

# Global Summit on Electronics and Electrical Engineering

November 03-05, 2015 Valencia, Spain

## Power monitoring in nuclear reactors

**Amir Zacarias Mesquita**

Brazilian Nuclear Energy Commission, Brazil

Power monitoring of nuclear reactors is done by means of neutronic instruments but its calibration is always done by thermal procedures. The reactor thermal power calibration is very important for precise neutron flux, fuel element burn up calculations and mainly to electrical power. The burn up is linearly dependent on the reactor thermal power and its accuracy is important to the determination of the mass of burned U-235, fission products, fuel element activity, decay heat power generation and radio toxicity. Different methods for monitoring and controlling power in nuclear reactors are used. The purpose of this paper is to analyze and present the monitoring processes of thermal power supplied by nuclear reactors and new methods under implementation. Optimization on power monitoring channel will result in a better reactor control and increase the safety parameters of reactor during operation. At first, some primary concepts like neutron flux and reactor power are introduced. Then, some new researches about improvements on power-monitoring channels, which are instrument channels important to reactor safety and control, are reviewed. Furthermore, some new research trends and developed design in relation with power monitoring channel are discussed. Power monitoring channels are employed widely in fuel management techniques, optimization of fuel arrangement and reduction in consumption and depletion of fuel in reactor core. Power reactors are equipped with neutron flux detectors, as well as a number of other sensors (e.g. thermocouples, pressure and flow sensors, ex-vessel accelerometers). The main purpose of in-core flux detectors is to measure the neutron flux distribution and reactor power.

### Biography

Amir Zacarias Mesquita is a Doctor of Science in Chemical Engineering from State University of Campinas/Brazil (2005), Master of Science and Nuclear Technologies from Federal University of Minas Gerais/Brazil (1981) and graduated in Electrical Engineering from Federal University of Minas Gerais/Brazil (1978). He is titular Researcher at Nuclear Technology Development Center, Professor and Collegiate Board Member of the Postgraduate Program in Science, Radiation Technology, Minerals and Materials at CDTN. He is involved in research in nuclear reactor technology, working mainly on thermo-fluid dynamics, reactor physics, instrumentation and data acquisition systems. He is author of more than 200 published technical papers in international journals and conference proceedings. He is also the book author entitled *Digital Control System Simulation for Nuclear Reactor Neutronic Parameters*, Book Editor: *Current Research in Nuclear Reactor Technology in Brazil and Worldwide* and *Nuclear Reactors*. He is an Expert of the International Atomic Energy Agency and the National Centre of Science and Technology Evaluation (Ministry of Education and Science of Kazakhstan). He is Member of the Brazilian Association for Nuclear Engineering and Brazilian Society of Mechanical Sciences and Engineering.

[amir@cdtn.br](mailto:amir@cdtn.br)

### Notes: