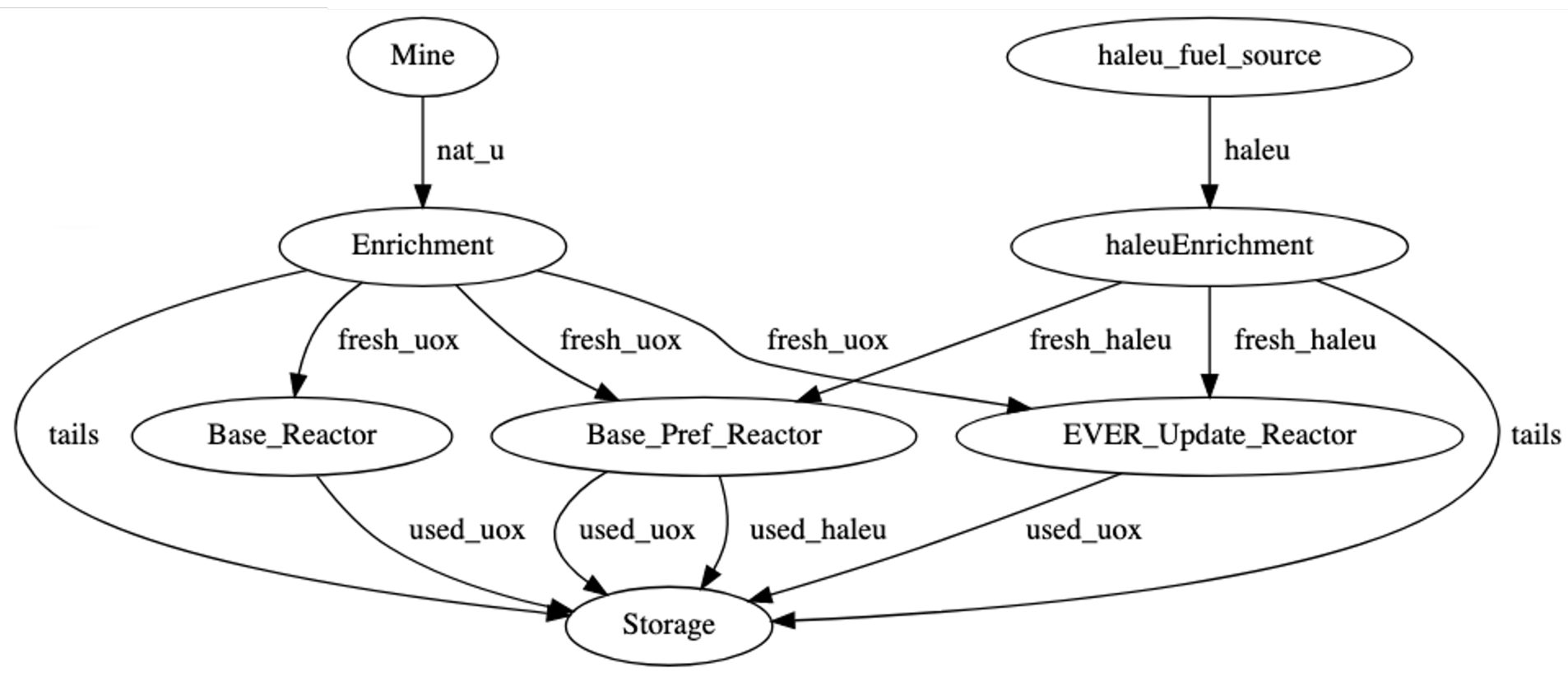


# Enrichment & Core-Loading Versatility in Cyclus Reactors

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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 OpenMCcyclus [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 **Enrichment Versatile non-Equilibrium Reactor** (EVER), and **Core LOading Versatile non-Equilibrium Reactor** (CLOVER). We demonstrate the low-fidelity version of EVER against the generic Cyclus reactor from the Cycamore repository.

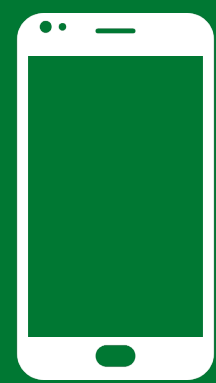


## Future Work

Going forward, we will add a high-fidelity version of EVER for users to dynamically couple the archetypal reactor 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.

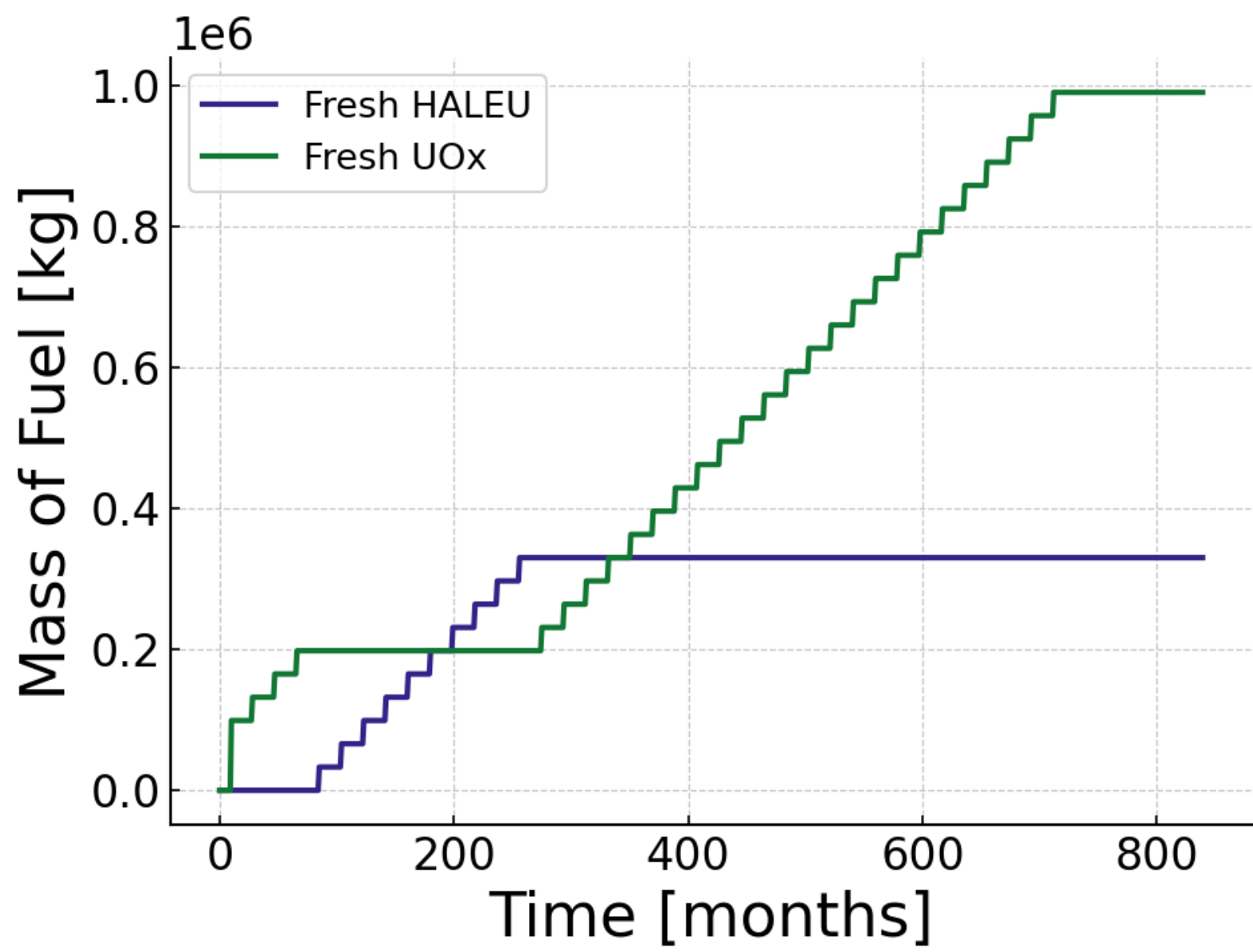


Versatility in fuel enrichment and core-loading improves fuel cycle simulations over short periods and with advanced reactor concepts [6, 5, 4, 2].

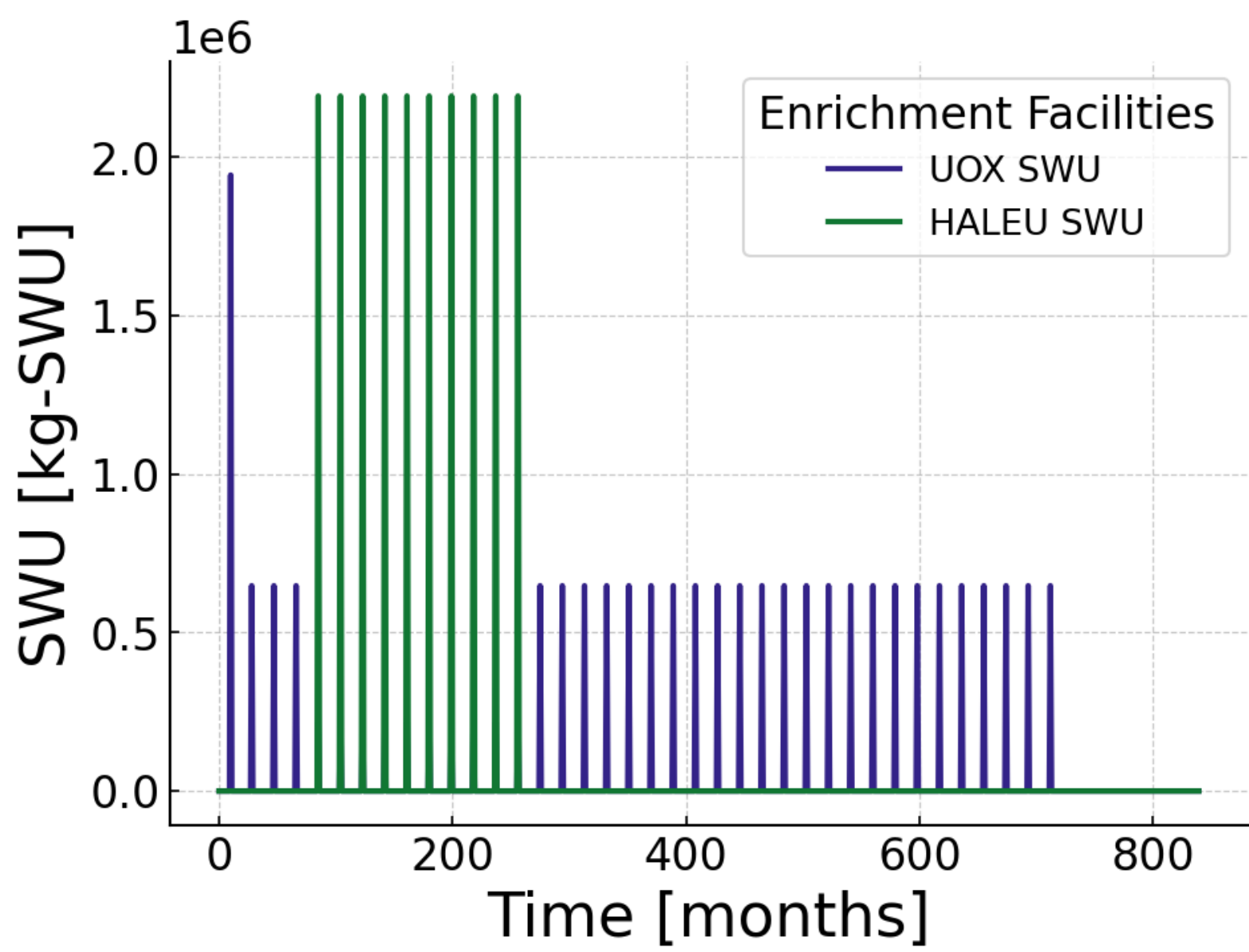


Scan for references and to learn more.

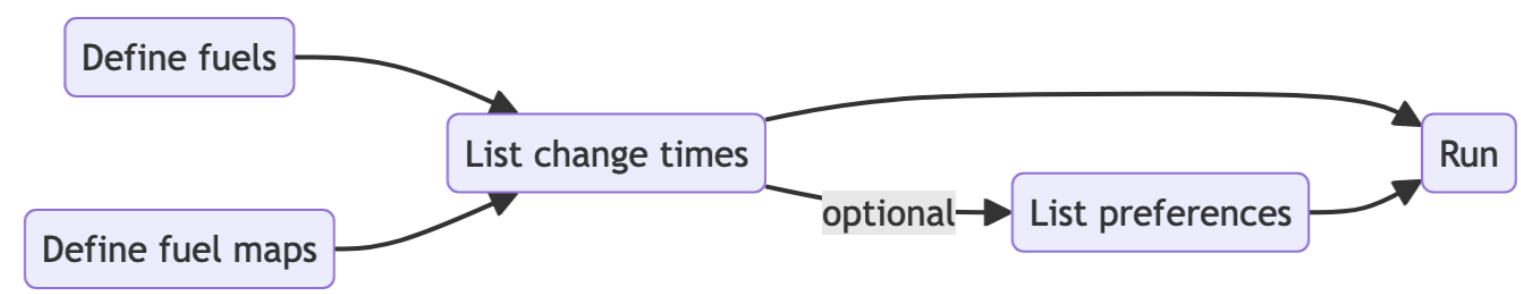
We have implemented the low fidelity version of EVER, where pre-defined isotopic compositions (called recipes) allow users to map the evolution of the fuel.



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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