Abstract: During the last five decades, radioisotope power systems have been used by NASA on 23 missions to the Sun and most planets in the solar system. These systems generate < 300 W, operate independent of the Sun, and had lasted far beyond their design lifetime of 5 years. Some operated for up to 20 years, or even longer. For future space travel, exploration of distant planets and human outposts, nuclear fission reactor power and propulsion systems are enabling. These systems are much lighter and more compact than solar, which are either impractical or not possible due to the lack of solar energy at destinations. Space reactor power systems could generate 10s to 1000s of kWe continuously or intermittently for up to 10 - 15 years, independent of the sun, support a multitude of housekeeping and scientific needs, and operate ion thrusters for propelling the spacecraft at a high specific impulse. The compactness, operation flexibility, and low specific mass of space reactor power and propulsion are very attractive for fast travel and surface operation at distant planets and moons. For these missions, however, shielding avionics, equipment, electronic, and human from the hostile and space harmful environment and high energy ionizing radiation are primary challenges. An additional concern is mitigating the threat of impacting the spacecraft by asteroids and by man-made debris in earth orbits. Generally, the threat from exposure to natural space radiation far outweighs that from operating fission reactors. This talk will discuss many aspects of space reactor power systems including recommendations on how they should be used.

Biography: Prof. El-Genk is Regent’s Professor and Director of the Institute for Space and Nuclear Power Studies, U. of New Mexico. He is a fellow of ASME, NAS, AICHE, and IAASS. He is also an Associate Fellow of the AIAA. He received the ANS Distinguished Faculty Member Honor in 1987 and the AICHE Heat Transfer and Energy Conversion Division Award in 2000. El-Genk was the primary organizer and technical and publication chair of the annual meeting: Space Technology and Applications International Forum (STAIF), 1993 – 2008, and the annual Symposium on Space Nuclear Power and Propulsion, 1984 – 1992. El-Genk was named in 2001 the 46th Annual Research Lecturer, the highest honor bestowed upon a member of the faculty at the University of New Mexico.