Kairos Power

ANS YMG NUCLEAR ENTREPRENEURSHIP PANEL

PER F. PETERSON, CHIEF NUCLEAR OFFICER

OCTOBER 2022

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*.

Overview of Kairos Power

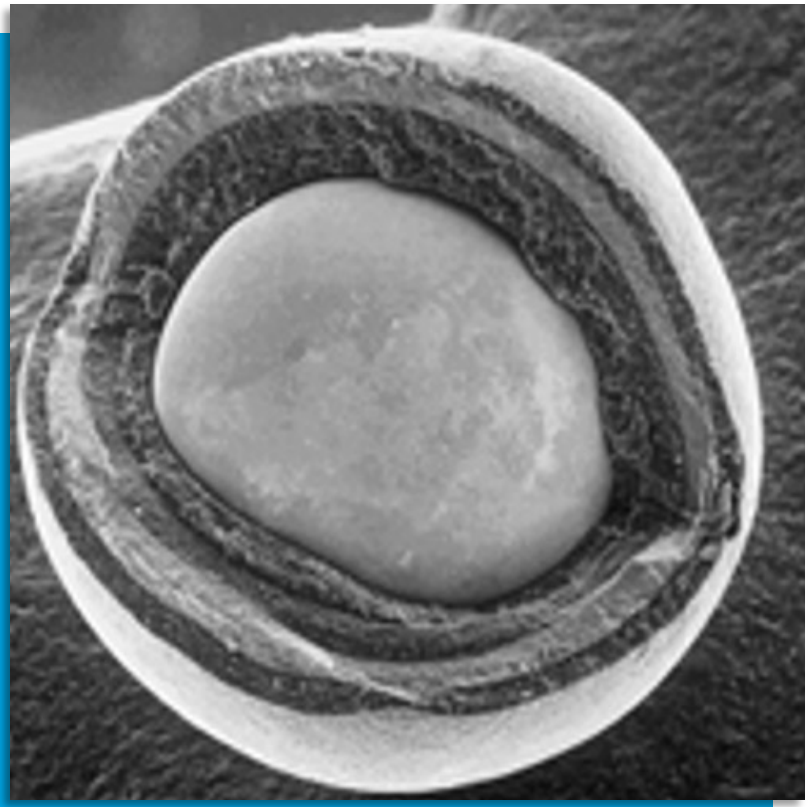
- Nuclear energy engineering, design, and manufacturing company ***singularly focused*** on the commercialization of the fluoride salt-cooled high-temperature reactor (FHR)
  - Founded in 2016
  - Current Staffing
    - 300 Employees
    - ~90% Engineering Staff
- Commitment to a novel approach to nuclear development, highly informed by the success of SpaceX, that includes iterative hardware demonstrations and in-house manufacturing to achieve disruptive cost reduction and provide true cost certainty
- Cost targets set to be competitive with natural gas in the US electricity market
- Schedule driven by the goal for U.S. commercial demonstration by 2031 to enable rapid deployment in 2030s.

Kairos Power Headquarters

Kairos Power Team

Fluoride Salt-Cooled High Temperature Reactor

Technology Basis



Coated Particle Fuel
TRISO

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

Molten Salt Properties

Motivated by original selection for Aircraft Nuclear Propulsion

Material Properties at 700°C	T_{melt} (°C)	T_{boil} (°C)	ρ (kg/m^3)	C_p (kJ/kg°C)	ρC_p (kJ/m^3°C)	k W/m°C	ν x 10^6 m^2/s
$^7Li_2BeF_4$ (Flibe)	459	1,430	1,940	2.34	**4,540**	1.0	2.9
Sodium	97.8	883	790	1.27	**1,000**	62	0.25
Lead	328	1,750	10,540	0.16	**1,700**	16	0.13
Helium (7.5 MPa)			3.8	5.2	**20**	0.29	11.0
Water (7.5 MPa) †	0	100	732	5.5	**4,040**	0.56	0.13

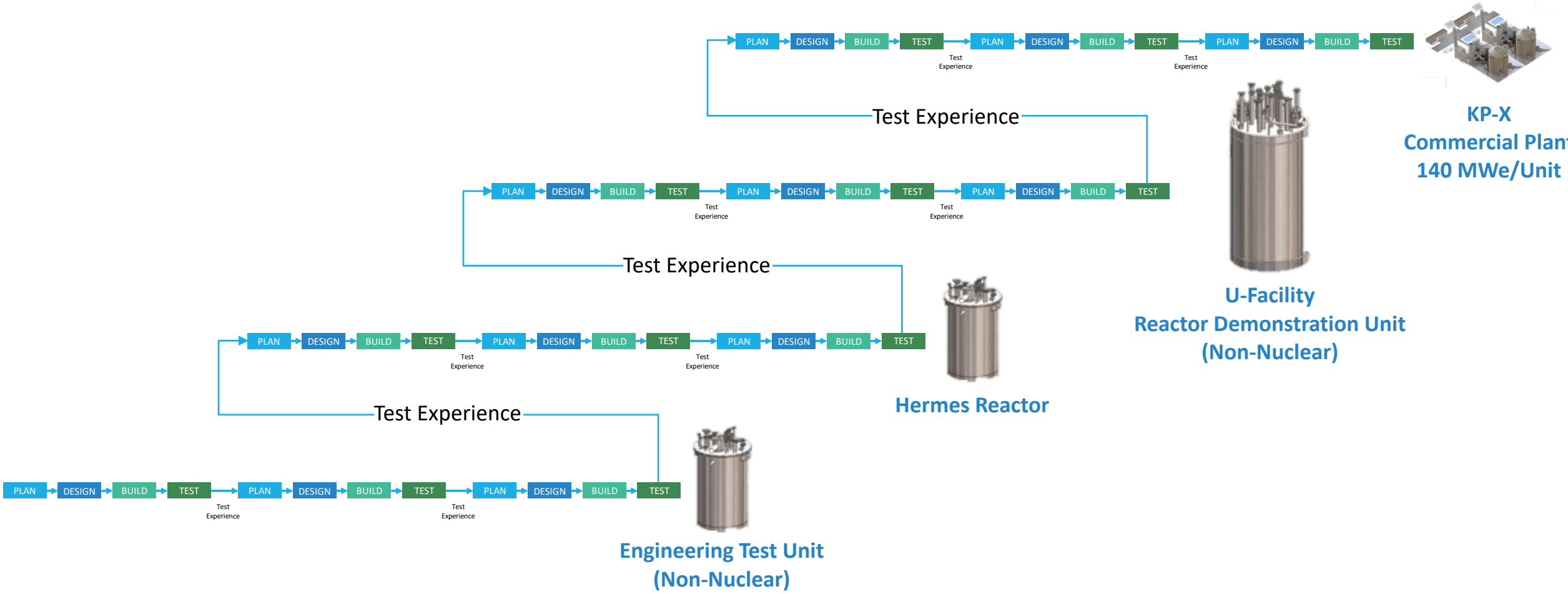
† Water properties at 290°C for comparison

- High volumetric heat capacity
  - Results in compact reactor primary system, low circulating power
- High boiling temperature
  - Intrinsically low pressure, thin-walled primary coolant boundary
- Chemically stable coolant compatible with graphite
  - Core internal structures have very large thermal margin

Molten salt reactors can achieve very high ratios of thermal power output to reactor weight

Kairos Power Path to Commercialization

Successive Large-Scale Integrated Demonstrations



Kairos Power Locations and Infrastructure

HQ / R-Lab / S-Lab
Alameda, CA

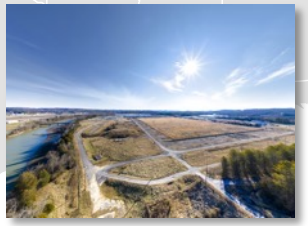
T-Facility / Engineering Test Unit
Production Development Facility
Albuquerque, NM

Kairos Power | MATERION

Molten Salt Purification Plant
Elmore, OH

Instrumentation Labs
Rexford, NY

Hermes Reactor
Oak Ridge, TN



Licensing Office
Charlotte, NC

Kairos Power Facilities

- RAPID Lab
- Salt Lab
- Testing Facility

ETU enclosure in T-Facility
August 2021

ETU enclosure in T-Facility
August 2022

ETU vessel is delivered
November 2021

ETU Control Room
Albuquerque, NM

Argos Remote Control Room
Alameda, CA

ETU
August 2022

Hermes Demonstration Reactor

Heritage Center K-33 Site / Oak Ridge, TN

Hermes Construction Permit Application (CPA) Submittal

- NRC accepted Kairos Power's CPA for review in November 2021
- Anticipated Construction Permit issuance in October 2023
- Robust pre-application engagement with 11 topical reports and several technical reports supporting the CPA

Project Status Dashboard:

https://www.nrc.gov/reactors/non-power/hermes-kairos/dashboard.html