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Next Generation of Nuclear Reactors: The Generation IV Integration Forum (GIF) and an Overview of Research in Australia

With increasing global population and the threat of global warming linked to greenhouse gas emissions (as noted in the Paris Climate Agreement), it is vital that development continues to investigate sustainable, low-emission power generation systems. Nuclear-based energy systems produce low greenhouse emissions per MW of generated electricity and are well-suited for base-load power generation, making them ideal for complimenting the intermittent renewable energy sources. Current reactors have consistently been a major source of the world’s low-carbon energy, with Nuclear Energy still being the second largest low-carbon power source today. However, since Fukushima there are still prevalent concerns over the safety and reliability of light water reactor systems. The next generation (Generation IV) of nuclear-based power generation systems is addressing the safety concerns by incorporating inherent safety features that prevent fuel meltdown and any explosion-like accident. In addition, Generation IV reactors are designed to deliver improved efficiency, and sustainability when compared to past nuclear reactor systems. The Australian Nuclear Science and Technology Organisation (ANSTO) and its predecessor, the Australian Atomic Energy Commission, has a long history in nuclear-based research and development in Australia. This talk provides a brief overview of the Generation IV International Forum (GIF), Australia’s role within GIF, as well as recent research outcomes focused on the experimental and numerical understanding of material degradation in extreme environments (high-temperature, molten salt corrosion, and radiation damage) of nuclear reactor systems.