Gen IV reactors and the transmutation of nuclear waste

Nuclear data (ND) underpin al nuclear physics and engineering, and modelling has become increasingly important in these fields. Uncertainty quantification (UQ) in modelling combines two difficult tasks, scientific modelling of advanced systems, and application of novel statistical methods. ND UQ is of particular importance in nuclear engineering for Gen IV reactors due to safety implications.

This project concerns improving novel methods in the field of modelling and ND UQ in the realm of Gen IV reactors.

The Generation IV International Forum (GIF) has pointed out six future reactor concepts which could produce sustainable nuclear energy at a competitive cost, enhance nuclear safety, minimize generation of nuclear waste, and further reduce the risk of weapons materials proliferation. Only about one percent of the mined uranium is used for electricity production in today's Light Water Reactors (LWR). Recycling the spent fuel currently stored at the Swedish interim storage CLAB in future fast spectrum Generation IV (Gen-IV) systems could fulfil the electricity needs of Sweden for a several hundred years.

Systems with a fast neutron spectrum have the option to close the fuel cycle. The reference technology is the sodium-cooled fast reactor ASTRID which is to be built in France during the next decade. LFR and gas-cooled fast reactors (GFR) compete to be adopted for construction of a demonstrator as alternative technology (ALFRED, ALLEGRO).

In your diploma-work you will study how nuclear data uncertainties affect the operation of Fast Spectrum Reactors to increase the safety of the next generation nuclear reactor fleet.

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