European Commission

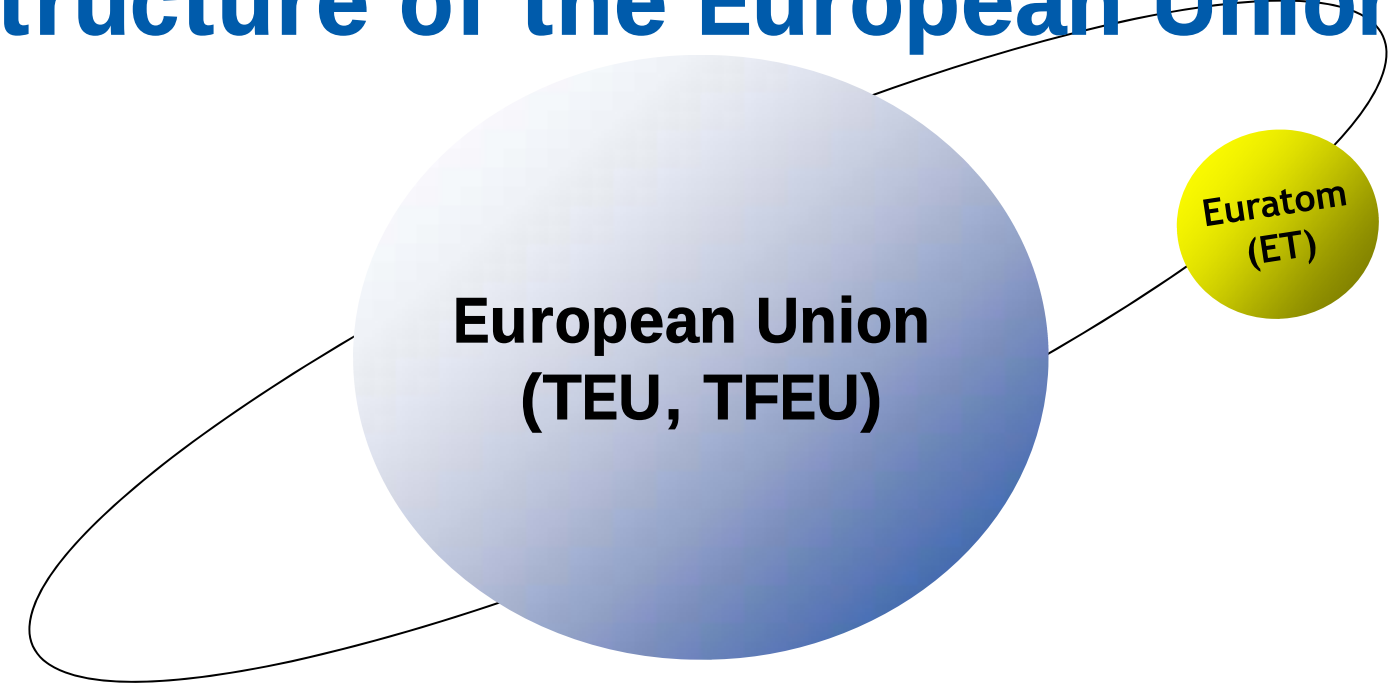
Euratom (nuclear fission) within the Energy Union (energy mix)

Georges Van Goethem
EC DG Research and Innovation / Energy / Euratom

Source: Directorate-General for Energy

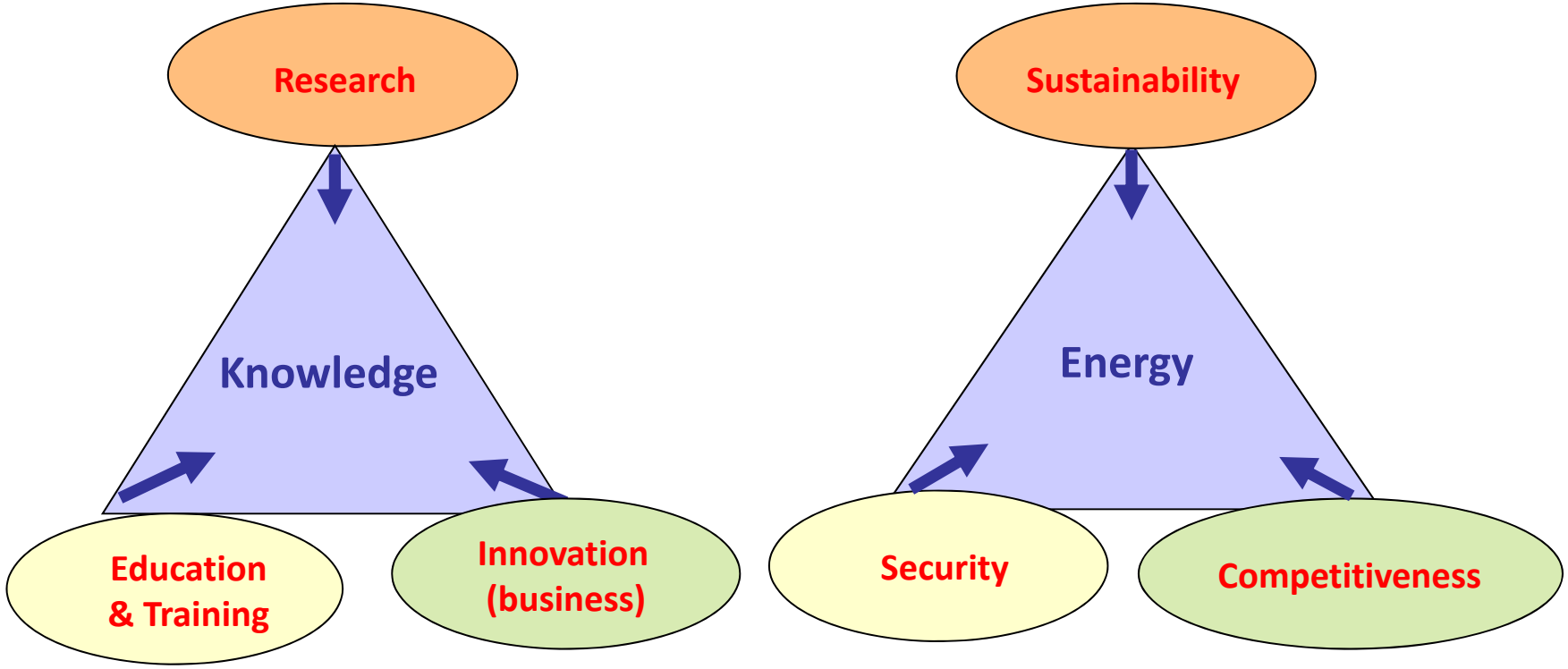
Table of Contents (focus on # 1)

Structure of the European Union



Research and Innovation in the "European Energy Union"

(J.C. Juncker Commission 2014-2019)



<= RD & DD =>

Research, Development …….. Demonstration, Deployment

<= Education (knowledge creation) ⇔ Training (competence building) =>

"*European Energy Union*" rests on five pillars, including "research, innovation and competitiveness"

« I want to reform and reorganise Europe's energy policy in a new European Energy Union. »

Jean-Claude Juncker
President of the EC
(2014 – 2019)

Source: Directorate-General for Energy

Energy in the EU: Results achieved

- Greenhouse gas emissions **fell 18 %** (1990-2011)
- **Energy efficiency** savings: 15.5 % (2013)
- Share of **Renewables**: 15.0% (2013)

to be improved:

- EU: the **largest energy importer** in the world
- **Competitiveness** of energy prices (higher than in the US)
- Internal energy market **not yet completed**
- 12 Member States still **insufficiently connected**
- **Transparency** of energy markets
- **Overdependence** on single supplier

Source: Directorate-General for Energy

European Commission

The way towards:

The Energy Union

Where we want to go:

A secure, sustainable, competitive, affordable energy for every European

What this means:

Energy security, solidarity and trust
A fully integrated internal energy market
Energy efficiency first
Transition to a long-lasting low-carbon society
An Energy Union for Research, Innovation and Competiveness

How we want to reach it:

5 GUIDING DIMENSIONS

15 CONCRETE ACTIONS

43 INITIATIVES

Source: Directorate-General for Energy

Our vision of an Energy Union

- True **solidarity and trust**; speaking with **one voice** in global affairs
- An **integrated** continent-wide energy system
- Sustainable, low-carbon and climate-friendly **economy**
- Strong, innovative and **competitive** European economy
- **Citizens** taking ownership of the energy transition

Source: Directorate-General for Energy

1 Secure supplies

5 GUIDING DIMENSIONS

We have to become less dependent on energy from outside the EU

This means increasing transparency on gas supply; diversifying sources, supplies and routes; working together on security of supply and developing a stronger European role in global energy markets.

Source: Directorate-General for Energy

2 Internal energy market

5 GUIDING DIMENSIONS

Energy should flow freely across the EU – without any technical or regulatory barriers

This means connecting markets through interconnections and implementing and upgrading the internal market's software while enhancing regional cooperation and empowering consumers.

Source: Directorate-General for Energy

3 Energy efficiency

5 GUIDING DIMENSIONS

Rethink energy efficiency as an energy source in its own right

This means increasing energy efficiency, in particular in the building sector, and promoting an energy-efficient and decarbonized transport sector as well as efficient products.

Source: Directorate-General for Energy

4 Emissions reduction

5 GUIDING DIMENSIONS

An ambitious climate policy is an integral part of our Energy Union

The next challenge will be to enforce the 2030 energy and climate framework, while becoming the number one in renewables.

Source: Directorate-General for Energy

5 Research & innovation

5 GUIDING DIMENSIONS

Developing EU technological leadership in low carbon technologies

This will reduce energy consumption, empower consumers, create huge industrial opportunities and boost growth and jobs.

Source: Directorate-General for Energy

ENERGY UNION PACKAGE (2015)

European Commission

Section 2.5. An Energy Union for Research, Innovation and Competitiveness

A new strategy for Research and Innovation must be at the very heart of the Energy Union. .... Equally, putting the EU at the forefront of smart grid and smart home technology, clean transport, as well as clean fossil fuel and the world's safest nuclear generation, is central to the aim of turning the Energy Union into a motor for growth, jobs and competitiveness.

....

– Nuclear energy presently produces nearly 30% of the EU's electricity (see *European Energy Security Strategy*, COM (2014) 330). The EU must ensure that Member States use the highest standards of safety, security, waste management and non-proliferation. The EU should also ensure that it maintains technological leadership in the nuclear domain, including through ITER, so as not to increase energy and technology dependence.

"*A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy*" - Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, the Committee of the Regions and the European Investment bank COM(2015) 80 final, Brussels, 25.2.2015
http://ec.europa.eu/priorities/energy-union/index_en.htm

Table of Contents (focus on # 2)

Euratom Treaty (1957) - 4 fields of action

- **Nuclear energy development (Including Research Activities)**
  (art. 4-11)

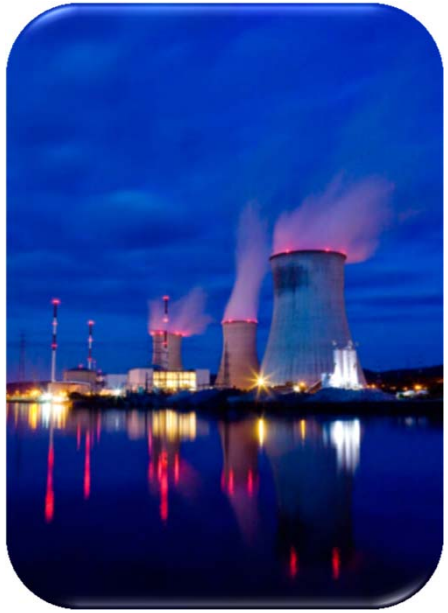
- **Health and safety**
  (art. 30-39)

- **Safeguards (Guarantees for peaceful uses)**
  (art. 77-85)

- **External relations**
  (art. 101-106)

European Nuclear Initiatives

Waste management (Dir 2011)



Radiation protection ("BSS" 2013)

Nuclear safety (Dir 2014)

Emergency preparedness & response

Waste Directive (2011)

"Objective": the establishment of a Community framework for responsible management of spent fuel and radioactive waste, ensuring that Member States make appropriate national arrangements for a high level of safety and maintain and promote public information and participation.

The scope covers only civilian activities: all stages of waste management are considered (from generation to disposal).

"General Principles":

- avoid undue burdens on future generations
- ultimate responsibility lies with the Member State
- embrace passive safety features for long term management
- the generator of the waste to bear the cost
- export under only very strict conditions.

The EC is also monitoring funding regimes in the Member States with a view to properly applying the "polluter pays" principle

"Waste Directive" - Council Directive 2011/70/Euratom of 19 July 2011 on the management of spent fuel and radioactive waste - (L 199/48 Official Journal of the European Union 2.8.2011)

Source: Directorate-General for Energy

Basic Safety Standards Directive (2013)

The BSS Directive provides:

- **better protection of workers and of the public, also taking into account economic and societal factors**
- **better protection of patients (radio-diagnosis and radio-therapy)**
- **obligations to ensure transparency (communication with undertakings and individuals)**
- **emergency preparedness and response (Section 5 – Art. 97 – 99):**
  - **establishment of national emergency management systems, including Assessment of emergency situations**
  - **requirement for the establishment of specific response plans for specific postulated events**
  - **establishment of long term strategies for existing exposure cases**
  - **improved cooperation at the international level**
  - **requirement for prompt provision of information to public**
  - **guidelines and training for the protection of emergency workers**

Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom - (L 13/31 Official Journal of the EU 17.2.2014) .

Source: Directorate-General for Energy

Revised Euratom Safety Directive (2014)

Improvements in 4 key areas:

- **introduction of a high-level "Nuclear safety objective for nuclear installations" (Article 8a – (1) new nuclear installations and (2) existing nuclear installations)**
- **instigation of topical peer reviews (significant common issues to be investigated with a view to improving nuclear safety /ENSREG/)**
- **obligations to ensure transparency of regulatory decisions and operating practices**
- **requirement for role, powers and independence of national regulators in decision making.**

⇒a major step toward achieving a common, legally binding framework and a strong nuclear safety culture

=> towards a new governance in nuclear decision making processes

Council Directive 2014/87/Euratom of 8 July 2014 amending Directive 2009/71/EURATOM establishing a Community framework for the nuclear safety of nuclear installations - (L 219/42 Official Journal of the EU 25.7.2014) (to be transposed into national legislation by 15/08/2017)

Source: Directorate-General for Energy

"Stress Tests" after the Fukushima accident (Great East Japan Earthquake, 11/03/2011)

The European Council requested on 24/25 March 2011 that the safety of all EU nuclear plants should be reviewed, on the basis of a comprehensive and transparent risk and safety assessment ("stress tests").

These "stress tests" are defined as targeted reassessments of the safety margins of nuclear power plants, developed by ENSREG, including the EC.

"Final report on the Peer Review of EU Stress Tests", 26 April 2012 - http://www.ensreg.eu/node/407

=> impact on revised "Euratom Safety Directive" (Council Directive 2014/87/Euratom 08/07/2014)

Table of Contents (focus on # 3)

Governance: openness, participation, accountability, effectiveness and coherence (1/2)

"Basic Safety Standards" (BSS) Directive (2013)

Article 77 – Transparency

"Member States shall ensure that <u>information …… is made available to undertakings, workers, members of the public</u>, as well as … …. Information shall be made available in accordance with national legislation and international obligations, provided that this does not jeopardise other interests such as, inter alia, security, recognised in national legislation or international obligations."

Source: Directorate-General for Energy

Governance: openness, participation, accountability, effectiveness and coherence (2/2)

Revised Euratom Safety Directive (2014)

- **Article 8, dedicated to "Transparency"**

"1. Member States shall ensure that necessary information in relation to nuclear safety of nuclear installations and its regulation is made available to workers and the general public, with specific consideration to local authorities, population and stakeholders in the vicinity of a nuclear installation. ……

4. Member States shall ensure that the public shall be given the appropriate opportunities to participate effectively in the decision making process relating to the licensing of nuclear installations, in accordance with relevant legislation and international obligations."

- **Chapter 2a "Peer Reviews and Guidelines" ("Stress Tests", started in March 2011): cross-border peer review (mutual assistance process involving the national regulators within the EU).**

Source: Directorate-General for Energy

Nuclear safety culture in revised Euratom Safety Directive (2014) (1/2)

"Whereas …. (19) …
"The establishment of a strong safety culture within a nuclear installation is one of the fundamental safety management principles necessary for achieving its safe operation".

Article 1 / Objectives / ***"The objectives of this Directive are: ……***
[(d) to promote and enhance nuclear safety culture]." ……
Revised Article 6 / Licence holders / "Member States shall ensure that the national framework requires that: …….. 5. licence holders establish and implement management systems which give due priority to nuclear safety [including promotion and enhancement of nuclear safety culture]."

Source: Directorate-General for Energy

Nuclear safety culture in revised Euratom Safety Directive (2014) (2/2)

"Whereas …. (18): Together with defence-in-depth, an effective <u>nuclear safety culture</u> is regarded as a fundamental factor in achieving a high level of nuclear safety and continuous improvement to nuclear safety.

Indicators for an effective nuclear safety culture include, in particular:

- ***the commitment at all levels of staff and management within an organisation to nuclear safety and its continuous improvement***
- ***the promotion of the ability of staff at all levels to question the delivery of relevant safety principles and practices …***
- ***the ability of staff to report in a timely manner on safety issues***
- ***the identification of lessons learned from operational experience***
- ***the systematic reporting of any deviation from normal operating conditions or arrangement relevant to accident management …***

=> important elements which help to achieve a strong <u>nuclear safety culture</u> include, in particular, … appropriate <u>education and training</u> …"

Source: Directorate-General for Energy

European Technological Platforms and authoritative expert associations (1/2)

The ETPs bring together the main stakeholders in nuclear fission research, namely:

- ***research organisations*** **(e.g. public and private sectors, industrial and radio-medical)**
- ***systems suppliers*** **(e.g. nuclear vendors, engineering companies, medical equipment)**
- ***energy providers*** **(e.g. electrical utilities, co-generation plants for process heat)**
- ***nuclear regulatory authorities*** **and associated technical safety organizations (TSO)**
- ***higher education and training institutions*****, in particular universities**
- ***civil society*** **(e.g. policy makers and opinion leaders), interest groups and NGOs.**

⇒common approach within the main areas of Euratom research and training programmes, i.e.

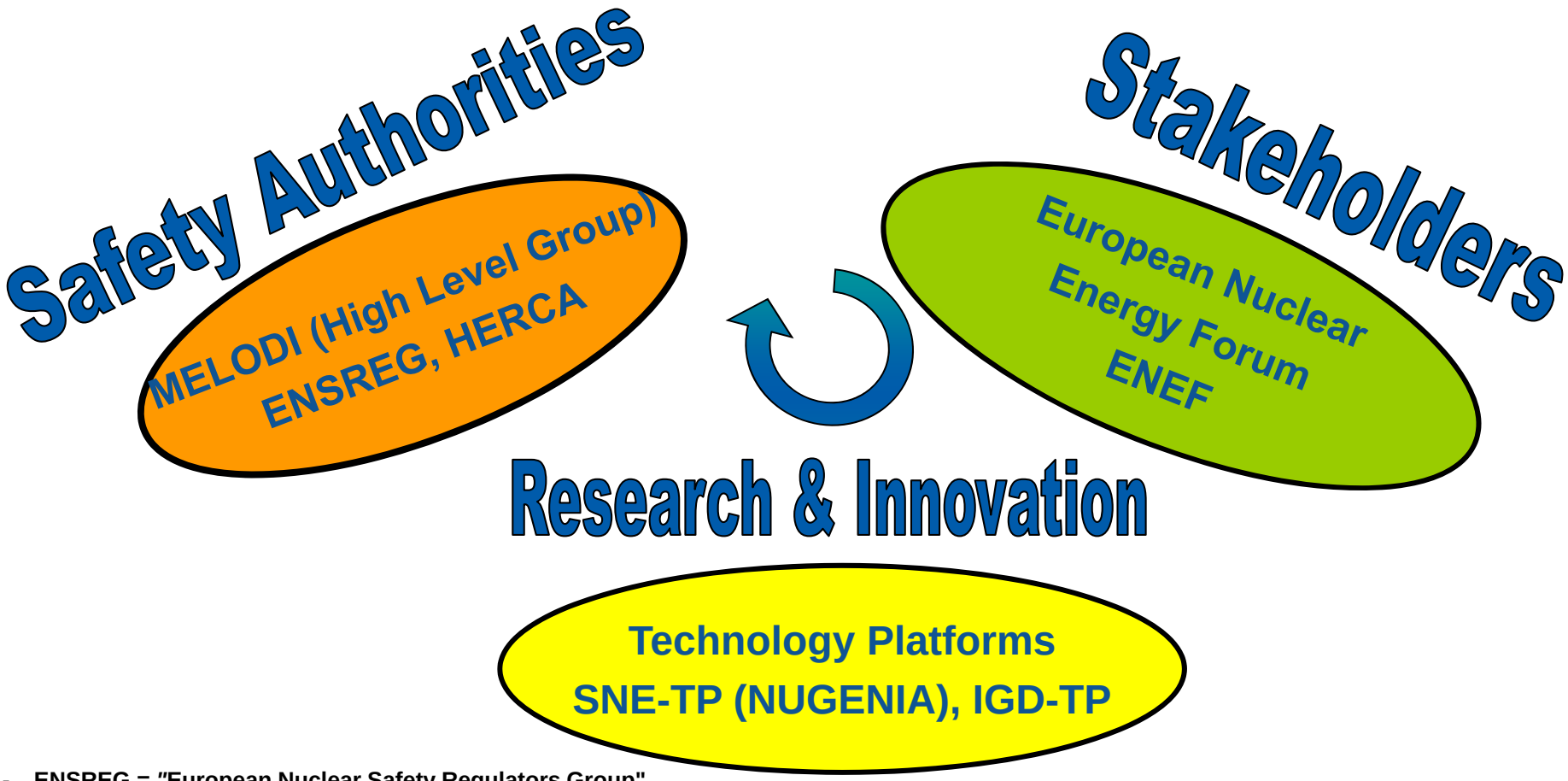
(1) Safe operation of reactor systems

(2) Management of ultimate radioactive waste

(3) Radiation protection, including medical applications of ionising radiation.

⇒guidance documents produced by ETPs:
"Vision Report", "Strategic Research and Innovation Agenda" and "Deployment Strategy".

European Technological Platforms and authoritative expert associations (2/2)



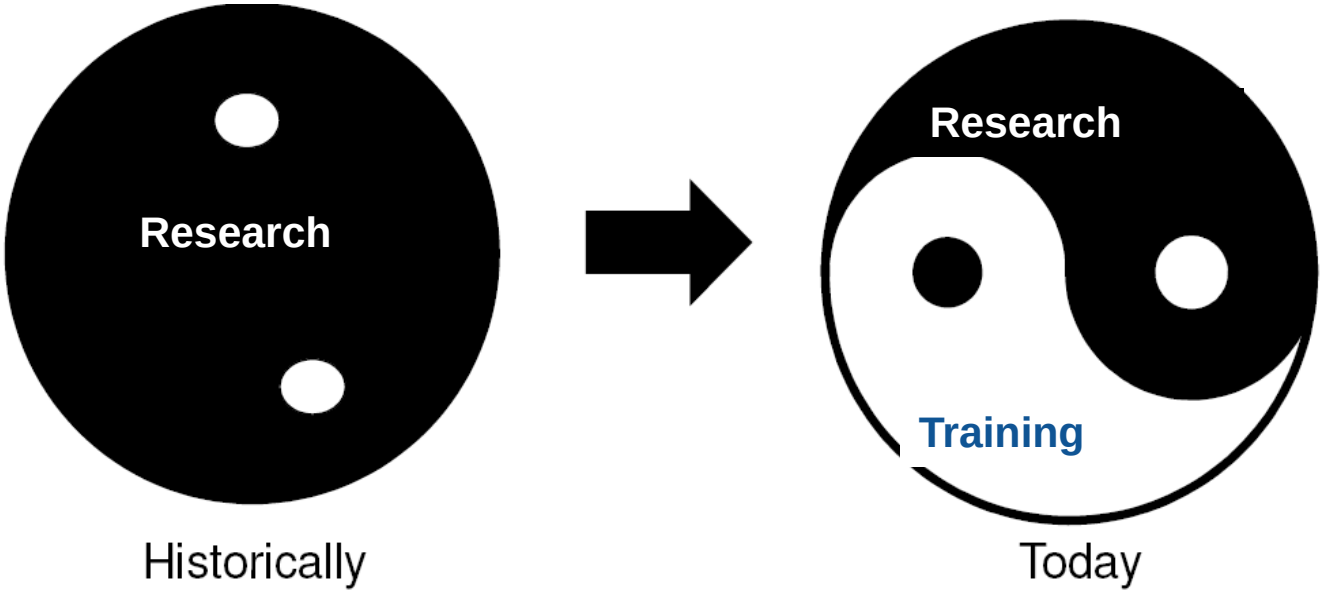
- ENSREG = "European Nuclear Safety Regulators Group" http://ec.europa.eu/energy/nuclear/ensreg/ensreg_en.htm
- HERCA = "Heads of European Radiological Protection Competent Authorities" - http://www.herca.org/index.asp
- MELODI = "Multidisciplinary European Low Dose Initiative" http://www.melodi-online.eu/

- ENEF = "European Nuclear Energy Forum" http://ec.europa.eu/energy/nuclear/forum/forum_en.htm

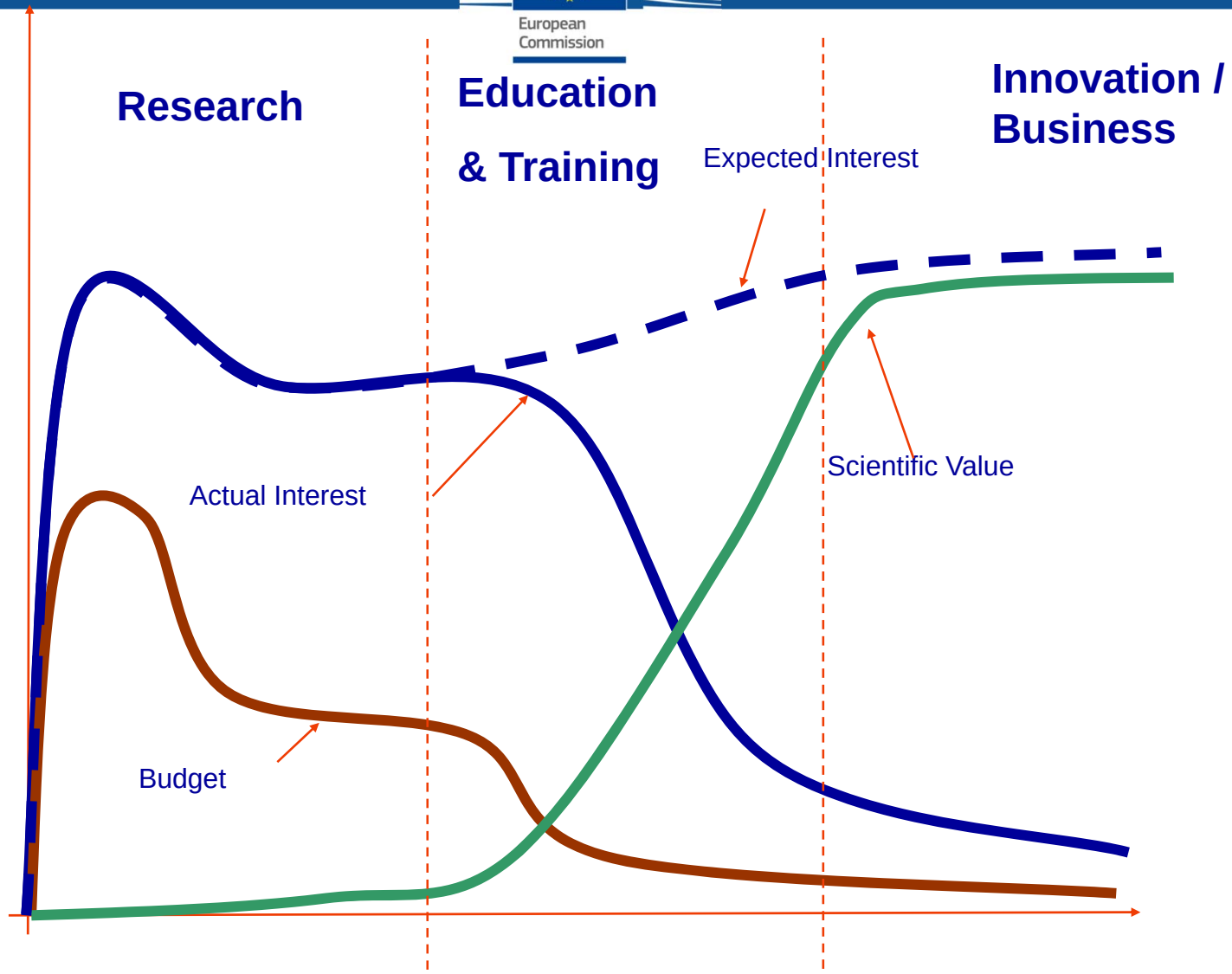
- SNE-TP = "Sustainable Nuclear Energy Technology Platform" - http://www.snetp.eu/
- NUGENIA = "NUclear GENeration II & III Association - http://www.nugenia.org/
- IGD-TP = "Implementing Geological Disposal of Radioactive waste" - http://www.igdtp.eu/

Table of Contents (focus on # 4)

Research and Training (R&T): together since Euratom Treaty (1957)



Euratom Treaty (1957), legal framework for research and training programmes
Title II, chapter 1: Promotion of Research
Article 7:"Community research and training programmes shall be determined by the Council, acting unanimously on a proposal from the Commission, …"



Knowledge Triangle - Knowledge cycle management

EU research - the story so far

European Commission

- 1957: Euratom Treaty
  - Concept of Community Research programmes
  - Joint Research Centre established
- 1984: 1st Framework Programme (1984-1987)
- 1987: 'Single European Act'
  - Science becomes a Community responsibility
  - 2nd Framework Programme (1987-1991)
- 1990: 3rd Framework Programme (1990-1994)
- 1992: Treaty on European Union
  - Role of RTD in the enlarged EU
- 1994: 4th Framework Programme (1994-1998)
- 1998: 5th Framework Programme (1998-2002)
- 2000: European Research Area (ERA) launched
- 2002: 6th Framework Programme (2002-2006)
- 2006: 7th Framework Programme (2007-2013)
  - EC Framework Programme (2007-2013)
  - Euratom Framework Programme **'FP7'** (2007-2011)
- 2011: Euratom Framework Programme **'FP7+2'** (2012-2013)
- 2013: Horizon 2020 (2014-2020) & Euratom programme (2014-2018)

Nuclear competences and skills + Education and Training (E&T) in the Directives

- **Waste Directive (2011)**

Article 8 "Expertise and skills

"***Member States shall ensure that the national framework requires all parties to make arrangements for education and training for their staff, as well as research and development activities to cover the needs of the national programme for spent fuel and radioactive waste management in order to obtain, maintain and to further develop necessary expertise and skills.***"

- **Revised Safety Directive (2014)**

Article 7 "Expertise and skills in nuclear safety"

".... in order to obtain, maintain and to further develop expertise and skills in nuclear safety and on-site emergency preparedness."

- **Basic Safety Standards Directive (2013)**

=> "Member States to have systems in place for the education, training and recognition of specific experts"(RPE, MPE, RPO)

Chapter IV on E&T&I: "*Requirements for Radiation Protection Education, Training and Information*" and Chapter IX: "*Requirements for regulatory control*"

Source: Directorate-General for Energy

European Commission

"EUROPEAN HUMAN RESOURCE OBSERVATORY IN THE NUCLEAR ENERGY SECTOR"

(http://ehron.jrc.ec.europa.eu/)

EHRO-N

Institute for Energy and Transport

1ST SITUATION REPORT ON EDUCATION AND TRAINING IN THE NUCLEAR ENERGY FIELD IN THE EU (COM(2011) 563, BRUSSELS, 16.9.2011)

http://ec.europa.eu/energy/nuclear/safety/doc/com_2011_0563_en.pdf

"**EHRO-N** is therefore the initiative to fill this gap, especially as it can provide a continuous monitoring and scanning of future challenges. **EHRO-N will be the central information source** for all stakeholders in the EU interested in the optimisation and rounding up of the initiatives taken. Member States are therefore invited to fully support the Commission in developing this promising tool."

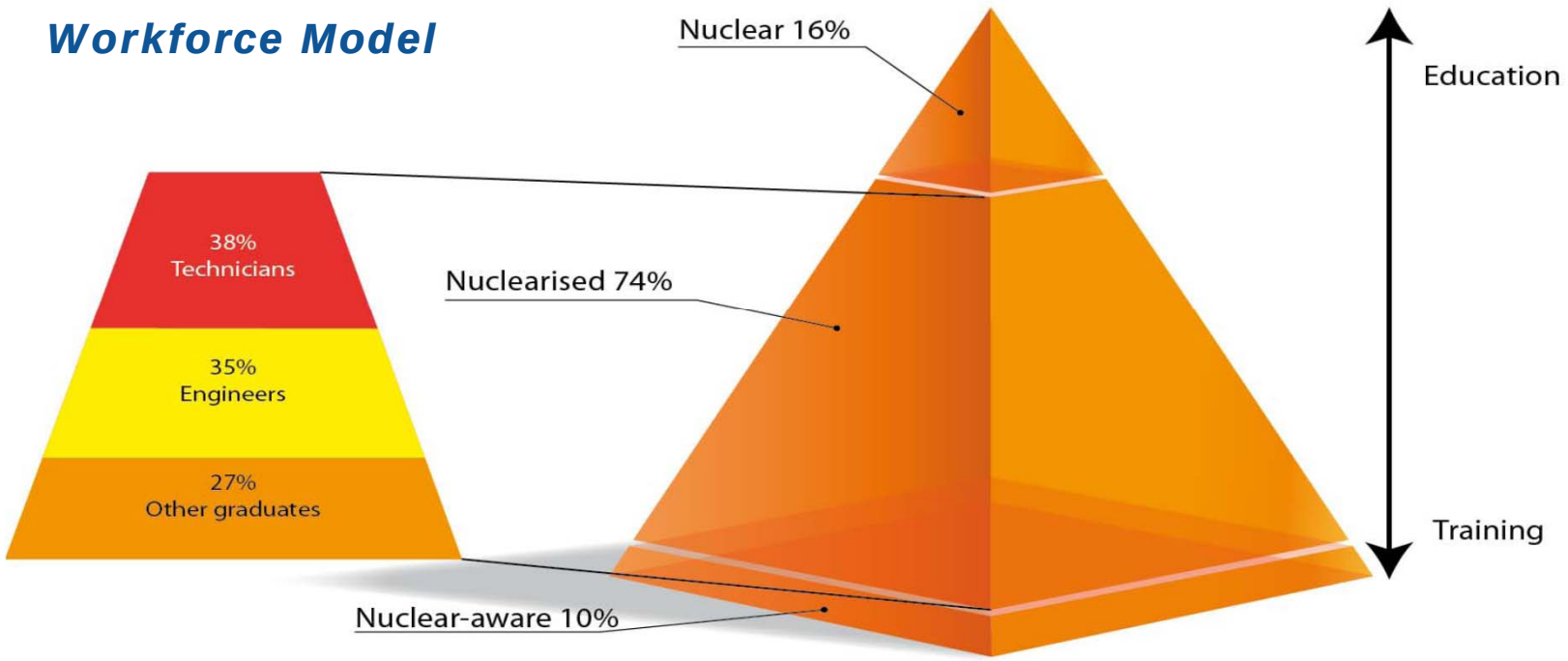
=> follow-up: The "*Second Situation Report on Education and Training in the Nuclear Energy Field in the EU*" was published as a «Commission Staff Working Document» on 3 October 2014 (Brussels, SWD(2014) 299 final / 13874/14)

=> First EHRO-N report on the supply and demand for nuclear experts for the present and future nuclear projects in the EU by 2020 (analysis done on data received from spring 2010 to spring 2011).
"PUTTING INTO PERSPECTIVE THE SUPPLY OF AND DEMAND FOR NUCLEAR EXPERTS BY 2020 WITHIN THE EU-27 NUCLEAR ENERGY SECTOR", April 2012, EHRO-N report, JRC-IET, EUR 25291 EN

European Commission

Competence Pyramid
Hypothetical graphical representation of the nuclear energy sector in the EU-28 by type of employees

Workforce Model



SOURCE: "EUROPEAN HUMAN RESOURCE OBSERVATORY IN THE NUCLEAR ENERGY SECTOR" - HTTP://EHRON.JRC.EC.EUROPA.EU/

Euratom Programme

Budget 2014-18

Euratom Programme (2014-18) complementing Horizon-2020

→ **Council Regulation of 16 December 2013**

Indirect actions
DG-RTD

Fusion R&D Programme

€ 728 million
(45 %)

Indirect actions
DG-RTD

Nuclear Fission, Safety and Radiation Protection

€ 315 million
(20 %)

Direct actions
JRC

Nuclear Safety and Security

€ 560 million
(35 %)

Total budget: € 1603 million

→ **Council Decision of 13 December 2013**

European joint undertaking for ITER (called "Fusion for Energy")
ITER (2014-2020): € 2915 million in current values (outside H2020)

Table of Contents (focus on # 5)

Conclusion

- improve continually sustainability, safety & reliability, socio-economics and proliferation resistance of nuclear installations

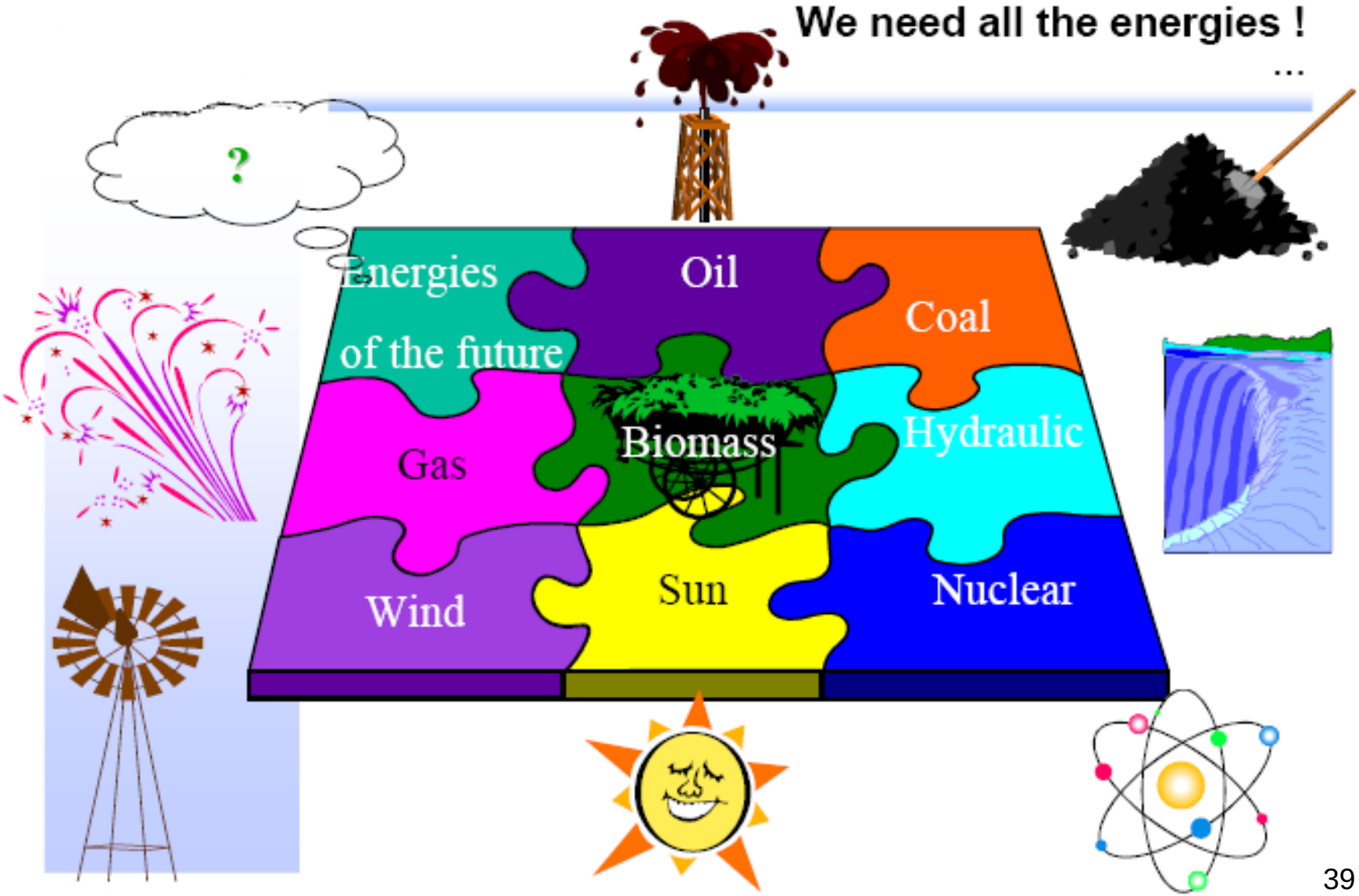
- contribute to the creation and transfer not only of *knowledge* but also of *skills* and *competences* (with emphasis on safety culture)

- ensure scientific and technological excellence in all parts of the EU, thereby attracting new generations to nuclear fission experts

=> a new way of "developing / teaching science" aiming at continuously improving policies related to nuclear fission and radiation protection

MORE SCIENCE BASED POLICIES

We need all the energies !



European Commission

Thank you

ありがとう

Information on Nuclear Energy / Safe nuclear power (EC DG ENER)

Nuclear safety; Radioactive waste and spent fuel; Radiation protection; Decommissioning of nuclear facilities; Safeguards to avoid misuse:

- http://ec.europa.eu/energy/en/topics/nuclear-energy

Information on Horizon-2020 Framework Programme (EC DG RTD) and access to RTD programmes and calls:

- http://ec.europa.eu/programmes/horizon2020/en/ (non-nuclear part)
- http://ec.europa.eu/programmes/horizon2020/en/h2020-section/euratom

Research & Innovation

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 http://ec.europa.eu/research/energy/pdf/euratom-fp7-vol-2.pdf
  - Volume III http://ec.europa.eu/research/energy/euratom/publications/pdf/euratom_fp7_research_&_training_projects_volume_3.pdf

- 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
- Financial Framework 2014 – 2020 "Horizon 2020"
- http://ec.europa.eu/budget/reform/index_en.htm
- http://ec.europa.eu/budget/biblio/documents/fin_fwk1420/fin_fwk1420_en.cfm
- http://ec.europa.eu/research/horizon2020/index_en.cfm
- 2013 Symposium on 'Nuclear Fission research for a low carbon economy'
  - http://www.eesc.europa.eu/?i=portal.en.events-and-activities-symposium-on-nuclear-fission
- FISA 2013 and Euradwaste'13 http://cordis.europa.eu/fp7/euratom-fission/fisa-euradwaste-2013_en.html

Source: Dr Makoto Akashi, National Institute of Radiological Sciences, Chiba, Japan (HRD int'l Conf, 27 Febr 2012, Bangkok)