

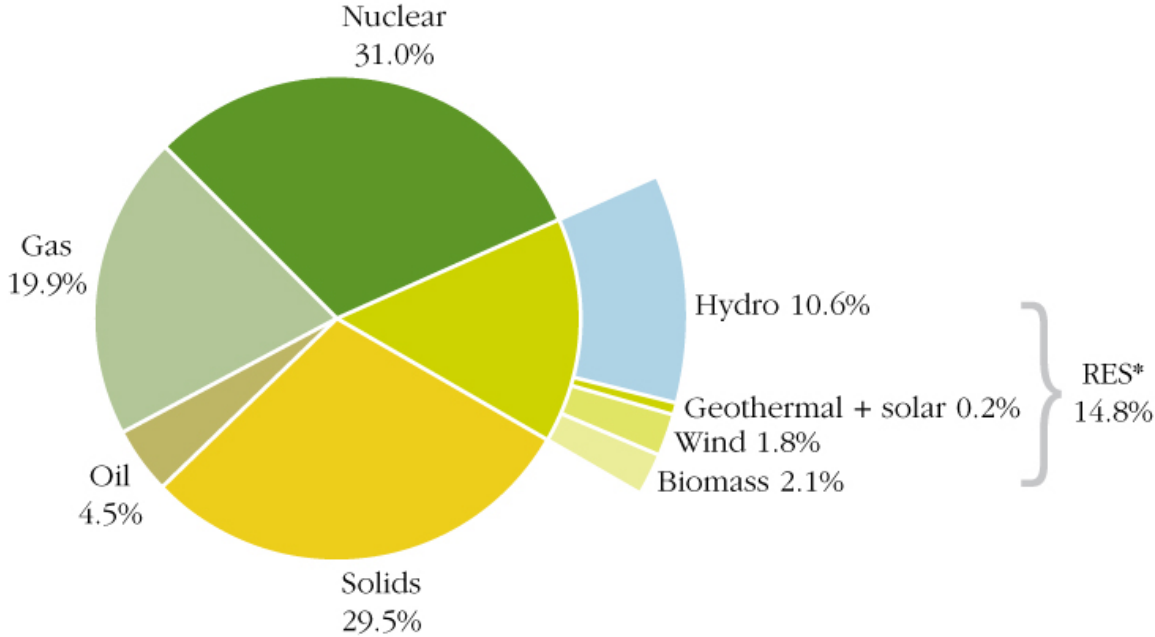
Sustainable Nuclear Energy Technology Platform (SNE-TP):

The Vision

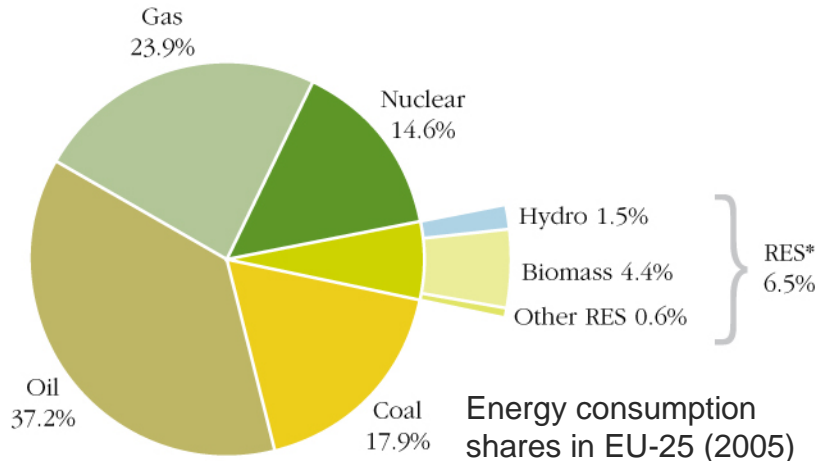


www.snetp.eu

Nuclear energy in Europe



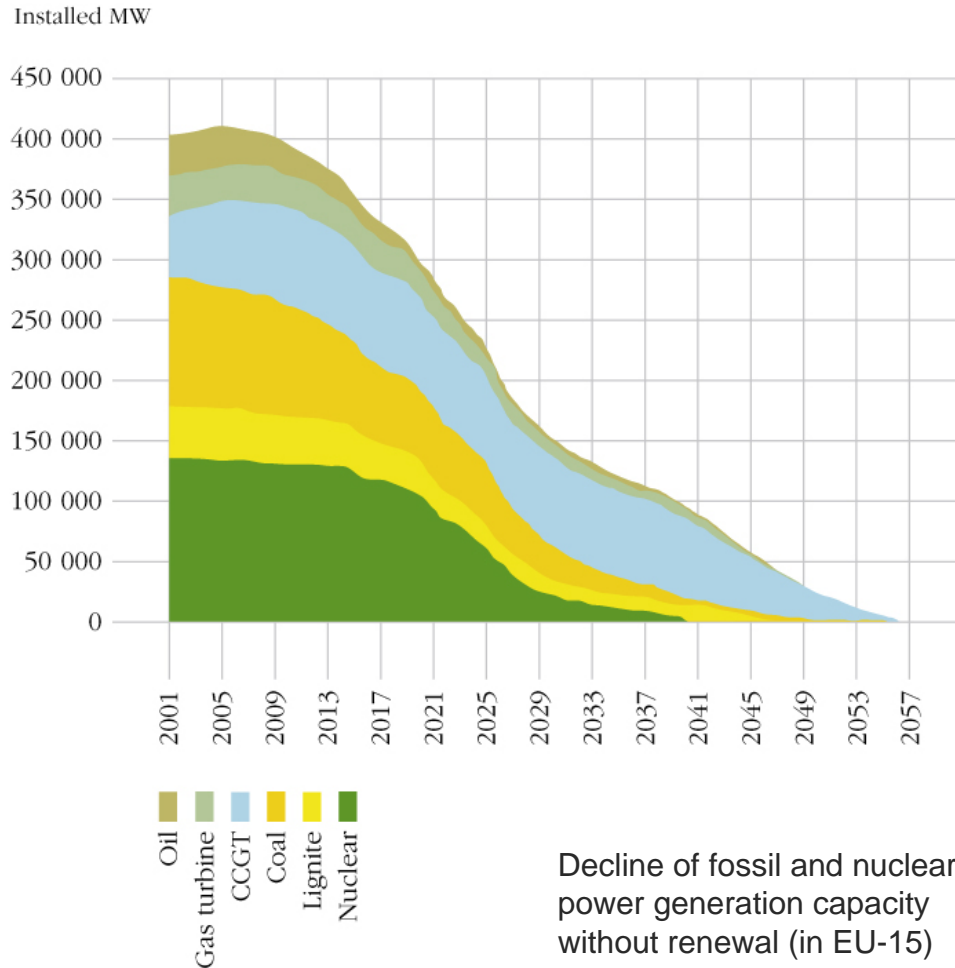
Electricity generation shares in EU-25 (2005)



Energy consumption shares in EU-25 (2005)

- 152 reactors in 15 countries in EU-27, producing 31% of EU's electricity
- The largest source of low carbon energy
- Excellent safety record
- Europe, a world leader – but competition is building (Russia, Japan, USA, China, India)

Power generation infrastructures



- Fossil and nuclear power generation plants are ageing.
- Need to invest in plant lifetime management and
- Large investments are necessary to build new plants to satisfy demand
 - For nuclear, Gen. III reactors (Finland, France)
- Action is needed now!

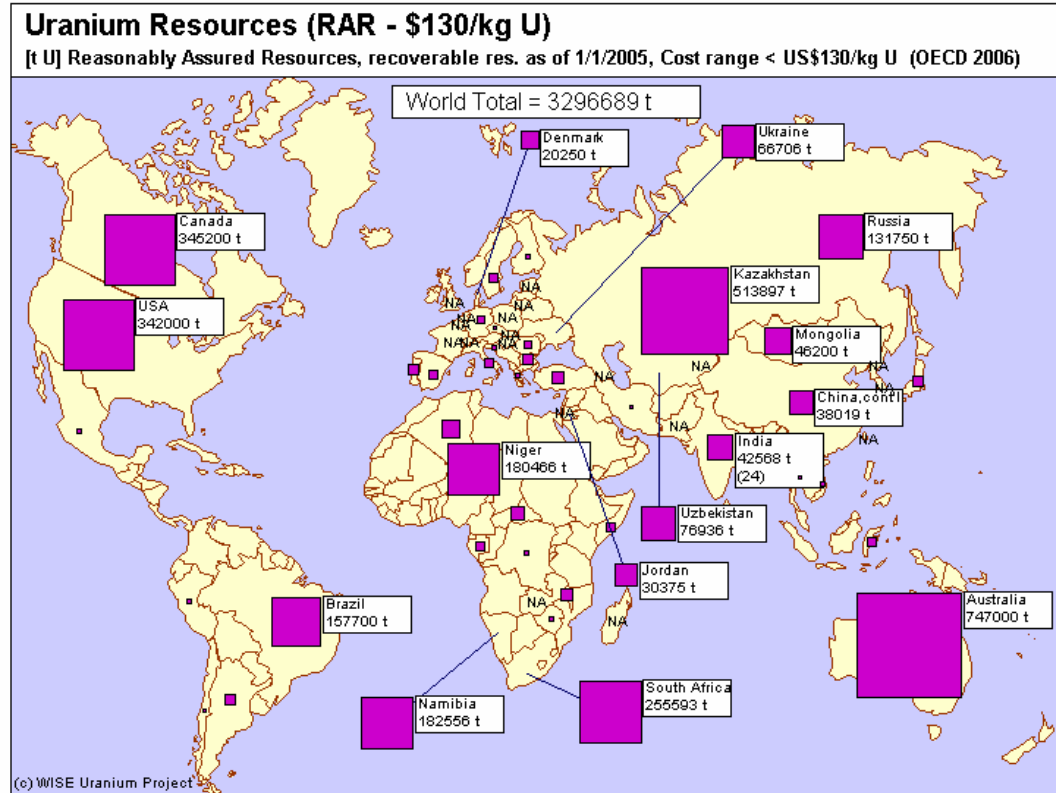
A contribution to Europe's energy challenges

- Security of supply
- Reduction of greenhouse gas emissions
- Competitiveness

- Sustainability of nuclear energy by
 - Continuing to maintain a high level of safety
 - Further developing technical solutions to waste management

Security of supply

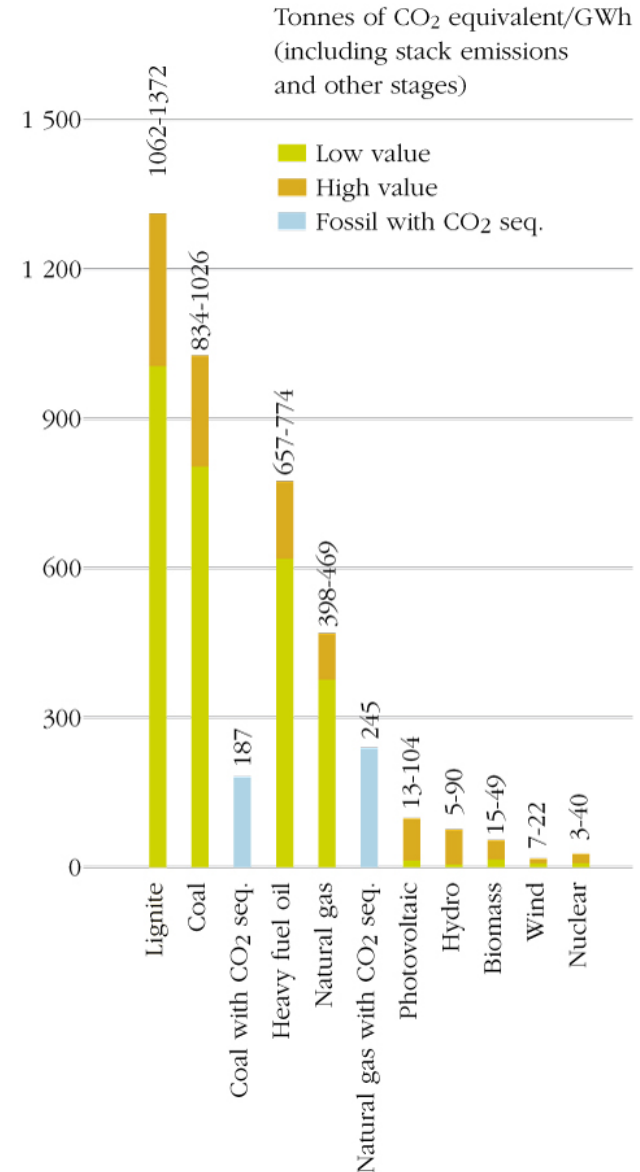
- EU imports nearly all its uranium ore but uranium is available throughout the world. Main suppliers to EU are stable countries: Canada (25%), Australia (16%)



- Uranium proven and estimated reserves are sufficient to accommodate deployment of Gen. III reactors at least until middle of century (and operation until end of century)
- Beyond, fast reactor technology with fuel multi-recycling shall be deployed – with nuclear fuel resources for thousands of years

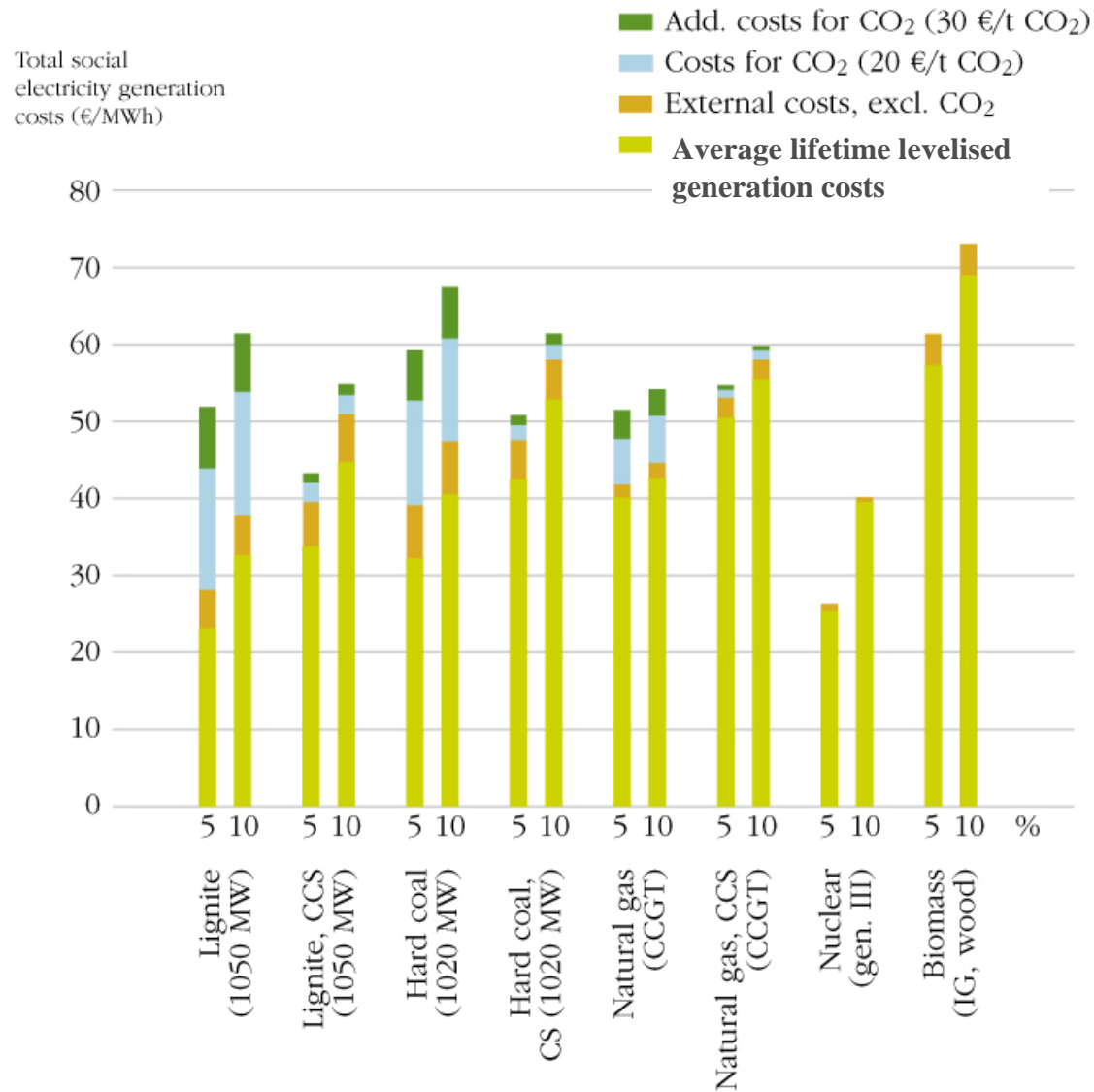
Reduction of greenhouse gas emissions

- Comparison of different technologies
- In 2004, in EU-25, the power generation & transport sectors emitted 1512 and 1021 Million tonnes of CO₂ respectively.
- Thanks to nuclear electricity production, a total of about 900 Million tonnes of CO₂ emission / year are saved.

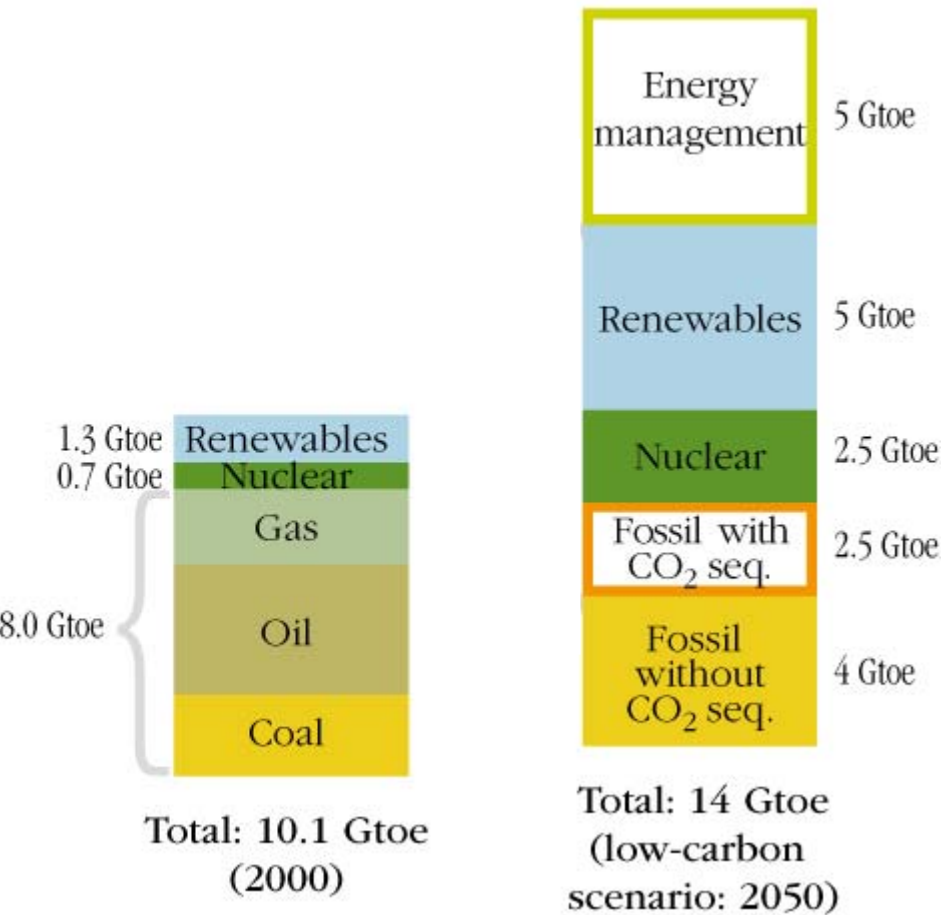


Competitive electricity

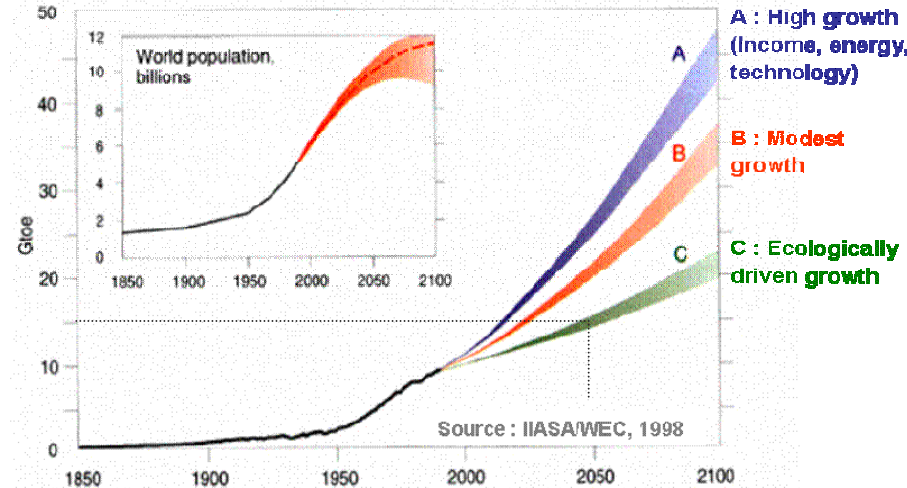
- Comparison of external costs



Low carbon energy scenario for 2050

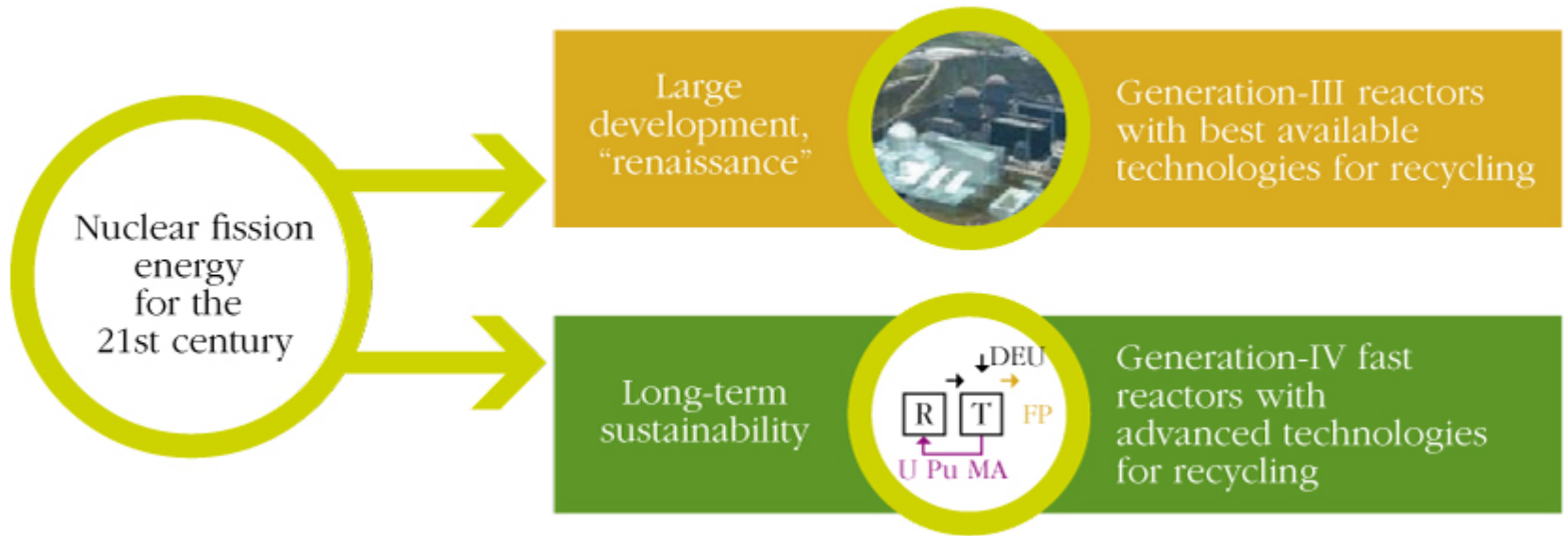
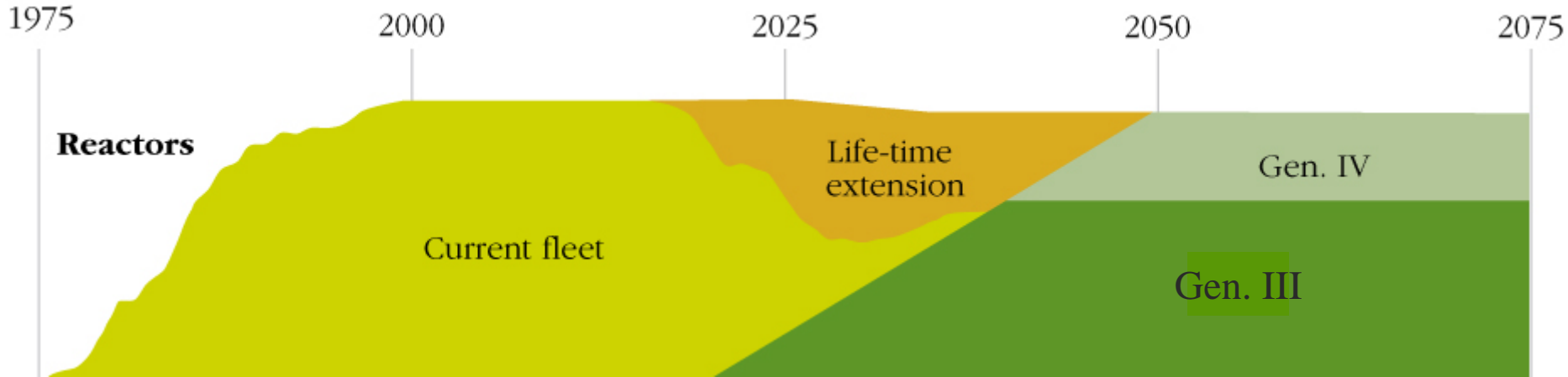


Today, nearly 2 billion people without electricity

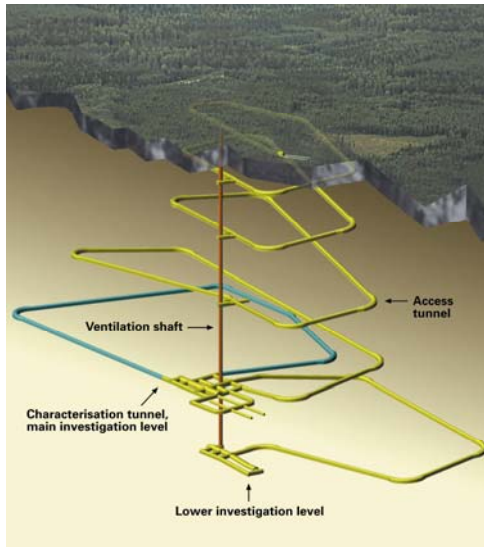


- Energy demand will increase (approx. double if no strong energy management / saving policy is implemented)
- Nuclear will play a major role along side renewables, fossil with carbon sequestration.

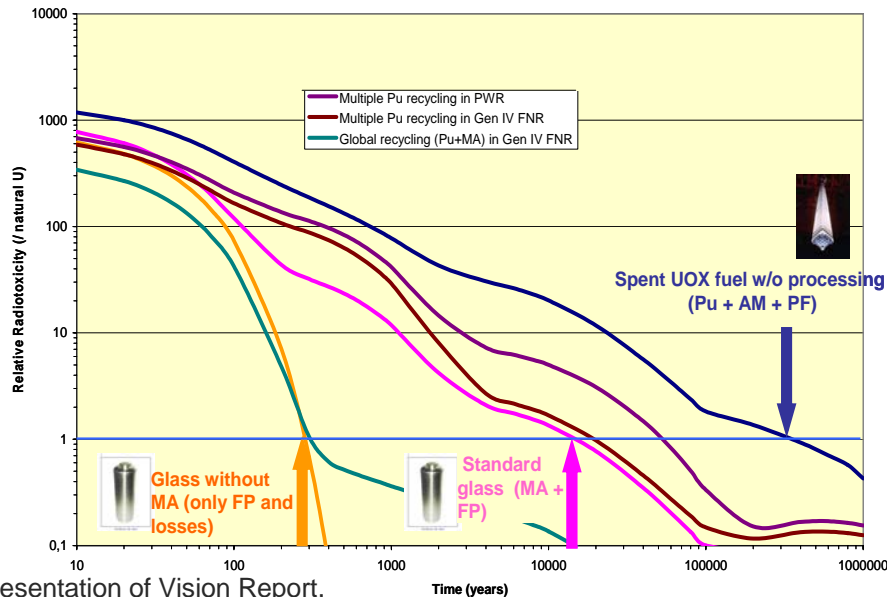
The R&D and industrial challenges



Waste management, multi-recycling strategy

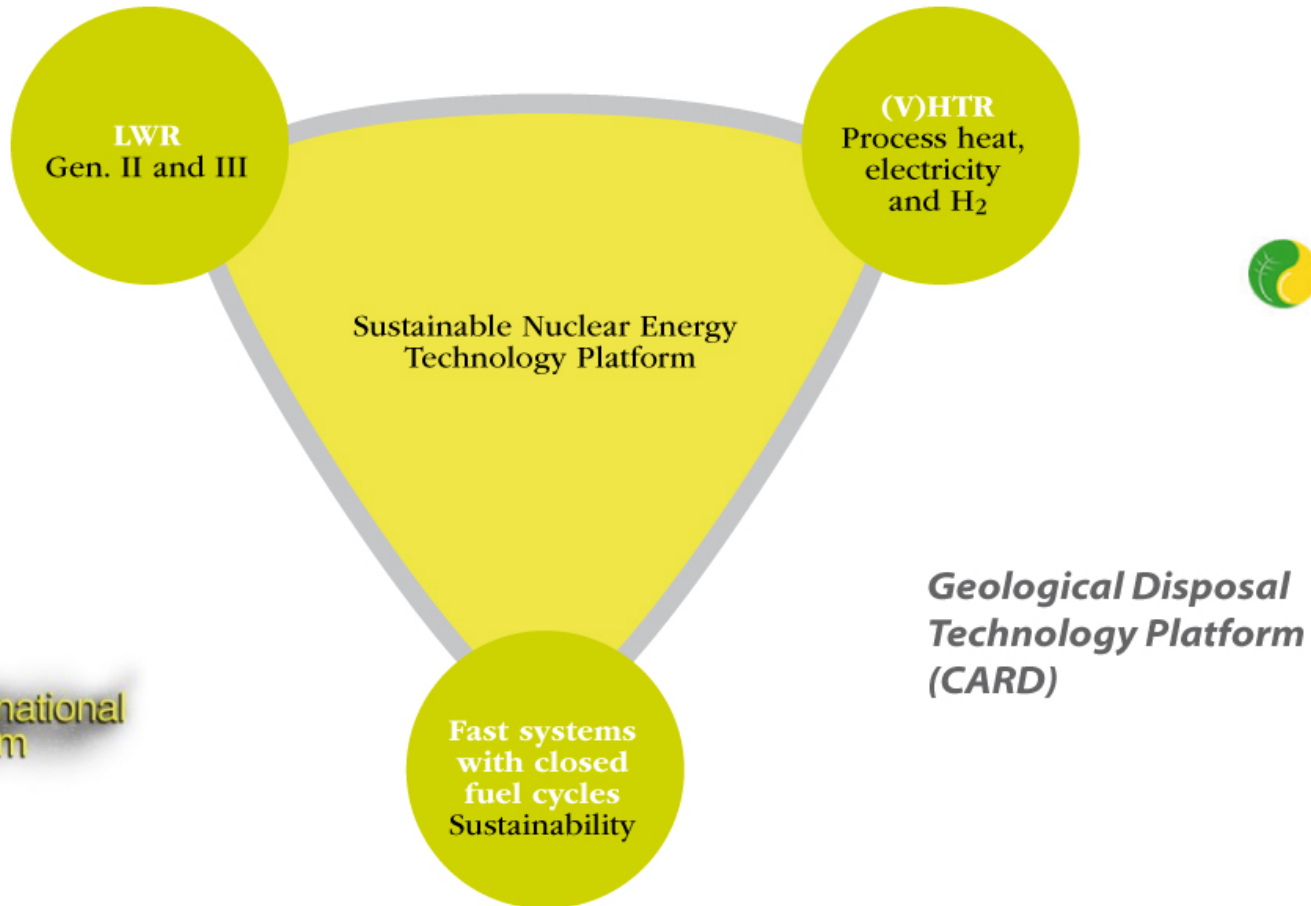


- Continuous progress has been made in the processing of spent fuel, recycling of nuclear material and conditioning of waste
- Reversible geological disposal is the object of an international technical consensus



- Recycling of minor actinides to reduce thermal load and radio-toxicity of waste is the object of on-going research

SNE-TP, interactions with other initiatives



LWR (Gen.II – Gen.III) Research Road Map

2010: Harmonized Life Time Extension Methodology

2010-12: Optimization of Severe Accident Management Procedure for LWR

Continuous optimisation of fuel performances and safety

2010: improved fuel cycle economy ; viability of high conversion ratio designs

2012: Viability of SCWR



Gen.IV Fast Neutron Reactors Research Road Map (Sustainability)

Sodium cooled Fast Reactor (SFR) R&D programmes to bring innovations (safety, competitiveness)

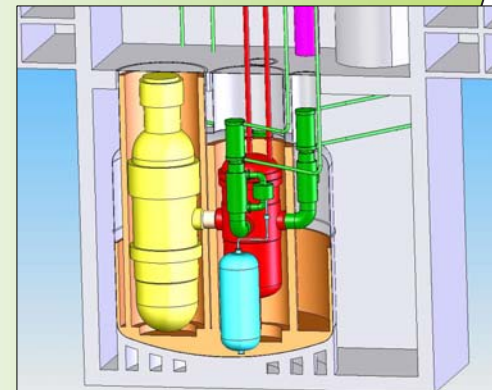
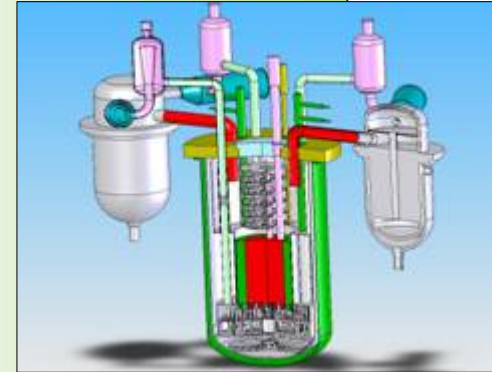
2009: Pre-selection of design options

2012: Confirmation of design options – Preliminary and detailed design, safety analysis reports, validation R&D, Construction of a prototype SFR in the range 250-600

MWe. **2020:** Start up of operations

R&D to assess viability and performance of **gas and lead cooled fast reactors**, as well as Accelerator Driven Systems.

Selection in **2010-12** of a second type of fast neutron system of importance for Europe. Construction of a 50-100 MWth first experimental facility in Europe, **2020:** start-up of operations



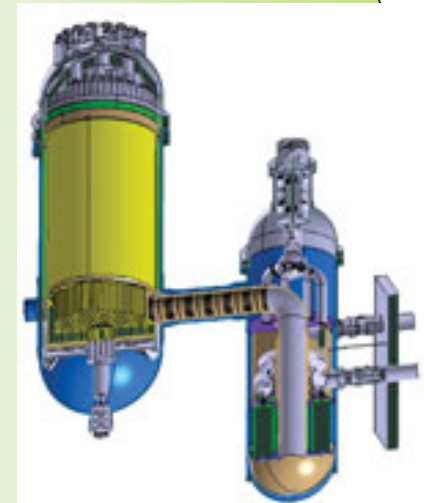
Research Road Map for New Applications of Nuclear Energy

Development of alternative fuels to oil for transport, including hydrogen and synthetic hydrocarbon fuel production, as well as processes that require heat and/or electricity such as desalination.

Tentative R&D agenda to support the realisation of First Of A Kind V/HTR Gen. IV reactor around 2020:

2010-12: confirmation of key technologies (fuel, materials, components, power conversion, hydrogen production)

2015-20: construction of a V/HTR and demonstration of cogeneration applications



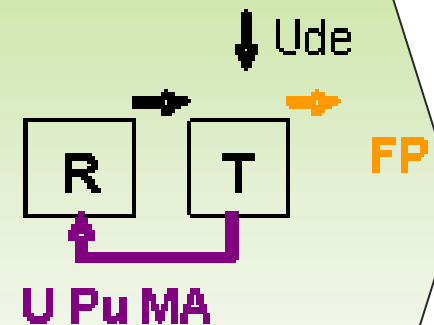
Research Road Map for Advanced Fuel Cycle Processes

2012: selection of technologies for the closed fuel cycle with the development of minor actinide bearing fuels ; selection made on a technological and economical basis, with an optimization of the waste form in terms of long term radio-toxicity and thermal load impact on the required volume for the geological repository.

Support the operation of a fast reactor prototype from 2020 onwards:

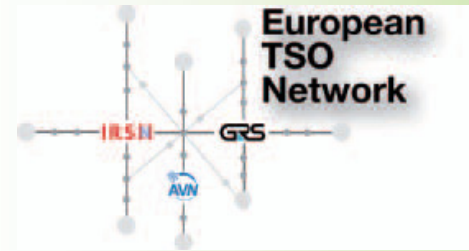
Construction in the period **2012-2017** of:

- a fuel manufacturing workshop
- a micropilot for minor actinide recycling (separation and minor actinide bearing fuel manufacturing)



But also, cross-cutting topics

- Safety
- Numerical simulation
- Education & training
- Material research
- Research infrastructures



Initiative for the Strategic Energy Technology (SET) Plan

- *Accelerating the transition to sustainable nuclear fission energy*: development of Generation IV Fast Neutron reactor prototypes in Europe
 - Prototype sodium-cooled fast reactor with power conversion system of 250 to 600MWe, to be built through research-industry partnership, together with fuel fabrication pilot plant. (**2B€**)
 - Fast spectrum experimental system with power range 50-100 MWth to support development and demonstration of alternative technology to sodium (**600M€**)

Funding for future research, development, demonstration and deployment programmes

- National programmes (coordinated via SNE-TP)
- Framework programmes (FP7, FP8, ...) (but will represent only a small fraction)
- Private/public partnerships
- Euratom loans?
- Other, eg. Regional funds to support new infrastructures?

A collective vision, endorsers and contributors



Institut "Jožef Stefan"



Universität Karlsruhe (TH)
Research University • founded 1825



SAPIENZA
UNIVERSITÀ DI ROMA

