KAIROS POWER OVERVIEW

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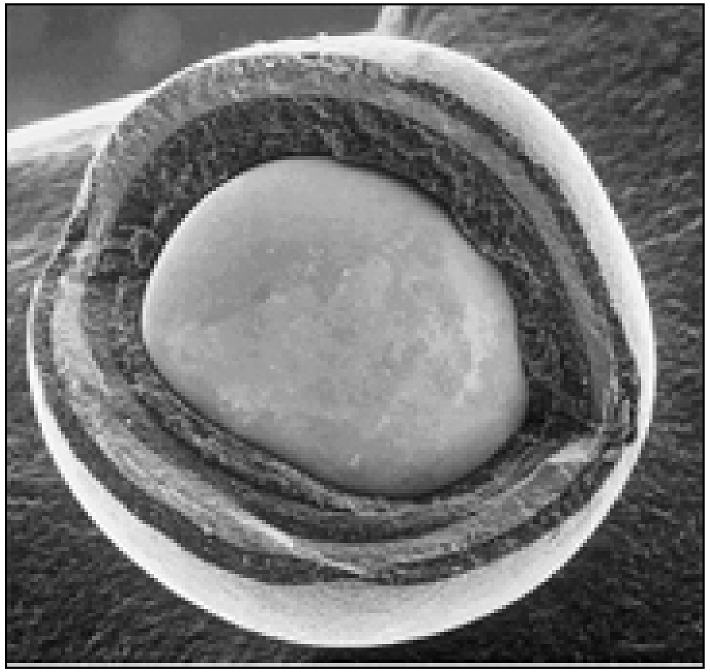
Kairos Power's mission is to enable the world's transition to clean energy, with the ultimate goal of dramatically improving people's quality of life while protecting the environment.

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

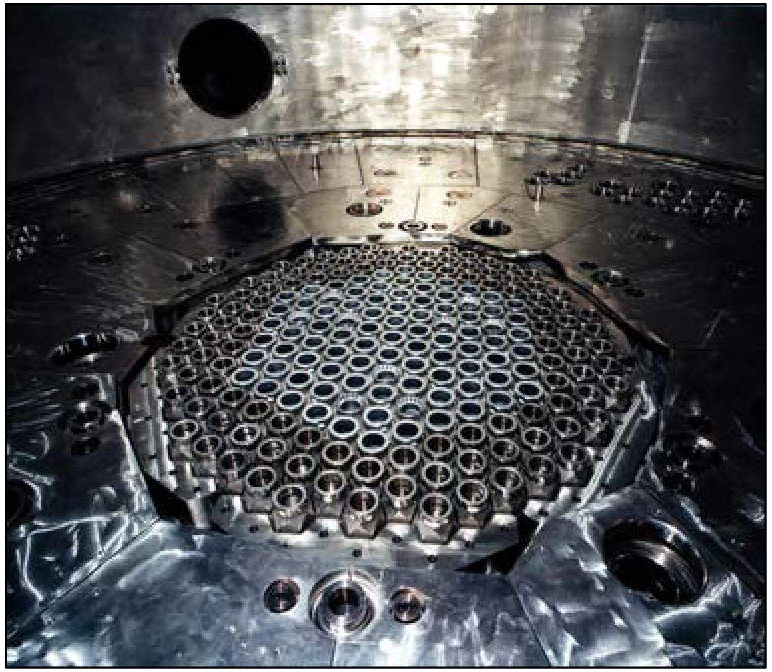
Fluoride Salt-Cooled High-Temperature Reactor (FHR) Technology Basis

Coated Particle Fuel
TRISO



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

Low-Pressure Reactor Vessel
(FFTF core shown)

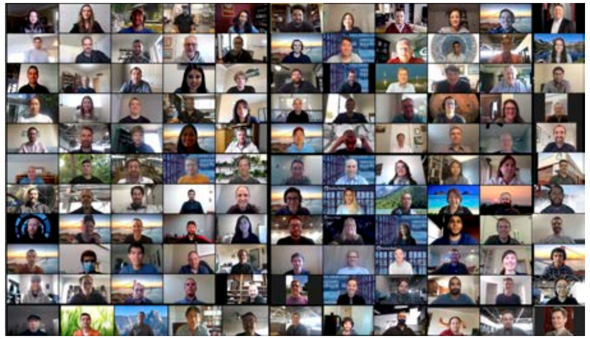


Overview of Kairos Power

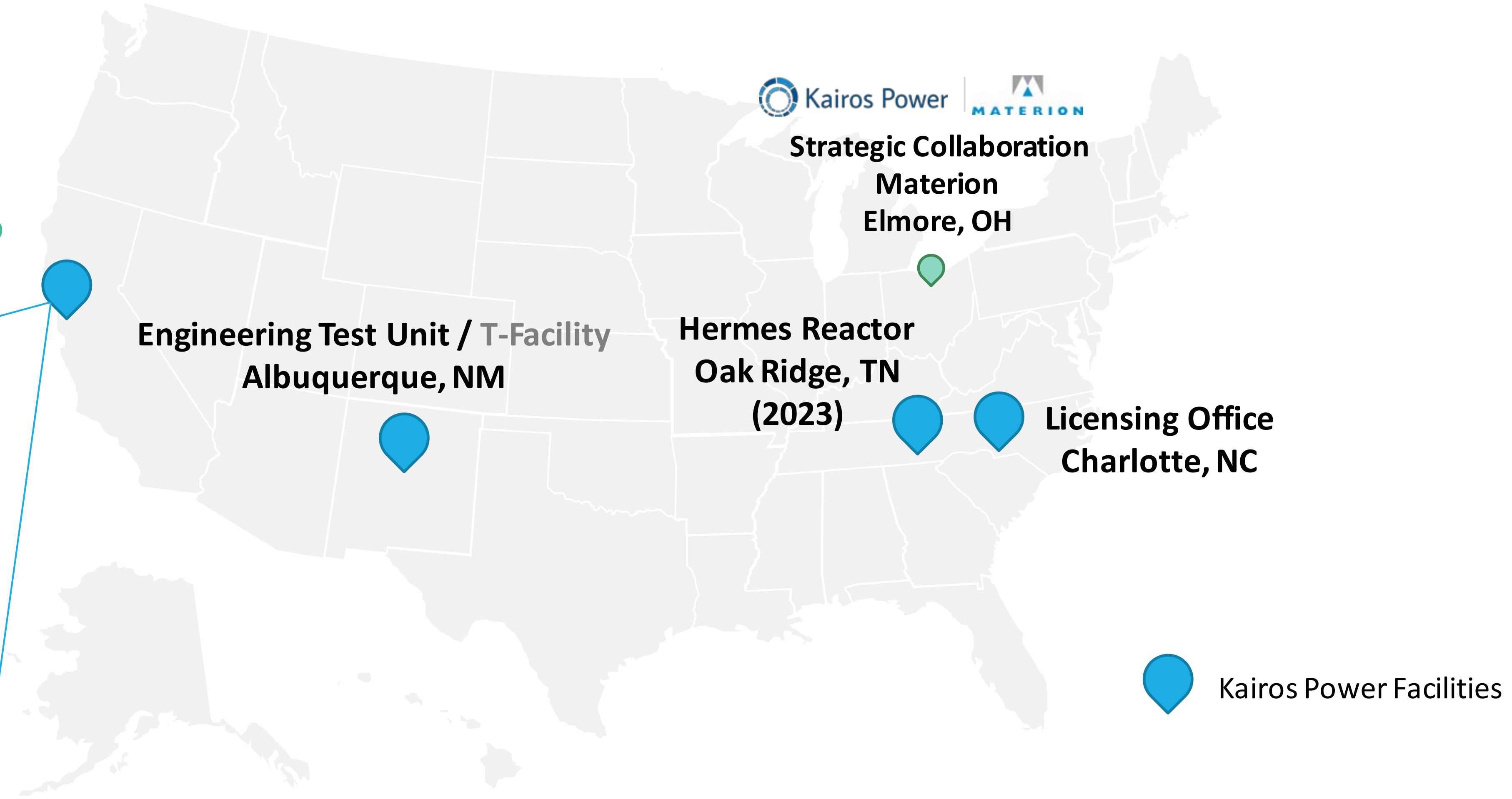
- Nuclear energy engineering and design company ***singularly focused*** on the commercialization of the fluoride salt-cooled high temperature reactor (FHR)
  - Founded in 2016
  - Current Staffing
    - 162 Employees
    - ~90% Engineering Staff
- Private funding commitment to engineering design and licensing program and physical demonstration through nuclear and non-nuclear technology development program.
- Schedule driven by US demonstration by 2030 (***or earlier***) and rapid deployment ramp in 2030s.
- Cost targets set to be competitive with natural gas in the US electricity market.

Kairos Power Headquarters

Kairos Power Team



Kairos Power Locations



Kairos Power Highlights of Recent Progress

R-Lab
Technology Development

Engineering Test Unit (ETU)
Major Component Fabrication

S-Lab
Flibe Chemistry and Materials Testing Lab

NRC
Pre-Application Engagement

ETU / T-Facility
New Mexico Expansion

Hermes Reactor Site Selection
East Tennessee Technology Park

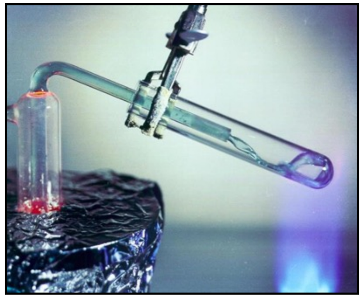
Kairos Power is Uniquely Suited to Supply the Nuclear Technology to Replace U.S. Natural Gas Capacity

- **Robust Inherent Safety**
  - Uniquely large ***fuel temperature margins***
  - Absorption of fission products in primary coolant
  - Low-pressure system
  - Effective passive decay heat removal
- **Lower Capital Costs**
  - Reduce requirements for high-cost, nuclear-grade components and ***structures*** through FHR intrinsic safety and plant architecture
  - Leverage conventional materials, existing industrial equipment, and conventional fabrication and construction methods

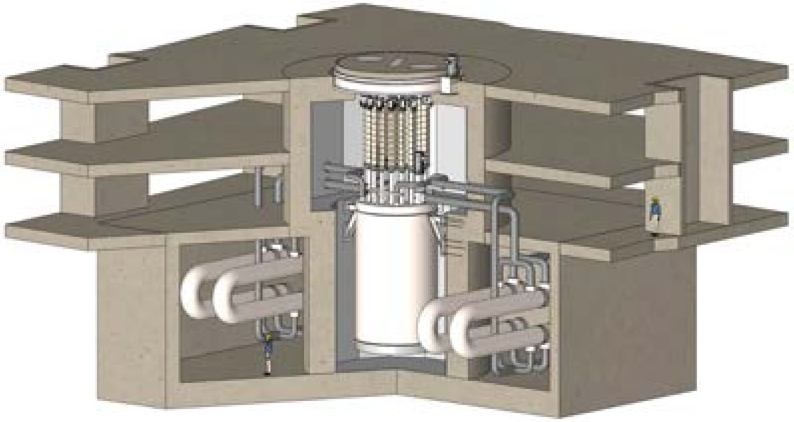
Technology Basis

Coated Particle Fuel
TRISO

Liquid Fluoride Salt Coolant
Flibe (2LiF-BeF$_2$)

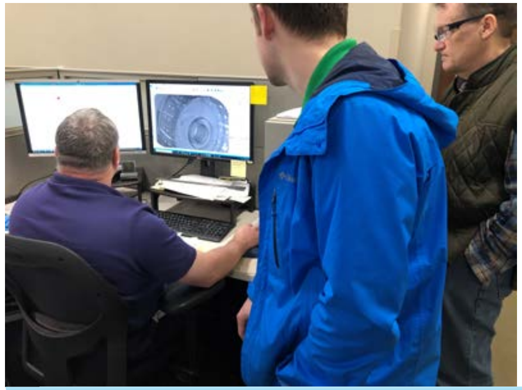


Kairos Power Reactor Nuclear Island



Kairos Power Nuclear **Development** Paradigm Shift

Design next pump impeller iteration



Additive manufacture water testing prototype

Also test the new materials for high-temperature performance

Conventional Nuclear Development Cycle

PLAN → DESIGN → BUILD → TEST

TEST EXPERIENCE

Kairos Power Accelerated Test Cycles for Innovation and Optimization

PLAN → DESIGN → BUILD → TEST → PLAN → DESIGN → BUILD → TEST → PLAN → DESIGN → BUILD → TEST

Test Experience

Test Experience

TEST EXPERIENCE

Kairos Power Testing Program - Rapid Technology Demonstration Requires Non-Nuclear Development and Qualification Facilities

R RAPID LAB

Rapid Analysis, Prototyping, and Iterative Design Lab

S SALT LAB

Salt Handling and Loop Testing Lab

T TESTING FACILITY

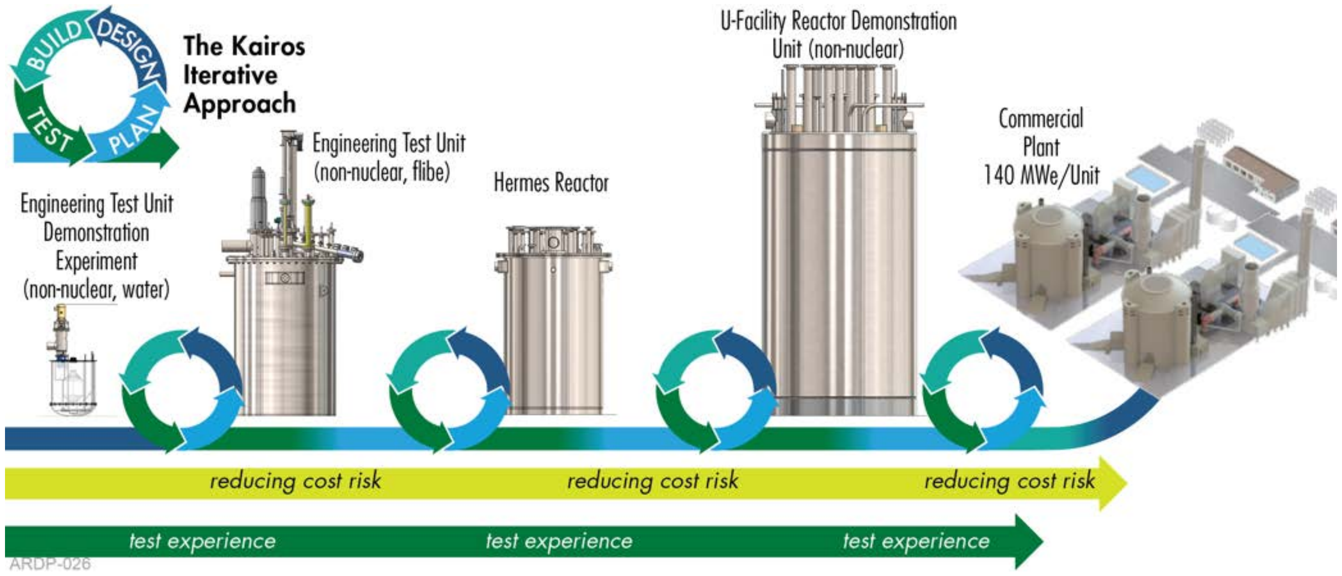
Component Testing Facility

U USER FACILITY

User Ops & Maintenance Training Facility

Kairos Power Design Approach

- Kairos Power believes *"hardware is worth 1000 calculations"* and ETU will be the proof case for this philosophy since it integrates all the major systems of Hermes in a non-nuclear environment
- Iterative strategy is supported by capabilities in Material Testing, Tritium Testing, Chemistry Control, Mod/Sim, Core Design and Neutronics, and Instrumentation and Controls

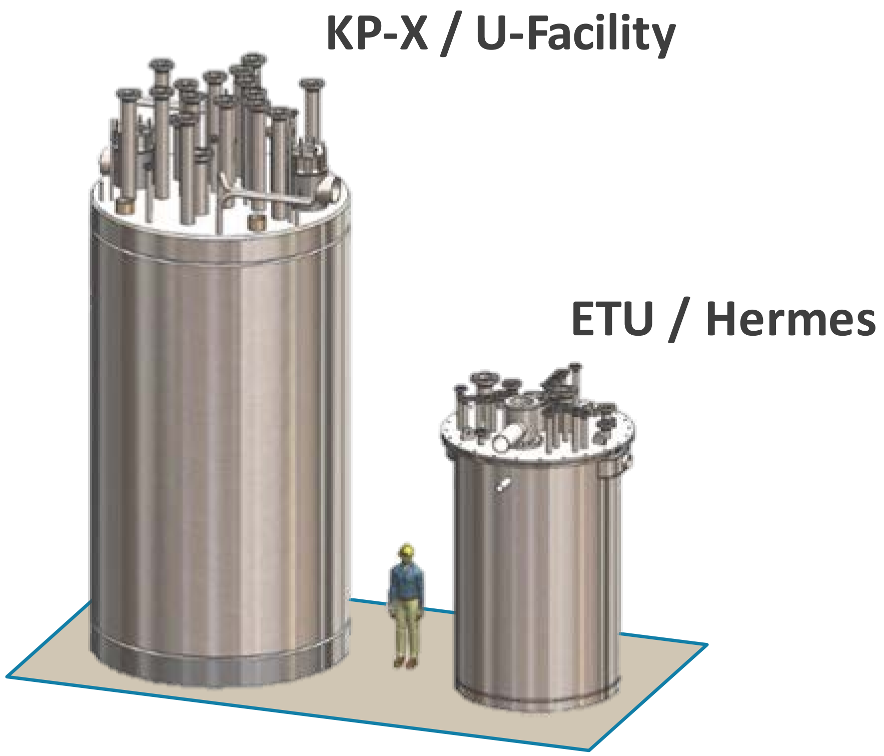


What is Kairos Power's Falcon 1?

SpaceX's Falcon 1 Flight 4 on the launch pad at Omelek Island in the Kwajalein Atoll of the Marshall Islands (19 Sep 2008)

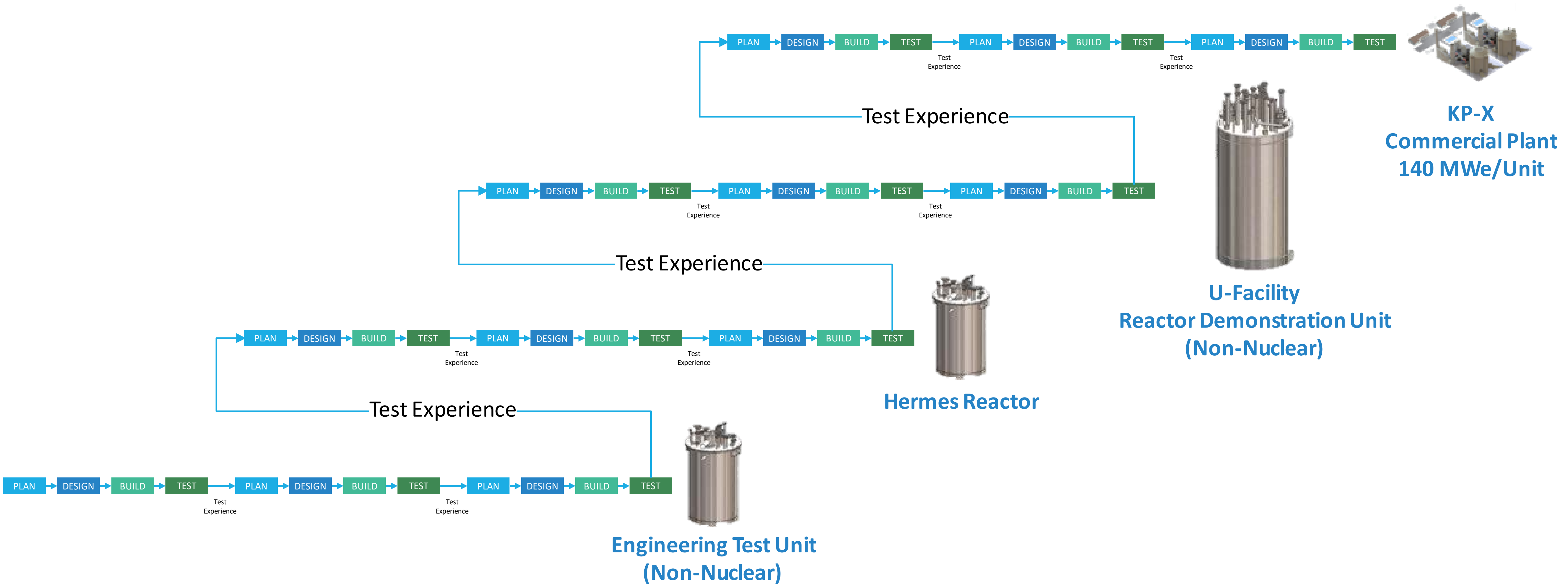
Kairos Power Engineering Test Unit (ETU) Overview

- What?
  - A non-nuclear, unenriched Flibe-wetted, and isothermal integrated test for principal SSCs (e.g., vessel, pump, pebble handling, CRDMs, etc.)
  - Full-scale version of Hermes and proportional to KP-X Commercial Reactor
- Why?
  - **Cost:** Establish competitive cost through vertical integration
  - **Supply Chain:** Initiate and exercise supply chain for KP-FHR specialized components and materials
  - **Design / Test**: Demonstrate design and integration of principal KP-FHR technologies
  - **Operations:** Accelerate experience base of large-scale Flibe facility and initial plant operations

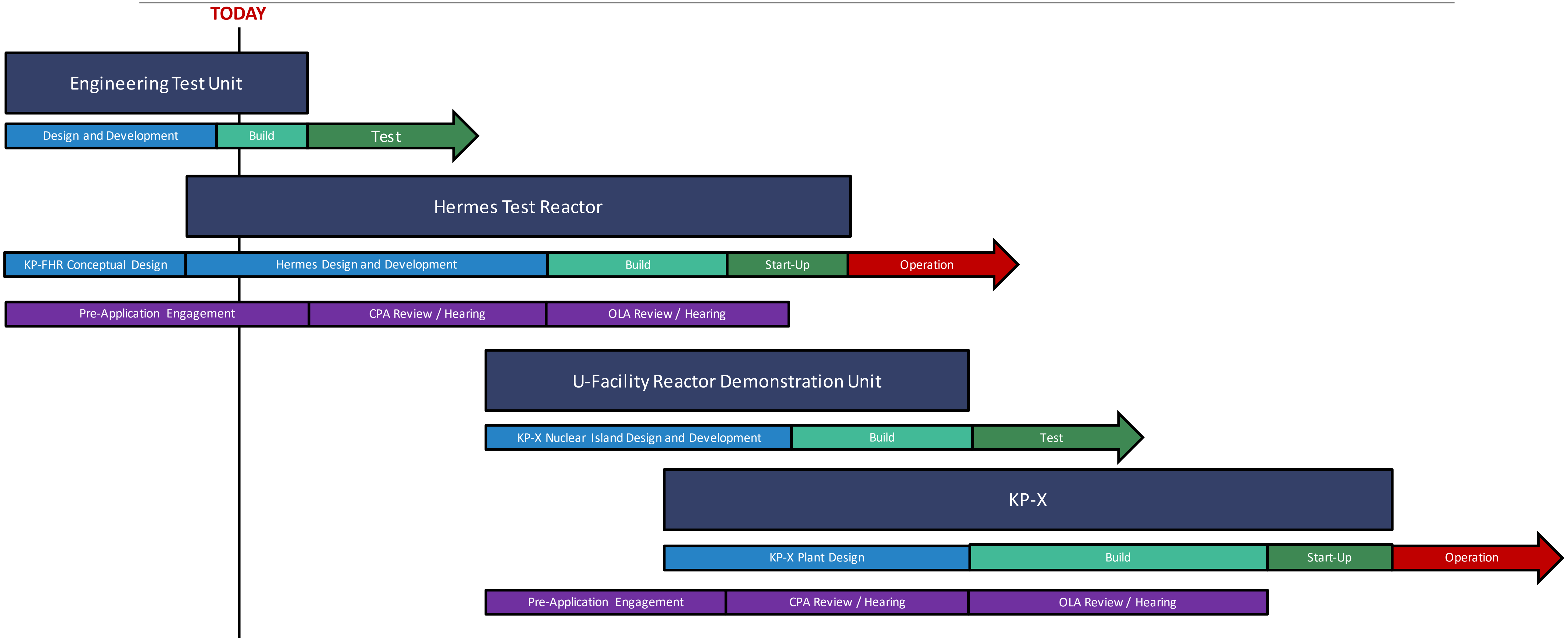


ETU should provide confidence in Kairos Power's ability to design, build, and operate high-temperature Flibe systems

Kairos Power Path to Commercialization: Successive Large-Scale Integrated Demonstrations

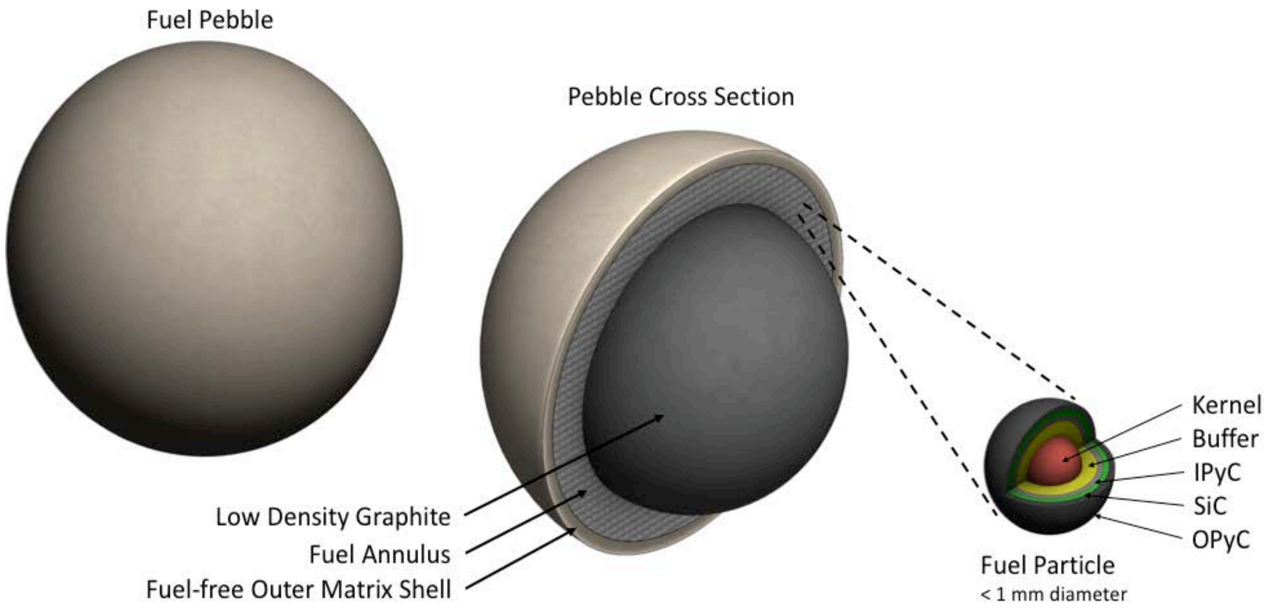


Kairos Power Development Schedule



KP-FHR Uses TRISO Fuel in Pebble Form

- Core design is a pebble bed concept within a graphite reflector
  - Pebbles are positively buoyant in Flibe
  - Mixture of fuel and moderator pebbles operates with optimal moderation
- Fuel particles:
  - Tri-structural isotropic (TRISO)-coated fuel particles embedded in a graphitized matrix
  - Baseline fuel uses AGR 5/6 coated particle design
- Pebble handling system monitors condition and burnup
  - Fuel reaches full depletion in 1.4 effective full power years
  - Rapid depletion reduces total fuel inventory and enables accelerated development of advanced fuel designs



4.0-cm diameter, annular fuel pebble is the same size as a ping-pong ball

KP-X Fuel Utilization Comparisons

Non-proprietary	KP-X	PBMR	4-loop PWR	S-PRISM
Coolant	Flibe	Helium	Water	Sodium
Core inlet/outlet temperatures (°C)	550/650	500/900	292/326	355/510
Reactor operating pressure (bar)	~0	75	150	~0
Coolant volumetric heat capacity (kJ/m3°C)	4540	20	4040	1000
Reactor thermal power (MWt)	320	200	3411	200
Reactor electrical power (MWe)	140	58	1092	58
Power conversion net efficiency	43.8%	43.8%	32.0%	29.0%
Fuel average enrichment (w/o %)	19.55%	9.60%	4.61%	8.93%
Fuel discharge burn up (MWt-d/kg-HM)	193.6	92.0	52.2	106.0
Core power density (MWt/m3)	19.0	4.8	105.2	321.1
Start-up fissile inventory (kg-U235/MWe)	0.73	1.30	2.07	6.15
Ratio fuel/moderator pebbles	50%/50%	100%/0%	N/A	N/A
Spent fuel dry storage density (MWe-d/m3)	8976	1922	16746	~
Fuel fabrication requirement (MWe-d/kg-HM)	84.7	40.3	16.7	~
Natural uranium utilization (MWe-d/kg-NU)	1.81	1.73	1.55	~
Separative work utilization (MWe-d/kg-SWU)	2.27	2.42	2.56	~

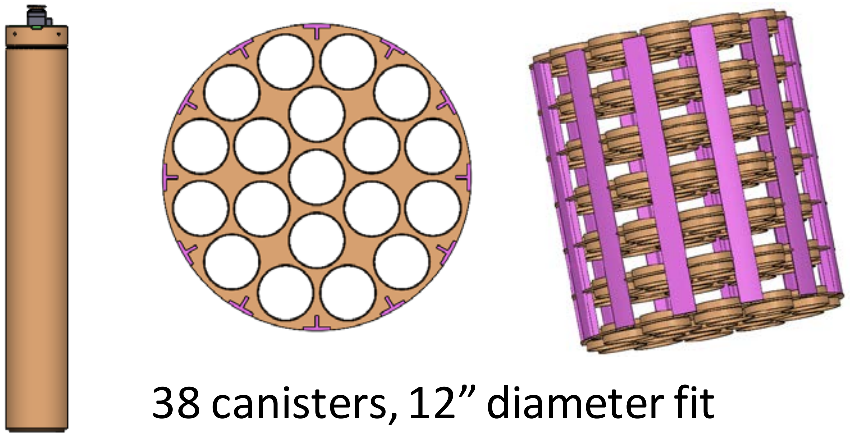
PBMR, 4-loop PWR and S-PRISM values from "Technical Description of the 'Mark 1' Pebble-Bed Fluoride-Salt-Cooled High-Temperature Fluoride-Salt-Cooled High-Temperature Reactor (PB-FHR) Power Plant," UC Berkeley, Report UCBTH-14-002, 2014.

KP-FHR Fuel Utilization is Substantially Better Than mHTGRs Such as PBMR

- KP-FHR Flibe coolant provides ~50% of neutron moderation
  - High moderating power enables design to have **negative coolant temperature/void reactivity feedback**
  - Substantially **reduces required carbon to heavy metal (C/HM) ratio** compared to mHTGRs
- KP-FHR Flibe coolant provides much more effective heat removal than helium
  - KP-FHR baseline **core power density** is **4.0 x greater than PBMR**
  - KP-FHR core can use mixture of fuel and moderator pebbles to further reduce used fuel volume
  - KP-FHR baseline **used fuel volume** is **4.6 x smaller than PBMR** **(but 1.9 x larger than LWRs)**
- KP-FHR high discharge burn up and thermal efficiency have important implications for fuel cost
  - Heavy metal consumption (mass of TRISO fabricated) greatly reduced
    - **47% of PBMR heavy metal consumption**
    - **20% of PWR heavy metal consumption**
  - Natural uranium consumption **reduced** compared to PBMR (90%) and PWR (86%)
  - Separative work consumption is **increased** compared to PBMR (107%) and PWR (113%)
- Rapid fuel depletion and on-line refueling enables rapid qualification of advanced KP-FHR fuel designs (all fuel completely replaced every 1.5 years)

KP-FHR Used Fuel Canister Design Can Use Same Transport and Disposition Infrastructure as LWR Used Fuel

- Compact canisters each hold 2100 used fuel pebbles
  - 12” (0.30m) diameter, 72” (1.8m) tall canisters
  - KP-FHR used fuel volume is 1/4 to 1/6 of the volume produced by high-temperature gas reactors (e.g. PBMR)
- Hermes implements in-reactor-building storage for fuel canisters sufficient for >10 years of operation
- Hermes canister transportation can use existing NAC-LWT transport cask
- KP-X canisters can use existing commercial dry storage overpacks and transport casks
  - Canister system enables flexible used fuel disposition by recycle, conventional geologic disposal, or borehole disposal, depending on national policies



38 canisters, 12” diameter fit inside a 68” ID overpack

Energy from KP-X used fuel stored in **one KP-X canister** is equivalent to **72 railcars each containing 120 tons of coal**

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