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# Overview of EU Activities in P & T Research in the EURATOM 6<sup>th</sup> and 7th Framework Programmes

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# OUTLINE

- **EU Energy Concerns and Strategy**
- **European Research Area and Framework Programs (FPs)**
  - **FP7**
  - **FP6**
- **Conclusions**





# EU Energy Concerns

- Energy is the driver of economic growth and prosperity
- Energy concerns have been a permanent feature of the European reconstruction
- Two of the three European treaties deal with energy:
  - European Coal and Steel Community (ECSC) Paris 1951
  - European Atomic Energy Community (**EURATOM**) Rome 1957





# EU Energy Strategy

- A 'round' of discussions on future direction of the EU energy policy started in 2000 which were outlined in the Green Paper '**Towards a European Strategy for the Security of Energy Supply**'.
- A new round of consultation and discussions are underway for '**A European Strategy for Sustainable, Competitive and Secure Energy**' and will be completed by the end of 2006: visit the website ([http://ec.europa.eu/energy/green-paper-energy/index\\_en.htm](http://ec.europa.eu/energy/green-paper-energy/index_en.htm)).
- **Six priority areas have been identified**
  - Competitiveness and the internal energy market
  - Diversification of the energy mix
  - Solidarity
  - Sustainable development
  - **Innovation and technology**
  - External policy
- The 7<sup>th</sup> Research Framework Program will be essential for the priority '**Innovation and technology**' for research in different areas of energy mix and a '**European Institute of Technology (EIT)**' is proposed to be established.





# EU Energy Strategy

- Implementation of EU energy strategy requires **research and development** of new technologies in a variety of areas.
- The technologies developed in Europe can be used or adapted to meet the needs of the other countries.
- **Framework Programs** of the European Union have been a very fruitful tool to channel common research funds in areas of European-wide interest especially where European added value dominates.
- International collaboration is an important policy element of the EU Framework Programs.





# EU Research

- There are at present 25 member nations\* in the EU.
- The principal framework of research in EU is national.
- Various initiatives of European Community and Inter-governmental Sc. & Tech. cooperation effort is < 17% of total public civilian expenditure of European research.
- EU framework program (FP) of research is only about 6% of total public financial effort of the entire EU.
- The fragmentation, isolation and disparity of regulatory and administrative systems, which lowers the impact of investment in research, is being constantly improved through the establishment of a 'European Research Area' (ERA).

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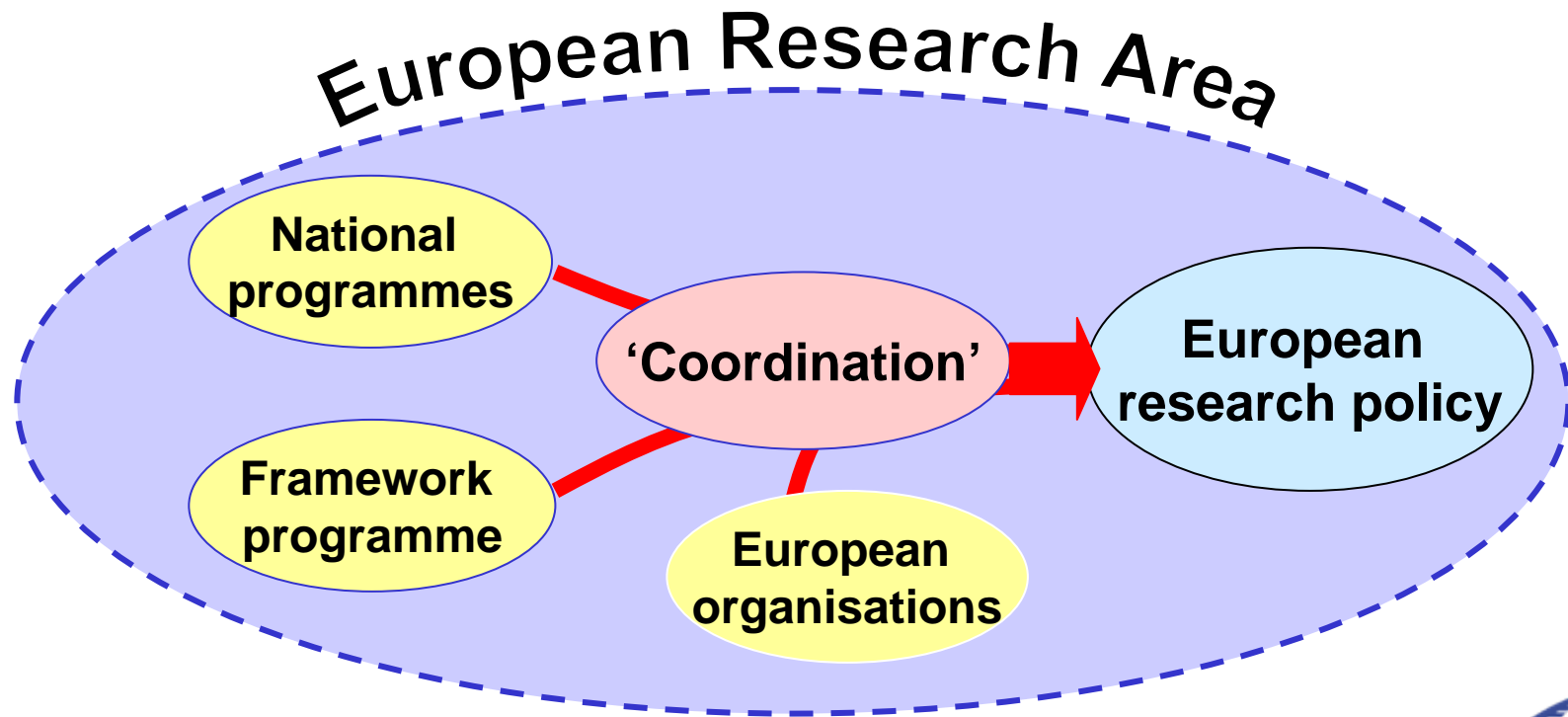
\* AT, BE, DK, Fi, FR, EL, DE, IE, IT, LU, NL, PT, ES, SE, UK and since May 2004 Cyprus, Czech Rep, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia.





# The European Research Area

- ERA is a blueprint for the future of research in Europe.
- Enjoys broad support at the highest political, scientific and industrial levels.
- The ERA has been implemented since the start of FP6.





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# The European Research Area (ERA)

## Aim:

- Achieve greater co-operation between Member States' research strategy
- Mutual Opening up of Programmes
- Bring its research effort on par with competitors







# EURATOM Budget (under discussion)

	FP6 (2002-06)	FP7* (07-11)	FP7** (07-11)	FP7** (07-13)
	M€	M€	M€	M€
• Fusion Energy Res	824	2159	1947	2900
• Fission & Rad Prot	209	394	287	411
• JRC's Nuclear Activity	319	539	517	750
<b>Total</b>	<b>1352</b>	<b>3092</b>	<b>2751</b>	<b>4061</b>

\*FP7 Commission's proposal April 2005

\*\* Revised 1st iteration with Council and EP (April 2006)





## EURATOM FP7 (2007-11) Nuclear Fission & Radiation Protection

**Geological disposal** of long-lived radioactive waste and the reduction of toxicity of radioactive waste through **partitioning & transmutation**

**Operational safety** of existing reactor systems and the **potential of future reactor systems** for safer, more efficient power plants and **competitive nuclear industry**

**Radiation protection** – especially risks from low doses, medical uses, emergency management and mitigation of the impact of **radiological terrorism**

**Key cross-cutting activities:**

- Support for **research infrastructures**
- retaining **competences and know-how** in all areas of nuclear science





# Management of Radioactive Waste in FP7

## OBJECTIVES

- Implementation oriented R&D on all remaining key aspects of deep **geological disposal** of spent fuel and long-lived radioactive waste and, as appropriate, demonstration on technologies and safety and to underpin the development of a common European view on the main issues related to management and disposal of waste
- Research on **Partitioning and Transmutation** and/or other concepts aimed at reducing the amount and or hazard of the waste disposal





# Cross-cutting Activities

## OBJECTIVES

- **Infrastructures**

To support the availability of, and cooperation between, research infrastructures necessary to maintain high standards of technical achievement, innovation and safety in the European nuclear sector

- **Human resources and training**

To support the retention and further development of scientific competence and human capacity in order to guarantee the availability of suitably qualified researchers and employees in the nuclear sector over the long term





## Aims of P&T in assisting waste management and geological disposal

- Extract a large part of the energy-bearing component of the waste thereby reducing the toxicity and waste volume and effectively increase the capacity of repositories.
- Assist in reducing the high temperature of the waste in the first 200 years that otherwise would restrict the packing capacity of the repository.
- Transmute selectively long-lived elements to more stable ones in dedicated fast-neutron devices
- P&T thus aims to
  - **Ease the final geological repository requirements.**





# R&D in Partitioning and Transmutation in FP7

- **Objective**

- Investigate ways of reducing the amount and/or hazard of the waste by P & T or other techniques

- **Activities**

- RTD in all areas of P&T to develop pilot facilities for the most advanced partitioning processes and transmutation technologies involving sub-critical and critical systems.
- Explore the potential of concepts that produce less waste in nuclear energy generation including the more efficient use of fissile material in existing reactors.





# Cross-cutting Activities

## Infrastructures

- **objective:** To support the availability of, and cooperation between, research infrastructures necessary to maintain high standards of technical achievement, innovation and safety in the European nuclear sector
- **Activities:** Pilot/test facilities for P & T

## Human resources and training

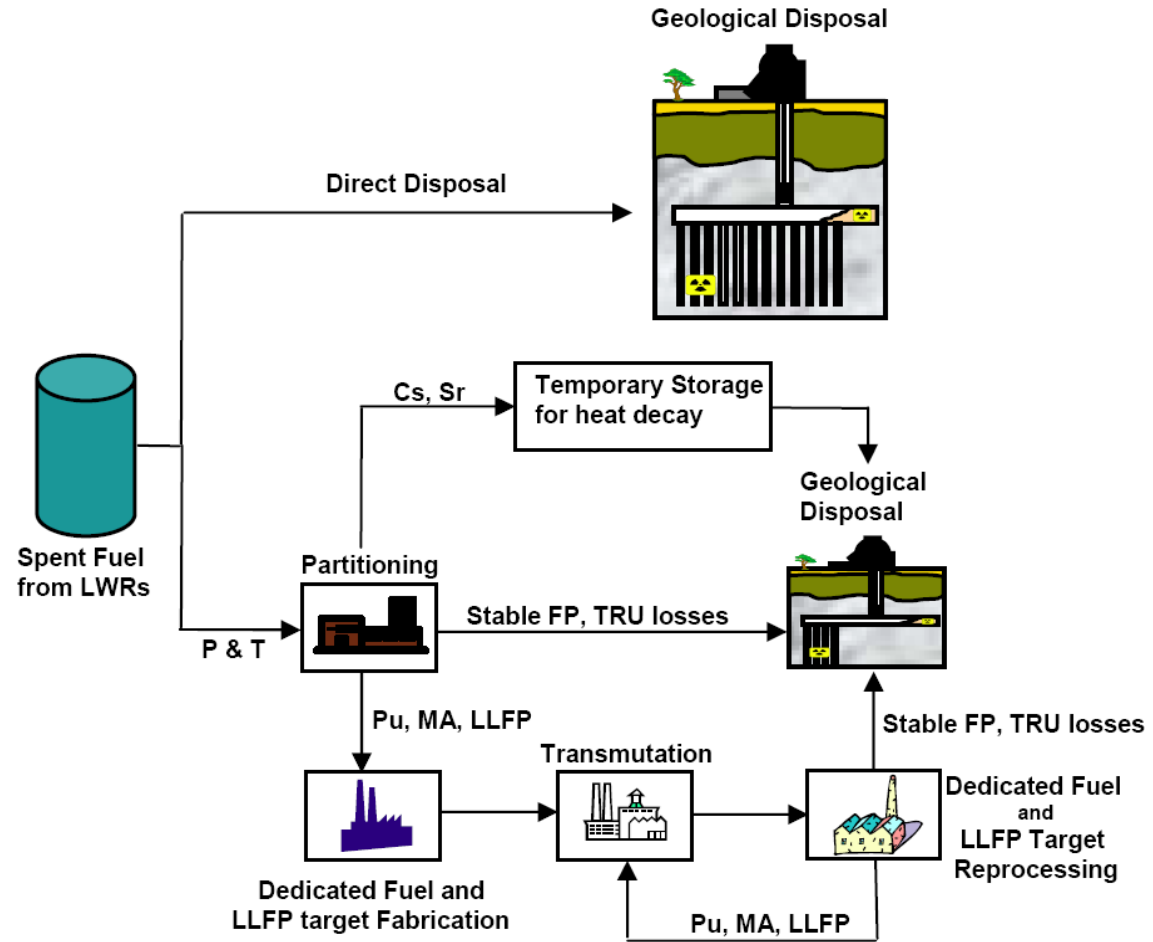
- **objective:** To support the retention and further development of scientific competence and human capacity in order to guarantee the availability of suitably qualified researchers and employees in the nuclear sector over the long term.
- **Activities:** Training and mobility of researchers





# Possible schemes for waste management

(Acknowledgement: EUROTRANS)



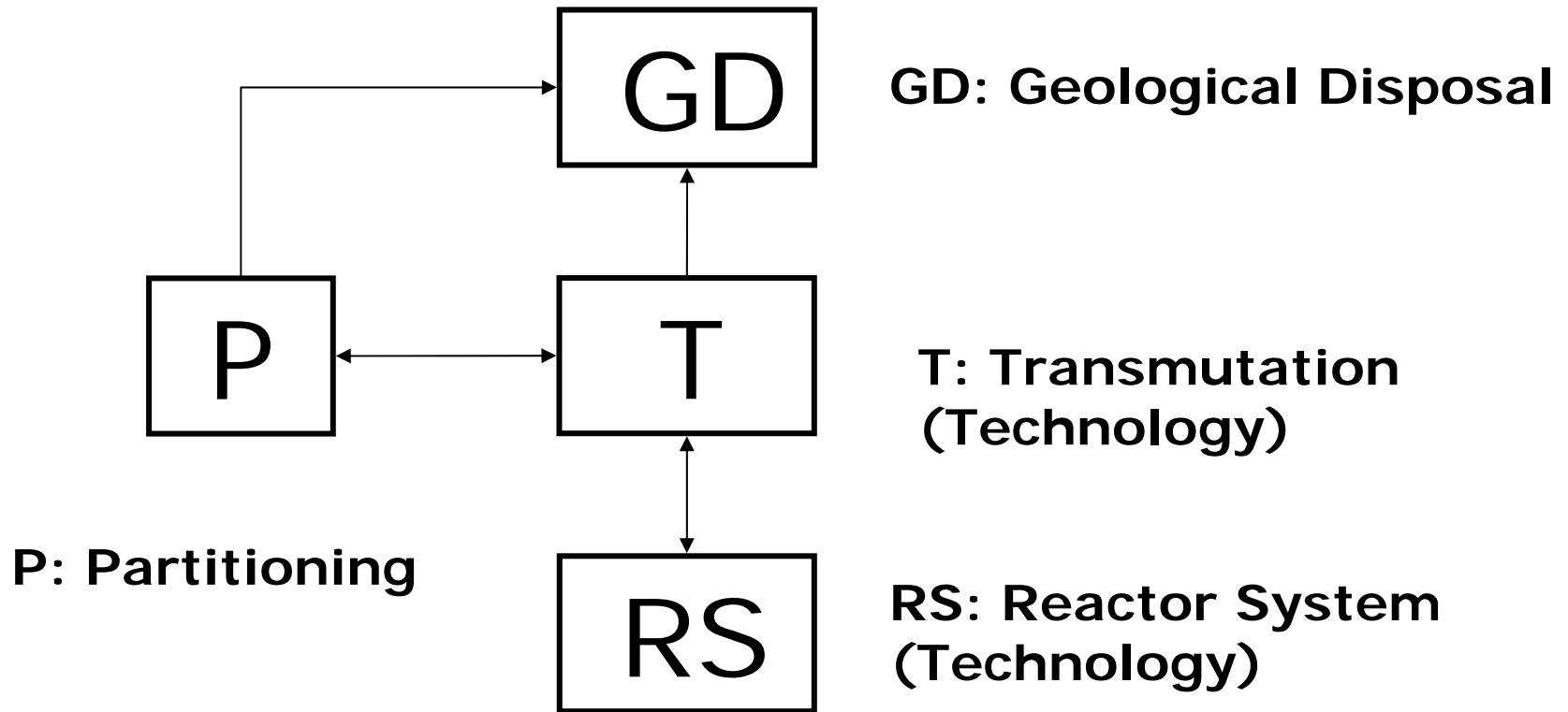
LLFP: Long lived fission products (Tc-99, I-129, Se-79, ...); MA: Minor Actinides (Am, Np, Cm)





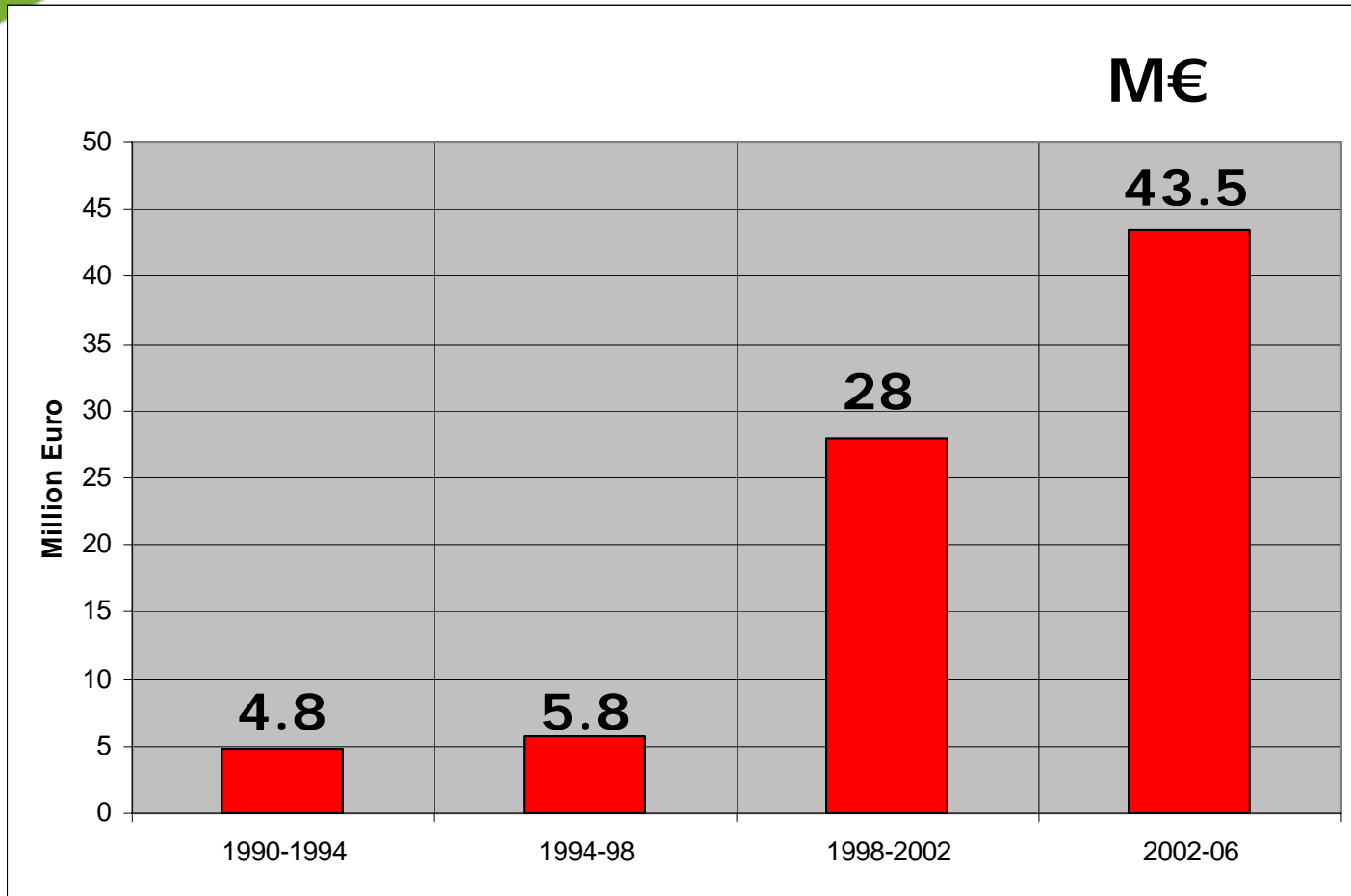


## Interconnections of P, T GD and RS





# EURATOM P & T Budget has grown



# EURATOM FP6 P&T Projects Underway

SN	Acronym	Title	Budget (M€)		Coordinator
			Total	EC	
1	<b>PATEROS</b>	P&T European Road-map	<b>0.8</b>	<b>0.6</b>	SCK/CEN (BE)
2	<b>RED-IMPACT</b>	Impact study of P&T on Waste management	<b>3.9</b>	<b>2.0</b>	KTH (SE)
3	<b>EURO-PART</b>	Partitioning techniques and processes	<b>11.2</b>	<b>6.0</b>	CEA (FR)
4	<b>EURO-TRANS</b>	All Aspects of Transmutation by sub-critical ADS	<b>45.0</b>	<b>23.0</b>	FZK (DE)
5	<b>ELSY</b>	Waste transmutation in Lead Cooled critical system	<b>6.9</b>	<b>2.95</b>	ANSALDO (IT)
6	<b>PUMA</b>	Pu and MA Management by thermal Gas-cooled system	<b>3.7</b>	<b>1.85</b>	NRG (NL)
7	<b>VELLA</b>	Networking of lead loop infrastructures in Europe	<b>3.3</b>	<b>2.3</b>	ENEA (IT)
8	<b>LWR-DEPUTY</b>	LWR fuels for deep burning of Pu in thermal systems	<b>2.4</b>	<b>1.25</b>	SCK/CEN (BE)
9	<b>EFNUDAT</b>	Networking of EU facilities for nuclear data measurements	<b>3.0</b>	<b>2.4</b>	CNRS (FR)
10	<b>CANDIDE</b>	Networking of Nuclear data for EU Industrial Development	<b>0.8</b>	<b>0.8</b>	UU (SE)
11	<b>NUDAME</b>	Trans-national access for nuclear data measurements	<b>0.2</b>	<b>0.2</b>	EC-JRC (IRMM)
		Totals	<b>81.0</b>	<b>43.5</b>	



# International Cooperation

- **Cooperation agreements with Canada, USA and some other countries.**
  - Technical cooperation with FP6 running projects such as **EUROPART** and **EUROTRANS**
- **Cooperation with Russian Federation and Ukraine under ISTC (Moscow) and STCU (Ukraine).**
  - **ISTC** (since 1992) funding parties (EU, Japan, USA, Norway, Rep. Korea)
  - **STCU** (since 1995) funding parties (EU, USA, Canada)
  - **COOPERATION FP5/FP6 and ISTC/STCU projects in the area of**
    - **Basic nuclear/material data and neutronics of ADS**
    - **Aqueous separation chemistry**





# Conclusions

- An important element in EU energy strategy, 'Innovation and technology', requiring **research and development** is being implemented via multi-annual (5-7 year duration) Framework Programs.
- Significant progress has been made in establishing **European Research Area** in Partitioning and Transmutation in the EU and will be further reinforced in FP7.
- A well-balanced portfolio of 11 P&T projects in Euratom **FP6 (2002-06)** are underway with a total budget of ~81 M€ and EC contribution of ~43.5 M€.
- All major actors of P&T in EU are a part of these projects.
- Launching of **FP7 (2007-11)** is well on its way and is due to start on 1 January 2007.
- **International cooperation** is an important element in the EU research policy.

