

**Military Technical College**  
Kobry El-Kobbah,  
Cairo, Egypt



**8<sup>th</sup> International Conference**  
**on**  
**Chemical & Environmental**  
**Engineering**  
19 – 21 April 2016

---

## **NPPS -3**

### **New Safety Features in the Design of Advanced Nuclear Power Reactors**

By  
Mohamed K. Shaat \*

#### Abstract

Safe, economic and reliable operation of nuclear power reactors are the main objectives for improving the current or future reactors. Long term nuclear energy strongly depends on the availability of nuclear fuels, advanced structural materials and passive safety systems. These materials

have to withstand extreme conditions,; high temperature/pressure, intense neutron irradiation, strongly corrosive environment with cyclic operation histories. The advanced nuclear power reactors should ensure high safety standards in material design, high safety margins, reduction in the frequency of component replacement, ensure high burn-up and therefore fuel cycle economics and safety. For achieving high burn-up, the selection of suitable fuel composition, cladding material and burnable poisons are the main items for the reactor core design. Also, based on the learned lessons from Fukushima Daiitcho accident, additional safety measures and passive safety features are incorporated in the advanced power reactors.

This lecture presents the main items necessary for improving the current or for the design of future nuclear power reactors. Also, AES-2006 is an evolutionary nuclear power station of VVER- 1200 design, developed on the basis of the standard Russian design VVER-1000, which is one type of Generation III+ reactors, will be presented as an example for the advanced power reactor which will be constructed in Egypt.

---

\* Prof. Nuclear Eng., Reactors department, Egyptian Atomic Energy Authority, Cairo, Egypt.