Kairos Power

MATERIAL CONTROL AND ACCOUNTING IN PEBBLE BED REACTORS

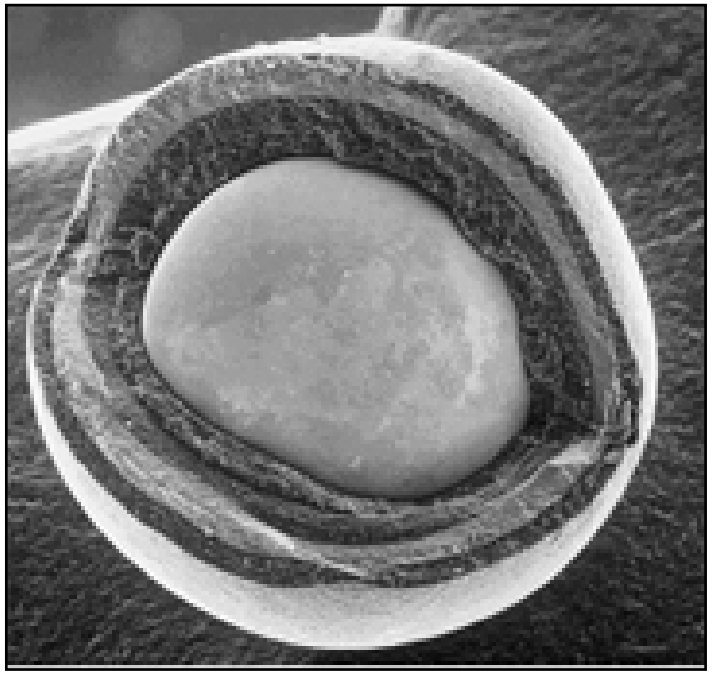
2021

Kairos Power's mission is to enable the world's transition to clean energy, with the ultimate goal of dramatically improving people's quality of life while protecting the environment.

In order to achieve this mission, we must prioritize our efforts to focus on a clean energy technology that is *affordable* and *safe*.

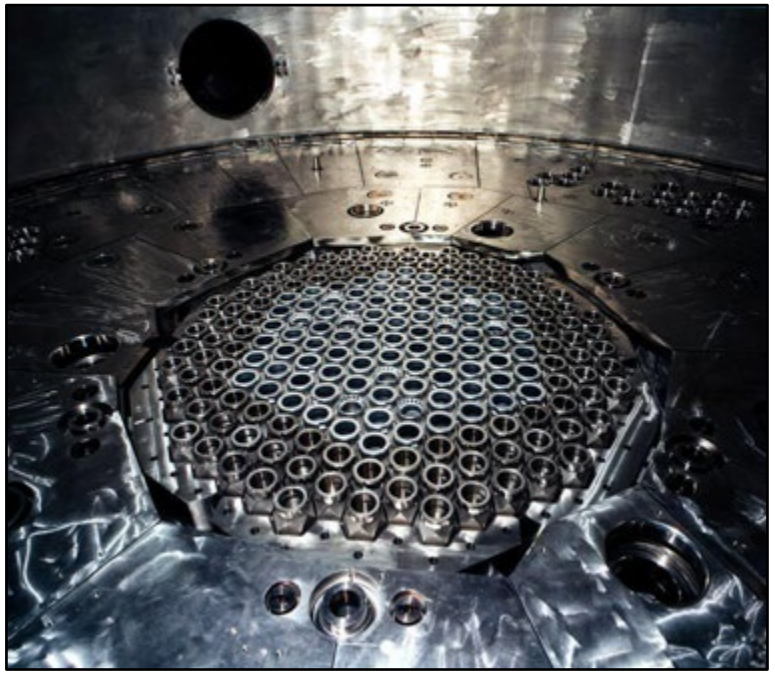
Fluoride Salt-Cooled High-Temperature Reactor (FHR) Technology Basis

Coated Particle Fuel
TRISO

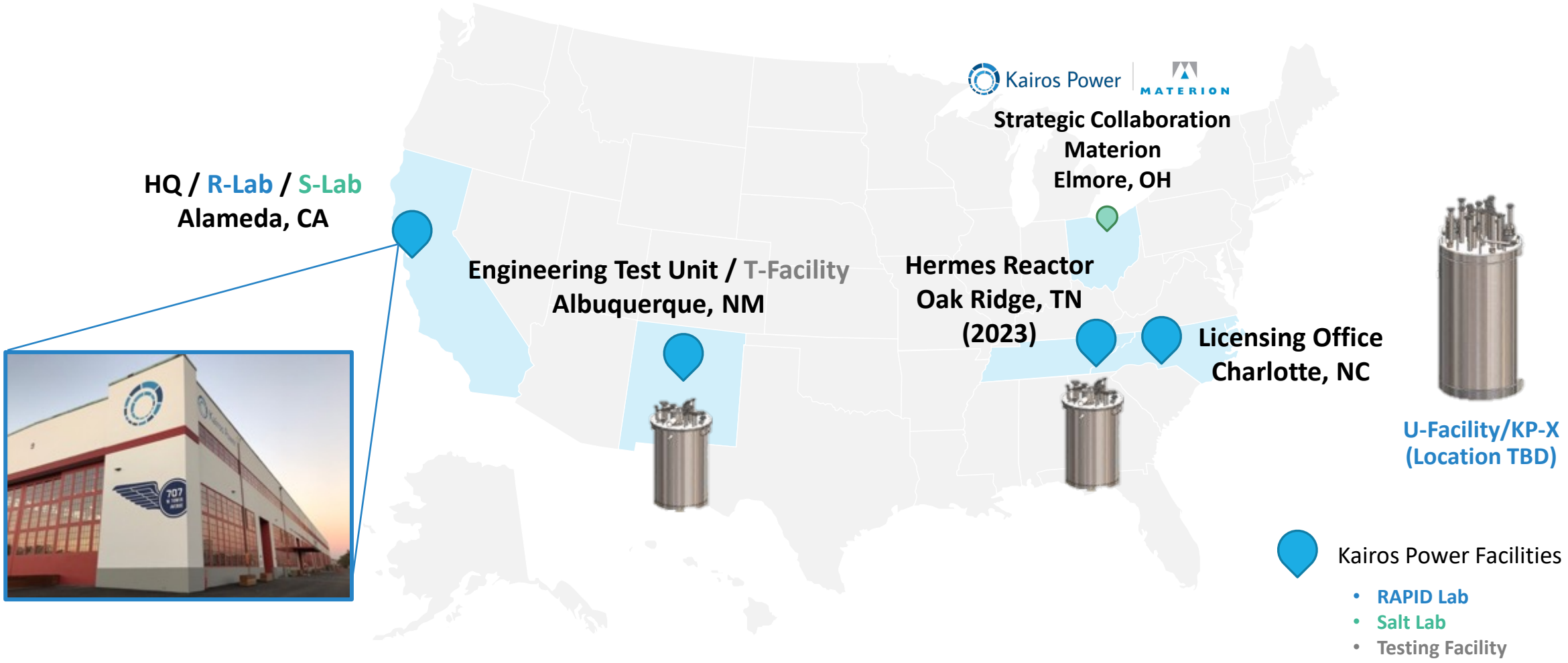


Liquid Fluoride Salt Coolant
Flibe ($2LiF\text{-}BeF_2$)

Low-Pressure Reactor Vessel
(FFTF core shown)

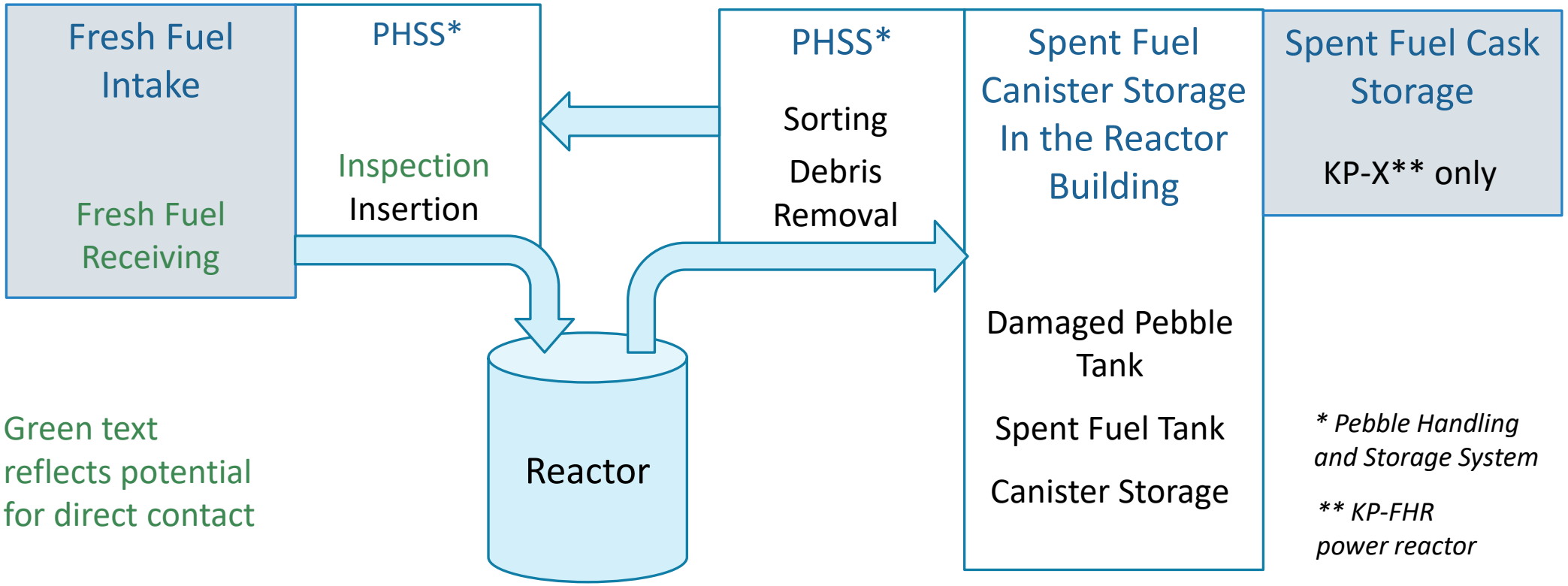


Kairos Power Locations



Conceptual Flow of Material at the Facility Level

Typical reactor SNMCA features can be applied when pebbles are inside canisters. Kairos Power is focusing efforts on those SNMCA program features that will be applied when pebbles are outside canisters.



Quantities

- The KP-FHR test and power reactor will have small quantities of U-235 onsite compared with a light water reactor.
- A KP-FHR will use pebbles with very small quantities of U-235 per pebble.

Kairos Power estimates that 63,000 fresh pebbles would need to be diverted to reach the IAEA significant quantity.

MCA Unique Elements for Pebble Bed Reactors

- Distinguishing between pebbles of different enrichments (0-20% enrichment)
- Direct contact with fuel informs choices about MCA program elements.
  - Accounting methods: bulk vs item
  - Robust prevention of diversion in areas of direct contact
  - Seeking licensing basis relief in areas where there is no direct contact (i.e., automatic pebble handling).
- Determining the licensing basis with respect to 10 CFR Part 74 for a reactor using HALEU that is consistent with the objectives of safeguards.
- Modular sites
- Unlike fluid-fueled reactors, diversion from the salt is not of concern for pebble bed reactors.