Euratom Framework Programmes FP6-FP7 Nuclear Fission & Radiation Protection Transnational Access Activities, Research Infrastructures and European Research Area ERA

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Contents

- FP7 Euratom programme in nuclear fission and RP
  - ➔ Strategic, operational priorities & Implementation
- European Research Area, SET-Plan
- Technology Platforms
- Overview of principal Euratom FP6 (2003-2006) & FP7 (2007-2011) projects supporting advanced and/or Gen-IV nuclear systems, nuclear data, P&T and ESNII (European Sustainable Nuclear Industrial Initiative) and Radiation Protection
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- Conclusions

Euratom FP7 fission & RP – *implementation*

Euratom 7th Framework Programme for "Nuclear Research and Training Activities"
(FP7: 2007-2011)

DG-Research
indirect actions

Fusion

€1947 M

DG-Research
indirect actions

Fission & Radiation Protection

€287 M

DG-JRC
direct actions

Nuclear-related activities

€517 M

Total Euratom FP7 = €2751 M

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Euratom FP7 fission & RP – *programme objectives*

- Establish a sound scientific & technical basis for the safe long-term nuclear waste management
- Promote safer, more resource-efficient and competitive exploitation of nuclear energy
- Ensure a robust and socially acceptable protection of man & the environment against the effects of ionising radiation.

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Euratom FP7 fission & RP – *strategic priorities*

- Promote a true "European Research Area" ERA in nuclear science and technology
  - ➔ Major stakeholders agree "Strategic Research agenda" and coordinated "Deployment Strategy" in key R&D fields
- Support EU policy initiatives, SET-Plan, Energy Policies and Nuclear is a very low carbon technology
- International cooperation

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Implementation of Euratom FP7 "fission"

- Annual work programmes & calls for proposals
- Evaluation by independent experts
- Main criterion: scientific and technical excellence
- Range of funding schemes promoting integration
- Shared cost & leverage effect of EU funding
  - ➔ 4 calls completed to date with €230M in EC funding and > €350M total costs

5th FP7 Euratom "fission" call for proposals published on 20 August 2010 with deadline 7 April 2011 and spring 2011 Evaluation Call budget €41.0M
http://cordis.europa.eu/fp7/wp-2011_en.html

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Within Euratom WP 2011
… *Infrastructures*

- ***"… Topic: Fission-2011-4.2.1: Transnational access to large infrastructures.*** Community support will be provided to cover costs of Transnational Access to Large Infrastructures (TALI) for researchers from Member States and Associated States, other than the state where the infrastructure is established, in order to promote access for researchers to infrastructures that provide essential and unique services to the European research community. Access to researchers from 3rd countries could also be envisaged, where such access is part of the promotion of broader international cooperation with the countries concerned. The active participation of major infrastructure operators and potential users will be required to achieve the objectives.

  Funding Scheme: Coordination and Support Actions (supporting).

  - ➔ ***Expected impact:*** **Optimised use of existing nuclear research infrastructures in Europe in all activities of the programme and facilitated access to these infrastructures by researchers throughout Europe and from 3rd countries…..”**

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Euratom FP7 fission & RP

Objectives – Waste Management

- Implementation-oriented R&D on all remaining key aspects of deep geological disposal of spent fuel and long-lived radioactive waste, demonstration of technologies and safety and the development of a common European view on the main issues related to management and disposal of waste

- RTD in all areas of Partitioning and Transmutation to develop pilot facilities for the most advanced partitioning processes and transmutation technologies involving sub-critical and critical systems

- Research on other concepts aimed at reducing the amount and or hazard of the waste disposal

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Euratom FP7 fission & RP
Objectives – Reactor systems

- Safety of Nuclear Installations
  - ➔ Continued safe operation of all relevant types of existing reactor systems (including fuel-cycle facilities)
  - ➔ Lifetime extension
  - ➔ Development of new advanced safety assessment methodologies (both technical and human element)
  - ➔ Prevention and mitigation of severe accidents

- Advanced nuclear systems:
  - ➔ Improve efficiency of advanced systems and fuels and collaborate with the Generation IV International Forum
  - ➔ Assess potential, proliferation resistance and long-term sustainability including upstream research activities (especially material science), the fuel cycle and innovative fuels and waste management aspects of selected advanced reactor systems

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Euratom FP7 fission & RP

Objectives – Radiation Protection

- Research on the risks from low doses, on medical uses and on the management of accidents, to provide a scientific basis for a robust, equitable and socially acceptable system of protection that will not unduly limit the beneficial and widespread uses of radiation in medicine and industry.
  - ➔ Quantification of risks for low doses and protracted exposures
  - ➔ Optimisation of Medical uses of radiation
  - ➔ Emergency management and rehabilitation
  - ➔ Security
  - ➔ Other topics

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European Research Area

- Launched at the Lisbon European Council in March 2000
- **In 2008, the Council set in motion the Ljubljana Process to improve the political governance of ERA and adopted a shared ERA 2020 vision**
- **3 ERA concepts**
  - ➔ The creation of an **"internal market" in research** (free movement of knowledge, researchers and technology)
  - ➔ The **restructuring** of the **European research fabric** (improved coordination of national research activities and policies)
  - ➔ The development of a **European research policy** (taking into account other EU and national policies)

http://ec.europa.eu/research/era/index_en.htm

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SET-Plan:
What is it?

- The Strategic Energy Technology - Plan is a tool for implementation of EU policy to meet 2020 energy objectives and realise the vision of low carbon energy economy by 2050
  - ➔ 3x20 (GHG emissions: 20% reduction by 2020 + 80% by 2050)
  - ➔ Business As Usual is not enough – need to foster technology development in all low carbon energy
  - ➔ A range of measures & initiatives proposed, most notable are the European Industrial Initiatives (EIIs) and establishing the European Energy Research Alliance (EERA)

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SET-Plan:
What does is say about nuclear?

- Regarding key EU technology challenges for the next 10 years to meet 2020 targets:
  - ➔ *Maintain competitiveness in fission technologies, together with long-term waste management solutions*
- Regarding key EU technology challenges for the next 10 years to meet 2050 vision:
  - ➔ *Complete the preparations for the demonstration of a new generation (Gen-IV) of fission reactors for increased sustainability*
- Regarding priority initiatives to be launched from 2008 onwards (initially 6 in total):
  - ➔ *European Sustainable Nuclear Industrial Initiative focusing on development of Generation-IV technologies*

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Euratom FP7 fission & RP – *Technology Platform main objectives*

- Framework to gather stakeholders around:
  - ➔ a common "vision" for the technology concerned
  - ➔ definition of a Strategic Research Agenda, deployment and Implementation strategies
  - ➔ mobilisation of a critical mass of research and innovation effort (facilities, competences in the nuclear field)
  - ➔ Support for EU policy initiatives, SET-Plan and Energy Policies
  - ➔ A true European ERA and International cooperation

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Euratom FP7
fission & RP programme and scope of ERA initiatives

Launch event 12 Nov.09
www.igdtp.eu

IGD-TP

- Geologic… disposal
- Partitioning & Transmutation

SRA published June 09
www.snetp.eu

S N E - T P

- Adv…

Intl. workshop Sept.09
www.melodi-online.eu

MELODI

- Risk fr…
- Medic…
- Emergen… management
- other

…tructure

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SNETP
Sustainable Nuclear Energy Technology Platform

MELODI

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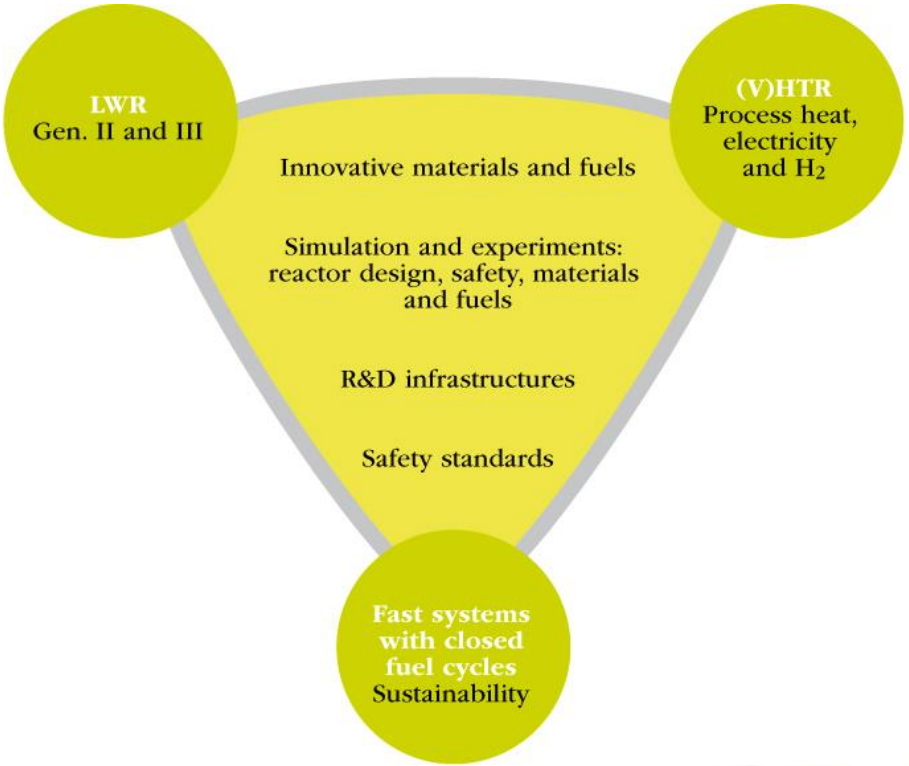
Sustainable Nuclear Energy TP

3 main pillars + key cross-cutting issues



- **Maintain safety and competitiveness of today's technologies**
- **Enlarge the nuclear fission portfolio** beyond electricity production **(H_2, synthetic fuels, petrochemical/ steelmaking/ paper/ cement industries, seawater desalination, etc.)**
- **Develop advanced reactors with** closed cycle **to enhance sustainability**

ESNII

SNETP
SUSTAINABLE NUCLEAR ENERGY TECHNOLOGY PLATFORM

ESNII = European Sustainable Nuclear Industrial Initiative

www.SNETP.eu

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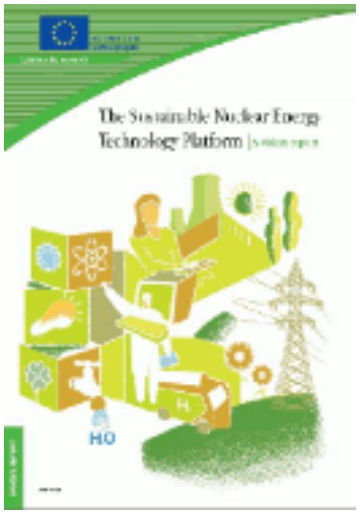
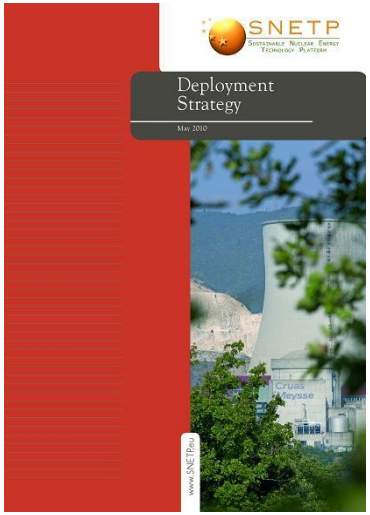
SNETP and ESNII
Strategic Documentation

- **Vision Report (September 2007)**
- **Strategic Research Agenda (May 2009)**
- **Deployment Strategy (May 2010)**
- **ESNII Concept Paper (May 2010)**
- **ESNII Implementation Plan (2010-2012)**

  ➔ ***http://www.snetp.eu/***





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Examples of major FP7 projects
safety / simulation / cross-cutting 1/2

Project acronym and title	Key areas of R&D	Coordinating organisation & no of partners*	Start date & duration	Total budget / EU contribution Scheme
ASAMPSA2 - Advanced Safety Assessment Methodologies: level 2 PSA (European Best Practices L2 PSA guidelines)	Developing best practice guidelines for severe accident probabilistic safety assessment (PSA)	IRSN (FR) **21 from 12**	1/1/08 36 months	**€2.1M / €1.5M** CSA-SA
MMOTION - Man-Machine-Organisation through Innovative Orientations for Nuclear	Analyse current and future situations concerning man-machine organisation (MMO) in nuclear power plants, as well as safety related aspects.	EDF (FR) **10 from 8**	1/01/09 24 months	**€2.4M / €1.4M** CSA
GETMAT - Gen-IV and Transmutation Materials	Development, selection, qualification, modelling, performance of Gen.IV structural materials	KIT (DE) **24 from 11**	1/2/08 60 months	**€14M / €7.5M** Large CP
NURISP - Nuclear Reactor Integrated Simulation Project	New generation of simulation tools Core Physics, Thermal-Hydraulics, Multi-Physics and more integration of the codes	CEA (FR) **22 from 14**	1/1/09 36 months	**€10.3M / €6M** Large CP

**only partners from EU MS and Euratom Associated Countries can normally receive EU funding*

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Examples of major FP7 projects
safety / simulation / cross-cutting 2/2

Project acronym and title	Key areas of R&D	Coordinating organisation & no of partners*	Start date & duration	Total budget / EU contribution Scheme
SARNET 2 – Severe Accident Research NoE 2	Common research programmes and developing common computer tools and methodologies for NPP safety assessment	IRSN (FR) **41 from 20**	1/04/09 36 months	**€38M / €5.75M** NoE
PERFORM60 - Prediction of the Effects of Radiation FOr reactor pressure vessel and in-core Materials using multi-scale modelling - 60 yrs foreseen plant lifetime	Multi-scale modelling tools to simulate the combined effects of irradiation and corrosion on the RPV	EDF (FR) **20 from 8**	01/03/09 48 months	**€13.6M / €6M** Large CP
THINS - Thermal-hydraulics of Innovative Nuclear	Cross-cutting thermal-hydraulic issues encountered in various innovative nuclear systems	KIT (DE) **24 from 13**	01/02/10 48 months	**€10M / €5.9M** Large CP

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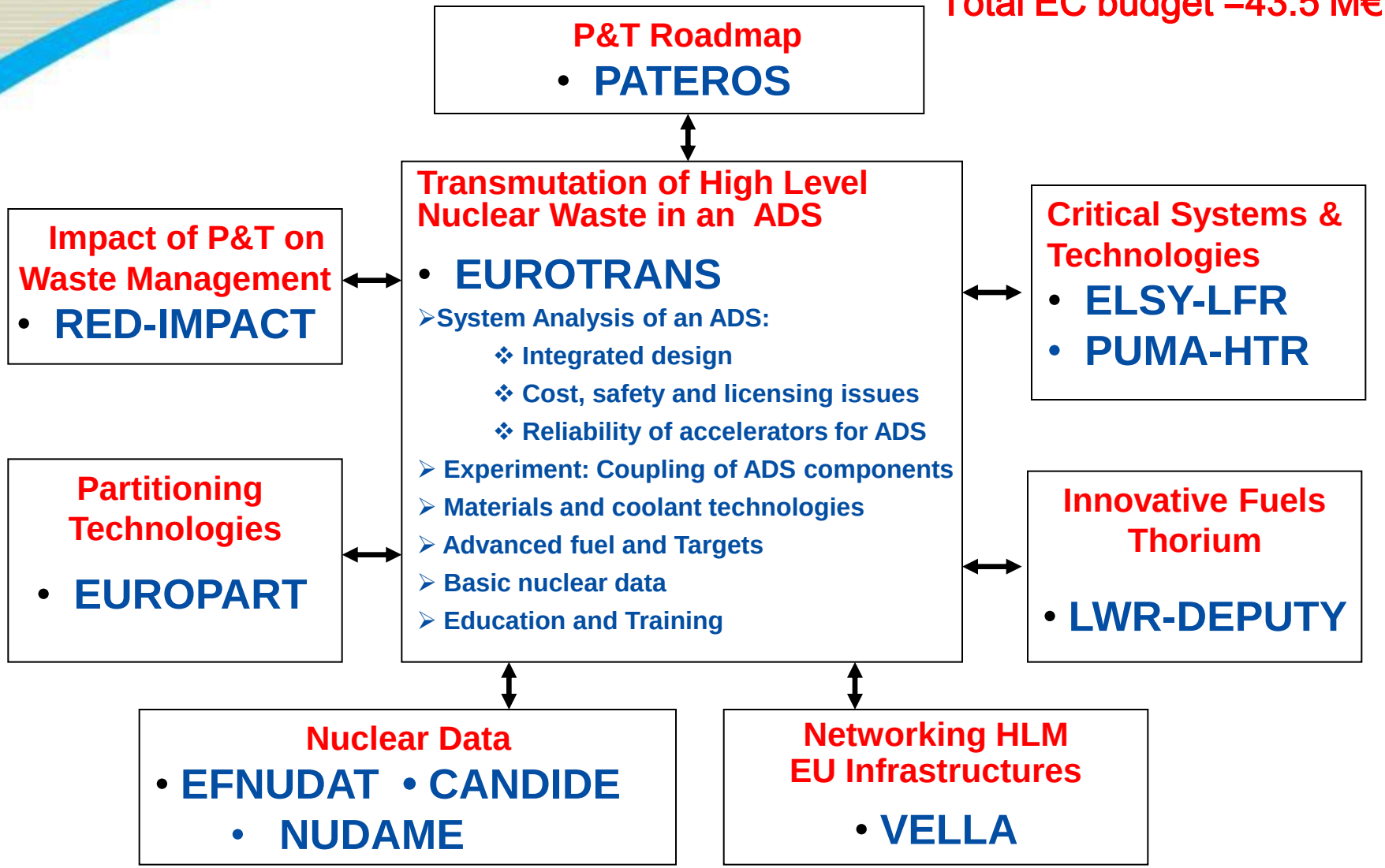
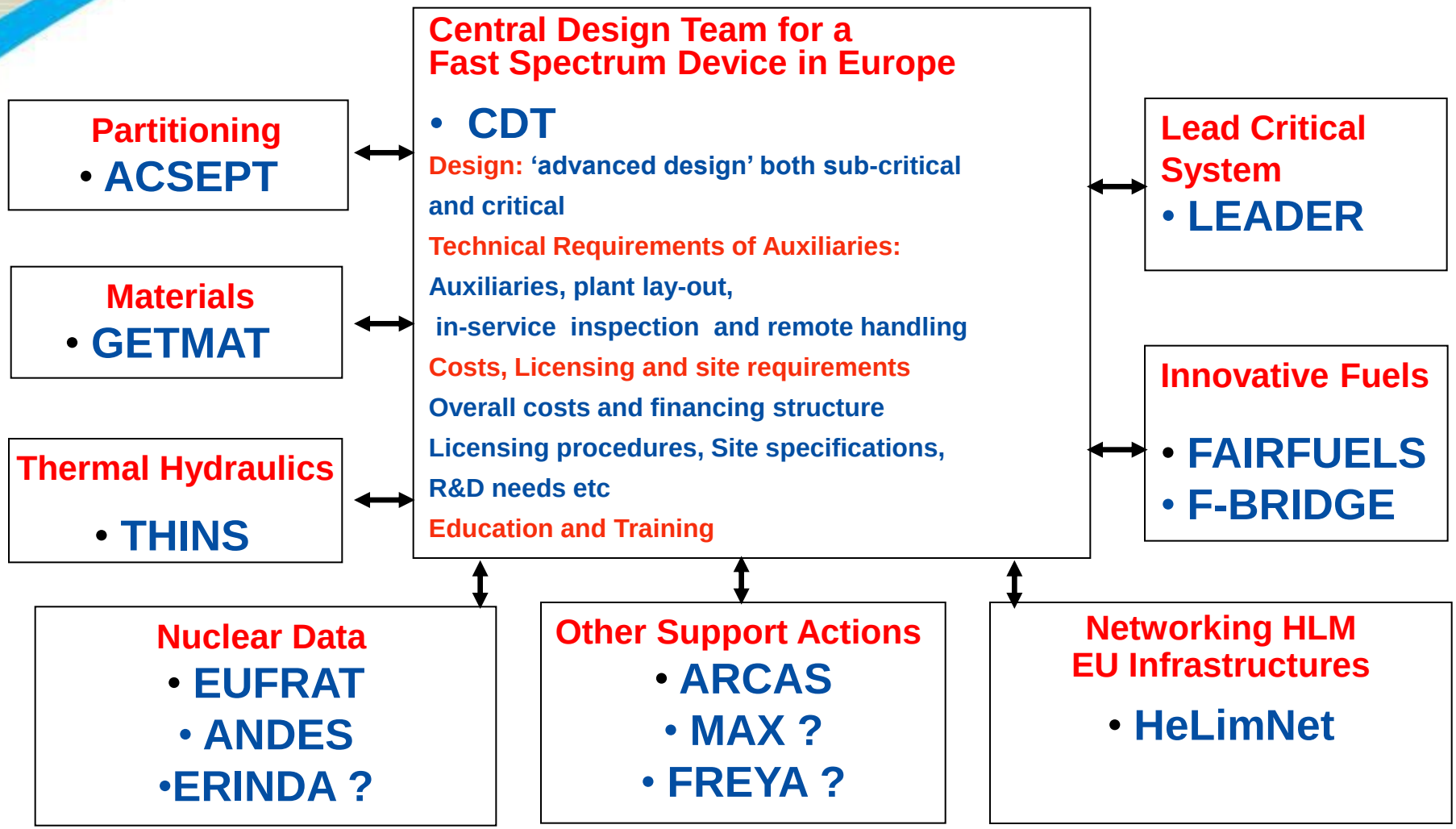
FP6 (2002-06) Projects on P&T

Total EC budget =43.5 M€



FP7 (2007-2011) Projects on P&T

Total EC budget = 40 M€



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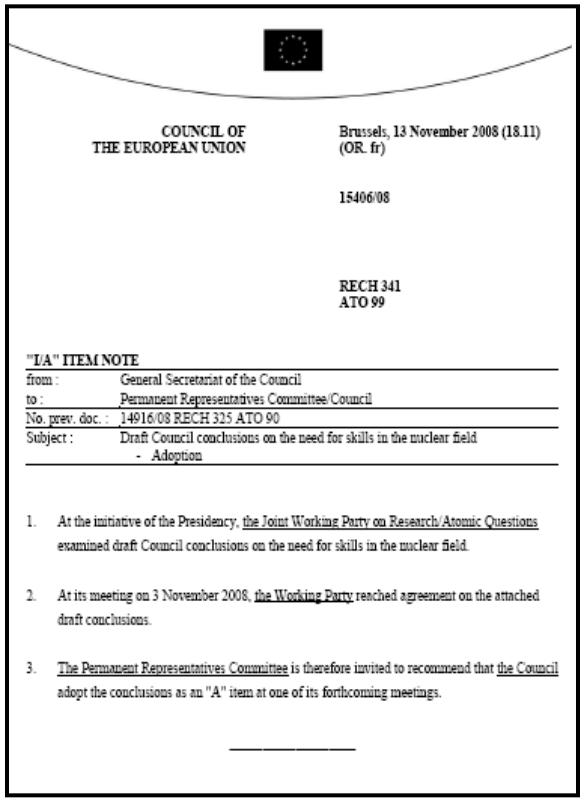
Maintaining competences
Education, Knowledge and Training

- Core aspect of the fission programme: training work packages in all major projects, EFTS – Euratom Fission Training Schemes, support for ENEN strategy



COUNCIL OF
THE EUROPEAN UNION

Brussels, 13 November 2008 (18.11)
(OR. fr)

15406/08

RECH 341
ATO 99

"I/A" ITEM NOTE

from :	General Secretariat of the Council
to :	Permanent Representatives Committee/Council
No. prev. doc. :	14916/08 RECH 325 ATO 90
Subject :	Draft Council conclusions on the need for skills in the nuclear field - Adoption

1. At the initiative of the Presidency, the Joint Working Party on Research/Atomic Questions examined draft Council conclusions on the need for skills in the nuclear field.

2. At its meeting on 3 November 2008, the Working Party reached agreement on the attached draft conclusions.

3. The Permanent Representatives Committee is therefore invited to recommend that the Council adopt the conclusions as an "A" item at one of its forthcoming meetings.

EU Council conclusions on the "need for skills in the nuclear field" (Brussels, 5 December 2008)

enen
european nuclear education network

http://www.enen-assoc.org/

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Pillar on present & future LWRs

Plant lifetime management / extension

- FP6: NULIFE Network of Excellence
  - 5 year project starting end 2006
  - Sustainable integration in PLIM and the evolution towards a NULIFE Institute with customer-driven programme
  - Utilities playing a leading role
- FP7: 2 collaborative projects
  - STYLE: non-RPV components
  - LONGLIFE: long-term embrittlement / RPV
  - … links with NULIFE & PERFORM60

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Pillar on other applications of nuclear

- FP6: RAPHAEL Integrated Project
  - ➔ *Reactor for Process Heat, Hydrogen and Electricity*
- FP7: EUROPAIRS coordination action
  - ➔ *End User Requirements for Process Heat Applications with Innovative Reactors for Sustainable Energy Supply*

Sustainability Pillar: *"European Sustainable Nuclear Industrial Initiative"* – ESNII (SET-Plan)

2008 2012 2020

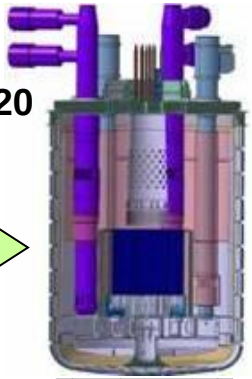
SFR **Reference (proven) technology**

LFR

Alternative technology

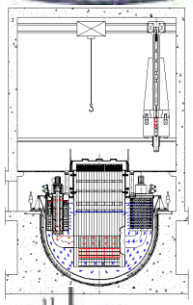
GFR

Supporting infrastructures, research facilities
loops, testing and qualification benches,
Irradiation facilities
incl. fast spectrum facility (MYRRHA)
AND **fuel manufacturing facilities**



SFR Prototype ASTRID

250-600 MWe



ETPP

EU Technology Pilot Plant MYRRHA

LFR Demo

ALLEGRO

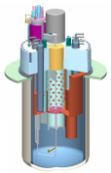
GFR Demo

- Test bed of GFR technologies
- Innovative fuel
- MA transmutation
- Coupling to heat applications

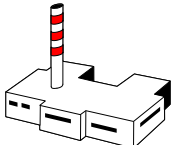
2040: Target for deployment of Gen-IV Fast Neutron Reactors

or earlier if new energy needs (electric vehicles, process heat applications)

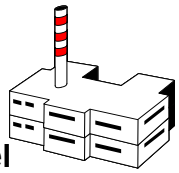
Cost: €6-10billion



XT-ADS MYRRHA



MA fuel micropilot



MOX fuel fab unit

ESNII - Advanced Reactor Systems

Aims of Gen-IV advanced reactor systems are:

- Enhanced resource utilisation
- Competitive economics (Capital & Operating Costs)
- Improved safety features (comparable/better than Gen-III)
- Waste minimisation and reduced "environmental footprint"
- Increased security, safeguarding and proliferation resistance

Technologies to be considered as part of ESNII:

- Sodium Cooled Fast Reactor (SFR) – reference system
- Lead-cooled Fast Reactor (LFR)
- Gas-cooled Fast Reactor (GFR)

- More information available at http://www.snetp.eu/
  - ➔ http://www.snetp.eu/www/snetp/images/stories/Docs-ESNI/esnii-concept-paper-2010.pdf

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ESNII budget estimations: Component costs (from Concept Paper) *NB under detailed analysis!*

- **ESNII-1:** Prototype SFR (400-600MWe – connected to grid)
  - → €1B for innovation and components development
  - → €2-4B for the construction phase (ASTRID), depending on the electrical power (250-600MWe) and technical options. Includes basic & detailed design, licensing, testing and qualification of components, construction & start up operations
- **ESNII-2:** Alternative technology LFR (€0.8-1B for MYRRHA as a Test Power Plant, included in ESNII-4)
  - → €1B for the Demonstrator (100MWe – connected to grid)
- **ESNII-3:** Alternative technology GFR (100MWth – not connected to grid)
  - → €400M for R&D activities including design activities before construction
  - → €800M for the construction phase (ALLEGRO). Includes basic and detailed design, licensing, testing & qualification of components, construction & start up operations
- **ESNII-4:** Supporting infrastructures
  - → €600M for the U-Pu fuel fabrication workshop
  - → €250-450€ for the prototype fuel fabrication workshop
  - → €1B for the fast spectrum irradiation facility (MYRRHA: 50 to 100 MWth)
  - → €600M for other experimental facilities
  - → Provision of €1B for R&D programmes performed in above facilities (equivalent to €100M/y over 10 years) to be consolidated with ESNII-1, 2 & 3

Total = €8.65-10.85B

ESNII Implementation
structure/means

- Memorandum Of Understanding signed by June 2010 by ESNII Task Force members
- Consortia around the 3 main proto/demos/pilot projects:
  - ➔ SFR: ASTRID (France – CEA)
  - ➔ LFR: Myrrha (BE – SCKCEN), demo? (IT?)
  - ➔ GFR: ALLEGRO (CZ/SK/HU? + FR, …?)
- Research infrastructures (wider geographical spread)
- Supporting research programme
- Financial contributions?
  - ➔ Deloitte Study on financing / legal options (FP 2009, ended Feb 2010), gives first indications
  - ➔ Industry contribution will be limited (20%?)
  - ➔ Host country of the facility must take the lead: currently assured for Myrrha and SFR, including funding for 2010/2012
  - ➔ EC contribution: 2010/2012 - Euratom FP7: essentially support for pre-conceptual and basic design & cross-cutting research
  - ➔ **Total estimated contribution (secured) 2010-2012: €610M**

ESNII Financial 'contributions' for 2010-12 (as of today – provisional)

- **Euratom:** FP6 & FP7 (to date):
  - ➔ All: €140M total / €70M EC contribution
  - ➔ SFR (€12M/€6M); LFR (€16M/€8M); GFR (€9M/€5M); Infra + crosscutting (€100M/€50M)
- **FR:** ASTRID SFR €265M + Infrastructures €65M
- LFR **BE:** Myrrha €40M (ESFRI process)
  IT : Demo €12M
- **CZ/SK/HU:** Allegro GFR? (ESFRI process)
  (**CZ:** loops cohesion funds – €120M)
- Interest also from **FI, SE, NL, PT, UK, CH …** ES, DE?

Total: €610M

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ESNII Planning

- SET-Plan 2007 & 2009 Communications – endorsement by EP & Council – nuclear is part of it
- 2010: launch of the EIIs – prepare for the financial perspectives
- ESNII level of readiness and planning:
  - Roadmap 2008-2009
  - Stockholm Conference Oct 2009
  - Detailed Concept Paper
  - Deloitte Study on financing / legal options (Euratom FP 2009)
  - Task Force MoU signed spring 2010
  - Detailed Implementation Plan 3-years 2010-12
  - 1st full 'ESNII Team Meeting' on 13 September 2010
  - ES SET-Plan Conference in June 2010
  - BE Conference 15-16 November 2010 – launch of ESNII
  - Refinement of Financing Plan (FP, EIB and financial perspectives)
  - Set-up of Consortia

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FP7 projects benefitting ESNII
1/2

Project acronym and title	Key areas of R&D	Coordinating organisation & no of partners*	Start date & duration	Total budget / EU contribution Scheme
ACSEPT – Actinide reCycling by SEParation and Transmutation	Advanced partitioning - chemical processes; aqueous & pyro	CEA (FR) **34 from 14**	1/3/08 48 months	**€23.79M / €9.0M** CP-IP
F-BRIDGE – Basic Research for Innovative Fuel Design for GEN IV systems	Basic research on Gen-IV fuel-cladding systems	CEA (FR) **20 from 8**	1/03/08 48 months	**€10.2M / €5.5M** CP
FAIRFUELS – FAbrication, Irradiation, Reprocessing of FUELS and targets for transmutation	Fuels an targets for partitioning, with close links to Gen-IV	NRG (NL) **11 from 6**	1/2/09 48 months	**€7.7M / €3.0M** CP-IP
CDT – Central Design Team	Design of a sub-critical or critical fast-spectrum Transmutation Experimental Facility	SCK.CEN (BE) **20 from 8**	1/4/09 36 months	**€3.85M / €2M** CP-FP
CP-ESFR – Collaborative Project on European Sodium Fast Reactor	Key viability and performance issues supporting development of a Gen-IV European SFR	CEA (FR) **24 from 9**	01/01/09 48 months	**€11M / €5.8M** CP-IP

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FP7 projects benefitting ESNII
2/2

Project acronym and title	Key areas of R&D	Coordinating organisation & no of partners*	Start date & duration	Total budget / EU contribution
GOFASTR – European Gas Cooled Fast Reactor	Key viability and performance issues supporting development of a Gen-IV European GFR	AMEC (UK) **24 from 11**	1st Q 10 36 months	**€5.3M / €3.0M**
LEADER – Lead Cooled European Advanced Demonstration Reactor	Key viability and performance issues supporting development of a Gen-IV European LFR	ANSALDO (IT) **17 from 11**	2/4/10 36 months	**€5.6M / €3.0M**
ADRIANA – Advanced Reactor Initiative And Network Arragement	Network dedicated to nuclear Industrial Inititiative ESNII Gen.IV needed research infrastructures	UJV-Rez (CZ) **15 from 6**	1/2/10 18 months	**€1.4M / €1.0M**
Deloitte Study – Financing and legal means for ESNII	Funding opportunities and legal status options for ESNII	Deloitte (SP) **1 from 1**	1/8/09 6 months	**€0.055M / €0.055M**

**only partners from EU MS and Euratom Associated Countries can normally receive EU funding*

CORDIS publication
http://cordis.europa.eu/fp7/euratom-fission/library_en.html
ftp://ftp.cordis.europa.eu/pub/fp7/docs/fin-266-euratom-web-jun09v02_en.pdf

ESNII Deloitte Study *1/4*

Deloitte.

- **Deloitte Study: Funding opportunities and legal status options for ESNII the future European Sustainable Nuclear Fission Industrial Initiative of the Strategic Energy Technology Plan**

http://cordis.europa.eu/fp7/euratom-fission/library_en.html

ftp://ftp.cordis.europa.eu/pub/fp7/euratom-fission/docs/deloitte-gen4-022010-executive-summary.pdf

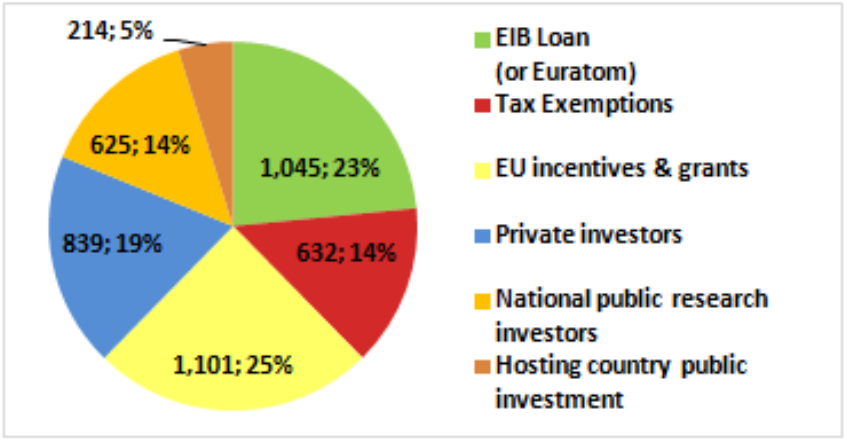
ESNII Deloitte Study 2/4
Financial sources

Source	Colour	Description	Criteria to include in the financial framework
EIB Loan (or Euratom)		Financial support provided by these institutions.	Gen-IV initiative projects results are subject to uncertainty, so this source is limited according to promoter risk profile. In any case this percentage will never exceed 25.8% of forecast project value
Tax exemptions		Exemptions of direct and/or indirect taxes due to Joint Undertaking or ERIC schemes.	Assumed that Joint Undertaking or ERIC schemes are used - represents between 14-15% of the total costs.
EU incentives & grants		Financial support provided by Cohesion Policy Funds, Framework Programme, subsidies, etc.	Cohesion funds: limited up to 35% Other subsides: according to the project characteristics and project promoters expectations.
Private investors		Amount of money supported by providers of nuclear utilities, facilities and equipments, and other private energy players.	Information provided by private investors, promoters, etc.
National public research investors		Financial support provided by national nuclear organisations and other public R&D institutions.	Information provided by national nuclear research organisations.
Hosting country public investment		Financial support dedicted to basic infrastructures co-related to the installation of a new research facility (land, civil buildings, access infrastructures, etc.)	Financial support that would be provided by national or local / regional authorities to host the projects: 5% of the budget.

This section was carried out with the collaboration of different agents, therefore being the best possible estimation in January 2010; it does not represent any financial commitment by the different project participants.

ESNII Deloitte Study *3/4*
Financial scheme SFR (600MWe)

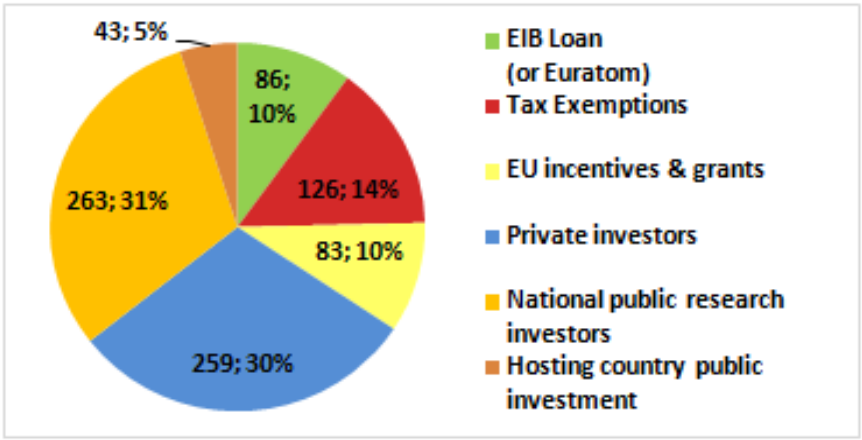
Million €	EIB Loan (or Euratom)	Tax Exemptions	EU incentives & grants	Private investors	National public research investors	Hosting country public investment
SFR 600 MWe	1,045	632	1,101	839	625	214



- Private bodies and national public research institutions each provide 20% of the funds; EIB finance 22.85% of the project
- If, during the design and construction, a joint undertaking scheme (or an ERIC) could be established according to project characteristics, then investment could be reduced (representing 14.2% of the financial support)
- A PPP agreement would be established (rights, liabilities, scope, contributions, etc.)

ESNII Deloitte Study *4/5*
Financial scheme MYRRHA (100MWth)

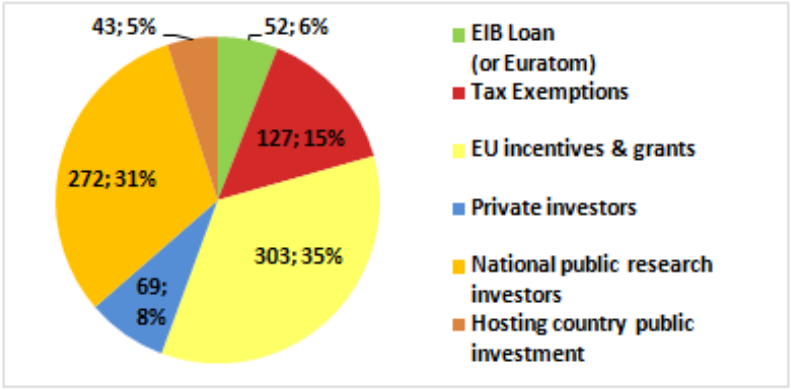
Million €	EIB Loan (or Euratom)	Tax Exemptions	EU incentives & grants	Private investors	National public research investors	Hosting country public investment
LFR ETPP 100 MWth	86	126	83	259	263	43



- National public research institutions provide 30.6% of the funds
- Private investors would finance 30.1% of the project costs
- EIB would provide funds up to 10%
- Tax exemptions (JU or ERIC schemes): 14.62%
- PPP agreement would be established (rights, liabilities, scope, contributions, etc.)

ESNII Deloitte Study *4/4*
Financial scheme GFR (100MWth) in a New Member State

Million €	EIB Loan (or Euratom)	Tax Exemptions	EU incentives & grants	Private investors	National public research investors	Hosting country public investment
GFR 100 MWth	52	127	303	69	272	43



- Project hosted in a New Member State
- Project developed in convergence region receiving Cohesion Funds providing 35% of total funds
- A Joint Undertaking scheme (or ERIC) would enable tax exemptions totalling 14-15% of the financial support
- Private investors would support 8% of the total costs & National public research institutions would provide c. 30%
- Total amount provided by EIB and private investors combined should not exceed 14% of the project costs

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ESNII

Mapping of Research Infrastructures

- NEA Research and Test facilities Database (RTFDB)
  - ➔ http://www.nea.fr/rtfdb/public
  - ➔ Report http://www.nea.fr/html/science/reports/2009/6293-Research-Test-Facilities.pdf
- ADRIANA (ADvanced Reactor Initiative And Network Arrangement) is a coordination action supported by the Euratom 7th Framework Programme, dedicated to the **mapping and gap analysis of research infrastructures** in support of the European Sustainable Nuclear Industrial Initiative: "ESNII" established under the umbrella of the Sustainable Nuclear Energy Technology Platform (SNETP).
  - ➔ http://adriana.ujv.cz/

AEN NEA Agence pour l'énergie nucléaire Nuclear Energy Agency

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Contents

- FP7 Euratom programme in nuclear fission and RP
  - ➔ Strategic, operational priorities & Implementation
- European Research Area, SET-Plan
- Technology Platforms
- Overview of principal Euratom FP6 (2003-2006) & FP7 (2007-2011) projects supporting advanced and/or Gen-IV nuclear systems, nuclear data, P&T and ESNII (European Sustainable Nuclear Industrial Initiative) and Radiation Protection
- **Transnational Activities and Research Infrastructures Impact Assessment**
- Conclusions

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What are Research Infrastructures (incl. e-infrastructures)?...

- High-level facilities, resources, and related services used by the scientific community for
  - ➔ Conducting leading-edge research
  - ➔ Knowledge transmission, knowledge exchanges and knowledge preservation
- Today Research Infrastructures include major scientific equipment, scientific collections, structured information, ICT-based infrastructures (single sited or distributed)

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EC Research Framework Programme Funding Instruments

- **Integrated Infrastructure Initiatives (FP6-I3)**
  - ➔ Networking Activities (NA) to optimise the use of the facilities and dissemination of results
  - ➔ Transnational Access Activities (TNA) for external users
  - ➔ Joint Research Activities(JRA) to raise the performance of the facilities and the efficiency of their use.
  - ➔ Continuous open call for proposals evaluated on a six months or yearly basis
- **Coordination and Support Actions (CSA-CA/SSA)**
  - ➔ Promote networking and coordination-type activities or
  - ➔ Provide support for such aspects as dissemination of programme results or pilot studies for possible future collaborative projects.
- **Networks of Excellence (NoE)**
  - ➔ Joint research, sustainable integration, and the spreading of knowledge.
- **Collaborative Projects (CP-FP/IP)**
  - ➔ R&D activities amongst European partners (e.g. industry, research institutes and organisations, and academia)

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Europe is faced with a wide spectrum of issues

- Infrastructures Globally unique to Regionally distributed
- Many stakeholders (from ministries to researchers)
- Underlying and growing use of e-infrastructures
- Opportunities but difficulties of interaction between basic research and industry…
- Lack of funding (public and private)
- Single countries do not have the critical mass or dimension → Need to cooperate…

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What can be said about quantitative evaluation of impacts of on-going actions at Community level?

- Some years of EC experience using three main criteria in evaluation of research actions:
  Excellence (E), Implementation (M), potential Impacts (I)

Is this sufficient?

- Evaluation of pertinence and impacts of FP6 RI actions (2007-2008) shows that much more work is needed…
  - ➔ **Case study findings of the RI-FP6 evaluation** 83 RI FP6 projects, covering 9 scientific areas
    - Relative prominence of different impacts to projects
    - Identified data relate mainly to scientific outputs, not so much to industrial or societal outputs…
    - No comprehensive data to determine socio-economic impacts
    - Source: http://ec.europa.eu/research/infrastructures/pdf/csri.pdf , Matrix / Ramboll report (2009)
  - ➔ Unfortunately Fission and Radiation Protection projects not covered but **most conclusions are applicable to Euratom according to today's EU representative**

Main Research questions
Objectives & Indicators 1/2

- **1. Pertinence of the RI schemes used under FP6**
  - ➔ 1.1 Were the programme objectives achieved?
  - ➔ 1.2 Was the level of funding appropriate?
  - ➔ 1.3 Were the scientific areas covered appropriate?
  - ➔ 1.4 Were the modalities for programme implementation appropriate?
- **2. Overview of the Impact that the EC actions on RIs, scientific communities and research policies**
  - ➔ What impact – planned, unexpected, unintended - have Community RI activities had on
  - ➔ 2.1 on scientific communities? 2.2 on research policy? 2.3 on the economy and industry? 2.4 on wider society?
- **3. Added value of European action**
  - ➔ 3.1 To what degree did FP6 projects lead to EAV?
  - ➔ 3.2 What would have happened if no EU funding had been provided?

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Main Research questions
Objectives & Indicators 2/2

- **4. To analyse the structuring effect of supported actions with regard to the ERA**
  - ➔ 4.1 To understand whether the FP6 support to RI is, in itself, furthering and strengthening integration of research at European level.
- **5. To provide the Commission with recommendations for further Community actions regarding RIs**
  - ➔ 5.1 Provide strategic advice about the sectors and actions that can best deliver the Commission's desired objectives.

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Key findings and impacts if networking of RIs…

- **On research effectiveness**
  - ➔ Pertinence in relation to the needs of the research community, its objectives and EC funding,
  - ➔ Generation of new standards and protocols
  - ➔ Opening to European and International users
  - ➔ Access to critically important equipment
  - ➔ Enhancement of inter-disciplinary research
  - ➔ Increased speed of end-user access
  - ➔ Improved standing and visibility of European RIs

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Key findings and Additional impacts of Community actions….

- **On the European Research Area**
  - ➔ Enable activities not possible otherwise
  - ➔ Increased involvement of researchers from New MS and improvements in RIs in NMS
  - ➔ Expand existing / new research networks
  - ➔ Develop a European spirit versus national
- **On Human Resources**
  - ➔ Access to the 'best' RI (7000 user groups)
  - ➔ Mobility of Researchers (> 30.000 people), etc.

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Lessons learnt from this impact study …

- Unfortunately there was no FP6 predefined definitions / measures according to impacts
- Definitions / measures adopted were based on "expert opinions" and feedback from Delphi method analysis
- Impacts were measured using a combination of statistical methods and qualitative data

How better to measure in the future?

- Standardised data collected across projects
- Establishing a set of indicators (data measures) for which comparable time-series data can be collected.
- Better understanding of long term impacts

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Success factors identified…

- Established User / supplier relationships: pre-existence of networks / business models is shown to be of high importance for impact generation
- Relevant expertise: mix of knowledge on socio-economic impact methodologies / relevant domains is also key to follow-up impacts studies

To analyse impacts, need for:

- Awareness and Data: retrospective analysis is only possible if data collected and retained
- Representative Case Studies and datasets

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Barriers to generation of impacts …

- Non adequate planning of work or lack of business model towards users and/or suppliers
- Non-availability or lack of Critical Mass of data
- Lack of maturity of the Discipline or its Information Use
- Imperfect or Partial Indicators / methodologies
- Non-Availability of Relevant expertise and/or Personnel

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Towards an 'eco-system' of Research Infrastructures within ERA

- a) Large single-sited facilities
- b) Distributed European Facilities
- c) Network of national facilities

Based on

- a) a consistent roadmap from the European stakeholders
- b) Strong links with universities & schools
- c) Network of industrial suppliers / users

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this is a major challenge,

not scientific but mainly political, possibly cultural...

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More work is needed !
Need to identify better the inputs!

- Not only…
  - ➔ Excellence of service provided
  - ➔ Quality of management of the facilities
  - ➔ Capacity to exploit, disseminate, train, etc.
- But also…
  - ➔ Political willingness to develop ERA
  - ➔ Critical mass (scale & scope), etc…

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Need to better identify the outputs!

- New scientific & technical knowledge
- New visions (science, society, industry)
- New way of managing organisations
- Improved research conditions within ERA
- Improved environmental conditions
- Economic gains at micro level (e.g. efficiency)
- Economic gains at macro level (regions, Europe)
- Patents, licences, spin-off companies, etc.

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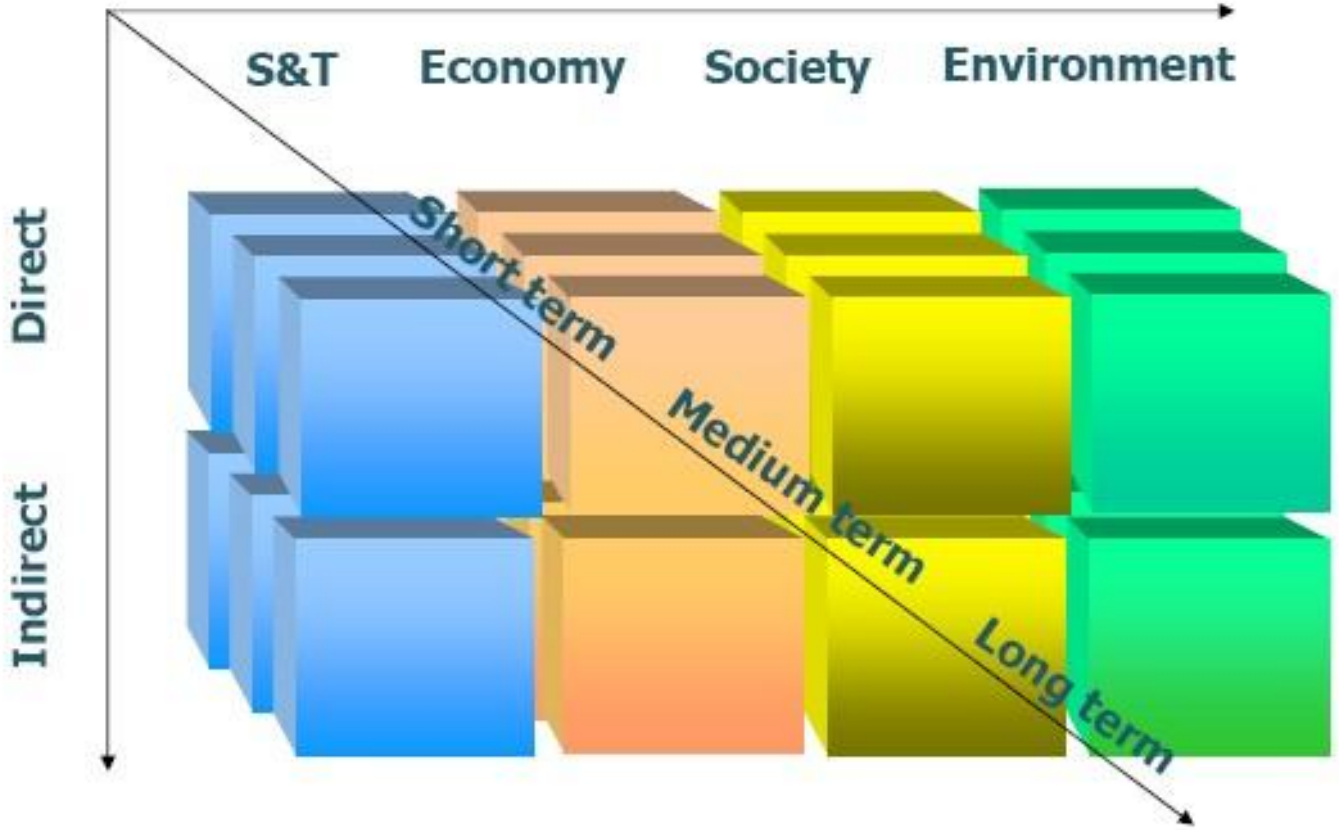
Outputs…
a three dimensional analysis (at least…) needed



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Need to characterize the overall environment!

- Overall positive environment needed to generate impacts, although inputs are present…
  - ➔ Some years of EC experience using three main criteria in evaluation of research actions: Excellence (E), Implementation (M), potential Impacts (I)
  - ➔ Stimulating Working environment (W)
  - ➔ Socially-friendly hosting environment (S)
  - ➔ Favorable Financial / eco environment (F)
  - ➔ Politically « working together » (P)

As if a theoretical equation was:

- ➔ **Impacts: function (E, M, T, W, S, F, P…)**

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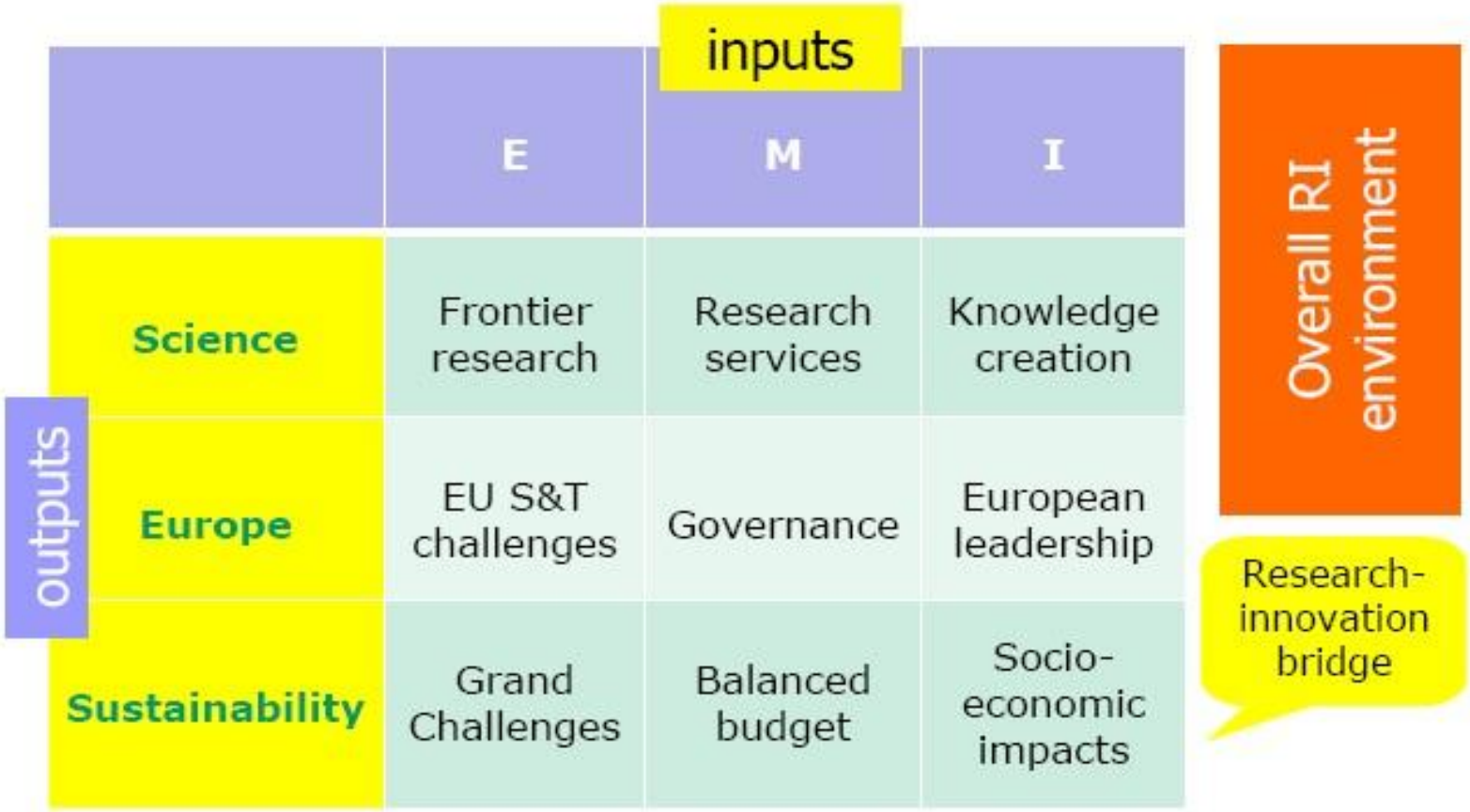
Another possible evaluation matrix to be looked at…



Conclusions *1/4*

- FP7: more strategic approach to maximise effectiveness & EU added value (->**ERA**), particularly in response to EU policy objectives, **especially energy / SET-Plan**
  - ➔ better coordination between FP, MS & industrial programmes -> TPs / JPIs established in key areas:
    - SNETP, IGDTP, MELODI
    - SRAs / Deployment Strategy / Implementation Plan
    - key R&D stakeholders, especially industry and/or end users need to be involved and commit their own resources
    - effective interaction needed with ENEF and ENSREG
  - ➔ bi & multilateral international R&D cooperation remains a priority

Conclusions *2/4*

- Tools at EU level: legislation, Forums (ENEF, ENSREG and SNETP/IGDTP/MELODI), SET Plan (implementation mechanism and financing means)
- Need to work all together EU/International and Public/Private partnerships, Nuclear renaissance?
- Financing Communication from October 2009 should be approved during 2010-2011 Council meetings
- ESNII Industrial Initiative due to be launched 15-16 November 2010 under the Belgian presidency

ENEF: EU Forum on transparencies issues, opportunities and risks of Nuclear energy gathering all relevant Stakeholders in Nuclear field (EU MS, EU institutions, European Parliaments, Nuclear industry, electricity consumers and civil society)

ENSREG: EU High Level Group on Nuclear Safety and Waste Management

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Conclusions *3/4*
2010 Eurelectric Power Choices Study

- The 2010 Eurelectric Power Choices Study (Union of the Electricity Industry at pan-European level, see http://www.eurelectric.org) is showing
  - ➔ **a decrease in global energy demand in the EU for 2050,**
  - ➔ **but an increase in electricity demand.**
- Energy Strategies 2020/2050 mention the goal of EU nuclear industry to maintain 30% of electricity share. The Eurelectric Study indeed leads to the conclusion that the % of electricity produced by nuclear in **2050 (with Light Water Reactors) should be 28% of the increased electricity demand**.
- To respect this between 150 and 200 new Nuclear Power Plants would have to be build in the EU for that time (when all existing Generation II plants will be shutdown, with 165 producing electrical power in Europe for now, 7 are under construction and others planned).

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Conclusions *4/4*
Available Links

- EU Energy research: http://ec.europa.eu/research/energy/index_en.htm
- Euratom Seventh Framework Programme: http://cordis.europa.eu/fp7/euratom/home_en.html
- Information on FP7 and access to programmes and calls: http://cordis.europa.eu/fp7/home_en.html
- Euratom Seventh Framework Programme funded projects http://cordis.europa.eu/fp7/euratom-fission/library_en.html

- CORDIS publications
  - http://cordis.europa.eu/fp6-euratom/library_en.html
  - http://cordis.europa.eu/fp7/euratom-fission/library_en.html
  - Euratom FP6 Research Projects and Training Activities, Volume I-II and III (PDF)
  - Volume I ftp://ftp.cordis.europa.eu/pub/fp6-euratom/docs/nuclear_fission_eur21228_en.pdf
  - Volume II ftp://ftp.cordis.europa.eu/pub/fp6-euratom/docs/nuclear_fission_eur21229_en.pdf
  - Volume III ftp://ftp.cordis.europa.eu/pub/fp7/docs/euratom-fission_eur22385_en.pdf
  - Euratom FP7 Research Projects and Training Activities, Volume I (PDF)
  - Volume I ftp://ftp.cordis.europa.eu/pub/fp7/docs/fin-266-euratom-web-jun09v02_en.pdf
  - Volume II To be published

- Research*eu magazine http://ec.europa.eu/research/research-eu/index_en.html
- Strategic Energy Technolog Plan SET-Plan http://ec.europa.eu/energy/technology/set_plan/set_plan_en.htm
- FISA 2009 http://cordis.europa.eu/fp7/euratom-fission/fisa2009_en.html

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Thank you for your attention!