

BUILDING TECHNICAL CAPABILITY FOR THE DEVELOPMENT OF NUCLEAR POWER PROGRAMME: UGANDA'S EXPERIENCE (IAEA-CN-179/IAP48)

By

Alex Jagenu

Jagenu@yahoo.com , jagenu@energy.go.ug

Head of Human Resources Management, Ministry of Energy and Mineral Development, P.O Box 7270 Kampala, Uganda

1.0. INTRODUCTION:

The Republic of Uganda is a landlocked country in East Africa with a population of about 33 million. It lies along the equator and is bordered on the east by Kenya, north by Sudan, west by the Democratic Republic of the Congo, southwest by Rwanda, and south by Tanzania.

Uganda has continued to suffer power shortage, mainly due to slow investment in the power sector as well as unreliable rainfall. To supplement the power supply, it has contracted independent power producers to supply electricity from fossil fuels. The Thermal power is expensive and contributes to emission of large amount of carbon dioxide – a major greenhouse gas causing global warming. The total estimated electricity generation potential is in the long term will be about 5300MW.

In view of the increasingly energy needs and urgent environmental concerns related to power production using fossil fuels, the government recognizes that nuclear technology will play important role in future sustainable energy systems. The Government is therefore considering nuclear energy as part of the future energy mix.

However, Uganda is not yet having the capacity to build a nuclear power plant, but is making earnest efforts to prepare for nuclear power programme. These include putting in place appropriate legislation and capacity building in nuclear power technology, implementing human resources development plan, which involves recruiting fresh graduate and sending them abroad for further studies in nuclear science and technology for power generation and regulations, and infrastructure requirement.

2.0. SITUATION ANALYSIS AND RATIONALE FOR NUCLEAR POWER PROGRAMME:

2.1. Existing Generation System

The Ugandan power network has a total installed capacity of 562MW with the two largest hydroelectric plants (Kiira and Nalubale) contributing 380MW, 150MW of reciprocating plants operating on heavy fuel oil and diesel, 17MW of bagasse plant and two small hydro plants at Kilembe mines and Kasese Cobalt totaling 15 MW.

Power supply shortages suffered, worsened by significant reduction in the level of Lake Victoria leading to load shedding (1990's) Brief relief in 2000 with the commissioning of first two 40MW units at Kiira power station. By 2009, drought and low water level reduced combined output of Nalubale and Kiira to 160MW from installed capacity of 380 MW.

From 2005, GOU entered into agreements with independent power producers (IPP's) for 3 x 50MW of emergency thermal plants comprising high-speed diesel units operating on distillate fuel. One was decommissioned in 2008.

A 50MW IPP medium speed diesel power plant operating on heavy fuel oil (HFO) was commissioned in April 2008 and the second at end of 2009. Despite these measures "status quo".

A 250-MW Bujagali Hydropower Plant is under construction and is expected to be commissioned by of 2011.

2.2. Energy Resources in Uganda

2.2.1 Renewable Energy Potential

Uganda is endowed with considerable Renewable Energy resources for electricity generation, yet they remain unexploited. (Biomass, geothermal, large scale hydro, mini/micro/pico hydro, wind and solar energy). With the exception of biomass whose contribution is very significant, the remaining renewable sources (including large hydros), contribute about 5% of the country's total energy consumption. This limits the scope and productivity of economic activities. Thus use of these abundant resources should be enhanced.

2.2.3. Oil and Gas Resources

Successful oil and gas exploration with the discovery of commercial petroleum resources in the Albertine Graben has created excellent opportunities for the country and the region but has also brought in challenges. The proven oil reserves estimated to be over one billion barrels. Part of this oil planned for power generation. Initially, 85-MW capacity will be installed but will be increased with production.

2.2.4. Why Nuclear Power

- Nuclear power is becoming increasingly more important as world seeks carbon-free energy, Uganda considering to launch nuclear electricity generation programme.
- The key drivers; Uganda has limited energy resources to meet future electricity demand for the growing population and the economy (total electricity potentials from renewable energy sources is less than 6000MW).
- On the other hand, growing effects of global warming and climate change make the future of hydropower in the region lie in balance (acute drought, low water levels & dried up rivers)
- Against this background, the Government envisages that nuclear power will play a very important role in the countries future energy mix.

3.0 POLICY AND LEGISLATIVE FRAMEWORK:

The Government has embarked on a power sector reform programme .to provide adequate, reliable and least-cost power supply to meet the country's demand, promoting the efficient operation of the power sector and scaling up rural and peri-urban access to maximize the impact on poverty reduction.

- The parliament of Uganda enacted the Electricity Act (1999) with the aim of bringing about an enabling environment for the transformation of the electricity sector.
- In 2002, comprehensive policy on energy - goal meeting the energy needs of Uganda in an environmentally sustainable manner.
- In 2007, The Renewable Energy Policy for Uganda - goal to increase the use of modern renewable energy from 3.8% to 61% of total energy consumption by the year 2016.
- Despite these reforms, there are significant power supply shortages, low rates of access to electricity and high levels of power losses, with negative impact on the country's economic growth.

4.0. STRATEGIC ACTION FOR CAPACITY DEVELOPMENT FOR NUCLEAR POWER PROGRAMME:

Uganda is not yet having the capacity to build a nuclear power plant, but preparing for nuclear power programme by the following These include putting in place appropriate legislation and capacity building in nuclear power technology.

4.1. Legislation

In 2008, Uganda enacted the Atomic Energy Act 2008.

4.1.1 The Atomic Energy Council

The Atomic Energy Council is established under the act as an independent regulator of atomic energy activities in the Country.

4.1.2 The Nuclear Energy Unit

The Unit is established in the Ministry of Energy and Mineral Development for promotion of nuclear power generation and other peaceful applications of the atomic energy.

4.2 Capacity Building

Uganda still lacks expertise in energy planning and related support services for nuclear power. The government is ensuring that adequate resources are put in place to support the launching of the nuclear power programme. Young graduates recruited and being trained in nuclear science and technology for power generation

4.3. International Cooperation

Under the Technical Cooperation Project: Increasing Awareness at Decision Making Level about the Requirements and Challenges Related to the Feasibility of a Nuclear Power Programme (RAF/0/033), IAEA assistance will be required in helping the country to make informed and knowledgeable decision on nuclear power programme. Specific assistance from the IAEA will be requested in the following areas:

- a. Ensure compliance with international requirements for peaceful nuclear power programs;

- b. Assist in staff development of the Nuclear Energy Unit (NEU) to enable them to oversee key aspects and requirements of a nuclear power program.
- c. Strengthen the energy planning capability through advanced training on energy planning, expert missions, fellowships and analytical reviews.
- d. The Government will undertake a national energy assessment in order to determine the possible role of nuclear power and other energy sources in Uganda's electricity and energy mix. (This will constitute a pre-feasibility activity for new energy supply options.) The IAEA will be requested to review the energy assessment document.
- e. Based in part on the energy assessment, the infrastructure requirements for the introduction of nuclear power will be studied. The IAEA will be requested to provide detailed briefings on the infrastructure milestones and related requirements for the introduction of nuclear power. This will enhance assessment of current infrastructure gaps and training of key staff members.
- f. Based on points (d) and (e) an assessment of the infrastructure gaps will be undertaken by the Government through the NEU. The IAEA will be requested to provide guidance and training to key staff on the execution.

5.0. CONCLUSION:

The future of civilization will depend upon the sustained supply of electricity. Clearly, there is a limit to the supply of fossil fuels. Although wind, solar and renewable energy sources can sustain our world with power indefinitely, the power generation potential from even a small amount of uranium is so great. Also, taking nuclear power out of the options as a viable alternative will prevent the global community from achieving long-term gains in the control of carbon dioxide emissions.

There is need to develop more interest in nuclear energy from an informed point of view in order to have a sustainable energy supply.

Nurturing the nuclear option requires overcoming the four challenges of costs, safety, proliferation and wastes. The effort to overcome these challenges is justified only if nuclear power can potentially contribute significantly to reducing global warming, which entails major expansion of nuclear power. Therefore preserving the nuclear option for the future requires comprehensive planning for growth, in which nuclear energy is a competitive, safer, and more secure source of power.

Reference:

1. THE RENEWBLE ENERGY POLICY for uganda 2007
2. ATOMIC ENERGY ACT for uganda 2008
3. A.T. GUTSALOV, E.S MATSULEV (1995): Development of rules and regulations in the Nuclear power in the Russian federation. Moscow
4. INTERNATIONAL ATOMIC ENERGY AGENCY, Mission Report (1996)
5. MINISITRY OF ENERGY AND MINERAL DEVELOPMENT Report 2008 Uganda
6. THE COUNTRY PROGRAMME FRAMEWORK (2009 – 2013)