

# HOLOS Micro-Reactor



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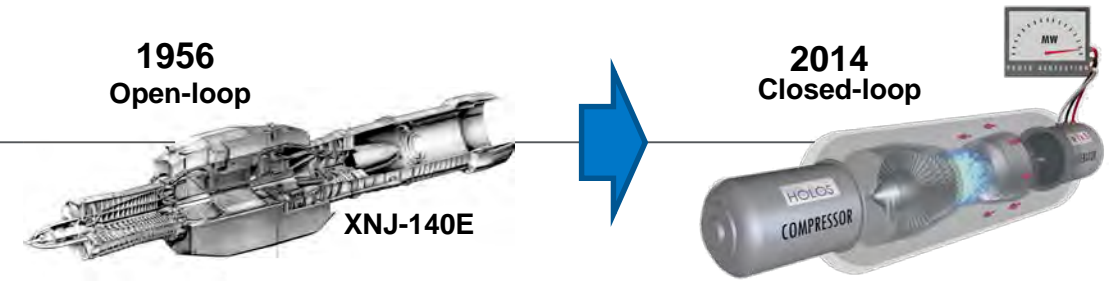
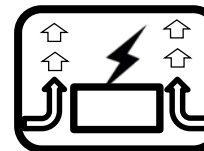
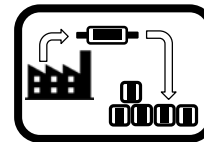
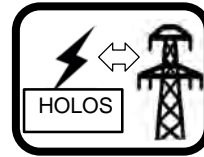
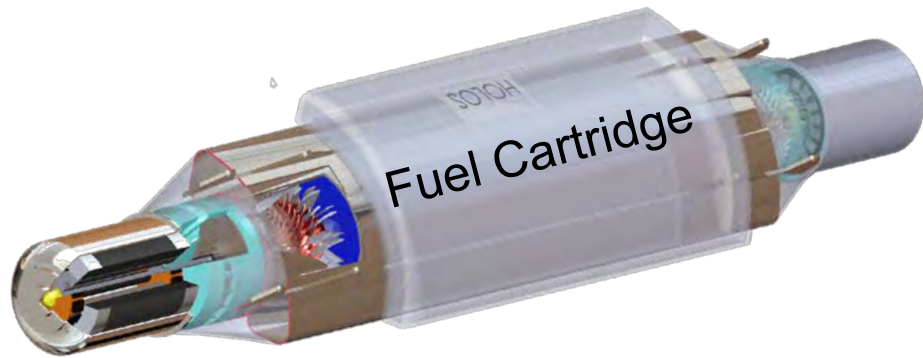
**Presentation at DOE GAIN Micro-Reactor Workshop**

**June 18, 2019**

# HOLOS Design At A Glance

## Subcritical Power Modules (SPMs)

Integrated Power Conversion System -- No BoP



## Safety

- Fueled with melt resistant fuels
- No volatiles release under LOCA
- Immune to Station Black Out
- Sealed fuel cartridges from factory to depository
- Fuel at atmospheric pressure
- EMP and ballistic strike resistant
- Decay heat passive removal

## Application-specific Features

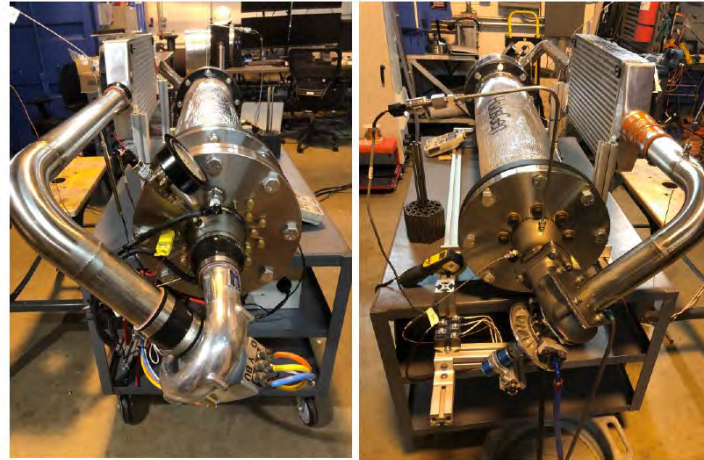
- Decay-heat driven electricity production after shutdown
- Economically competitive at 2019 market conditions
- True load-following

# Current Development Activities

HolosGen has partnered with Parsons and Honeywell to bring additional technology and manufacturing capabilities

## DOE ARPA-E MEITNER Program

- HolosGen working with Parsons on a sub-scale version of MNPP for ARPA-E
  - Elimination of Balance of Plant
  - Sub-Scale Program Simulator
  - Simplified Design Optimized for Distributed Energy
  - Techno-Economic Basis for HOLOS Design



HolosGen™

PARSONS



## DoD SCO Pele Program

- Parsons leading team with HolosGen and Honeywell on MNPP prototype for SCO
  - Highly mobile
  - Scalable, Load-following Power
  - Deployable as Fully Assembled System
  - Multiple Redundant Layers of Containment
  - Integrated Power Conversion System



PARSONS

HolosGen™

Honeywell



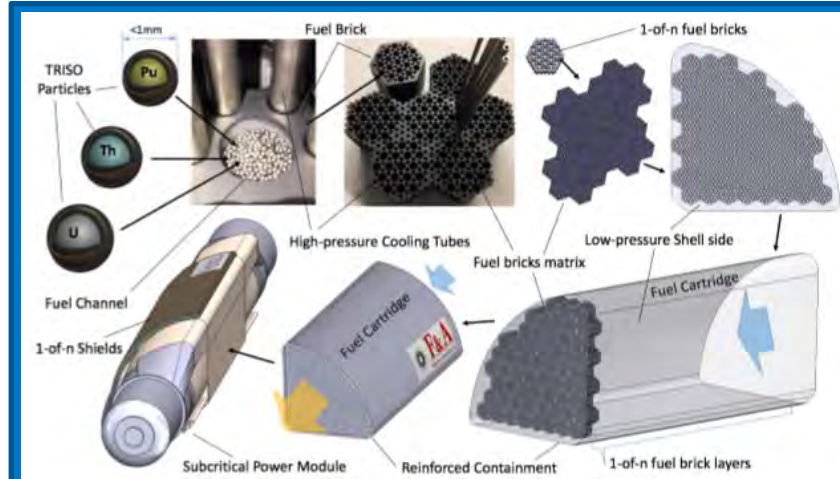
# Development Areas – DOE GAIN Assistance Requests

Several areas of HOS design development may require National Laboratories' expertise and resources



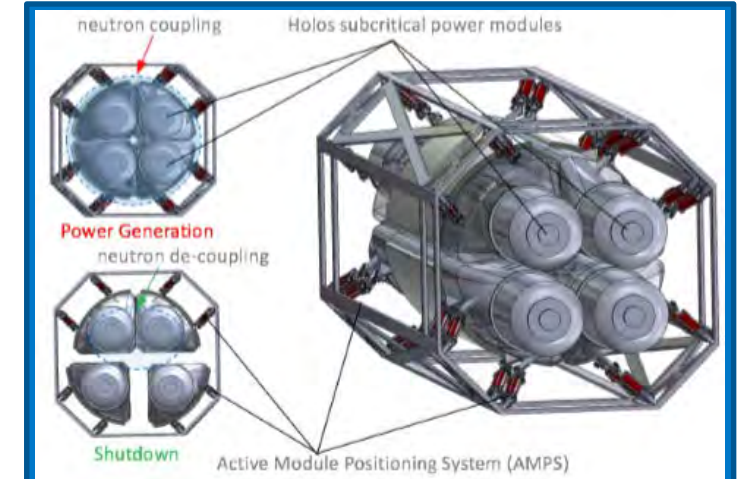
## Materials and Manufacturing

Additive manufacturing of ultra high temperature carbon-carbon and composite materials, and of ultra high temperature refractory alloys



## Composite Shielding

Radiation attenuation and ballistic protection, special applications composite shielding



## Control System Development

Semi-autonomous control system development, sensors instrumentation and controls (I&C), I&C architecture development for integrated system

# HOLOS – Control System Development

Define requirements for semi-autonomous control system and I&C to assure safe operation

## Unique Attributes Required for HOLOS System I&C

- Semi-autonomous control system
  - Minimal operator actions on start-up and shut-down
  - Autonomous during normal operation
- Load-following capability
  - Uses battery ballast to absorb momentary power/load mismatch
- Control of a dynamically coupled HTGR reactor core
  - Positioning of SPMs - primary reactivity control
  - Reactivity insertion devices – additional control
- Applicable to all scales of HOLOS design
  - Small SCO Pele system, 8-9 MWe Quad system, up to 81 MWe Titan



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Example: Ivanpah Solar Field Control System

- 80x scale-up FOAK project
- Dual-axis control of 180,000 Heliostats (HTs)
- Solar Flux from HTs varies via input from Boiler Management System
- Off-Nominal and Emergency Shutdown scenarios