

Capacity Building and Nuclear Knowledge Maintenance for Sustainable Energy Development

Objective

To enhance the capacity of Member States to perform their own analyses of electricity and energy system development, energy investment planning and energy–environment policy formulation and their economic implications; to sustain and effectively manage nuclear knowledge and expertise; to enhance information and knowledge resources for the peaceful use of nuclear science and technology.

Energy Modelling, Databanks and Capacity Building

In 2008, the Agency revised upward its projections for global nuclear power development. The revised high case projects 748 GW(e) of installed nuclear power worldwide in 2030, compared with 372 GW(e) at the end of 2008, that is, a doubling of capacity in 22 years. The low case projects 473 GW(e) in 2030, an increase of only 27%.

These projections are prepared by an expert group convened each year by the Agency. The low case includes: (a) new nuclear construction currently under way or firmly established; and (b) scheduled retirements and planned licence extensions. The high case adds in announced longer term plans of governments and utilities for new reactors. The high case is thus a reasonable possible quantification of what has been labelled the ‘nuclear renaissance’.

Successive updates have generally raised projections over the last five years. For the high case, the 2008 projection for nuclear capacity in 2030 is about 30% higher than that made in 2003. For the low case, the 2008 projection for nuclear capacity in 2030 is about 23% higher than that made in 2003. The 2003 low case projection even forecasted a decline in global capacity after 2020.

Demand continued to increase for Agency assistance in analysing different national and regional energy systems and energy strategies.

In 2008, French and Spanish versions of the user interface were completed for the energy supply system model MESSAGE, the principal model used in many Agency supported studies. This increases the model’s accessibility in French and Spanish speaking countries.

The Agency’s analytical tools are now being used in 115 Member States. Their reach is further increased by six international organizations that are also using them for energy assessments in developing countries. During 2008, 402 energy analysts and planners from 58 countries were trained to use the Agency’s analytical tools. To expand its ability to meet the increased demand for training, and following a successful pilot project in 2007, the Agency introduced on-line training for distance learning (see box on the next page).

Energy Economic Environment (3E) Analysis

In line with its mandate to provide objective and up to date information about nuclear power, the Agency contributes to international studies and deliberations that provide the context within which nuclear power is assessed compared with other sources of energy. At the 14th Conference of the Parties to the

United Nations Framework Convention on Climate Change (UNFCCC) held in Poznan, Poland, in December 2008, the Agency organized two side events with the Polish Nuclear Energy Agency and the OECD/NEA. The Agency also released a special publication, *Climate Change and Nuclear Power 2008*, which provides information on all aspects of nuclear power in the context of current climate change concerns and presents national perspectives from seven countries. The booklet confirms the diversity of reasons to introduce or expand nuclear power (including climate change mitigation, energy supply security, fossil energy price volatility and regional air pollution), as well as concerns that still exist (such as operational safety, proliferation and waste disposal). The Agency further raised

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Expanding the Agency's ability to build capacity in Member States

To respond to the increased demand from Member States for training, the Agency introduced in 2008 'Technology Supported Learning', which uses on-line multimedia training packages to facilitate training in conducting distance learning programmes. The sessions using these packages also make use of the cyber platforms of the Asian Network for Education in Nuclear Technology and the Latin American Energy Organization. Human interaction is provided by videoconference sessions and on-line tutors.

Increased demand for technical support prompted the Agency to launch the web based 'Tele-Support Expert Service', which supports users of the Agency's analytical tools. It allows a user to post a question through the Internet, which is routed to an expert inside or outside the Agency. The response is then posted on the web.



its profile, as had been requested by Member States, by providing an on-site information centre, staffed throughout the conference, to distribute publications and answer questions.

At the request of several interested Member States, including Belarus, Chile, Kenya, Malaysia, Poland and Thailand, the Agency provided special presentations on the benefits and concerns associated with nuclear power. The Agency also contributed to three nuclear information workshops: in Bariloche, Argentina; Beijing, China; and Daejeon, the Republic of Korea. The workshops were organized by the World Nuclear University for young nuclear professionals from countries already using nuclear power and those considering starting nuclear power programmes.

A special issue of the *International Journal of Global Energy Issues* on the prospects for nuclear energy in the 21st century was published with significant contributions from the Agency. It included regional and thematic papers reviewing both past experience and the factors now being weighed in regions with interest in nuclear power, for example, West Asia, northern Africa, sub-Saharan Africa, South East Asia and Australia, and provided a major contribution to international deliberations on the role of nuclear power in meeting the world's energy challenges.

Financing the construction of new nuclear power plants continues to be a major concern, particularly in countries considering the introduction of nuclear power. In 2008, the Agency published a report on the *Financing of New Nuclear Power Plants* (Fig. 1). It emphasizes that there is no simple financing

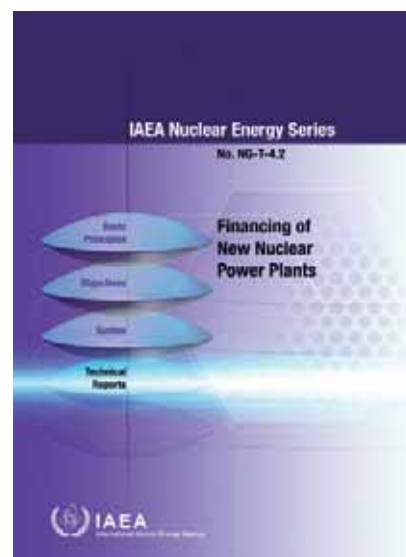


FIG. 1. An Agency report on financing new nuclear power plants emphasizes that, while markets have changed since most of today's plants were built, the underlying importance of the basics remains: stability, long term commitment, sharing of financial risk wisely and ensuring that revenues cover costs.

solution, that markets have changed since most of today's plants were built, but that the underlying importance of the basics remains: stability, long term commitment, sharing financial risk wisely and making sure that revenues cover costs.

A workshop organized jointly by the Agency and the ICTP compared geological disposal of radioactive waste from nuclear energy with the disposal of carbon dioxide from fossil fuel combustion. Carbon dioxide capture and storage (CCS) could reduce emissions of this gas from fossil electricity generation by up to 90% and allow the continued use of fossil fuels even in a highly climate constrained future. The workshop identified similarities between the two waste disposal problems. For example, both carbon dioxide and radioactive waste raise concerns about leakage over very long time spans and about the associated health, liability and intergenerational ethical issues (for example, present generations leaving long lived waste that poses remote but continuing risks to future generations). Adding CCS technology to fossil fuelled plants will add to their upfront and waste disposal costs, making their cost structure more like that of nuclear power. The workshop also outlined a broad comparison of the economic and climate change benefits of nuclear energy versus fossil electricity generation with CCS, and initiated a CRP in which research teams from interested Member States will prepare in-depth comparisons of selected aspects of the geological disposal issue.

Nuclear Knowledge Management

Concerns have been expressed in a number of countries about the possible lack of availability of people with the skills needed by the nuclear power industry. These include countries with established nuclear power programmes and newcomers. Their concerns cover skills associated with all steps in the fuel cycle, from uranium exploration through reactor operation to decommissioning and spent fuel management. Agency activities on nuclear knowledge management address topics across the full range of concerns.

The Agency convened a meeting of senior officials in May to review nuclear knowledge management needs and discuss priorities. Participants agreed that, for the immediate future,

education in nuclear science and technology and knowledge transfer to the next generation should be given the highest priority.

The Agency published guidance on the *Planning and Execution of Knowledge Management Assist Visits for Nuclear Organizations* (IAEA-TECDOC-1586) and conducted three such visits in 2008 to: the Ignalina nuclear power plant in Lithuania; the Zaporozhye nuclear power plant in Ukraine; and the Atomic Energy Commission of Kazakhstan and the Institute of Nuclear Physics in Kazakhstan. As the name implies, assist visits provide assistance, education and advice on best practices and strategies in knowledge management; they reinforce existing strengths; and they offer recommendations on possible improvements.

The Agency also conducts training courses on nuclear knowledge management to reach broader audiences, and supports networks that disseminate information in this area. In cooperation with the ICTP, the European Commission and the World Nuclear University, the Agency conducted the 2008 Knowledge Management School at the ICTP. It also

conducted a workshop at the Research Centre Karlsruhe, in Germany, and a regional training course in Vienna on the development of

the ANENT cyber platform and distance learning, at which participants from Asia received training in operating the ANENT web portal and cyber platform (www.anent-iaea.org).

The Fast Reactor Knowledge Organization System was completed in 2008. It establishes an information structure in the area of fast reactors, provides an open mechanism for introducing new documents or references from owners, and supports information searches. The system contains more than 50 000 records and will be an important resource for countries considering fast nuclear technology. This is a result of the Agency's pilot project on a fast reactor knowledge preservation system that began in 2004. Member States with either extensive experience with fast reactors or active programmes will continue to update the system.

International Nuclear Information System and Library

Member States, in particular those considering the introduction of nuclear power, research

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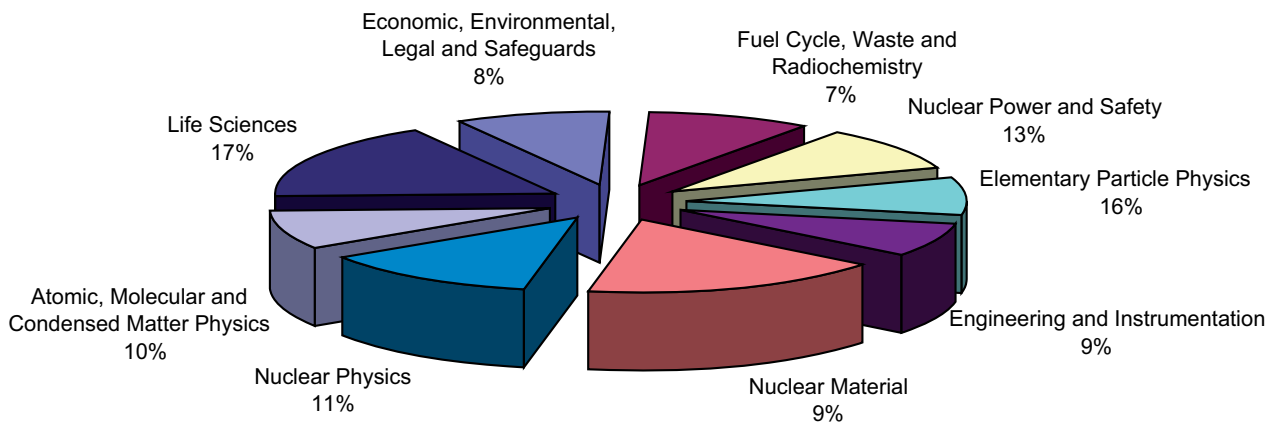


FIG. 2. The range of subjects covered by INIS in areas of the Agency's activities in nuclear science and technology.

reactors or other peaceful applications of nuclear techniques, require easy access to reliable and authoritative information on numerous aspects of nuclear science and technology. The International Nuclear Information System (INIS) provides instant on-line access to such information (Fig. 2). The 34th Consultative Meeting of INIS Liaison Officers endorsed a pilot project for free public access to the INIS on-line database, which would increase accessibility significantly. In 2008, INIS also moved

"The International Nuclear Information System ... provides instant on-line access to ... information [on nuclear science and technology]."

from a bibliographic database of metadata to a searchable full text database. The number of full text records increased to over 650 000, and the total number of bibliographic records rose to over three million.

The IAEA Library complements INIS data by coordinating the International Nuclear Libraries Network (INLN). In 2008, the INLN focused on the information needs of newcomers to nuclear power. Membership in INLN increased from ten partners in 2007 to 23 in 2008.