

ENC 2002 Conference Invited Paper

NUCLEAR ENERGY IN FUTURE SUSTAINABLE, COMPETITIVE ENERGY MIXES

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*Extended Synopsis**

Nuclear energy is an established component of electricity supply worldwide (16%) and in particular in OECD (nearly a quarter). It is supported by a mature industry benefiting from extensive experience (more than 8000 reactor years of commercial operation) and dynamic R&D programmes implemented by governments and industries.

Existing nuclear power plants are competing successfully in deregulated electricity markets owing to their low marginal production costs, their technical reliability (availability factors exceeding 80% in many countries) and good safety performance. Stringent safety requirements and radiation protection regulations in place in OECD countries allow potential impacts of nuclear energy facilities on human health and the environment to remain extremely low. Furthermore, nuclear energy, a nearly carbon free source, contributes to alleviating the risk of global climate change (worldwide, GHG emissions from the energy sector are already 8% lower than they would be without nuclear energy).

Issues related to high-level waste management and disposal are being addressed in comprehensive, step by step approach. Progress towards the implementation of deep geological repositories is being demonstrated (e.g., Yucca Mountain in the US, Olkiluoto in Finland) and research on innovative fuel cycles aiming at partitioning and transmutation of minor actinides is being actively pursued.

Up to 2010-2020, nuclear energy will maintain its role mainly through capacity upgrade and lifetime extension of existing plants, in many cases the most cost effective means to increase power capacity and generation. Examples are provided by utility policies and decisions in a number of OECD countries (e.g., Spain, Sweden, Switzerland, UK, US). Although only few new units are being or will be built in the very near term, their construction and operation is bringing additional experience on advanced evolutionary nuclear systems and paving the way for the renaissance of nuclear power.

For the medium term, 2030-2050, new reactors aiming at reducing capital costs, enhancing safety and improving the efficiency of natural resource use are being developed by designers. In order to address new challenges of deregulated markets, innovative reactor designs should enhance economic competitiveness and reduce financial risks of nuclear energy.

The renewed interest of governments for the nuclear option (e.g., US, Finland) has triggered national and international initiatives (GIF, INPRO) aiming at defining and implementing co-operative R&D programmes leading to the deployment of a new generation of nuclear systems meeting the economic, environmental and social goals of sustainable development.

International co-operation is essential for a successful renaissance of nuclear energy in the competitive context of the new millennium. Sharing experience, expertise and know-how across countries offers unique opportunities for synergy and cost effectiveness. Intergovernmental organisations such as NEA can play a key role in this regard through providing a framework for exchanging information and undertaking joint projects.

* The paper will include illustrative nuclear development scenarios, based upon the IEA (short-term) and IIASA/WEC (long-term) energy demand perspectives.