

Reawakening of United States Nuclear Energy: Materials Challenges for a New Generation of Power Plants

Todd M. Osman, TMS

Iver Anderson, Ames Laboratory, Iowa State University



The United States Nuclear Power Industry is “reawakening”. This is evident with increased attention being placed on nuclear power by federal agencies and the recent application for 30 new plant construction permits. On May 3, 2007, TMS co-sponsored a [Materials Information Luncheon \(MIL\)](#) with the American Nuclear Society and ASM International to further the discussion of materials needs for next generation nuclear power plants. The session was held for members of Congress and staffers in Washington, D.C., providing a perspective on materials demands and challenges related to the Global Nuclear Energy Partnership.

There is growing public interest in electric power generation with reduced emissions of greenhouse gases. During the past 25 years, the nuclear power has been stagnant at about 20 percent of the United States electricity supply. In the last year, however, there were more than 30 new construction permit applications, signaling a rebirth of interest in nuclear fission power plants. This enlarged emission-free capacity would provide a solid platform of non-interruptible power. Additionally, an expanded nuclear power capacity can provide the necessary time for research and development efforts for viable large-scale, long-term renewable energy solutions.

In an effort to provide sound, high quality information to members of Congress and staffers, a Materials Information Luncheon (MIL) was organized on May 3, 2007 by the Federation of Materials Societies (FMS) and co-sponsored by TMS, the American Nuclear Society and ASM International. The session summarized the critical materials challenges that require federally sponsored research to promote safety, security and reliability in these new facilities.

Dr. Harold McFarlane from Idaho National Laboratory and the current American Nuclear Society President was the first speaker. Dr. McFarlane’s talk, “[On the Road to Global](#)

[Nuclear Energy Expansion: Economic and Environmental Needs](#)”, highlighted the trends leading to a renewed interest in nuclear power to meet the world’s energy needs with reduced greenhouse gas emissions. Dr. McFarlane reviewed the current United States nuclear power capacity and introduced the proposed designs for next generation power plants, including those being considered by the [Global Nuclear Energy Partnership](#).

Professor Gary Was from the University of Michigan then reviewed materials research and development issues in his presentation entitled “[Materials: The Bridge to Future Nuclear Power](#)”. In particular, Professor Was detailed the burden of success that advanced nuclear reactor systems place on materials, including safety and waste minimization. Professor Was also highlighted the aggressive service environment for materials in nuclear power systems and the material qualification process.

Dr. Steve Zinkle from Oak Ridge National Laboratory and the winner of the [E.O. Lawrence Award](#) wrapped up the session discussing “[Fuel Systems for Future Generations of Nuclear Power](#)”. Dr. Zinkle emphasized the materials-related challenges for closing the nuclear fuel cycle in a safe, secure and environmentally sound manner. In particular, materials research and development programs are ongoing to address critical needs, including high performance cladding materials, fuel performance modeling and waste repository materials.

In summary, these presentations fulfilled the mission of the Materials Information Luncheon to provide members of Congress and staffers with information on the materials issues for the evolving nuclear power industry. The need for this discussion is not limited, however, to Capitol Hill and to this event. As such, the presentations from this session are being archived on [Materials Technology@TMS](#) for future use by the Materials for Nuclear Power Community. Furthermore, the [Digital Resource Center](#) on this site provides additional resources that are useful for continued dialogue on the reawakening of U.S. Nuclear Energy, including links to the global nuclear industry, materials-specific primers and recommended resources for materials behavior in nuclear applications.