Enrichment & Core-Loading Versatility in Cyclus Reactors

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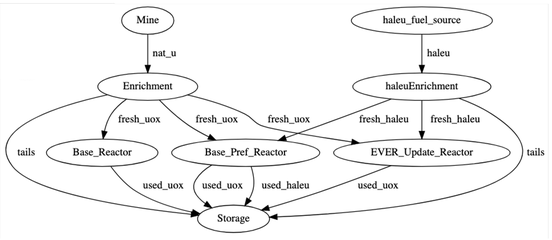
Introduction

If a fuel cycle simulator focuses exclusively on equilibrium-core conditions, it sacrifices precision in the amount of separative work units (SWU) and the composition of used fuel. Here we build alongside OpenMCyclus [1] to enhance the depletion fidelity and will introduce fuel loading capability in Cyclus [3] simulations of non-equilibrium core reactors through the creation of two archetypes: the **E**nrichment **V**ersatile non-**E**quilibrium **R**eactor (EVER), and **C**ore **LO**ading **V**ersatile non-**E**quilibrium **R**eactor (CLOVER). We demonstrate the low-fidelity version of EVER against the Cycamore archetype.



Future Work

Going forward, we will add a high-fidelity version of EVER for users to dynamically couple the archetype to a depletion code, allowing multiple energy groups or updating core-averaged cross sections. We will also deploy CLOVER in a similar low-/high-fidelity fashion, where the user will first pre-determine loading patterns.

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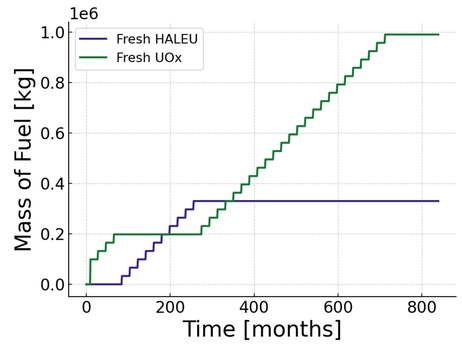
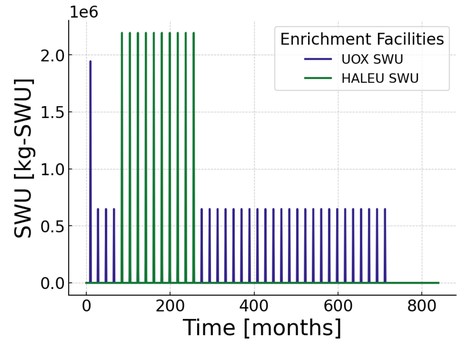
Versatility in fuel **enrichment** and **core-loading** improves fuel cycle simulations over short periods and with advanced reactor concepts [6, 5, 4, 2].

Scan for references and to learn more.

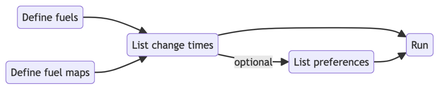
We have implemented the low fidelity version of EVER, where pre-defined recipes allow users to map the evolution of the fuel.



Differences appear in other metrics to the fuel cycle [5] like SWU or the isotopics; you can see the impact of the higher enriched HALEU in the SWU below.



Our core loading archetype (CLOVER) will give stakeholders assembly-level control over how the reactor's physics interact with the fuel cycle.



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