PHYSICAL SYSTEMS AND REGULATORY OVERSIGHT FOR THE PROTECTION AND OPERATION OF THE NIGERIA RESEARCH REACTOR

BY

PROF. ITA OKON BASSEY EWA

Nuclear Science And Technology Section
Ahmadu Bello University, Zaria, NIGERIA

Presented at the International Conference on Physical Protection of Nuclear Material and Nuclear Facilities, Vienna, Austria, 13th -17th Nov. 2017
# TECHNICAL DETAILS
## NIGERIA RESEARCH REACTOR-1 (NIRR-1)

<table>
<thead>
<tr>
<th>Reactor Type</th>
<th>Tank-in-Pool (MNSR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criticality Date</td>
<td>3rd Feb. 2004</td>
</tr>
<tr>
<td>Nominal Core Power</td>
<td>31 kW(th)</td>
</tr>
<tr>
<td>Max Neutron Flux</td>
<td>$1 \times 10^{12}$ cm E-2 s E-1</td>
</tr>
<tr>
<td>Coolant/Moderator</td>
<td>De-ionised Water</td>
</tr>
<tr>
<td>Reflector</td>
<td>Be (Annular, Top, Bottom)</td>
</tr>
<tr>
<td>Control Rod</td>
<td>1 Stainless Steel Clad Cd Absorber</td>
</tr>
<tr>
<td>Fuel Elements</td>
<td>347</td>
</tr>
<tr>
<td>Core (Shielding)</td>
<td>Shielded in stainless Steel lined pool water</td>
</tr>
<tr>
<td></td>
<td>(Diameter 2.7m; Depth 6.5m)</td>
</tr>
</tbody>
</table>
THE NIGERIA RESEARCH REACTOR IN OPERATION
EMERGENCY PREPAREDNESS PROGRAMS (EPP)

- Participation in IAEA organized Programs
- Emergency Preparedness Activities
- Emergency Response Programs (Drills)
  - Simulating Sabotage
  - Simulating Terrorist Attacks
PHYSICAL PROTECTION REGIMES

Delay Barriers (Physical Structures)
Guard Interventions
Regulated Admission of Visitors
Nuclear Security Culture
Screening of Guests
Gate Passes to Visitors
Issuance of Badges to Employees
3-Stage Barrier Perimeter Fencing
Reactor installed at a Protected Area
Enclosed Zone with limited Access
Constant Patrol
24/7 surveillance by Guard Force
- Armed Forces Support
Central Alarm Activation System
CCTV Monitoring System
Graded Approach (Facility, Materials, Drills)
EMERGENCY DRILLS
(OBJECTIVES)

ON SITE RESPONSE
1. Assessment of Evacuating time to MUSTER POINT
2. Response & Attitude of Employees (Emergencies)
3. Human Reliability towards Emergencies

OFF SITE RESPONSE
1. Arrival of Teams (Time, Preparedness)
2. State Force (Police)
3. Medical Team
REGULATORY OVERSIGHT

1. ON SITE:
   REACTOR SAFETY COMMITTEE
   (NIGERIA ATOMIC ENERGY COMMISSION)

2. OFF SITE:
   NIGERIAN NUCLEAR REGULATORY AUTHORITITY (ACT 19 OF 1995)
## OVERSIGHT FUNCTIONS (ROLES)

<table>
<thead>
<tr>
<th>REACTOR SAFETY COMMITTEE</th>
<th>NIGERIA NUCLEAR REGULATORY AUTHORITY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.</strong> PERIODIC REVIEW OF SAFETY ANALYSIS REPORT</td>
<td><strong>1.</strong> LICENSING OF FACILITY AND OPERATORS</td>
</tr>
<tr>
<td><strong>2.</strong> ENSURING COMPLIANCE ON SAFETY AND SECURITY</td>
<td><strong>2.</strong> REGULATORY OVERSIGHT</td>
</tr>
<tr>
<td><strong>3.</strong> OPERATION WITHIN THE LIMITS (OLC) ESTABLISHED</td>
<td><strong>3.</strong> NUCLEAR MATERIAL ACCOUNTANCY</td>
</tr>
<tr>
<td><strong>4.</strong> RECORDS (MATERIAL AUDITING)</td>
<td><strong>4.</strong> (AGEING MANAGEMENT) APPROvals OF REPLACEMENT OF STRUCTURES/SYSTEMS/COMPONENTS</td>
</tr>
</tbody>
</table>
CERT HAS OPERATED NIRR-1 FOR OVER THIRTEEN YEARS
NO ACCIDENT NOR LOSS OF NUCLEAR MATERIALS
PHYSICAL PROTECTION REGIMES ARE CONSTANTLY REVIEWED
REGULATORY OVERSIGHT FUNCTIONS
EMERGENCY PREPAREDNESS AND RESPONSE PROGRAMS –WELL ESTABLISHED
HIGH PROSPECTS OF A FUTURE NATIONAL NUCLEAR POWER PROGRAMME
ACKNOWLEDGEMENTS

- GOVERNMENT OF THE FEDERAL REPUBLIC OF NIGERIA (NIRR-1)
- NIGERIA ATOMIC ENERGY COMMISSION
- NIGERIAN NUCLEAR REGULATORY AUTHORITY
- INTERNATIONAL ATOMIC ENERGY AGENCY, VIENNA, AUSTRIA
THANK YOU