Analysis for Sustainable Energy Development

Objective

To increase the capability of Member States to carry out their own energy and electricity sector analyses and investment planning, including the objective analysis of nuclear technologies and their alternatives for the purposes of sustainable energy development, and to ensure that Member States and various international organizations have access to state of the art information on nuclear power in the context of Agenda 21 (the action plan of the 1992 United Nations Conference on Environment and Development) and mitigation of climate change.

Energy Modelling, Databanks and Capacity Building

Capacity building activities for sustainable energy development and planning in Member States, particularly developing countries and transition economies, received further impetus in 2003 following the World Summit on Sustainable Development (WSSD) in Johannesburg in 2002, which emphasized the need for such activities to accelerate the implementation of *Agenda 21*. The Agency organized nine regional and national training courses and workshops to enhance the planning and analytical skills of experts from developing countries. Fellowships were offered and scientific visits for energy analysts were arranged (Fig. 1). Collaborating in some of the training sessions were the ICTP in Trieste, Argonne National Laboratories in the USA, and the Korea Atomic Energy Research Institute.

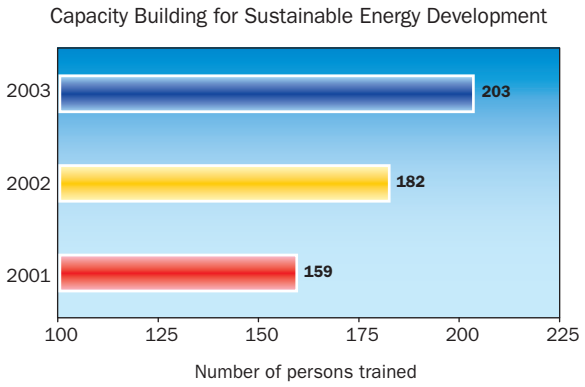

FIG. 1. The Agency provides training to professionals in Member States in energy system planning and analysis and in the use of its models (2001–2003).

The Agency received over 150 requests for its energy models and related databases. About 90 Member States are now using these models to analyse technology choices and policy options for the development of their energy sectors. Some Member States (for example, Belarus, Croatia, Tunisia, the Russian Federation and the United Arab Emirates) are also using the models for research and teaching at their universities. Three national energy studies — for Armenia, Mexico and the Syrian Arab Republic — were conducted through the Agency's technical cooperation programme. In related work, a multi-language user interface for the SIMPACTS[1] model for assessing the external costs of electricity generation was added at the request of Member States.

The medium term nuclear energy projections published annually by the Agency were extended to 2030 (Table 1).[2] The low projection essentially assumes no new nuclear power plants beyond those already being built or firmly planned today, plus the retirement of old plants. The projection was revised upwards in 2003 and estimates a 20% increase in global nuclear generation up until the end of 2020, followed by a decrease, resulting in global nuclear generation in 2030 that will be only 12% higher than in 2002. Nuclear power's share of global electricity generation decreases after 2010 to 12% in 2030, compared with 16% in 2002. Increases are most substantial in the Far East, and decreases are greatest in Western Europe.

The high projection shown in the table takes into account additional reasonable nuclear proposals, even if there is currently no firm commitment. It shows global nuclear power generation steadily increasing by 46% through 2020 and by 70% through 2030, as compared with 2002. There are increases in all regions, again led by the Far East. However, overall electricity generation is projected to increase even faster than nuclear power, causing nuclear power's share of overall electricity to decline. By 2030, the nuclear share is down to 11%.

[1] SIMPACTS: Simplified Approach for Estimating Environmental Impacts and External Costs of Electricity Generation.

[2] Published in *Energy, Electricity and Nuclear Power Estimates for the Period up to 2030, July 2003 Edition*, Reference Data Series No. 1, IAEA, Vienna (2003).

Table 1. Low and High Estimates of Total Electricity Generation and Contribution by Nuclear Power (low estimate: first row in each region; high estimate: second row)

Region	2002			2010			2020			2030		
	Total Elect. TW·h	Nuclear TW·h	%	Total Elect. TW·h	Nuclear TW·h	%	Total Elect. TW·h	Nuclear TW·h	%	Total Elect. TW·h	Nuclear TW·h	%
North America	4779	851.1	17.8	5034	874	17.0	5784	870	15.0	6451	844	13.0
				5444	894	16.0	6709	939	14.0	8146	944	12.0
Latin America	1078	28.6	2.7	1178	29	2.5	1628	47	2.9	2227	30	1.3
				1427	38	2.7	2291	50	2.2	3758	92	2.4
Western Europe	3084	880.2	28.5	3352	858	26.0	3634	823	23.0	3942	564	14.0
				3609	893	25.0	4687	961	20.0	6061	1090	18.0
Eastern Europe	1758	298.5	17.0	1884	319	17.0	2174	423	19.0	2463	378	15.0
				2074	399	19.0	2867	552	19.0	4133	611	15.0
Africa	459	12.0	2.6	538	13	2.5	699	14	2.0	876	14	1.6
				612	14	2.3	973	24	2.4	1530	60	3.9
Middle East and South Asia	1176	19.6	1.7	1342	41	3.1	1805	53	3.0	2327	70	3.0
				1626	47	2.9	2596	100	3.9	3946	194	4.9
South East Asia and the Pacific	600			736			934			1162		
				786			1119	5.5	0.5	1584	18	1.2
Far East	3157	484.3	15.3	3399	695	20.0	4199	855	20.0	5073	981	19.0
				4296	702	16.0	6605	1125	17.0	9830	1361	14.0
World total (Low estimate)	16 090	2574.2	16.0	17 463	2830	16.0	20 857	3085	15.0	24 520	2881	12.0
World total (High estimate)				19 873	2987	15.0	27 848	3756	13.0	38 989	4369	11.0

Energy–Economy–Environment

The two international meetings in 2003 that were most relevant to energy use and sustainable development were the World Climate Change Conference (WCCC) in Moscow in August and September and the Ninth Session of the Conference of the Parties to the UNFCCC (CoP-9) in Milan in December. The Agency was a member of the WCCC organizing committee and provided an invited address to the opening plenary, the first time such attention has been given to the role of nuclear energy. While nuclear energy was not an issue at the CoP-9 negotiations, the Agency was part of a "side event" organized specifically on nuclear power.

Both of the Agency led "Type-2 Partnerships" are conducted in cooperation with UNDESA, which leads the overall UN effort to develop a full range of sustainable development indicators. The immediate objective of one of the partnerships is to produce a report on energy indicators comparable to UNDESA's *Indicators of Sustainable Development: Guidelines and Methodologies* and EUROSTAT's *Measuring Progress Towards a more Sustainable Europe: Proposed Indicators for Sustainable Development.* In 2003, the Agency completed a draft of this report with contributions from the OECD/IEA, UNDESA, the European Environment Agency and EUROSTAT. Under the Type 2 Partnership on Designing Country Profiles on Sustainable Energy Development (CPSED), two new studies were begun in cooperation with UNDESA — for South Africa and Cuba.

Other related international initiatives in which the Agency participated included the 2003 update of the *World Energy Assessment* (to be published by UNDP, the United Nations Department for Economic and Social Affairs and WEC), and a special report by the IPCC on carbon capture and storage.

Increased Agency participation in international endeavours was mirrored by a large number of requests from Member States and international organizations to participate directly in its work. These included three requests for topical studies (in Belgium, Haiti and Lithuania), six requests to participate in cost–benefit studies and three requests for assistance in regional assessments.

Beginning in 2003, the Agency placed special emphasis on using its own planning and analytical tools in energy–economic–environment analyses. The aim is to demonstrate their applicability to Member State analyses of current and topical issues. Use of Agency tools in preparing country profiles in the CPSED partnership is one example. Another is the development of templates for incorporating

the Indicators for Sustainable Energy Development directly into the Agency's own Energy and Economic Data Base. This is a prelude to the broader use of these templates in Member States and by other international organizations.

The extension of topical analytical studies, or analytical approaches, to new applications in areas of interest to Member States was another new focus. An example was a study of the costs and benefits of risk reduction from nuclear power plant modifications that was expanded to an approach for quantifying the full economic, engineering and risk related costs and benefits of upgrades, life extensions and safety enhancements for a variety of reactor types. ■