

# 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; and to enhance information and knowledge resources on the peaceful uses of nuclear science and technology serving the needs of Member States and the Secretariat.

## Energy Modelling, Databanks and Capacity Building

The rising expectations for the future contribution of nuclear power were reflected in the Agency's 2007 projections for nuclear power development in the world. Table 1 shows the low and high estimates of nuclear power capacity for various regions. The low estimates include only firm plans by governments and power utilities for construction of new nuclear power units and life extensions of existing units, adjusted for the planned retirements of units. According to these low estimates, the global nuclear power capacity will increase to 447 GW(e) in 2030, compared with 370 GW(e) at the end of 2006. In the high estimates, which include additional nuclear power units suggested by the long term plans

of governments or utilities, global nuclear power capacity is expected to reach 691 GW(e) in 2030. The largest increase is estimated for the Far East region, where even in the low case about 55 GW(e) of new nuclear power capacity is expected. In the high case, this additional capacity would be over 100 GW(e).

In 2007, steps were taken by Member States interested in making use of nuclear power for meeting their future needs. The Agency received national and regional requests, involving more than 70 countries, for technical assistance in conducting energy planning studies. Currently, through the technical cooperation programme, such studies are being supported in 77 countries, of which 29 are evaluating the nuclear power option.

The Agency develops and transfers to interested Member States analytical tools for energy assessments, with emphasis on building local capabilities for the application of these tools in national energy studies. During 2007, 22 regional and national training events were organized through which 429 energy analysts and professionals received training (see Fig. 1). Ten fellows were also hosted at the Agency.

A pilot project was successfully completed in 2007 for a new distance learning service that features an Internet training package. This included an e-training course using the Asian Network for Education in Nuclear Technology (ANENT) platform. Based on this experience, distance learning will be expanded

TABLE 1. NUCLEAR POWER CAPACITY PROJECTIONS: LOW AND HIGH ESTIMATES

Country group	2006	2010		2020		2030	
		Low	High	Low	High	Low	High
North America	112	114	115	125	132	129	168
Latin America	4	4	5	8	8	9	19
Western Europe	123	121	122	91	131	71	149
Eastern Europe	47	48	49	70	85	81	111
Africa	2	2	2	3	5	3	12
Middle East and South Asia	4	10	11	16	27	21	46
South East Asia and the Pacific					1	1	7
Far East	78	79	82	112	136	133	179
World total	370	378	386	425	525	447	691

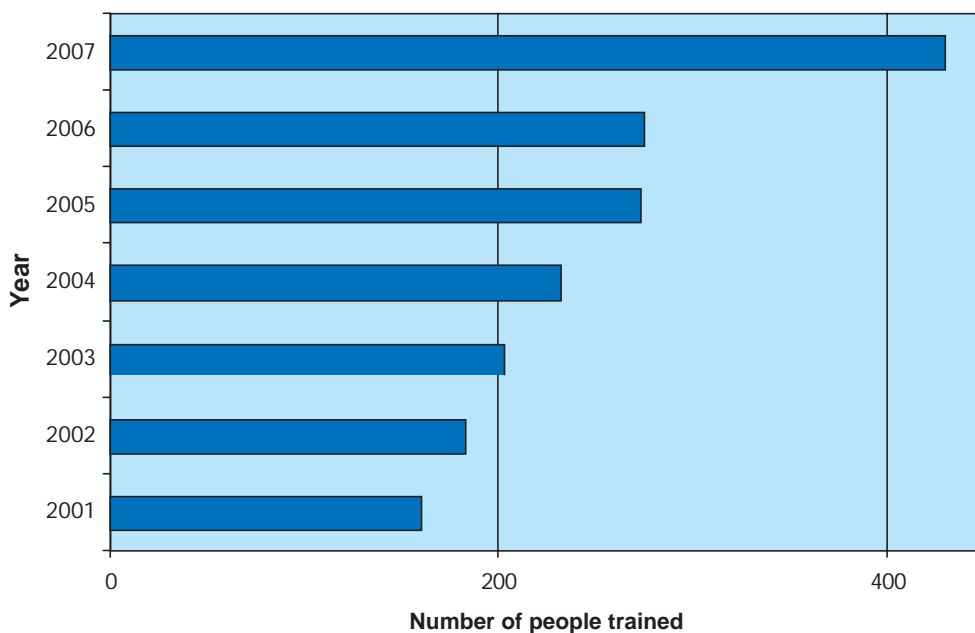


FIG. 1. Agency training of professionals in Member States in energy system planning and analysis and in the use of its models (2001–2007).

to reach more energy analysts and professionals in Member States.

### Energy Economy Environment (3E) Analysis

The year 2007 saw new scientific and policy developments that facilitated a better understanding of global climate change, with crucial implications for nuclear power. In the scientific area, for example, the Intergovernmental Panel on Climate Change completed its Fourth Assessment Report, to which the Agency contributed as a member of several working groups. These groups: confirmed the increasing anthropogenic influence on the climate system due to the emission of greenhouse gases (GHGs), the bulk of which originate from the burning of fossil fuels; presented discernible impacts of climate change, particularly in sensitive ecological systems; analysed the vulnerability of societies and ecosystems to changing climatic conditions; identified adaptation options and their limitations; and concluded that beyond certain magnitudes of climate change adaptation possibilities become exceedingly expensive or vanish altogether. This calls for a drastic reduction of GHG emissions (about 50% globally by 2050), and greatly increases the importance of low carbon energy technologies

such as nuclear power. The groups also found that in the power sector, over the time horizon to 2030, nuclear energy has the largest mitigation potential in terms of emissions avoided at the lowest average social cost globally. A comprehensive survey of technological assessment studies concluded that nuclear power (together with hydro and wind power) generates the lowest lifetime GHG emissions per unit of electricity generated.

On the policy side, parties to the United Nations Framework Convention on Climate Change (UNFCCC) adopted the Bali Action Plan at the 13th

Conference of the Parties (COP-13) in December. This document frames a two year process to finalize and adopt a post-2012 global climate agreement, including GHG emission reduction

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arrangements. The Agency arranged a side event at COP-13 to provide information about the potential role of nuclear power in GHG mitigation and about its services to interested Member States for analysing the nuclear option as part of their national energy planning. The Agency also assisted the UNFCCC Secretariat in preparing background documents for the negotiators.

At the 15th session of the Commission on Sustainable Development (CSD-15), focusing principally on energy, three publications were released for which the Agency was an author jointly

with other international organizations (i.e. UNDESA, UN-Energy and the World Bank). The first, *Assessing Policy Options for Increasing the Use of Renewable Energy for Sustainable Development: Modelling Energy Scenarios for Sichuan, China*, presents results using the Agency's energy analysis models. The second was *Energy Indicators for Sustainable Development: Country Studies on Brazil, Cuba, Lithuania, Mexico, Russian Federation, Slovakia and Thailand*, while the third was entitled *Energy for Sustainable Development: Policy Options for Africa*.

## Nuclear Knowledge Management

In June, the Agency hosted an international conference in Vienna on 'Knowledge Management in Nuclear Facilities'. The main areas covered were the role of knowledge management in the safe operation of nuclear power plants, knowledge management's contribution to gains in operating economics and performance, the preservation of existing knowledge and its use in relation to future innovations, and the smooth and effective transfer of knowledge to the next generation. The main conclusions were the importance of the human factor in knowledge management for issues relating to nuclear safety and security, and the need for nuclear knowledge management to be an integral part of all nuclear activities at the project, corporate and national levels.

Providing training in nuclear knowledge management methodology continued to be a high priority. The annual school of nuclear knowledge management at the Abdus Salam ICTP in Trieste provided 34 participants with an overview and basic understanding of the tools, mechanisms and challenges of nuclear knowledge management. In addition, the Agency supported the 2007 World Nuclear University Summer Institute by funding the participation of 24 candidates from developing countries. Regional workshops on nuclear knowledge management were also hosted by Germany, Japan and the Russian Federation.

In order to enhance the methodology and guidance for nuclear knowledge management, the Agency completed a report on *Web Harvesting for Nuclear Knowledge Preservation*. In addition, special publications on *The World Nuclear University: New Partnership in Nuclear Education* and *Asian Network for Education in Nuclear Technology (ANENT): IAEA Activities and International Coordination* were issued.

The methodologies developed by the Agency were applied through knowledge management assistance visits to the Darlington and Bruce nuclear power plants in Canada, and to the Ignalina nuclear power plant in Lithuania. An important element of the visits was the guided self-assessment, through discussions with the Agency expert team, of the risks involved when knowledge is lost.

The Agency's services to Member States in the area of knowledge management were channelled through ongoing technical cooperation projects. For example, Kazakhstan received assistance in the development of a national concept on nuclear knowledge management. A regional technical cooperation project for Europe on strengthening capabilities for nuclear knowledge preservation supported an expert meeting on the development of a knowledge portal for nuclear power plants and the conceptualization of a guidance document on conducting knowledge management assistance visits. A meeting of national coordinators for a regional project in support of ANENT, held in Goa, India, assisted in the development of the ANENT cyber education platform and planned future activities.

## International Nuclear Information System

INIS continues to play an important role in nuclear information management and preservation and remains the single source of nuclear information for some Member States. The addition of Seychelles in 2007 brought the INIS membership to 141 (118 countries and 23 international organizations).

As with other knowledge management activities, the Agency supported INIS Member States through its technical cooperation programme. In 2007, several national INIS centres were established or reactivated. New national centres were launched in Burkina Faso, Kenya, Niger and Uzbekistan. Assistance was provided to Qatar to reactivate its national INIS centre, and a national training course on INIS was conducted in Ghana. Also, a multilingual thesaurus was completed in 2007 and distributed among Member States in seven languages — the six official Agency languages and German.

The Agency continued efforts to expand free access to the INIS database for universities. In 2007, a total of 354 universities in 63 Member States were granted free access to INIS bibliographic and full text information through the Internet.