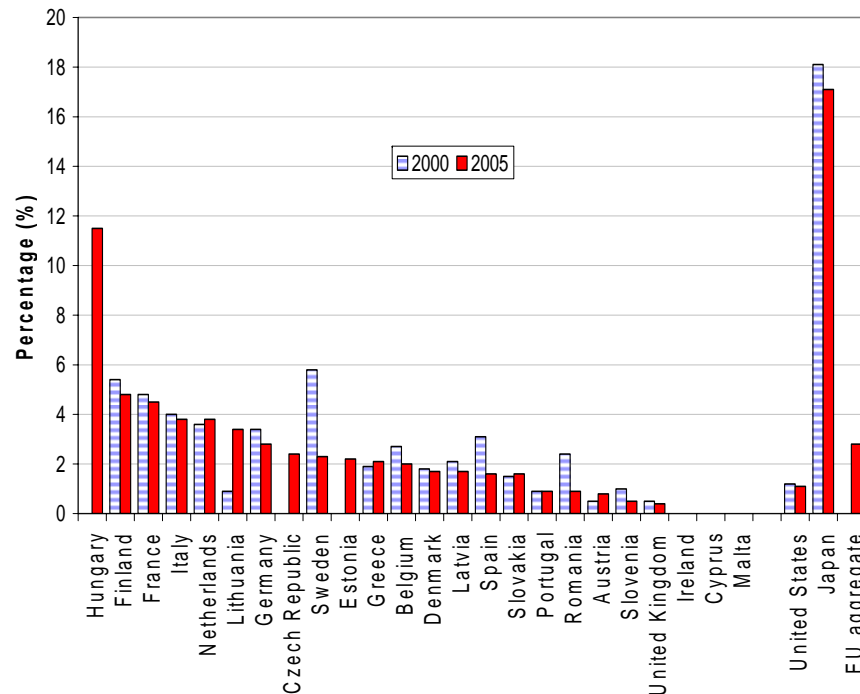
**Although Europe has a world class research and industrial base, achieving harnessing this low carbon technology potential necessitates a step change in the way we invest and work together.**

## Scope of the 'Capacity Map'

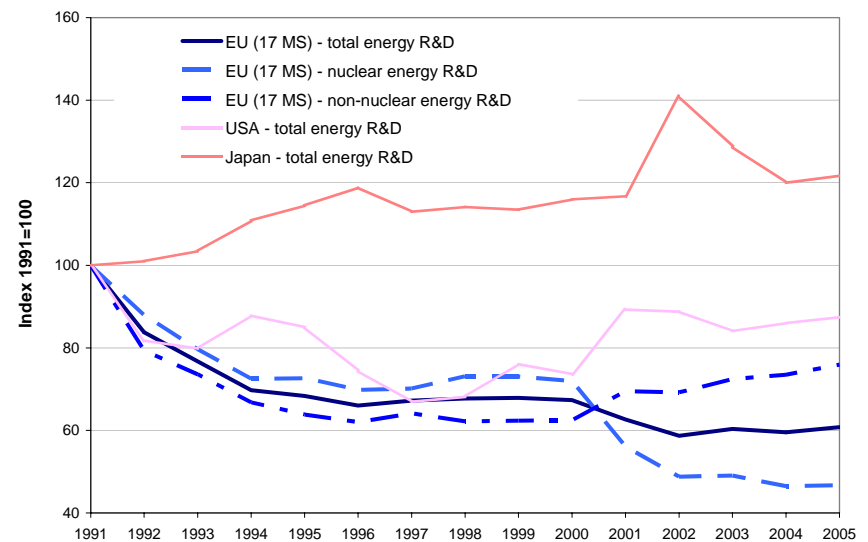
- ✚ Provide an overview of the energy research capacities in the EU Member States through an inventory of
  - companies involved in energy research
  - public and private spending on energy research
  - institutions involved in energy research
  - pull-instruments used for the market deployment of innovative technologies

# Public spending for energy R&D (source: Eurostat, IEA)

**Government budget appropriations for production, distribution and rational utilization of energy relative to overall GBAORD. 2005.**

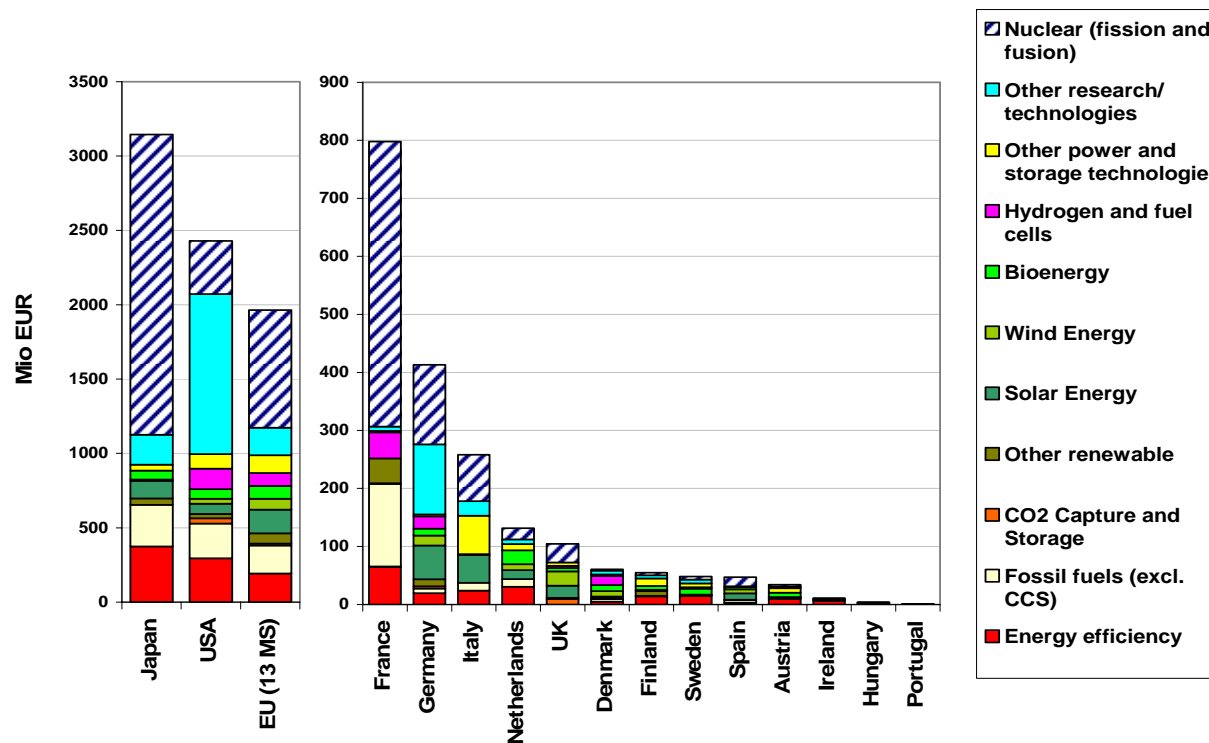


**Development of public spending on energy R&D in selected EU Member States, the USA and Japan.**



→ EU Member States award a relatively low importance to energy research

## Public energy R&D expenditure in selected EU Member States, Japan and USA in 2005 (source: IEA)

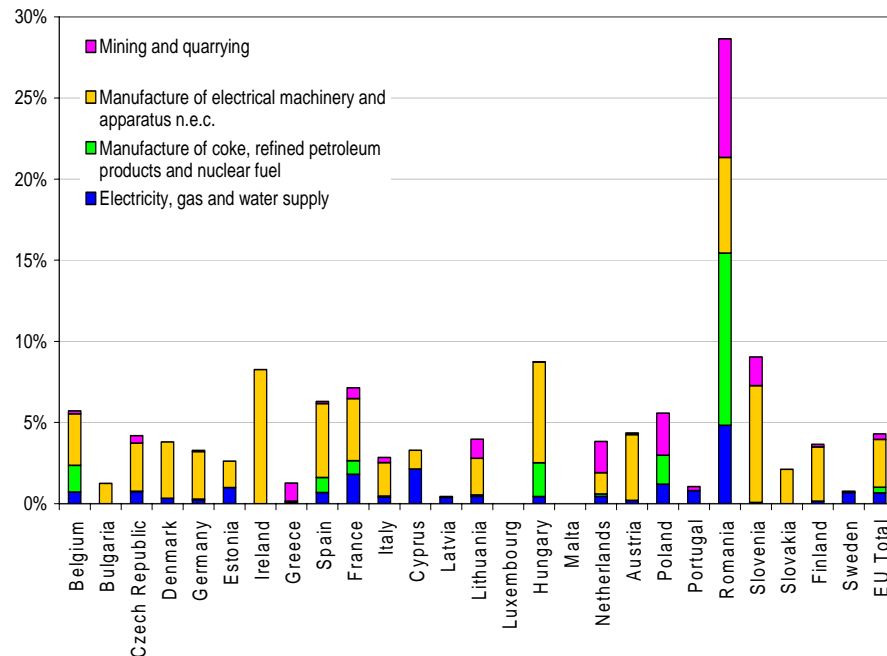


→ Energy R&D funding concentrates in few Member States

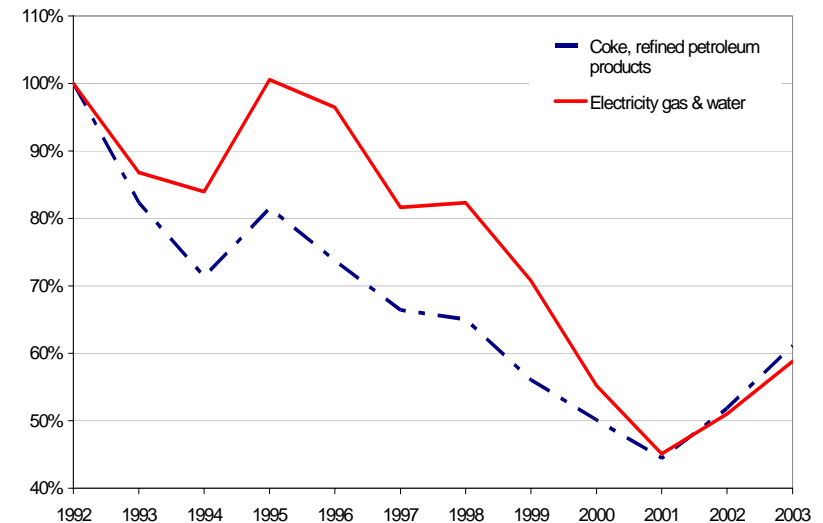
→ Some areas of shared priorities exist, e.g. renewables, energy efficiency

# Private investment in energy R&D (source: Eurostat, OECD)

Share of energy and transport-related business and enterprise expenditures in total BES R&D expenditure, 2005



EU-15 aggregated expenditures of the business and enterprise sector for electricity, gas and water supply and the manufacture of coke



→ Industrial energy R&D is limited and has decreased in some areas

- **Even in areas of shared priorities, cooperation remains limited**
- **May be influenced by diverse organizational structures in energy R&D**
  - Responsibility for energy R&D policy within several ministries, varying by MS
  - Implementation of energy R&D takes different forms
  - Performers of energy research vary
  - Energy R&D programmes vary strongly among MS, and are missing in some
  - Pull-instruments for new technologies follow different approaches
  - Science-Industry link can be improved in many Member States
- **Positive examples demonstrate that coordination is still possible** (e.g. Nordic Energy Research Programme, ERA-NETs, Technology Platforms)

→ **Action needed to exploit synergies through better coordination**

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