WE ARE THE NEXT GENERATION

European Nuclear Young Generation

Position Paper on Nuclear Energy and the Environment

Climate change and energy access: challenges for the next generations

The world population is continually growing; from 1 billion in 1800 to 7 billion in 2011, we are expected to reach 10 billion by the end of the 21st century. To sustain this population growth, an increased energy supply is required to provide sufficient clean water, healthcare, education, food, shelter, communication and transportation. Whereas energy access is today guaranteed in OECD countries, around 1.3 billion people still live without sufficient access to energy.

Affordable and reliable sources of energy are required to sustain our development.

At the same time, it is now acknowledged by the scientific community that human activities are mainly responsible for climate change. Our growing energy-intensive societies are accelerating climate change and its associated consequences: rise of ocean levels, more frequent extreme meteorological phenomena and massive loss of biodiversity; consequences that must be prevented at all costs.

We need sustainable, affordable, reliable and safe sources of energy. It is our responsibility to promote low carbon energies and responsible consumer behaviors that will prevent social and environmental disasters for current and future generations.

Nuclear, a solution?

Nuclear power is regarded by many as being environmentally friendly. Nuclear power plants have nearly no CO_2 emission [1], while the nuclear industry is recognized as one of the safest industries; backed by stringent safety standards, transparency culture [5] and international cooperation based on an evolution of lessons learnt from a variety of operations. Moreover, solutions for decommissioning and waste management exist and are already implemented in most European countries [2].

Nuclear power is affordable and reliable.

Nuclear power has one of the lowest production costs within the energy market, this stems from production costs which mainly depend upon the investment costs; fuel and operating costs have little impact on the price of nuclear electricity [4].

Nuclear generation is predictable and provides base-load electricity with high reliability to the end-user. It is not subject to variations in fuel availability as uranium is largely available from diverse politically stable countries that secure its supply. Nuclear power is therefore a key asset for energy security and independence.

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Nuclear energy is part of the solution!

The European Nuclear Society Young Generation Network believes that nuclear is part of the solution.

Current nuclear power plants operate safely with negligible CO_2 emissions and provide energy to millions of people. Existing and future nuclear reactors will help humanity to overcome energy challenges whilst respecting the environment.

Research is still on-going for more efficient use of nuclear fuel and the transmutation of high activity long-term waste. These objectives are carried out by the promising implementation of Generation IV [3] of nuclear power plants with commercial prospects by 2030-2040. Research on nuclear fusion such as the ITER project aims to provide an almost inexhaustible source of energy while suppressing the issue of handling long-lived radioactive waste. This is the future of the nuclear industry.

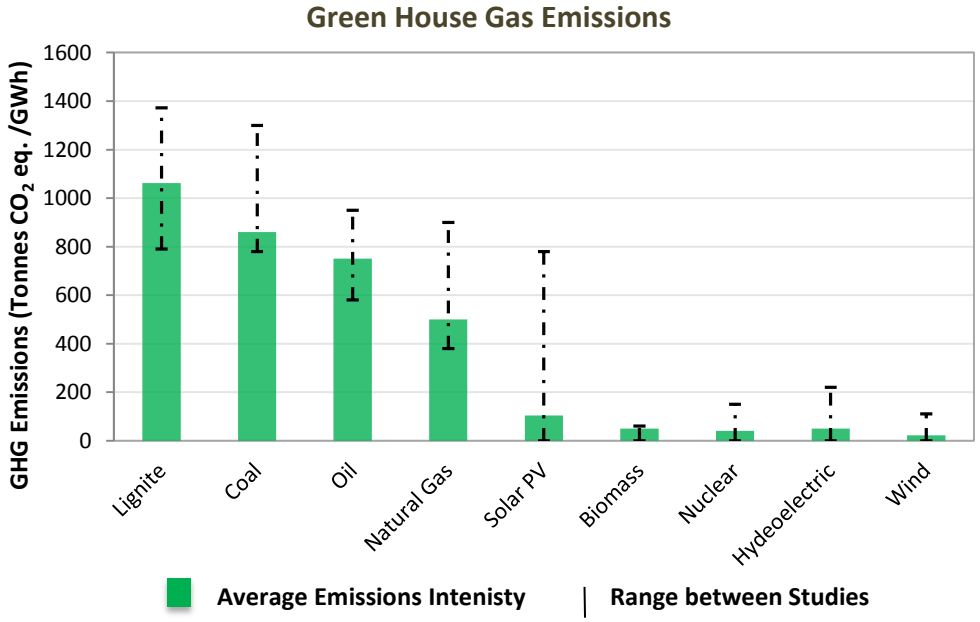
Our belief is that fighting climate change cannot discard, on ideological background and judgment, such promising technologies. It is our duty to inform the public in an objective and scientific way of the benefits of nuclear power. COP21 is a unique opportunity to internationally develop a low-carbon society in which nuclear power will have a key role to play.

For the ENYGF 2015,

The European Nuclear Society Young Generation Network

[1] Greenhouse Gas Emissions

Each electricity generation method produces greenhouse gases (GHG) in varying quantities through its whole life cycle: construction, operation (including fuel supply activities) and decommissioning. Coal fired power plants release the majority of GHGs (mainly CO_2) when their carbon-containing fossil fuels are burnt. Others, such as wind power and nuclear power, give rise to much less emission; this being during construction and decommissioning.
A review has been carried out of over twenty studies assessing the GHG emissions produced by different forms of electricity generation. The results show that life cycle emissions from all of the major forms of renewable energy (solar, wind, biomass, hydroelectric) and nuclear were similar, and generating electricity from fossil fuels results in GHG emissions far higher than the others.



Sources: *New Energy Externalities Development for Sustainability Project Report, 2009*
International Energy Agency - Energy Technology Perspectives, 2008
World Energy Council - Comparison of Energy Systems Using Life Cycle Assessment, 2004

[2] Nuclear Waste Management

Around 370 000 tons of spent nuclear fuel was produced worldwide by 2013 of which one quarter has been reprocessed. As an illustration, this total amount could fit into a volume of 100 x 100 x 100 m that is the size of a large stadium. Many countries are currently in the process of selecting their final waste disposal site. In Finland the world's first deep geological repository for high level waste is about to start its operation in the 2020s.

Sources: *International Atomic Energy Agency - Nuclear Technology Review 2014, july 2014*
https://www.iaea.org/About/Policy/GC/GC58/GC58InfDocuments/English/gc58inf-4_en.pdf
IAEA-TECDOC-1591, Estimation of Global Inventories of Radioactive Waste and Other Radioactive Materials, June 2007

[3] Generation IV forum objectives

The four areas of improvement identified by the Generation IV International Forum for the next generation of nuclear power plants are: sustainability, economics, safety and reliability, proliferation resistance and physical protections.

Sources: *https://www.gen-4.org/gif/jcms/c_9260/public*
https://www.gen-4.org/gif/jcms/c_9502/generation-iv-goals

[4] Energy independence

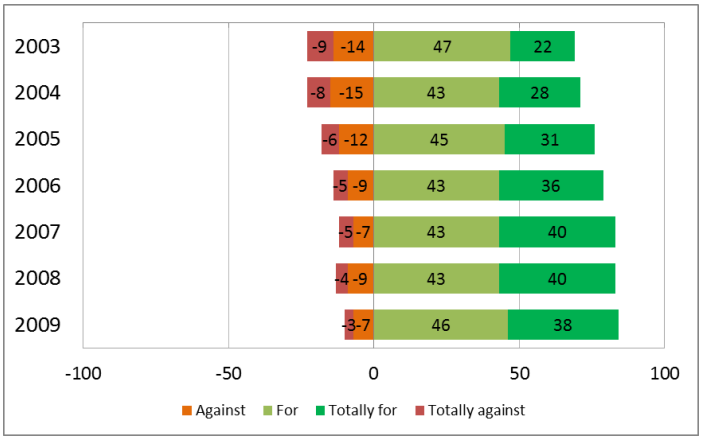
Unlike other conventional sources, especially oil and gas for which the main reserves are located in politically volatile countries; the nuclear fuel market is open and global. Yellow cake (chemically processed mined uranium), enrichment and conversion services are open markets in the EU, supported by several international initiatives for establishing uranium banks. Fabrication of fuel assemblies is becoming more open as a number of countries are establishing their own fabrication capacities. Nuclear is safe against failures of fuel supplies as fresh fuel for years of full power operation can be stored at relatively low cost for strategic reserve. Nuclear provides secure and diverse energy supply by reducing reliance on imported energy and energy production from intermittent sources.

1 kg of fuel	Output of electrical energy (kWh_e)
Firewood	~ 1
Coal	3
Oil	4
Uranium	50.000

Source: *Vattenfall Fuel, IC on Innovative Nuclear Power, Vienna, 2003 & H.Blix, World Nuclear Association Annual Symposium, London, 2001*

[5] Transparency in the nuclear industry: site selection for the final repository for spent nuclear fuel in Sweden

The Swedish Nuclear Fuel and Waste Management Company (SKB) put in place measures to ensure openness and transparency throughout the site investigation process for a final repository for spent nuclear fuel in Sweden. Activities were performed in parallel in the two municipalities of Östhammar and Oskarshamn between 2002 and 2009. A prerequisite to build and operate the repository in one of the municipalities was their acceptance of the repository. SKB arranged over 60 official consultation meetings with full transparency and openness according to the regulatory framework of its Environmental Impact Statement (EIS). The EIS included a description of the potential environmental and societal consequences of the planned final storage facility, as well as their prevention and mitigation means. This transparent and democratic information process on nuclear energy, waste and final repository leads to an evolution of the public opinion of the concerned municipalities in favor of the final repository as presented in the graph below.



Following site analyses results, including long-term safety and environmental impact, SKB selected Östhammar as the location in June 2009. Currently preparation is ongoing for application for the permission to build the repository in Östhammar in the vicinity of the Forsmark nuclear power plant.

Source: *EU publication: Good Practices Guide on Transparency for nuclear projects in the European Union*