THE NUCLEAR TECHNOLOGY CENTRE

THE RESEARCH REACTOR

5.0 INTRODUCTION:

The Nuclear Technology Centre (NTC) is one of the three major components of the Sheda Science and Technology Complex (SHESTCO). The NTC is mandated to initiate, promote and implement rational, realistic, pragmatic and innovative research and development (R&D) Programmes in nuclear science and technology for the socio-economic development of Nigeria.

In consonance with this mandate, the main thrust of our nuclear programme is the peaceful application of nuclear technology for use in all the major sectors of our national development. The centre is therefore designed to utilize the state of the art advancements in nuclear science and engineering for peaceful application in the fields of energy, agriculture, health, environment, industry and research in the natural and applied sciences.

The activities of the NTC, when fully functional, are designed and organized around a multi-purpose research reactor comprising of the following units and facilities:

A 7MW multi-purpose Nigeria Research Reactor with long-term fuel storage facility;

Radioisotope Plant;

Gamma Irradiation Facility (GIF);

Health Physics Laboratory;

Neutron Scattering and Neutron Radiography Laboratory;

Waste Treatment Plant; and

Central Mechanical and Electrical Workshop;

5.1 THE IMPORT OF PROGRAMME.

The reactor component of the programme is designed to optimally utilize reactor technology in a safe and secure manner for application in medicine, food and agriculture, mining and industry, and in applied and basic scientific research, in conformity with acceptable international standards as enunciated by the International Atomic Energy Agency. It is also expected for capacity building in the generation of electricity from nuclear power plants.

Implementation of a nuclear energy research programme is usually very capital intensive. Thus, the concept of modularity in a phased implementation of a project is of utmost applicability.

Accordingly, the Gamma Irradiation Facility has been completed in the first phase. This is expected to be followed by the reactor and its ancillary components..

Thus, the second phase of the NTC programme, as indicated above is the emplacement of the reactor component and some of the peripheral experimental facilities, and other components. It is expected that when operational, the research reactor is designed to have a peak neutron flux of 9 x 10^{13} n/cm^{2}-s.

Picture showing some of the facilities of the Nuclear Technology Centre: Central Mechanical and Electrical Workshop (left); Water Treatment Plant House (middle); and Gamma Irradiation Facility Building (far right).

5.2 The Research Reactor

5.2.1 Electricity Generation

The major plank in our national energy policy is the provision of adequate energy to power the economy. Implementation of this policy is hinged on the twin strategies of power sector reforms and diversification of the nation's electricity generation base. In consonance with the modern international trend, generation of electricity from nuclear power plants is thus, one of the options being seriously considered.

The world's energy supply is mainly dependent on fossil fuels – coal, crude oil and natural gas, which are non-renewable resources, and are being rapidly depleted. Nuclear energy, which currently supplies about 20% of the world's electricity generation, offers a reliable and veritable addition.

The primary focus of the research reactor will be for capacity building in developing the requisite manpower, technical know-how and infrastructure for the generation of electricity from nuclear power plants.

5.2.2 Other Applications

The reactor facility will also be used for quite a number of other applications, such as materials testing, environmental monitoring, development of electronic components, production of radiopharmaceuticals, agriculture and

food production, and as a research tool in a host of other scientific applications.

5.3 Current Activities

For now, the main activities are planning and developmental, leading to the construction of the reactor. Some of the current activities include:

i Development and assemblage of various simulation and nuclear reactor software on neutronics and reactor dynamics, shielding, heat transfer characteristics, and fission product generation, and the requisite hardware to implement them.

ii Establishment of a Nuclear Instrumentation and Measurement Laboratory to provide a veritable practical training ground for nuclear professionals in the fundamental aspects of radiation measurement and instrumentation, and their applications including environmental monitoring

iii Development of a Nuclear Roadmap for the deployment of nuclear power plants in Nigeria.

1.5 Profile of The Director

Dr. Franklin Erepamo Osaisai had his undergraduate training in the Physical Sciences at the University of Port Harcourt and graduated with an Honours degree in Chemistry in 1981. He received his engineering education at the University of California, Berkeley, California, where he took his Masters and Doctoral degrees in Nuclear Engineering in 1984 and 1987, respectively. For about sixteen years, he taught courses in Computer Programming, Numerical Methods, Computational Transport Phenomena and Engineering Analysis at the University of California, Berkeley and the University of Port Harcourt, Nigeria, respectively. Dr. Osaisai is a Fellow of the Nigerian Society of Engineers, with publications and research interests in Nuclear Science and Engineering, Numerical Modeling and Energy Systems Integration. He is the author of two books and a co-author of another in specialized areas of Science and Engineering. He is the Director of Reactor Engineering at SHESTCO.