Plan 'A' for Africa

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African countries are building their capabilities for sustainable energy development through IAEA-supported channels and tools.

Energy is a primary engine for socio-economic development all over the world. In developed countries, access to energy is often taken for granted, but that is not always the case in the rest of the world. In fact, the task of achieving a sustainable and reliable energy platform in developing countries remains a huge one.

Today, an estimated one-quarter of the world's population — 1.6 billion people — has no access to electricity. Ensuring such access, i.e., 'connecting the unconnected', has been highlighted by the Commission on Sustainable Development (CSD) as an essential task for advancing socio-economic development.

Planning is the key

Expanding access to clean and affordable energy services is a highly complicated task that requires careful planning. Poor planning has led to adverse environmental impacts. They range from local deforestation driven partly by firewood consumption, to global warming driven largely by carbon dioxide (CO_2) emissions from energy use.

All countries do not have equal access to energy planning expertise and tools. Countries of the Organisation for Economic Cooperation and Development (OECD) and some others have plenty of university support capacity and expertise, government departments, think-tanks and consulting firms to analyze policy options and future alternative strategies. Other countries do not have those resources and need to develop adequate capabilities for analyzing and planning energy systems with the same standards, using modern tools and know-how.

For years now, the IAEA has been developing a set of analytical tools (models) for energy planning, transferring them to Member States upon request. The IAEA's role in this energy planning and development undertaking is wide-ranging: it transfers the latest data on technologies, resources and economics; it trains local experts; and it assists in the analysis of national options and interpretation of results. The objective is capacity-building, i.e., to establish the continuing local planning expertise necessary to chart national paths to sustainable development.

Multiple Energy Dimensions

In the past, energy system planning was largely restricted to national boundaries, while energy trade with neighbouring countries was often regarded as a last resort. To focus planning exclusively within national boundaries, however, ignores many synergies that can be exploited if countries were to adopt a regional approach to energy planning.

For example, many issues of sustainable energy development — such as energy security and reliability, environmental protection and economic viability — may be better advanced in a regional context.

Regional energy planning, of course, does not obviate national energy planning — the latter is an inevitable first step. It just takes it one step further. It is not a panacea but

it can identify potential low-cost energy supply opportunities that would otherwise not be straightforwardly visible in a national context only.

National and Regional Projects

The IAEA's Technical Cooperation Programme — currently in the first year of the 2007-2008 cycle — includes ten national projects and one regional project to help African States build up their capabilities and carry out cooperative activities in the area of sustainable energy development.

Algeria

The project aims to enhance national capabilities in the area of energy planning and electricity system expansion analysis and to support national efforts aimed at establishing the country's first nuclear power plant for electricity generation. IAEA assistance will help national counterparts at the Ministry of Energy and Mines to develop appropriate methods using IAEA tools to evaluate the country's future energy requirements and to establish a long-term balance between energy supply and demand, along with the formulation of an optimal power system expansion programme up to 2025.

Botswana

The IAEA's support aims to assist the country in developing a medium- to long-term national energy plan by projecting future energy and electricity demand and analyzing the optimal energy supply mix and optimal expansion plan for the electric power sector.

The national team will be provided training, with subsequent follow-up missions to help conduct a detailed country study.

Burkina Faso

The IAEA's assistance seeks to apply Agency tools to assess future energy demand and analyze supply options for meeting it in a sustainable manner. There is an emphasis on analyzing options for providing clean energy to replace the use of biomass in households. The role of the IAEA is to provide technical support in terms of analytical tools and training to national energy professionals who will be responsible for the planning activities.

Chad

The project aims to establish national capabilities for sustainable energy development planning and to diversify energy production sources. The national team will be provided IAEA's analytical tools and training in their use to carry out national energy planning studies.

Ghana

The objective of the project is to help develop a long-term energy plan by determining future energy and electricity demand, the future optimal energy supply mix and an optimal expansion plan for the electric power sector. Recently, Ghana has requested to include an in-depth analysis of nuclear and coal power options in order to assess the potential role of these two technologies and determine which technology should be introduced first. The project will incorporate detailed analysis of the role of renewable energy in sustainable energy development in Ghana. The United Nations Industrial Development Organization (UNIDO) will assist in identifying potential sources of renewable energy. The national team is responsible for carrying out studies to help formulate the long-term energy plan.

Côte d'Ivoire

The project analyzes how to change energy consumption patterns to improve health and economic conditions in the country. Currently, fuel use in Côte d'Ivoire is depleting natural resources, and the lack of energy supplies is hindering socio-economic development. The IAEA will provide technical support in designing a country case study and to provide appropriate analytical tools and training to carry out the case study.

Libya

The IAEA's assistance aims to build up local capabilities in the area of energy planning and to conduct comprehensive studies for designing a national energy strategy that is compatible with sustainable development goals. The studies will cover: an assessment of future energy and electricity needs for all sectors of the economy; an assessment of the availability of conventional energy resources and their future potential for expansion; an assessment of the potential role of renewable energy sources and advanced energy technologies, including wind, solar, nuclear and hydrogen, in meeting future energy needs; the development of alternative energy scenarios and optimal development paths for the energy supply system and the electric system; and an assessment of the social, economic and environmental impacts of alternative energy scenarios.

Mauritania

The project aims to train energy planners and professionals in the area of sustainable energy development particularly in the analysis of techno-economic and environmental issues of power system expansion. The planning tools for projecting energy/electricity demand and for analyz-

ing energy systems will be used to assess energy demand through 2025 and establish a long-term supply/demand balance. The expertise will also help national bodies to develop scenarios appropriate to the country and to evaluate social, economic and environmental factors related to power generation chains.

Niger

The IAEA's support is provided to the Ministry of Mines and Energy. A country study will be carried out to analyze options to reduce fuel wood consumption and to ensure the better use of local resources, thereby helping to reduce the share of imported energy in the country's total energy supply. The IAEA will provide technical support in designing the case study and to train energy professionals in the use of analytical tools for energy planning for sustainable development.

Sudan

Sudan completed in 2002, with IAEA support, a detailed study on 'Energy Economics and Power Planning'. The study identified nuclear power as a possible option for Sudan and recommended that the government should investigate all the necessary activities to be carried out to initiate a nuclear power programme in the country. Sudan plans to establish an Inter-Ministerial Committee for Nuclear Power Planning, supported by a Nuclear Power Implementation Team (NPIT) with a chairman who will act as the interface with the IAEA for the Nuclear Infrastructure Development Project. The identified coordinator of the NPIT will be responsible for planning and implementing project activities and coordinating with other ministries and departments and with the IAEA.

Regional Project

The IAEA is also involved in a regional project that is looking at ways to strengthen planning capabilities for sustainable energy development. A total of 32 countries are eligible to participate in the project and currently 26 are participating. The overall objective is to enhance the capabilities of the participating States to elaborate national energy strategies for sustainable development. To that end, the project will:

- assist countries in strengthening institutional capabilities for energy planning;
- assist countries in establishing human resources development programmes in the field of energy planning;
- assist countries in conducting national studies on sustainable energy development;
- facilitate comparative assessment studies of electricity supply options using interconnected grids and related sustainable energy strategies;
- assist countries in strengthening integration at the national level among energy agencies and national development organs; and
- enhance regional cooperation and networking for energy planning.

Working with Global Partners

In May 2006, the IAEA and partners presented a detailed study to the 14th Session of the CSD. The study — entitled Assessing Policy Options for Increasing the Use of Renewable Energy for Sustainable Development: Modelling Energy. Scenarios for Ghana — looked at generic policies to increase the share of renewable energy in a country's generation mix. That is one of the policy goals called for in the Johannesburg Plan of Implementation.

The study was a joint effort of the UN Department of Economic and Social Affairs, the IAEA, the UN Food and Agriculture Organization (FAO), the UN Environment Programme, UNIDO, and the Energy Commission of Ghana. Using Ghana's data, it analyzed four scenarios that were assessed in terms of effectiveness, total costs, operating and maintenance costs, and the source of the funds (utilities, consumers or foreign funders).

Also, within the global framework, the United Nations Economic Commission for Africa (UNECA) and the IAEA conducted a regional workshop in Addis-Ababa, Ethiopia, on integrated resource planning for energy/electricity in Africa. The objective of the course was to

IAEA Energy Planning Models

Energy Model	Releases to Member States
ENPEP – Energy and Power Evaluation Programme	69
FINPLAN – Model for Financial Analysis of Electric Sector Expansion Plans	19
MAED – Model for Analysis of Energy Demand	71
MESSAGE – Model of Energy Supply Strategies and their General Environmental Impacts	60
SIMPACTS – Simplified Approach for Estimating Impacts of Electricity Generation	32
WASP – Wien Automatic System Planning Package	85
A total of 112 Member States are using the IAEA's Energy Models	

Source: IAEA

introduce IAEA's methodologies for integrated resource planning to the managers of African power pools. The workshop was attended by energy planners from the West Africa Power Pool; the Southern Africa Power Pool, the 'Communauté des Etats Sahélo-Sahariens', the East African Community, Energie des Grands Lacs, the Inter-Governmental Authority on Development and the Eastern Africa Power Pool. This event represents a first step in collaboration between the IAEA and UNECA in the field of energy planning and strategies.

Prospects for Nuclear Energy in Africa

Of the 439 nuclear power reactors operating around the world today, just two are in Africa — Koeberg-1 and Koeberg-2 in South Africa. Of the 30 nuclear power plants under construction, none is in Africa, although in July 2007 South Africa released for public comment a draft Nuclear Energy Policy and Strategy for the Republic of South Africa, which anticipates the construction of several new nuclear power plant units between 2011 and 2015.

Over the longer term, however, nuclear power may provide a significant share of Africa's electricity. Alongside South Africa, in 2006 Egypt and Nigeria announced steps they are taking toward their first nuclear power plants. In 2007, Namibia announced interest in looking into the option of nuclear power for the longer term. Algeria, Egypt, Libya, Morocco and Tunisia are at different stages of exploring seawater desalination using nuclear energy.

An important challenge for many African countries in the near to medium-term would be that of bridging the gap between the economies of scale that favour large nuclear plants and their present smaller electrical grids and capital capabilities. Possibilities are, first new small and medium-size reactor designs will come first, and second integration of electricity grids among neighbouring countries will follow.

Indeed, of the handful of promising new small and medium-size reactor designs now reaching the prototype stage, an important one is African — South Africa's 165 MW(e) Pebble Bed Modular Reactor (PBMR). The PBMR is expected to be commissioned around 2012 or 2013. The South African Government has allocated initial funding for the project and orders for some lead components have already been made.

Building up Capabilities

The IAEA provides its Member States with invaluable assistance in the nuclear field. With the exception of issues relating to commercial decisions, it can assist by providing technical support for the assessment of potential technology, the managerial approaches that can be considered in the implementation of a project and issues related to the safe and economic operation of a nuclear power plant.

Assistance is also available through a legislative assistance programme for developing comprehensive national legal frameworks. Specific support can also be sought in assisting the development of regulatory bodies. The aim is to build effective and fully competent bodies to oversee the licensing of facilities, and to provide review services covering all aspects of a nuclear power programme. The IAEA aims to strengthen the planning capabilities of its Member States in identifying the role of various technologies and resources needed to meet their energy/electricity demand considering socio-economic, technical, environmental and financial constraints. The analytical tools provided are technology-neutral and can help in the analysis of all energy options including nuclear power technology.

South Africa is home to the continent's only nuclear power station comprising the Koeberg-1 and 2 reactors.

Photo: Eskom

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