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

The Agency assists interested countries to build their energy planning capabilities with respect to all three aspects of sustainable development — economic, environmental and social. Specifically, it develops and transfers planning models tailored to their special circumstances, as well as making available the latest data on technologies, resources and economics (Table 1). As of 2004, Agency energy planning tools were being used in more than 100 countries around the world.

Demand for the Agency's energy assessment models — which treat all energy supply options equally — and services is growing due to increasingly complex energy systems, market liberalization, privatization and environmental concerns. Country studies were completed in 2004 for Bulgaria, China, Haiti, India, Indonesia, Republic of Korea, Lithuania, Mongolia, Nigeria, Pakistan, Philippines, Sri Lanka and Vietnam. Technical cooperation projects are the main mechanism for such studies. In 2004, eight such projects — four national and four regional, involving 36 Member States — were either concluded or were in progress. Two new regional projects will be launched in Asia (with 13 countries) and Europe (three countries), as well as five national projects in Azerbaijan, Colombia, Ghana, Guatemala and Nicaragua.

The number of people attending Agency regional, interregional and national training courses and workshops has risen steadily in recent years and reached a record high in 2004 of 231 energy professionals from 43 countries.

Training and national applications of the Agency's modelling tools are supplemented by CRPs that serve both to improve the understanding of important aspects of energy planning and further disseminate the models to interested Member States. For example, in a CRP on 'Cost Effectiveness of Nuclear Power Compared with CO_2 Capture and

Table 1. Agency Planning Models and their Distribution in 2004

Model	Description	Releases to Member States
MAED	Evaluates future energy needs based on development scenarios in a country or region	55
WASP	Identifies the optimal long term expansion plan for a power generating system within constraints defined by the user	80
MESSAGE and ENPEP	Formulate and evaluate alternative energy supply strategies for a country or region	62
FINPLAN	Assess the financial viability of plans and projects	13
SIMPACTS	Estimates environmental impacts and costs using minimum data input	23

ENPEP: Energy and Power Evaluation Package; **FINPLAN:** Model for Financial Analysis of Electric Sector Expansion Plans; **MAED:** Model for Analysis of Energy Demand; **SIMPACTS:** Simplified Approach for Estimating Environmental Impacts and External Costs of Electricity Generation; **MESSAGE:** Model of Energy Supply Systems and General Environmental Impacts; **WASP:** Wien Automatic System Planning Package.

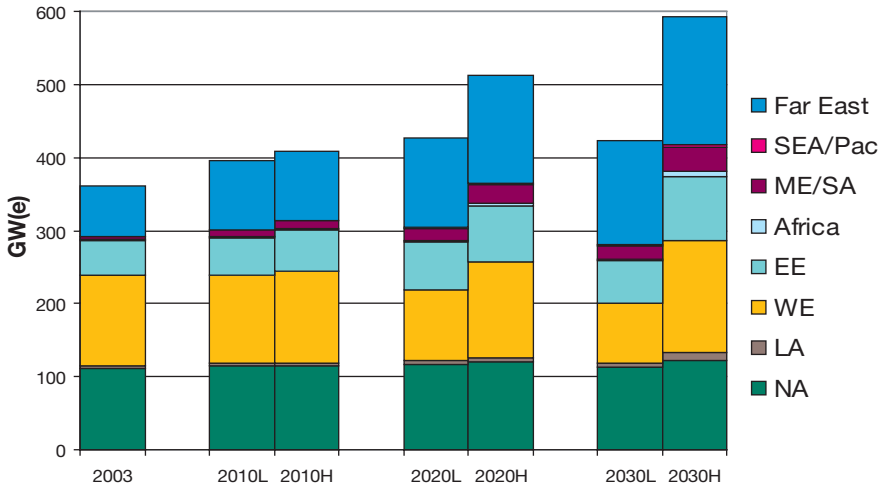

FIG. 1. The Agency's latest low and high projections through 2030 for worldwide installed nuclear power capacity (source: Energy, Electricity and Nuclear Power Estimates for the Period up to 2030, July 2004, *Reference Data Series No. 1, IAEA, Vienna (2004)). (**L:** Low; **H:** high; **NA:** North America; **LA:** Latin America; **WE:** Western Europe; **EE:** Eastern Europe; **ME/SA:** Middle East and South Asia; **SEA/Pac:** South East Asia and the Pacific.)*

Sequestration from Fossil Fuel Power Plants' five publications were completed, and one of the teams participating in the CRP received an international award in 2004 for its work in the design of a CO_2 pipeline.

In addition, the Agency is constantly improving its models and databanks for energy planning and analysis. In 2004, the Agency developed PMAT (Plant Modification Assessment Tool) to rank prospective plant modifications both in terms of their performance impact and their risk impact.

The Agency publishes two projections for nuclear energy use every year — a low projection, which assumes that no new nuclear power plants will be built beyond those already under construction or currently planned, and a high projection that incorporates nuclear projects proposed beyond those already firmly in the pipeline. Figure 1 shows the Agency's two medium term nuclear energy projections, as updated in 2004. The low projection is shown by the left bar in each pair, while the high projection is represented by the right bar in each pair. The figure shows different trends for different regions. For North America, for example, both projections are relatively flat. Western Europe shows a notable decrease in the low projection and a notable increase in the high projection. The Far East shows expansion in both projections. Both projections are higher than comparable projections made in 2003, reflecting a sense of rising expectations for nuclear power. For the low projection, 2004 was the fourth year in a row in which the projection was adjusted upwards. For example, in 2000 the low projection projected 300 GW(e) for 2020. The 2004 low projection in Fig. 1 now projects 427 GW(e).

Energy Economics Environment (3E) Analysis

In addition to capacity building, the Agency assists Member States in analysing and designing energy strategies consistent with national sustainable development objectives. In 2004, the Agency completed an initial study on *Energy Supply Options for Lithuania* (IAEA-TECDOC-1408) to assess alternative energy strategies in light of the scheduled closure of the Ignalina nuclear power plant. A subsequent study was initiated on energy security and independence in the Baltic region with the participation of Estonia, Latvia and Lithuania. The Agency also launched a study to assess the contribution of nuclear technology to economic development in the Republic of Korea. Finally, an *Energy and Nuclear Power Planning Study for Armenia* (IAEA-TECDOC-1404) was completed. It identifies least cost energy strategies and their dependence on economic growth and nuclear development policy.

The Agency is active in several initiatives within the UN system to promote sustainable development and follow up the Johannesburg Plan of Implementation and the UN's Millennium Development Goals. A major activity in 2004 was the Agency's continuing coordination of a multi-year effort to produce a major interagency publication, *Energy Indicators for Sustainable Development: Guidelines and Methodologies*. Partners in the report's

development were UNDESA, OECD/IEA, Eurostat and the European Environment Agency. The report — which was finalized in 2004 and published in early 2005 — is intended both to support stand-alone national assessments of sustainable energy development and also, in combination with scenarios and models, to chart national sustainable energy strategies. Another initiative to promote sustainable development was the establishment, in cooperation with FAO, of a prototype financial decision support system for selecting countermeasures in regions contaminated by radioactive material.

Work in the area of sustainable development also included the involvement of the Secretariat staff as coordinating and lead authors of several reports prepared by the IPCC, the UN Water Assessment and the Millennium Ecosystem Assessment. The Agency provided input to global policy processes such as the Conference of the Parties to the UNFCCC. With the entry into force of the Kyoto Protocol on 16 February 2005, many Member States are re-evaluating nuclear power as an important option for meeting their Kyoto obligations, and in terms of prospective, possibly tighter restrictions beyond the UNFCCC's first 'commitment period' of 2008–2012.

The Agency also took an active role in the creation of 'UN Energy' in April 2004, working with sister UN organizations involved in providing energy related assistance to Member States. The creation of UN Energy followed a specific request by the UN's High Level Committee on Programmes, after their review of the UN system's capacity to carry out its part of the Johannesburg Plan of Implementation. UN Energy is designed to better connect energy activities throughout the UN system, to continuously improve efficiency and mutual support.

Nuclear Knowledge Management

Scenarios of expanding global energy demands project growing requirements for nuclear energy, nuclear expertise and nuclear knowledge. At the same time, some sections of the nuclear community are already experiencing work force ageing and attrition. Agency activities in the field of nuclear knowledge management address both of these concerns.

In this context, an international conference on 'Nuclear Knowledge Management: Strategies, Information Management and Human Resource Development' was held in September in Saclay, France. The conference supported development by the Agency of 'knowledge packages' targeted at specific user needs and encapsulating key knowledge about nuclear technologies and power plants.

Educational networking is a key strategy for capacity building and for the better use of available educational resources. The Asian Network for Higher Education in Nuclear Technology (ANENT) was established in 2004. ANENT was set up to promote, manage and preserve nuclear knowledge and to ensure the continued availability of talented and qualified staff in the nuclear field in the Asian region and to enhance the quality of human resources for the sustainability of nuclear technology.

The Agency was a founding supporter of the World Nuclear University (WNU), together with the OECD, WANO and the World Nuclear Association. In June 2004, the Agency convened a technical meeting on planning support activities for WNU and to prepare an action plan for 2004–2005. It was agreed that the first activity would be a WNU Summer Institute in 2005. A meeting of the WNU hosted by the Agency in December 2004 finalized the syllabus of the Summer Institute and discussed the technical and financial support needed to ensure wide participation by all interested States, particularly developing countries.

Data and information from the German KNK-II experimental fast reactor continued to be retrieved and archived within the Agency's Fast Reactor Data Retrieval and Knowledge Preservation Initiative. In 2004, documents from various KNK archives were quality checked, digitized and preserved. Moreover, all documents have been integrated into the Agency's INIS network, and a CD-ROM was produced that documents progress on the KNK-II knowledge preservation project.

International Nuclear Information System

The International Nuclear Information System (INIS) collects and distributes scientific information in all areas of nuclear science and technology published in Member States, including bibliographic data and the full text of documents not readily available through commercial channels, such as reports and dissertations. The INIS Database contains more than 2.5 million records and is the largest of its kind in the world. The addition of Botswana in 2004 brought the membership to 130 — 111 States and 19 international organizations.

In 2004, INIS added a record 106 929 bibliographic entries. The increase was due to the introduction of a computer assisted indexing system and the direct

acquisition of electronic records from publishers. A total of 10 675 items of non-conventional literature (NCL) were also added to the INIS NCL Collection. There were 399 subscriptions to the INIS Database on the Internet in 2004, an increase of 20% over 2003. The total number of authorized users reached 974 475, representing an increase of 66% over 2003, and an additional 74 universities were provided with access, an increase of 42% over 2003.

New innovations introduced during the year include a pilot version of a new Internet interface that provides direct linking to all NCL full text documents, and a computer assisted indexing system that began operation in June. This system accelerated the indexing of electronic records acquired from publishers without compromising quality.

Assistance in the use of INIS in Member States around the world continued through two technical cooperation projects that provided the services of experts, staff training, equipment and support materials. The Agency also continued its cooperative arrangement with the OECD/NEA Data Bank through which the Agency both distributes programmes to non-OECD countries (1060 in 2004) and facilitates non-OECD contributions to the Data Bank. ■