



Climate Change - Can We Do Without Nuclear Energy?

European Nuclear Society
Young Generation Network
Side Event

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International Youth Nuclear Congress

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IYNC Background - I

Formed in 1998

- o Network of young professionals in over 50 countries with goals to:
 - Develop new approaches to communicate benefits of nuclear power, as part of a balanced energy mix;
 - Promote further peaceful uses of nuclear science and technology for the welfare of mankind ; and
 - Transfer knowledge from the current generation of leading scientists to the next generation and across international boundaries.



IYNC Background - II

Biennial Congress

2000, Bratislava, Slovakia

2002, Daejeon, South Korea

2004, Toronto, Canada

2006, Stockholm,

Sweden/Olkiluoto, Finland

2008, Interlaken, Switzerland:

- Over 330 participants
from 30 different countries!

2010, Cape Town, South Africa

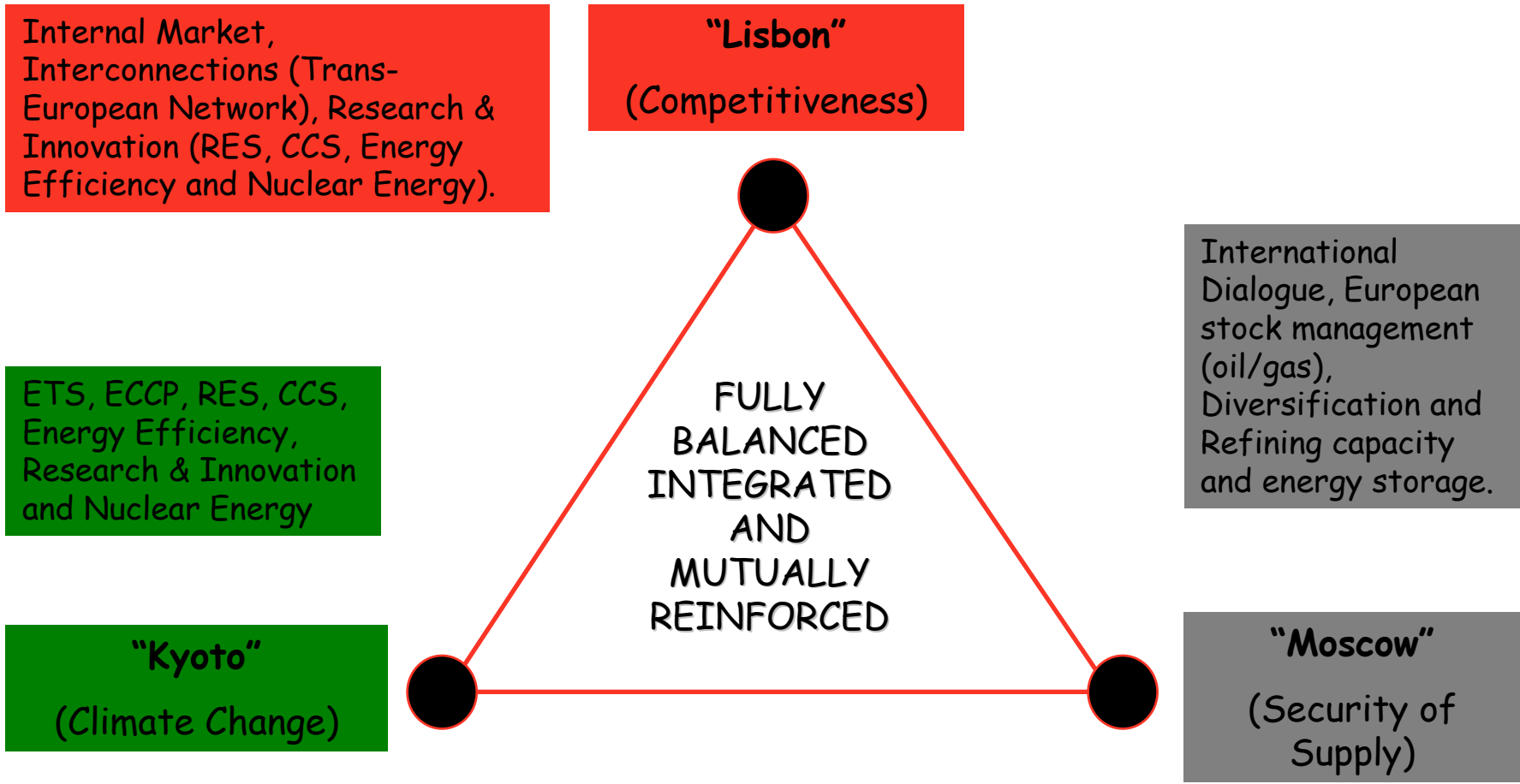




IYNC Today

- o **Global voice** of young professionals in nuclear.
- o Stimulate development of national/regional Young Generation Networks (YGNs).
- o Foster communication and coordination among YGNs.
- o Special projects to advance the interests and development of young professionals around the world.

Elements of the "Energy Policy for Europe"



Strategic Energy Review II

(published on 13 November)



- o Aimed at helping EU meet its ambitious 'triple-twenty' energy targets and at improving the security of the EU's energy supply
- o Endorses the important role that nuclear energy plays, along with other low-carbon energy sources, "in the transition to a low-carbon economy."
- o Stresses that if strategic investment in nuclear and renewables are "taken rapidly, nearly two thirds of the EU's electricity generation could be low-carbon by in the early 2020's."

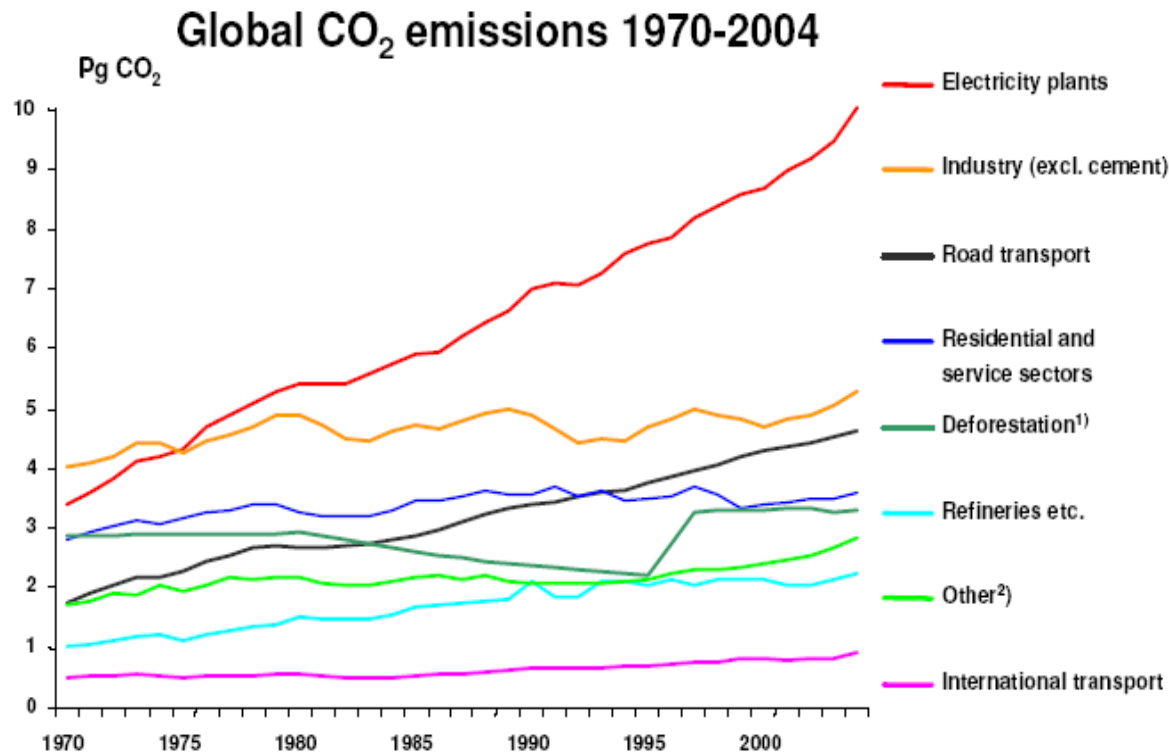
Challenge for EU's Energy and Climate Change Policy



- o Climate Change
 - *Electricity accounts for 40% of energy related global emissions, more than transport (20%)*
- o Security of Supply is a major concern
 - *Energy becomes scarce and expensive, and may cause international tensions*
- o The investments needs to replace the ageing power plants are enormous.
- o Reliable electricity supply at affordable and predictable prices is essential.



Sources of Global CO₂ Emissions



Data sources: IEA; EDGAR 3.2 and FT2000; USGS, FAO, GFED

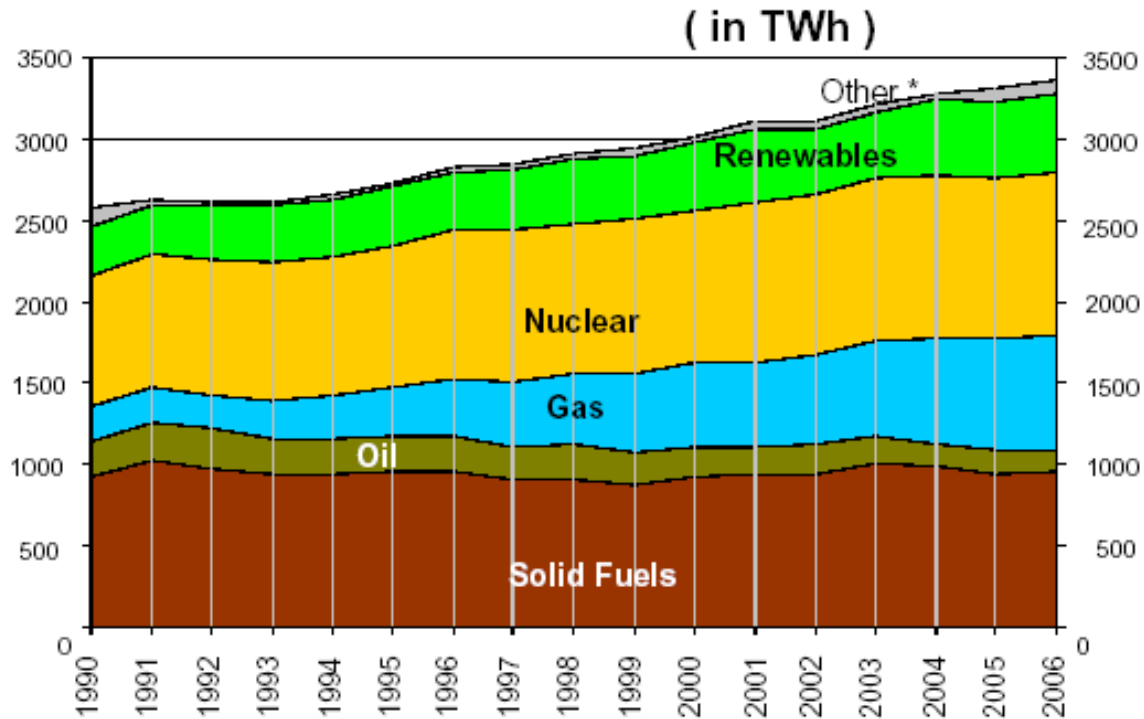
¹⁾ Including fuel wood at 10% net contribution

For large-scale biomass burning averaged activity data for 1997-2002 were used from GFED, based on satellite data

²⁾ Other domestic surface transport, non-energetic use of fuels, cement production, and venting/flaring of gas from oil production



Electricity Generation in EU-27

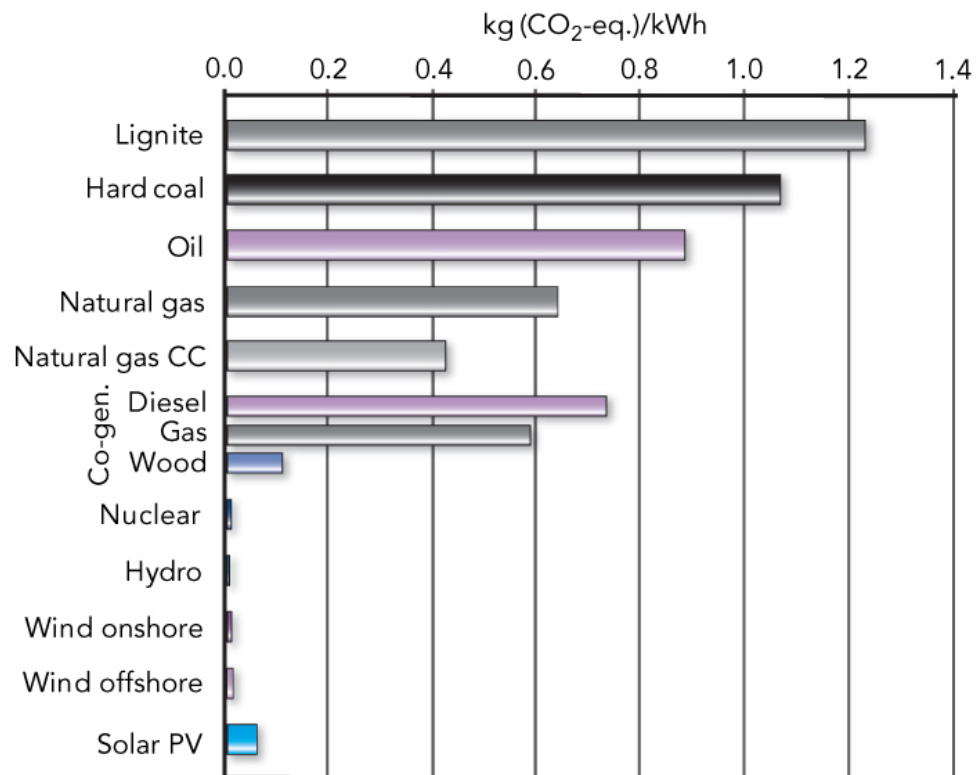


Source: Eurostat ; May 2008

* Pumped Storage Plants and Other Power Stations

Greenhouse Gas Emissions of Selected Energy Chains

Figure 4.7: Greenhouse gas emissions of selected energy chains



Source: OECD/NEA



Nuclear Energy and Climate Change

- o Nuclear power, unlike fossil fuel, does not generate greenhouse gases directly.
- o There are no GHG emissions at the point of generation, but there are releases during the mining and processing of the fuel, construction of the plant, disposal of spent fuel and by-products, and waste management and decommissioning.
- o Emissions from these stages depend, among other factors, on the national mix of electric power production.
- o GHG emissions from a nuclear fuel cycle are due to the fossil fuel-based energy and electricity needed to mine and process fuel and for the construction and materials of fuel cycle facilities.

Factors Influencing GHG Emission Rates from Nuclear Power



- o Energy use for fuel extraction, conversion, enrichment and construction / decommissioning (plus materials).
- o Fuel enrichment by gas diffusion, which is an energy intensive process that can increase GHG releases by an order of magnitude when compared to enrichment by centrifuge.
- o Emissions from the enrichment step, which are highly country-specific since they depend on the local fuel mix.
- o Fuel reprocessing (uranium oxide or mixed oxide), which can account for 10% to 15% of the total nuclear GHG burden.



Nuclear Energy Contribution to Carbon Avoidance - EU

- o In the EU as whole, the use of nuclear energy avoids up to **675 million tonnes of CO_{2eq}** per year.
- o **GHG emissions from electricity generation would rise by 53%** if there was no nuclear contribution.
- o This amount is comparable to the emissions from the **entire passenger car fleet (212 million)** in the EU.
- o By comparison, the EU has a **GHG emission reduction target of 446 million tonnes of CO_{2eq}** below 1990 level by 2008-2012.



Nuclear Energy Contribution to Carbon Avoidance - World

- Around the world, the use of nuclear energy avoids up to **2.1 billion tonnes of CO_{2eq}** per year.
- GHG emissions from electricity generation would **rise by 22%** if there was no nuclear contribution.
- UNFCCC estimates that the Kyoto Protocol's **CDM will generate 1.2 billion tonnes** of emission reductions by the end of 2012.
- Overall Kyoto GHG emission reduction target of Parties bound by the **Kyoto Protocol** is approximately **549 million tonnes CO_{2eq}** .



Nuclear Energy and Competitiveness

- Nuclear electricity is more competitive than electricity from fossil fuels (OECD), even without carbon tariff.
- Any rise in uranium prices has only a minor impact on the cost of nuclear electricity.
- A 50% increase in uranium, coal and gas prices would make nuclear generating costs increase by 3%, coal generating costs by 20% and CCGT generating costs by 38%.
- The cost of nuclear electricity is stable and predictable.
- Most nuclear power plants operate continuously as a base load with very high capacity factors.

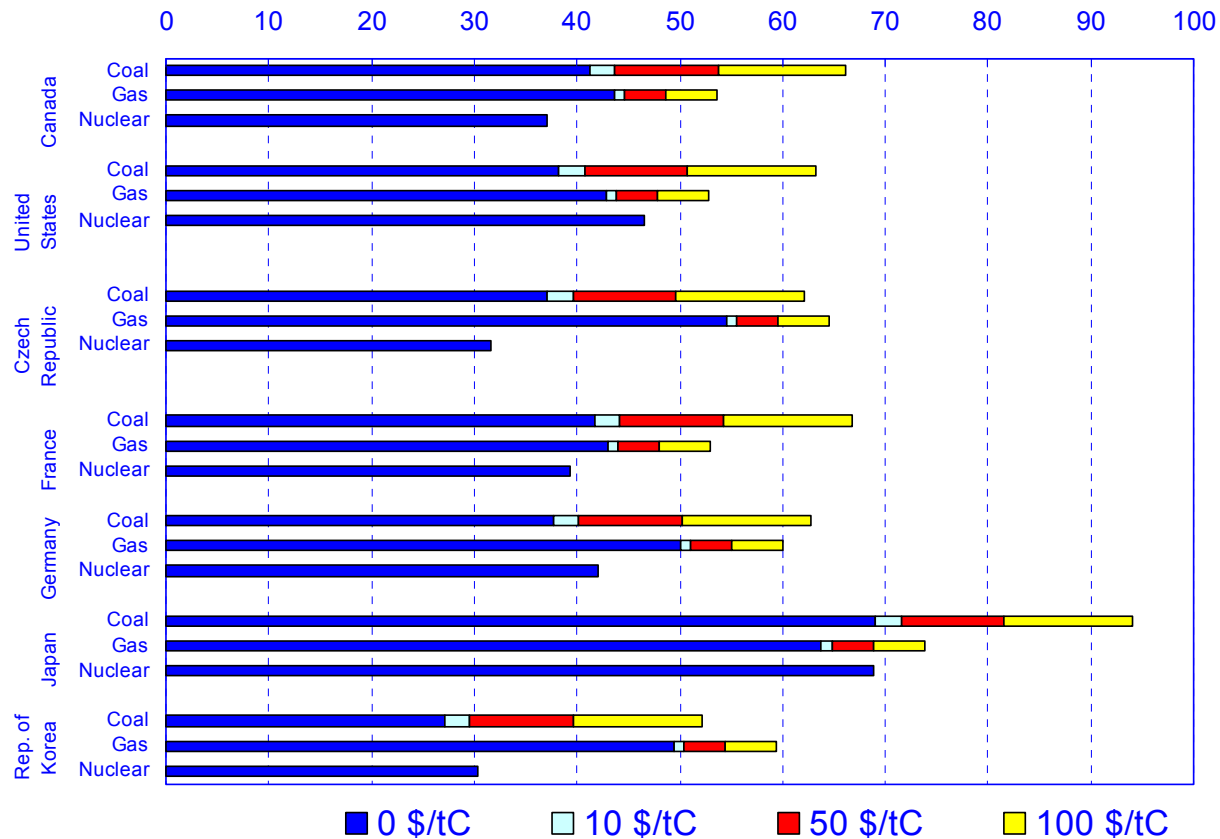


Lifetime of uranium resources (years)

Technology	Identified resources ~5.5 MtU	Total conventional resources ~16.0 MtU	Total conventional resources plus phosphates up to 38 MtU
LWRs once through	100	300	700
Progressive introduction of FBRs*	> 3 000	> 9 000	> 21 000

Source: Nuclear Energy Outlook, OECD NEA 2008

Impact of carbon values on generation costs at 10% [USD/MWh]



Renewed Momentum for Nuclear Energy in the EU



- o EU Commissioners, including President Barroso and vast majority of MEPs recognise the benefits of nuclear energy.
- o Barroso: "By 2020, 60% of our electricity could come from carbon-free sources (nuclear and renewables)."
- o Nuclear new build projects in Finland, France, Slovakia, Bulgaria and plans to develop nuclear power in UK, Czech Republic, Romania, Baltic States, Italy and Poland.



Conclusions

- o Nuclear energy is an important part of the EU low-carbon energy mix and will play an increasing role in limiting CO₂ emissions.
- o EU should encourage more investment in low-carbon power generation technologies including nuclear power.
- o EU is ready to have a dispassionate debate on nuclear energy and to ensure that nuclear energy is placed on an equal footing with other methods of carbon abatement.

Thank you for your attention!