



EUROPEAN COMMISSION

Directorate-General for Energy and Transport  
Directorate Nuclear Energy



# ***Perspectives on Nuclear Safety***

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# Contents



- ✧ European Energy Policy & Nuclear Energy
- ✧ Current Actions on Community Level
- ✧ “Environment”:
  - ✧ Industry actions (investments ↔ safety)
  - ✧ Public perception
- ✧ Sustainability of Investment Notifications
  - ✧ Art. 41-44 Euratom Treaty



## ❖ European Energy Policy & Nuclear Energy



- ✧ **Energy (coal & nuclear) right at the beginning !**
  - ✧ 1952 Treaty of Paris: ECSC (50y) → EC(2002)
    - ✧ Common program of production/consumption
  - ✧ **1957** Treaties of Rome: EEC + **EAEC(Euratom)**
  - ✧ 1967: EEC + Euratom merged, 1992 Maastricht: EC/EU
  
- ✧ **Euratom Treaty:**
  - ✧ to promote research & info dissemination ( →JRC, FPs)
  - ✧ to establish uniform safety standards to protect health of workers and general public and ensure that they are applied
  - ✧ to facilitate investment and ensure the establishment of the basic installations necessary for the development of nuclear energy in the EU
  - ✧ to ensure that all users in the EU receive a regular and equitable supply of ores and nuclear fuels ( →ESA)
  - ✧ to make certain that civil nuclear materials are not diverted to other (particularly military) purposes ( →Safeguards (EU: Euratom+IAEA))
  - ✧ to establish joint undertakings ( →ITER)
  - ✧ to exercise right of ownership with respect to special fissile materials
  - ✧ to foster progress in the peaceful uses of nuclear energy by working with other countries and international organisations



**Key driver for „Nuclear Renaissance“  
at EU Level:  
STRATEGIC OBJECTIVE TO REDUCE GHG  
EMISSIONS**

✧ **March 2007 European Summit:**

**“LIMITING GLOBAL CLIMATE CHANGE TO 2°C:  
*The way ahead for the EU and the World for 2020 and  
beyond*”**

**“20–20–20“ strategy → «low-carbon energy economy»**

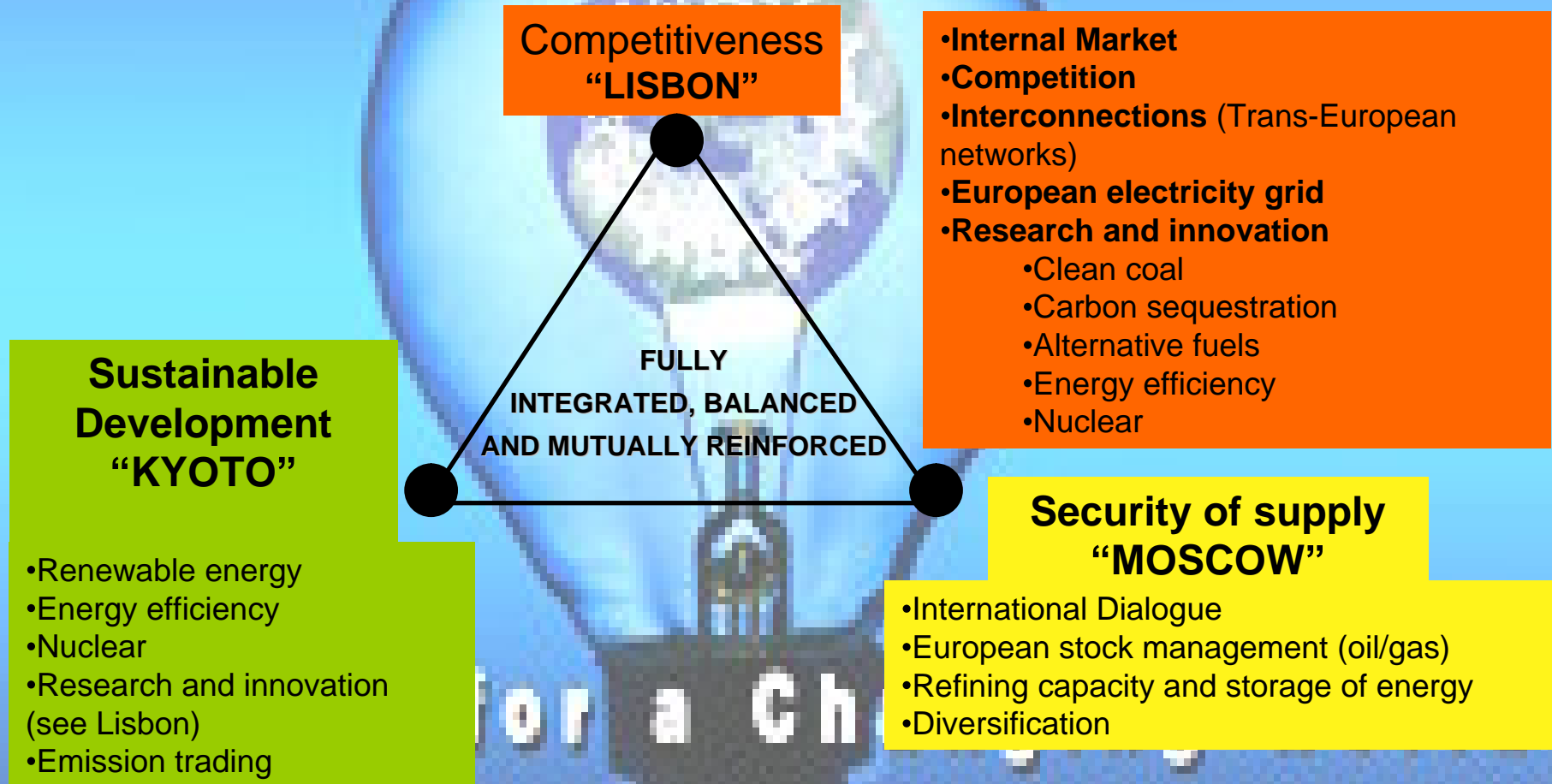


## Six Priority areas for Action in the EU

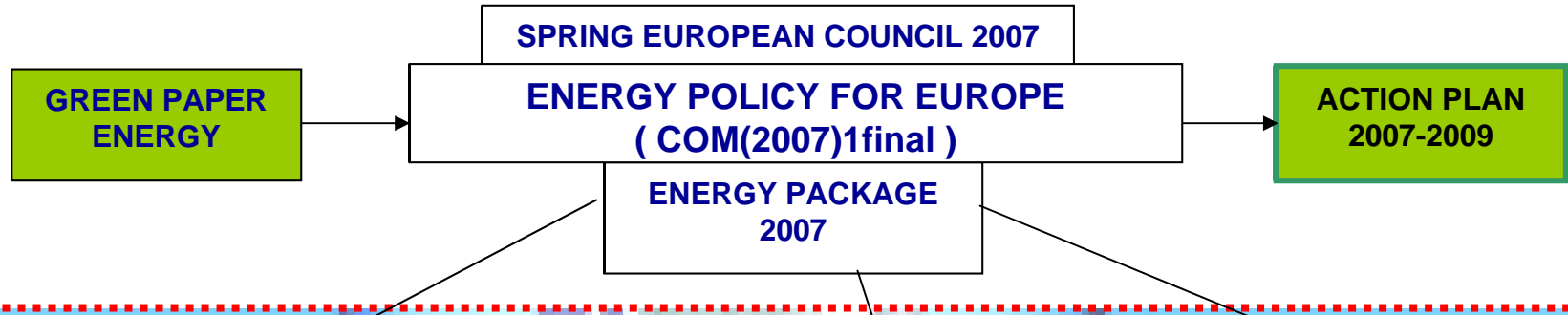
- ❖ Growth and job creation: complete the internal market
- ❖ **Security of supply**: ensure solidarity among Member States
- ❖ **Economic Competitiveness**: maintain sustainability, efficiency and diversification
- ❖ **Climate change**: further develop the Emission Trading Schemes
- ❖ Innovation: focus research and means on strategic plan (EIT)
- ❖ External policy: stimulate partnership, dialogue, replications, integration



# Energy Policy for Europe – The Three Challenges



# ENERGY POLICY FOR EUROPE (EPE)



## SUSTAINABILITY AND LOW-CARBON ECONOMY

RENEWABLE ENERGY ROAD MAP

HEATING AND COOLING FROM RES

BIOFUELS

RES ELECTRICITY

ENERGY EFFICIENCY ACTION PLAN (19 OCT 2006)

SUSTAINABLE COAL TECHNOLOGIES

ILLUSTRATIVE NUCLEAR PROGRAMME (PINC)

## INTERNAL MARKET

SECTOR INQUIRY

REPORT ON FUNCTIONING OF INTERNAL MARKET

PRIORITY INTERCONNECTION PLAN

## EXTERNAL RELATIONS

JOINT COMMISSION/HR /COUNCIL JUNE PAPER AND COM PAPER OCT 2006

NEGOTIATION MANDATE FOR NEW AGREEMENT WITH RUSSIA

DIALOGUE WITH PRODUCERS: OPEC-NORWAY-GCC-ALGERIA-CASPIAN BASIN (BAKU PROCESS)

DIALOGUE WITH CONSUMERS: CHINA, US, INDIA, JAPAN

THE R&D 7<sup>TH</sup> FRAMEWORK PROGRAMME → STRATEGIC ENERGY TECHNOLOGY PLAN (2007)



## Purpose & Legal Basis of COM(2006) 844 final (PINC), published in January 2007



### **1957 Euratom Treaty – Article 40**

- ❖ **To stimulate actions by persons, undertakings and facilitate co-ordinated development of their investments in the nuclear field.**
- ❖ **Commission shall periodically publish illustrative programmes (4+1 published, last one in 1997)**
- ❖ **Indicates, in particular, nuclear energy production targets and all types of investments required for attainment.**
- ❖ **Opinion of Economic and Social Committee required before publication.**



## Aim of COM(2006) 844 final – PINC, published in January 2007



- ✧ **Provide an overview of status of the nuclear power industry – A factual analysis.**
- ✧ **Steer the Energy Review's evaluation of nuclear power as part of future energy mix**
- ✧ **To evaluate whether nuclear energy is competitive and sustainable?**



## COM(2007) 1 final - An Energy policy for Europe – (3.8 Future of Nuclear), corresponding to PINC conclusions



- ✧ **Nuclear power has major role to play in the fight against climate change.**
- ✧ **Nuclear is one of the largest and cheapest low-carbon energy sources in the EU.**
- ✧ **Nuclear power is less vulnerable to price changes in cost of primary fuel source, reduces import requirements and mitigates security of supply concerns.**
- ✧ **Decision on use of nuclear power rests with individual Member States.**
- ✧ **Commission to draw up new nuclear energy framework – priority on nuclear safety, decommissioning and waste management.**



## ❖ Current Actions on Community Level



# ACTIONS ON COMMUNITY LEVEL



1. Commission Recommendation on Decommissioning (2006/851/Euratom)
2. Council Conclusions – High Level Group (HLG)
3. European Summit – Nuclear FORUM
4. Euratom FP7



# 1. RECOMMENDATION ON DECOMMISSIONING FINANCING



## 20 Recommendations

- Majority “best practices”
- Principles:
  - **(1) Adequacy, (2) Availability**
  - **(3) Transparency, (4) Use**
- “Polluter pays”
- Safety: main focus
- Dismantling & waste management
- Segregated funds internal or external
- Special historical cases (case-by-case basis, transparency!)



# 1. RECOMMENDATION ON DECOMMISSIONING FINANCING



Accession Treaties' spirit for nuclear energy was already commensurate with EPE:

=> Commitment for definitive closure of

- ✧ Ignalina 1 (2004), 2 (2009)
- ✧ Bohunice V1 2006 (unit 1), 2008 (unit 2)
- ✧ Kozloduy 1-4 (2002/2006)



## ✧ Solidarity of EU for closure commitment

| <b>Financial support to the Member States (million €*)</b> |                  |                  |   |              |
|--|------------------|------------------|---|--------------|
| <b>Country</b>   | <b>1999-2003</b> | <b>2004-2006</b> | <b>2007-2013<br/>(2007-2009 for BU)</b> | <b>Total</b> |
| <b>Lithuania</b>   | <b>210</b>       | <b>319</b>       | <b>837</b>                              | <b>1366</b>  |
| <b>Slovakia</b>  | <b>90</b>        | <b>101</b>       | <b>423</b>                              | <b>614</b>   |
| <b>Bulgaria</b>  | <b>155</b>       | <b>185</b>       | <b>210</b>                              | <b>550</b>   |
| <b>Total</b>   | <b>455</b>       | <b>605</b>       | <b>1470</b>                             | <b>2530</b>  |

**BU: up to 2009**



## 2. COUNCIL CONCLUSIONS

(8 May 07)

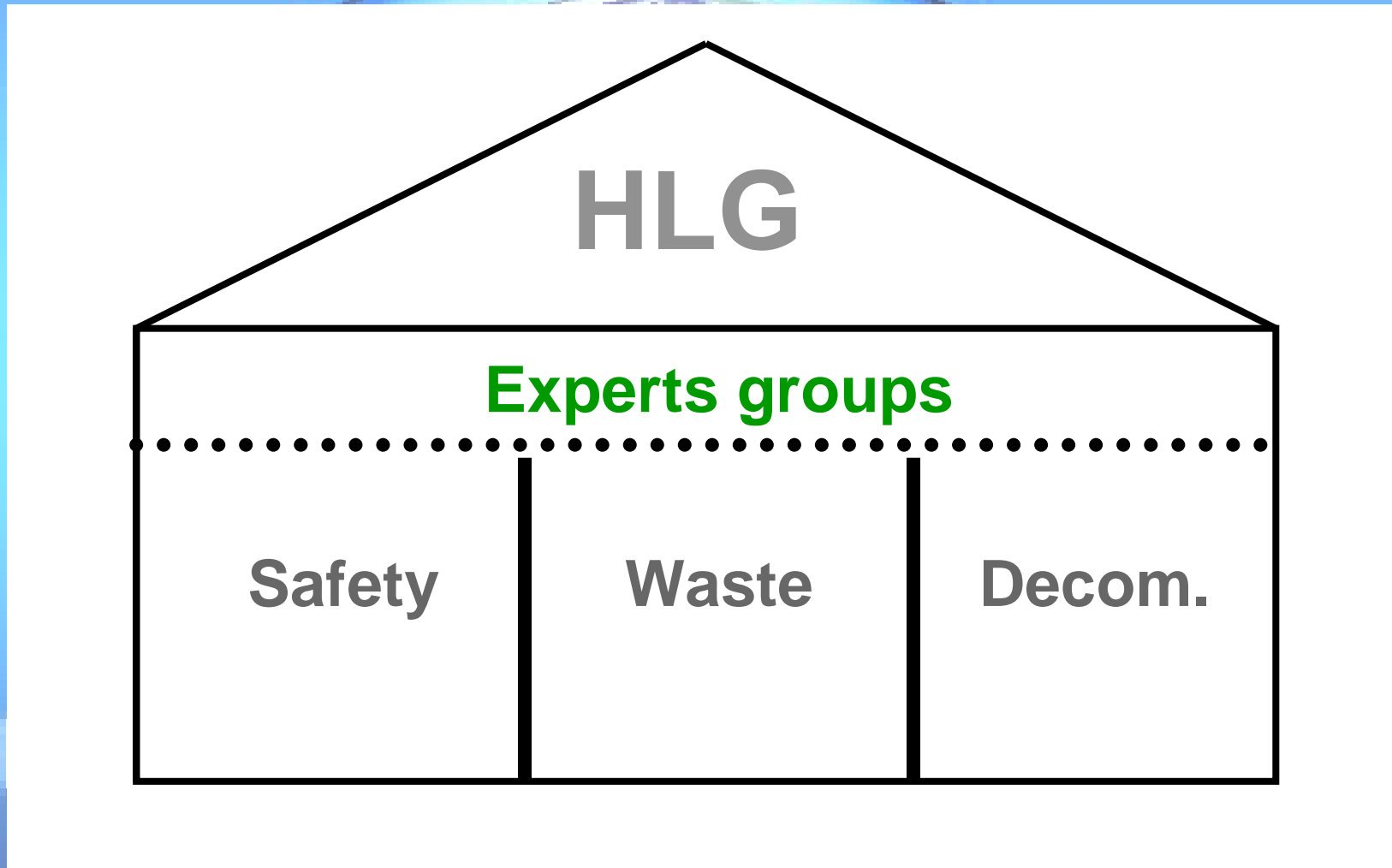


- Importance of further improving nuclear **safety**, safe management of radioactive **waste** and financing of **decommissioning**
- Invites **Commission** to set up **HLG** (senior regulators)
- List of actions proposed for HLG
- HLG to be assisted by **expert groups**

1st meeting in October 2007



# High Level Group





## 3. EUROPEAN SUMMIT

(9 March 07)



**Action plan** proposes:

- Envisage HLG on nuclear safety & waste management
- Supports R&D on waste management under FP7
- Suggest broad stakeholder discussion (**Nuclear FORUM**) on opportunities & risks of nuclear energy

Energy for a Changing World



# NUCLEAR FORUM



- Addresses at high political level all nuclear issues of importance
- Challenges
  - Aging plant replacement
  - New investments
  - Public acceptance
  - Generation IV reactors
- 1<sup>st</sup> meeting in November 2007
  - 3 WGs established:
    - Risks
    - Opportunities
    - Information/Communication



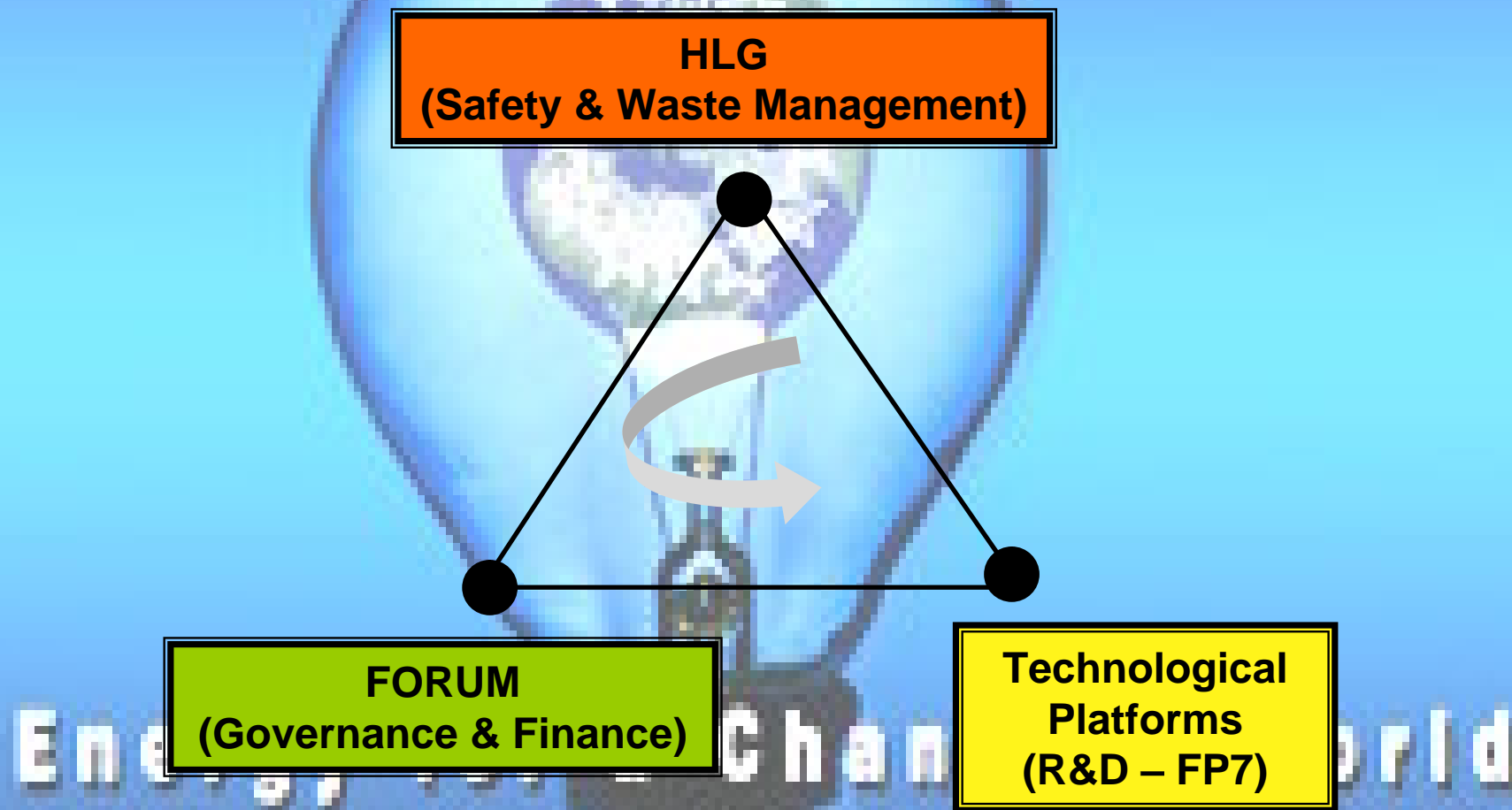
## 4. EURATOM FP7: NUCLEAR RESEARCH



- **7<sup>th</sup> Euratom Research Framework Programme (2007-2011)**
- Budget: 2.750 mio €)
- 1/3 of budget for nuclear fission:
  - Indirect actions and direct ones (JRC)
  - Safe exploitation & development of fission reactor systems
  - Management of radioactive waste
  - Radiation protection
  - Safety & security related to non-proliferation
- 2/3 for nuclear fusion



# Synergies at EU level



Energy for a Sustainable World



Create the political  
climate  
to give nuclear  
the chance it deserves



## ✧ “Environment” – Industry Actions



## How does “the environment” look like?



### ✧ **Despite**

- ✧ **20% increase in electricity consumption over last decade,**
  - ✧ **Very few new nuclear builds (2 EPRs, RO, SK, BG), and**
  - ✧ **Continuing phase-out policies in DE, ES, BE,**
- ✧ **Nuclear electricity generation share remained constant (32% in 1994, 31% in 2004)**
- ✧ **→ Significant investments were made to:**
- ✧ **Uprate capacities**
  - ✧ **Increase availabilities**
  - ✧ **Extend lifetime**



- ❖ **Increasing thermal power or improving thermal conversion efficiency (turbine)**
- ❖ **Capacity upgrading at >25% of EU plants (except UK(downrating), FR(>2008))**
- ❖ **Total additional power output: >3000 MWe (=2 EPRs)**



## Availability Increasing



- ✧ **In liberalised markets, nuclear can only compete at high availability levels**
- ✧ **Through improvements in operational practices, engineering support and strategic management**
- ✧ **Current EU-average: 84% (79% in 1996)**
- ✧ **>90% in FI, SI, NL**
- ✧ **Largest increases in BG, SI, SE**
- ✧ **Total additional power output: >3000 MWe (=2 EPRs)**



## Lifetime Extension



- ✧ **Design life: 30-40 y, PLEX up to 40-60 y**
- ✧ **Under the existing conditions of large investment & regulatory risks, longer term operation is more economic than new construction (EPR: 2000 €/kWe overnight costs)**
- ✧ **Differences in costs due to type & age of plants, e.g. modernising old UK GCRs (>500 €/kWe) is >>expensive than modernising LWRs (typically <200 €/kWe) and would probably be beyond limit of economical upgrading**
- ✧ **No difference between 2nd generation VVERs and "Western PWRs" can be detected.**
- ✧ **Non-technical factors seem to strongly influence costs, such as for German NPPs.**



# “Modernisation Programs” and Safety



- ✧ **Increase of plant availability:**
  - ✧ Improvements in operational practices, engineering support and strategic management
  - ✧ → Effects on safety can only be positive.
- ✧ **Power uprating:**
  - ✧ Possibility of degradation of systems and components due to changes in operating conditions (accelerated ageing)
  - ✧ Reduced intervention times in case of BDBA (additional mitigation measures?)
- ✧ **Longer Term Operation:**
  - ✧ RPV lifetime up to >60 y (for most LWRs)
  - ✧ Unknown ageing mechanisms? → Provisions in safety margins!
- ✧ Note:
  - ✧ Ageing (and thus lifetime) management is a continuous task in a NPP and should, strictly speaking, be separated from actual lifetime extension for longer term operation beyond the originally set plant life.
  - ✧ However, as some NPPs are confronted with legally imposed limits which are not suggested by safety, economical, environmental or security of supply criteria but represent the consequences of a political decision to phase-out nuclear, there is no way to clearly separate these issues in reported programs.

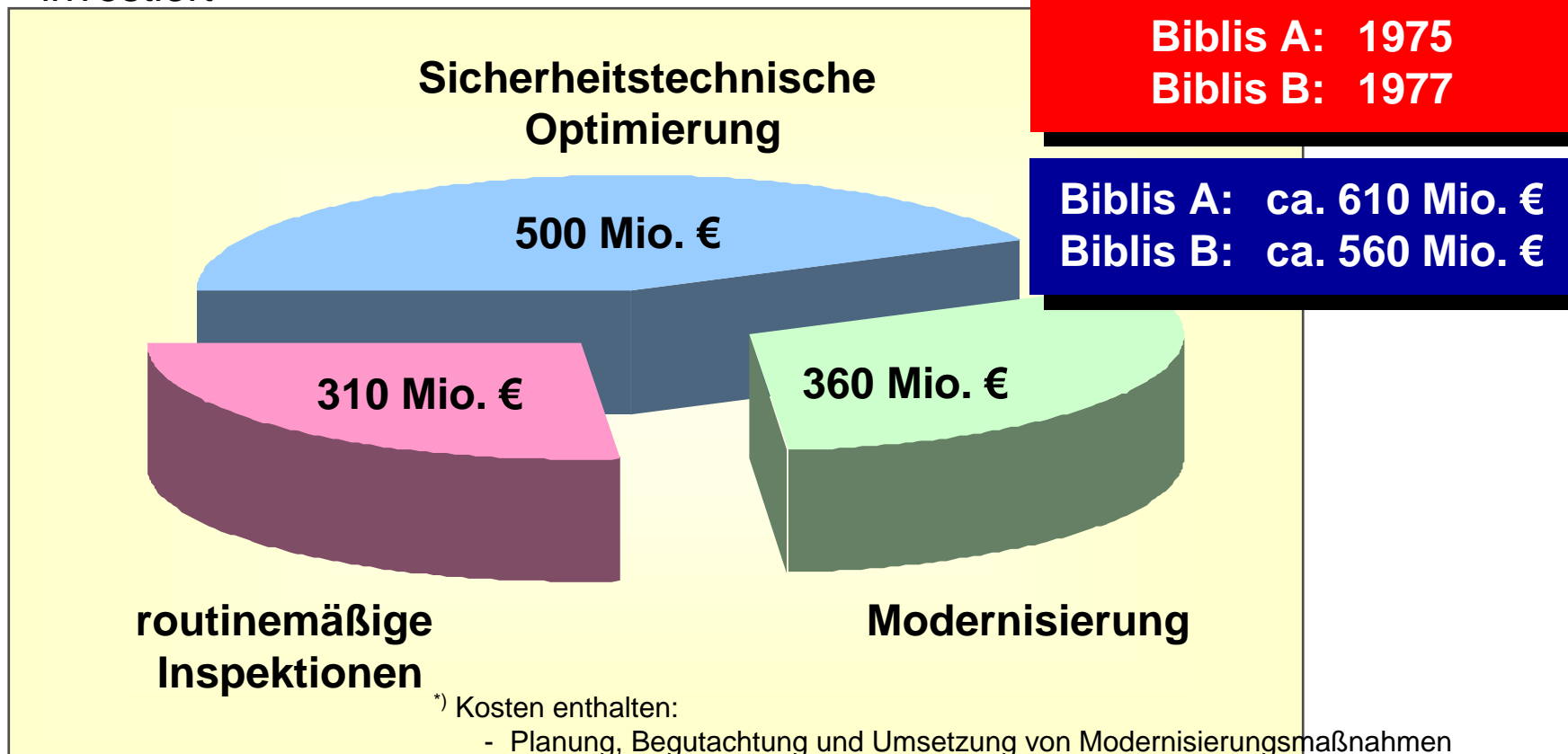


# “Modernisation Programs” and Safety



## Standort Biblis

Seit 1999 wurden rund 1,2 Mrd. €\*) in Nachrüstung und Modernisierung investiert

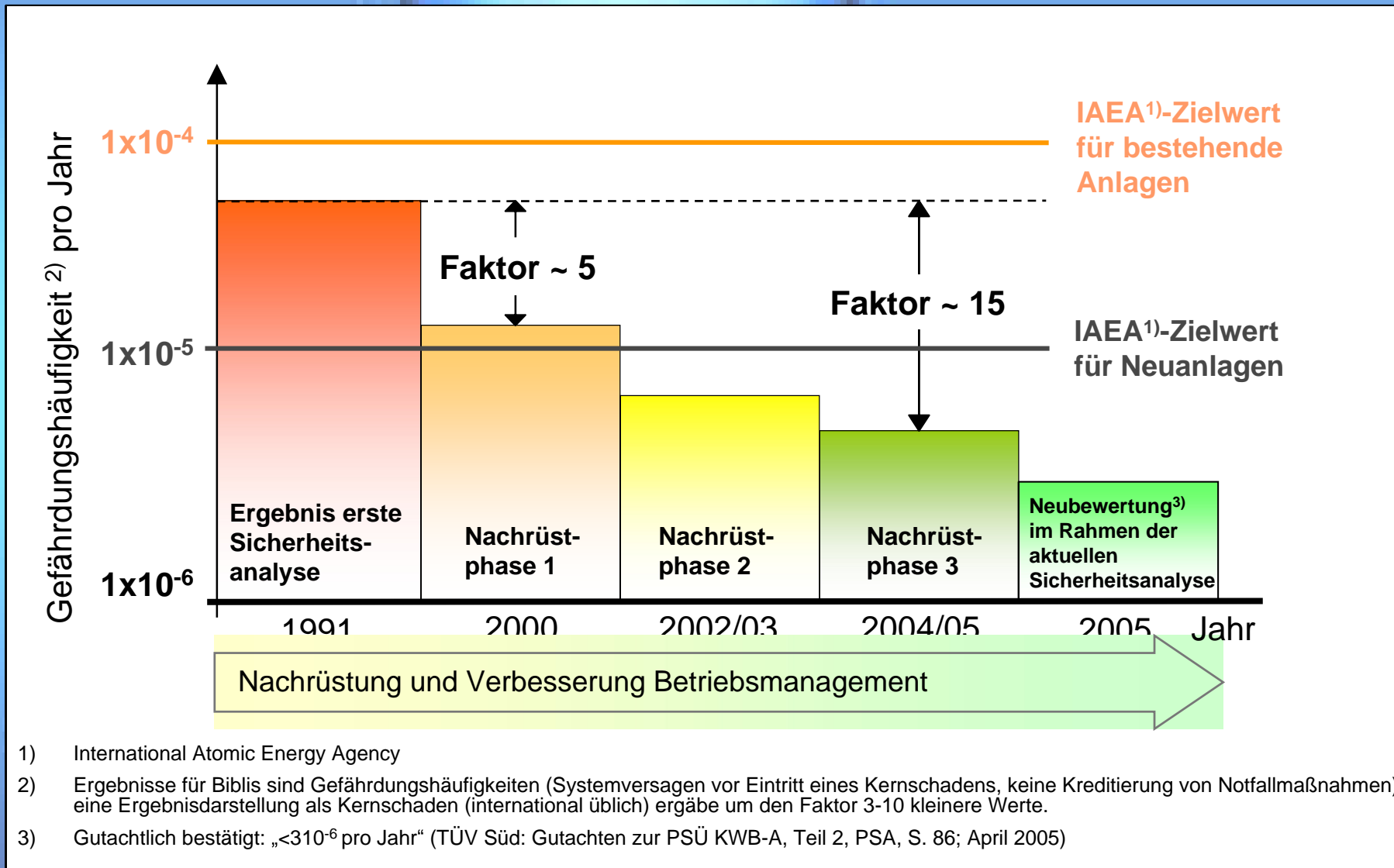


\*) Kosten enthalten:

- Planung, Begutachtung und Umsetzung von Modernisierungsmaßnahmen
- Sicherheitstechnische Optimierung
- routinemäßige Prüfungen, Inspektionen und Instandhaltungen



# “Modernisation Programs” and Safety





## ✧ “Environment” – Public Perception



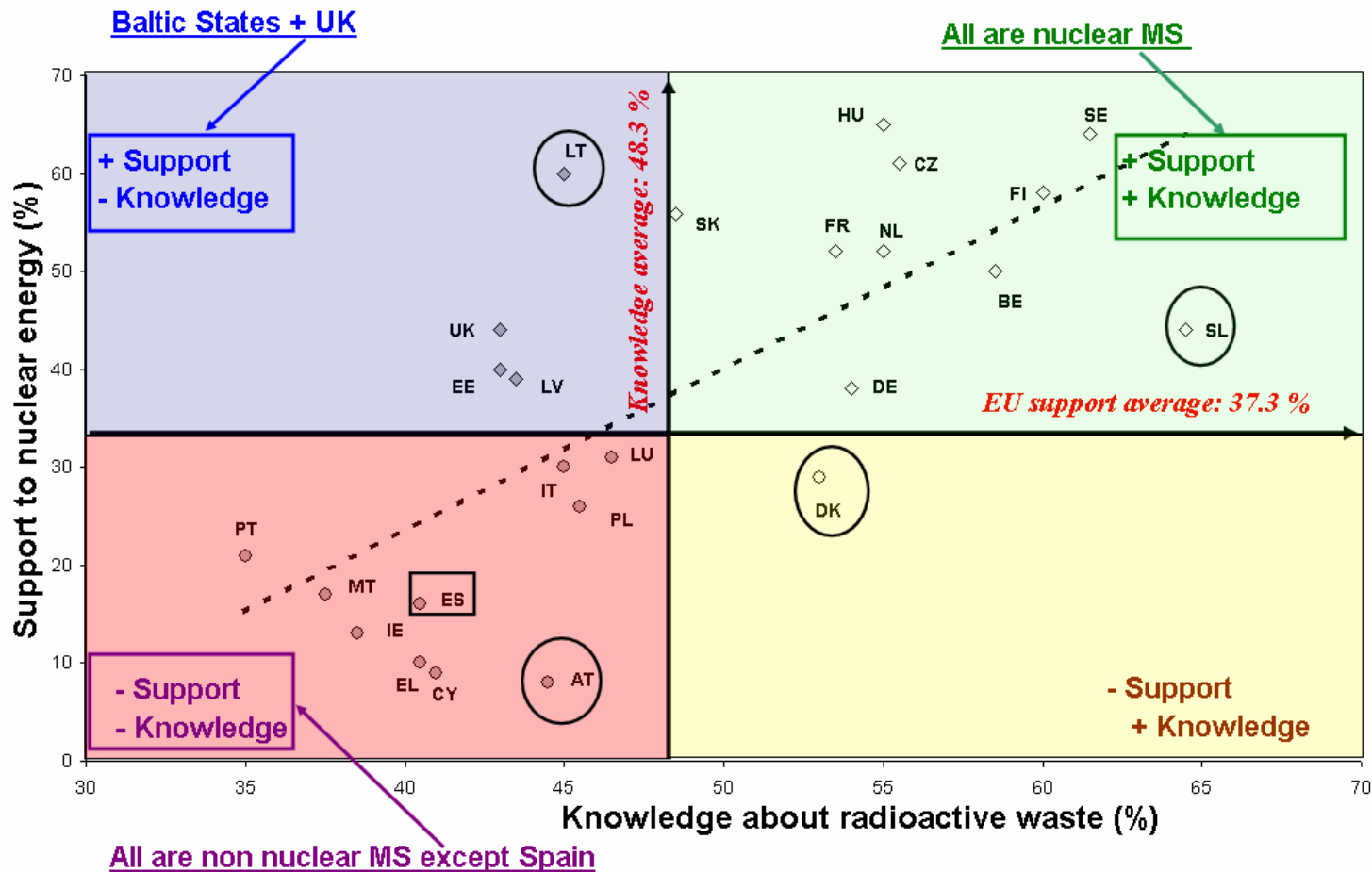
- ✧ **When it comes to nuclear safety, the highest risks are considered to be:**
  - ✧ **the threat of terrorism,**
  - ✧ **the misuse of radioactive materials, and**
  - ✧ **the disposal of radioactive waste.**



# Last Eurobarometer Surveys



## Support is correlated with information:





- ✧ Sustainability of Investment Notifications
- ✧ Art. 41-44 Euratom Treaty



## ✧ Euratom Treaty Investment Notifications:

✧ **EC gives opinion on new investment projects and communicate its views to the Member State concerned.**

✧ **Aim = Sustainable Investments**

✧ **Some important criteria:**

✧ **State-of-the-art technology (“Gen-III”)**

✧ **Adequate knowledge infrastructure (regulator, operator, TSO)**

✧ **National decommissioning / radwaste management strategy/fund**

✧ **WENRA Reference Levels, IAEA SS, EUR, e.g.:**

- ◆ **Is sufficient protection against external events ensured? (full containment for new installations) (cf. Eurobarometer)**