Contribution ID : **82** Type : **Oral**

Overview of the Conceptual Design of the Upgraded Neutron Radiography Facility (INDLOVU) at the SAFARI-1 Research Reactor in South Africa.

Tuesday, 4 September 2018 13:30 (20)

The value added by neutron beam line facilities through research of is evident from the number of new facilities planned and commissioned worldwide. In order to provide local and international researchers with world-class capabilities, Necsa embarked on the upgrade of the neutron beam line instruments at the SAFARI-1 nuclear research reactor, which entails inter alia a complete functional neutron diffraction facility. The concept design of an upgraded neutron radiography (NRAD) beam line named INDLOVU (Zulu name for Elephant – one of the "Big Five") ("**I**maging **N**eutron **D**evice to **L**ocate the **O**bscure and **V**isualise the **U**nknown") has been finalised and the documentation for legal requirements, safety, electronic and control systems are in the approval stage, thereafter facility assembly will commence.
The upgraded NRAD facility will be unique in its application format as it can perform, through selective filtering, not only thermal neutron radiography but also utilise individually, the full radiation beam, the intermediate or fast neutron spectrum as well as the gamma-ray component of the radiation beam. As the beam port is positioned axial to the reactor core, a maximum radiation flux of 1 × 10^9 neutrons.cm-2.s-1 is envisaged, without filtering and when utilising the full radiation beam. The traditional scintillator-mirror-CCD camera concept, mounted inside a light tight box as detection system, is adopted. The CCD camera will be able to focus on an interchangeable field of view from 5 x 5 cm^2 to 35 x 35 cm^2 on the back of the scintillator screen. The detection system comprises of application specific (as determined by radiation sensitivity) exchangeable scintillation screens and the CCD camera is equipped with an automatic focusing capability.
INDLOVU comprises of a number of subsystems and components inter alia such as the processing systems (e.g. shutters, collimators, radiation filters, beam and flight tubes, experimental), safety systems (e.g. shielding, conventional and radiation safety), control system (e.g. DACS, PLC), utilities (e.g. electrical, HVAC) and sample management system (e.g. sample receiving, storage, dispatch and data management). This presentation will describe the design of the South African INDLOVU NRAD facility with respect to each of the subsystems in terms of their design, functionality, importance and operational interconnection with each other. In addition, to evaluate the performance of the facility in terms of expected radiation beam intensity and quality, neutron ray tracing simulations of the attainable flat field at the detector plane, for each of the 4 different L/D ratios (125, 250, 400 and 800), will be compared to theoretical design calculations.

Primary author(s) : Mr DE BEER, Frikkie (Necsa)

Co-author(s) : Mr RAATHS, Christo (Necsa); Dr MARAIS, Deon (The South African Nuclear Energy Corporation (Necsa) SOC Limited); Mr MORABA, Evens (Necsa); Dr NOTHNAGEL, Gawie (Necsa); Mr SCHALKWYK, Gerhard (Necsa); Mrs HANEKOM, Jacoline (Necsa); Mr VAN ROOYEN, Johann (Necsa); Mr ECKARD, Kobus (Necsa); Mr RADEBE, Mabuti (Necsa); NSHIMIRIMANA, Robert (Necsa); Mr VAN HEERDEN, Rudolph (Necsa); Mr MODISE, Tankiso (Necsa)

Presenter(s) : Mr DE BEER, Frikkie (Necsa)

Session Classification : Speaker Sessions and Seminars

Track Classification : Instrumentation