

# Capacity Building and Nuclear Knowledge Maintenance for Sustainable Energy Development

## Objective

To enhance the capacity of Member States to perform their own analyses regarding electricity and energy system development, energy investment planning and energy–environment policy formulation; to maintain and enhance the information and knowledge resources concerning the peaceful uses of nuclear energy; and to keep the nuclear option open for Member States who wish to retain it.

## Capacity Building and Energy Economics Environment (3E) Assessments

Agency projections of global nuclear power development, published in 2005, show a considerable increase in world nuclear power capacity by 2020 and beyond. Most of the development is expected in the Far East and South Asia. Table 1 shows low and

high projections. The low projection considers only firm plans announced by governments and power utilities for: (a) construction of new nuclear power plants; (b) licence renewals for existing plants; and (c) the retirements of old plants. The high projection includes the additional nuclear power plants indicated in the long term plans of governments and utilities that were judged plausible at an expert meeting convened by the Agency. The updated projections are available on the Agency's web site at <http://www.iaea.org/OurWork/ST/NE/Pess/RDS1.shtml>.

The Agency regularly updates and enhances its energy–environment analysis tools on the basis of feedback from users in Member States and the recommendations of experts. In this regard, a new version of the Agency's Model for Analysis of Energy Demand (MAED) was completed in 2005. The most prominent feature of the new version is its flexibility in analysing the structure of energy use on the basis of a particular economy and energy

Table 1. Agency Projections for Global Nuclear Power Development

Country group	2004			2010 <sup>a</sup>			2020 <sup>a</sup>			2030 <sup>a</sup>			
	Total elect. GW(e)	Nuclear		Total elect. GW(e)	Nuclear		Total elect. GW(e)	Nuclear		Total elect. GW(e)	Nuclear		
		GW(e)	%		GW(e)	%		GW(e)	%		GW(e)	%	
North America	1055	111.3	10.6	1099	116	11	1194	118	10	1318	115	8.7	
				1155	117	10	1279	128	10	1422	145	10	
Latin America	264	4.1	1.6	303	4.1	1.4	383	6.1	1.6	483	5.8	1.2	
				350	4.1	1.2	543	6.1	1.1	828	15.0	1.8	
Western Europe	724	125.1	17.3	762	119	16	842	97	11	940	79	8.5	
				816	125	15	951	130	14	1118	145	13	
Eastern Europe	466	49.4	10.6	469	48	10	505	64	13	543	66	12	
				496	51	10	605	78	13	736	97	13	
Africa	105	1.8	1.7	115	1.8	1.6	143	2.1	1.5	181	2.1	1.2	
				135	1.8	1.3	207	4.1	2	316	9.3	3	
Middle East and South Asia	284	3	1	331	9	2.8	430	15	3.6	556	18	3.2	
				370	10	2.8	555	27	4.9	811	43	5.3	
South East Asia and the Pacific	143			169			213	0.9	0.4	264	0.9	0.3	
				184			270	0.9	0.3	391	3	0.8	
Far East	651	72.8	11.2	685	82	12	804	113	14	937	131	14	
				840	85	10	1167	142	12	1589	183	11	
World total	Low estimate	3693	367.5	10	3934	380	10	4515	416	9.2	5223	418	8
	High estimate				4347	395	9.1	5576	516	9.3	7210	640	8.9

<sup>a</sup> Nuclear capacity estimates take into account the scheduled decommissioning of the older units at the end of their lifetime.

system, making it now more suitable for widely diverse country situations. Enhancements to two other Agency models — MESSAGE (Model of Energy Supply Systems and General Environmental Impacts) and SIMPACTS (Simplified Approach for Estimating Environmental Impacts and External Costs of Electricity Generation) — were also incorporated. The user interface of SIMPACTS was further developed so that SIMPACTS is now available in Arabic, English, French, Spanish and Russian. Enhancements to MESSAGE include the analysis of the nuclear fuel cycle and carbon dioxide capture and storage. A total of 109 Member States are now users of the Agency’s energy models. Many international and regional organizations, such as the European Union, OLADE, UNDP, USAID and the

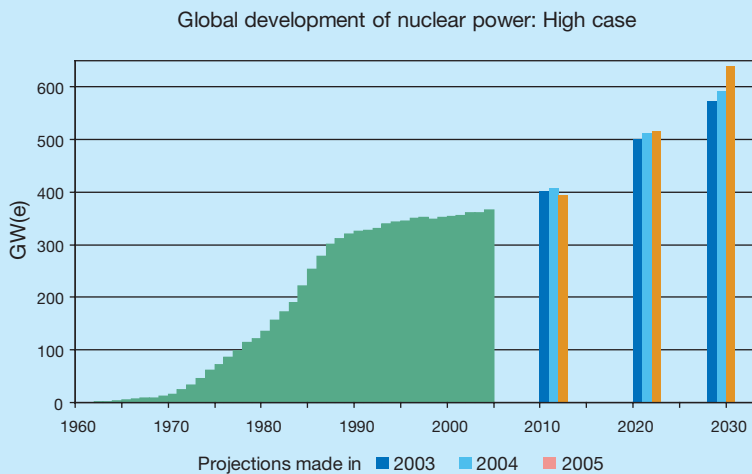
World Bank, are also using these models for their energy projects in developing countries.

Capacity building in Member States, for sustainable energy development and energy planning, remained a central focus of Agency efforts in 2005. Driven partly by rising expectations around the world for nuclear power, the Agency received numerous requests from Member States for assistance in conducting energy studies to evaluate future energy options. In 2005, the Agency organized 18 training courses, including interregional, regional and national courses and workshops on energy issues and analytical tools.

Prior capacity building efforts, including training in the use of Agency tools for 3E analysis, were used in a series of national energy system modelling

### **Building Analytical Capacity in Member States to Meet Future Energy Needs**

Governments and industry around the world are considering increased investments in nuclear power. This is reflected in the latest high projection for the global development of nuclear power, prepared by the Agency in 2005 on the basis of government plans and expert estimates.



In this regard, the Agency expanded its capacity building activities for national energy studies, including analyses of the potential role of nuclear power in meeting future energy needs and training. A total of 272 energy professionals from 51 States received such training in 2005.



exercises and analyses, including a study of energy supply security in the Baltic States and studies of energy system requirements in India and Mexico. Further assessments included studies of the cost effectiveness of nuclear power for greenhouse gas mitigation, and an economic assessment of the contribution of nuclear technologies to the economic growth of the Republic of Korea over the last 20 years. An integrated assessment of the economic impacts of an early closure of nuclear power plants in Bulgaria was also completed.

The Agency's project on developing indicators for sustainable energy development resulted in the interagency publication, *Energy Indicators for Sustainable Development: Guidelines and Methodologies*, published jointly with the European Environment Agency, Eurostat, OECD/IEA and UNDESA. The CRP on applying these indicators in several Member States was completed, and the reports of the participating countries are being published by UNDESA, which has been an active partner in this project. A joint IAEA-UNDESA publication containing the seven country reports from the CRP is also being prepared for publication by UNDESA, which intends to distribute both reports at the 14th Session of the UN Commission on Sustainable Development (CSD-14) in May 2006.

The Agency was also active during the year in 'UN-Energy', the new mechanism established after the 2002 World Summit on Sustainable Development (WSSD) to promote coherence among UN agencies in the area of energy. In 2005, UN-Energy published *The Energy Challenge for Achieving the Millennium Development Goals* for the September World Summit in New York. Under the umbrella of UN-Energy, the Agency led a joint project with FAO, UNDESA and UNEP to apply the Agency's models to specific WSSD recommendations. The project includes case studies in Africa and China, with initial results to be presented at CSD-14. The focus on Africa coincides with the growing number of participants from African Member States in the Agency's capacity building activities – 41 in 2005 compared with only 13 in 2001.

The Agency continued its active participation in the activities of the Intergovernmental Panel on Climate Change (IPCC), and also in the 11th Session of the Conference of the Parties to the UN Framework Convention on Climate Change. For example, it contributed to the *Special Report on Carbon Dioxide Capture and Storage*, published by the IPCC in December 2005, and to the IPCC expert meetings on uncertainties and on emission scenarios.

## Nuclear Information Management

The Agency's International Nuclear Information System (INIS), celebrating its 35th anniversary, expanded in 2005 at a record pace, adding 116 000 abstracted records and 15 000 electronic documents to its database. This brought the total to over 2.6 million records and 600 000 documents, the greatest annual growth in the history of INIS. The INIS system has grown to nearly 1.3 million authorized users with 438 subscriptions.

Six new members joined INIS in 2005: Burkina Faso, Kyrgyzstan, Haiti, the Middle Eastern Radioisotope Centre for the Arab Countries (MERRCAC), the World Nuclear Association (WNA) and the World Nuclear University (WNU), bringing the total number of participating members to 136 (114 countries and 22 international organizations). A new INIS centre was established in Azerbaijan. In addition, two new technical cooperation projects were started, one to establish an INIS centre in the United Republic of Tanzania and one to upgrade the National Information and Documentation Centre of the Egyptian Atomic Energy Authority.

The Agency is taking a proactive approach in supporting the use of INIS by Member States. For example, in the INIS Training Seminar held in autumn 2005, participants from 28 national INIS centres were trained in INIS operation. Such training is also provided through the INIS Distance Learning Programme. The Agency granted free access to INIS to an additional 33 universities in 2005, bringing the total number to 283.

In cooperation with the national INIS centres, the first electronic version of the *INIS Multilingual Thesaurus* was developed. The number of OECD/NEA computer codes provided over the past 35 years to IAEA Member States reached 10 000.

The Agency is also active in the preservation of information, mainly by digitizing printed information. In 2005, over 1.5 million pages were digitized in close cooperation with the Russian and French INIS centres. In addition, all available materials related to INIS were digitized and published as *INIS Historical Materials*.

The Agency has been assisting African Member States in establishing national and regional capabilities for using information communication technology (ICT) in training and education. Particular emphasis was paid in 2005 to the training of nuclear engineers, computer scientists and technicians. This work was supplemented by train-the-trainer programmes, as well as the provision of

## **Helping Member States Manage Nuclear Knowledge**

Many Member States, confronted with ageing workforces in their nuclear industries, have begun to set up mechanisms to preserve information and knowledge for use by future generations. The Agency has a range of activities focused on the preservation and management of nuclear knowledge. Key areas of work include:

- Providing guidance for policy formulation and for implementation of nuclear knowledge management;
- Pooling, analysing and sharing nuclear information to facilitate creation of knowledge banks;
- Implementing effective knowledge management systems;
- Preserving and maintaining nuclear knowledge;
- Securing sustainable human resources for the nuclear sector;
- Enhancing nuclear education and training.

ICT tele-centres, for the Democratic Republic of the Congo, Mauritius, Morocco and Zambia.

## **Nuclear Knowledge Management**

The maintenance and preservation of nuclear knowledge have continued to be key Agency objectives. In 2005, the focus was on the development of methodology and guidance, on creating a “knowledge management culture” involving governments, industry and academia, and on dedicated projects in knowledge management.

In the area of development of guidance and methodologies for nuclear knowledge management, a workshop was held in August 2005 at the Abdus Salam ICTP, in Trieste, Italy, to share best practices in supporting young nuclear professionals. Two publications were finalized, one on *Knowledge Management for Nuclear Industry Operating Organizations* and the other on *Risk Management of Knowledge Loss in Nuclear Industry Organizations*. In addition, the Agency conducted missions to support the nuclear power plants in Krško, Slovenia, together with WANO, and Kozloduy, Bulgaria, to help develop a strategy for knowledge management.

As part of its work in knowledge management, the Agency helped to organize a regional meeting with AFRA Member States. The meeting focused on national strategies for human resources development, including retention of skills, succession plans, and management and preservation of nuclear science knowledge and technology.

Agency activities in the area of preservation of knowledge included the production of a DVD containing documents on experience and the lessons learned from the Chernobyl accident. Under the Fast Reactor Knowledge Preservation (FRKP) Initiative, a structured process for collecting data and knowledge on fast reactors was established, and fast reactor taxonomies are being developed, together with specifications for the FRKP Internet portal that will eventually make the collected data and knowledge accessible to all members of this initiative.

Tools and services are being developed for better access to information and knowledge. For example, two new web services, ‘Find-An-Expert’ and ‘Ask-An-Expert’, were started. In December, a new information and knowledge portal — *Nucleus* — was set up by the Agency to facilitate access to a range of nuclear information. ■