

Safety Case for BWR Cores Operating in Self-Sustainable Th-U233 Fuel Cycle

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It is generally believed that Fast Reactors are needed to close the fuel cycle and achieve the fuel resource sustainability and high level waste management goals set by the Generation IV International Forum for advanced future systems. It has been shown however that Light Water Reactors with modified core configuration can potentially perform the same task and indefinitely recycle all the actinides within their cores requiring only natural uranium or thorium feed and fuel reprocessing infrastructure. Designing such LWR cores is extremely challenging if, in addition to self-sustainability requirement, all the operational and safety constraints are taken into account. As a result, all the currently studied designs have limitations. For example, Boiling Water Reactor (BWR) option with closed Th-U233 fuel would require an addition of natural uranium in order to satisfy certain safety constraints but also lead to significant Pu and higher actinides production. Such ternary U-Th-Pu fuel may prove to be more complex to reprocess and handle. Therefore, Th-U fuel is more preferable.

This project will investigate alternative approaches to BWR core design with self-sustainable Th-U fuel which can also satisfy all the operational and safety requirements.