

Friday morning panel – A. Machiels' contribution

Impact of Advanced Fuel Cycles on Waste Management

Balancing the needs for sustainability (potential shift to a plutonium economy and reduction in high-level waste burden on permanent geologic repositories), operational efficiencies, and diversion resistance of plutonium-based fuel cycles may eventually require strategies relying on multi-recycling of some or all transuranic elements in fast reactors. Although analysis of any future nuclear energy systems under steady-state conditions gives indications on the end states, closing the fuel cycle introduce complex dynamic feedback effects with regard to mass flows, inventories, and isotopic compositions. Advantages and drawbacks of minor actinide multi-recycling have to be weighted in the framework of a cost-benefit analysis, integrating the impact of the presence of minor actinides on the unit costs for each of the fuel cycle operations. The benefits to waste management of multi-recycling vs. direct disposal appear to be relevant only in the context of a long-lasting nuclear era based upon economic operation of Liquid Metal Reactors (LMRs) over several hundreds of years. Development tasks toward defining and developing the most cost-effective LMR and associated fuel cycle remain very important on a schedule consistent with their expected roles in meeting future energy demands.