Westinghouse DeVinci™ Micro Reactor

(Mobile Nuclear Power Plant)

Westinghouse Government Services LLC
3000 Westinghouse Drive
Cranberry Township, PA 16066, USA
www.westinghousenuclear.com

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Technology Overview

Value Proposition: *DeVinci mobile nuclear power plant (MNPP) is a portable nuclear battery capable of supplying 1-2 MWe for more than 3 years, without refueling*

- Based on proven heat pipe reactor technology developed for NASA
- Leverages standard military shipping containers (CONEX boxes)
- Transportable by road, rail, sea and air (C-17) with no secondary fuel storage
- Semi-autonomous operation
- Minimal training
- Setup time < 3 days

Development Stage: Preliminary Design

Technology Readiness Level: 6

Commercialization : 2023

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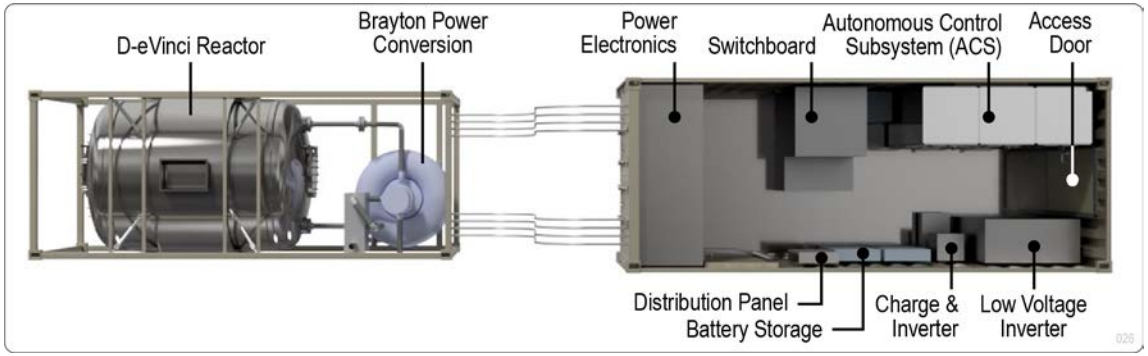
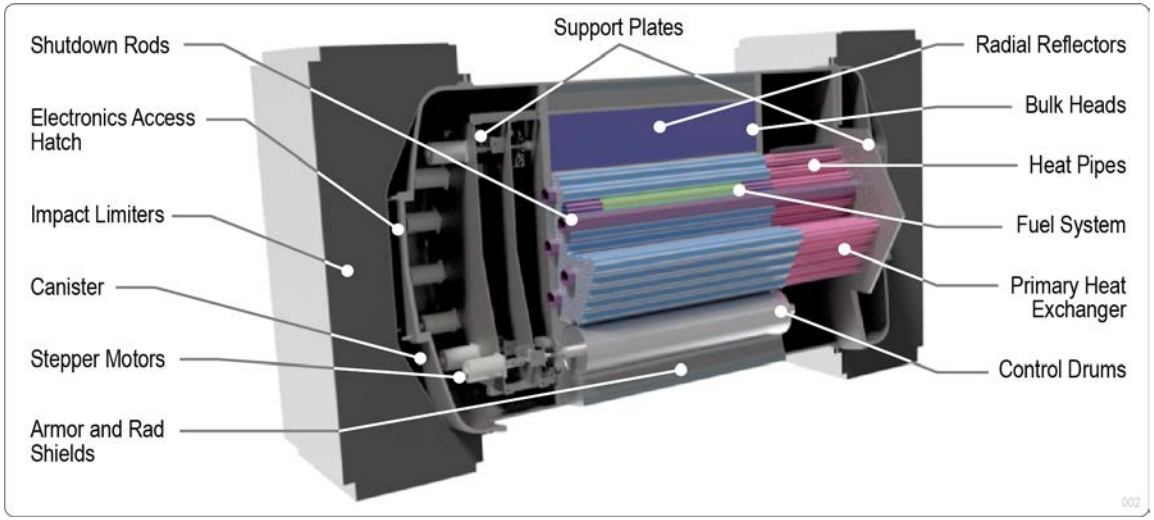
DeVinci Micro Reactor - Design





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Attributes

~1-2 MWe CLEAN ELECTRICITY

HEAT REMOVAL VIA HEAT PIPES

FITS IN 20’ CONEX CONTAINERS

TRANSPORTABLE BY ROAD, RAIL, SEA, AIR

3+ YEAR CONTINUOUS POWER

MINIMAL MOVING PARTS

OPEN AIR BRAYTON POWER CONVERSION

MICRO-ENCAPSULATED TRISO FUEL

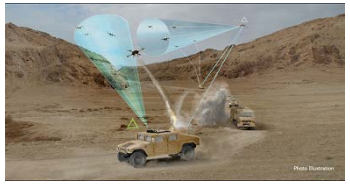
BLACK START CAPABILITY

>98% AVAILABILITY

DeVinci Military Application

DoD Applications

- Reliable and mobile energy for FOB to reduce supply vulnerabilities and reduce reliance of ground operations on liquid fuel
- Durable and energy dense power source for future weapons that use directed-energy and electromagnetic energy
- Cost-effective clean energy to ensure energy security of critical defense assets seeking improved resiliency



Solves Reliance on Continuous Diesel Fuel Supply

- Saves lives
- Minimizes emissions
- Increases resiliency

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DeVinci Logistics

Mobilization

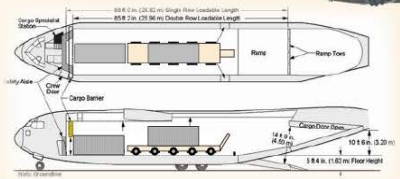
Transportation

Entire system fits in 2, ISO-certified 20' CONEX boxes
- CONEX 1: Reactor & power conversion = 31 US tons
- CONEX 2: Instrumentation, control and electrical = 8 US tons

M-1000 Trailer

M-1070 Tractor

C-17 Globemaster

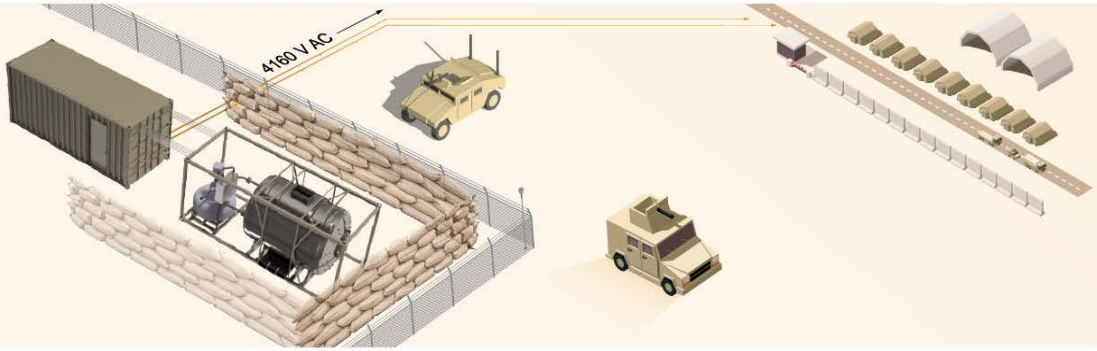


Installation within 24 hours

- No excavation needed
- Can operate in any site
  - Arctic
  - Arid-desert
  - Humid jungle

Operation

Duration of Need with Fuel Changes Every 3.5 years

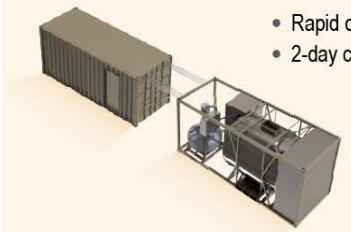


- Generates 1.9 MWe
- Capable of supplying district heat and process heat
- Autonomous operation
- Inherently safe shutdown
- One onsite monitoring operator

Demobilization

Shutdown, Cool Down, Disconnect and Removal for Transport —3 days

- Rapid disassembly
- 2-day cool-down



Transportation

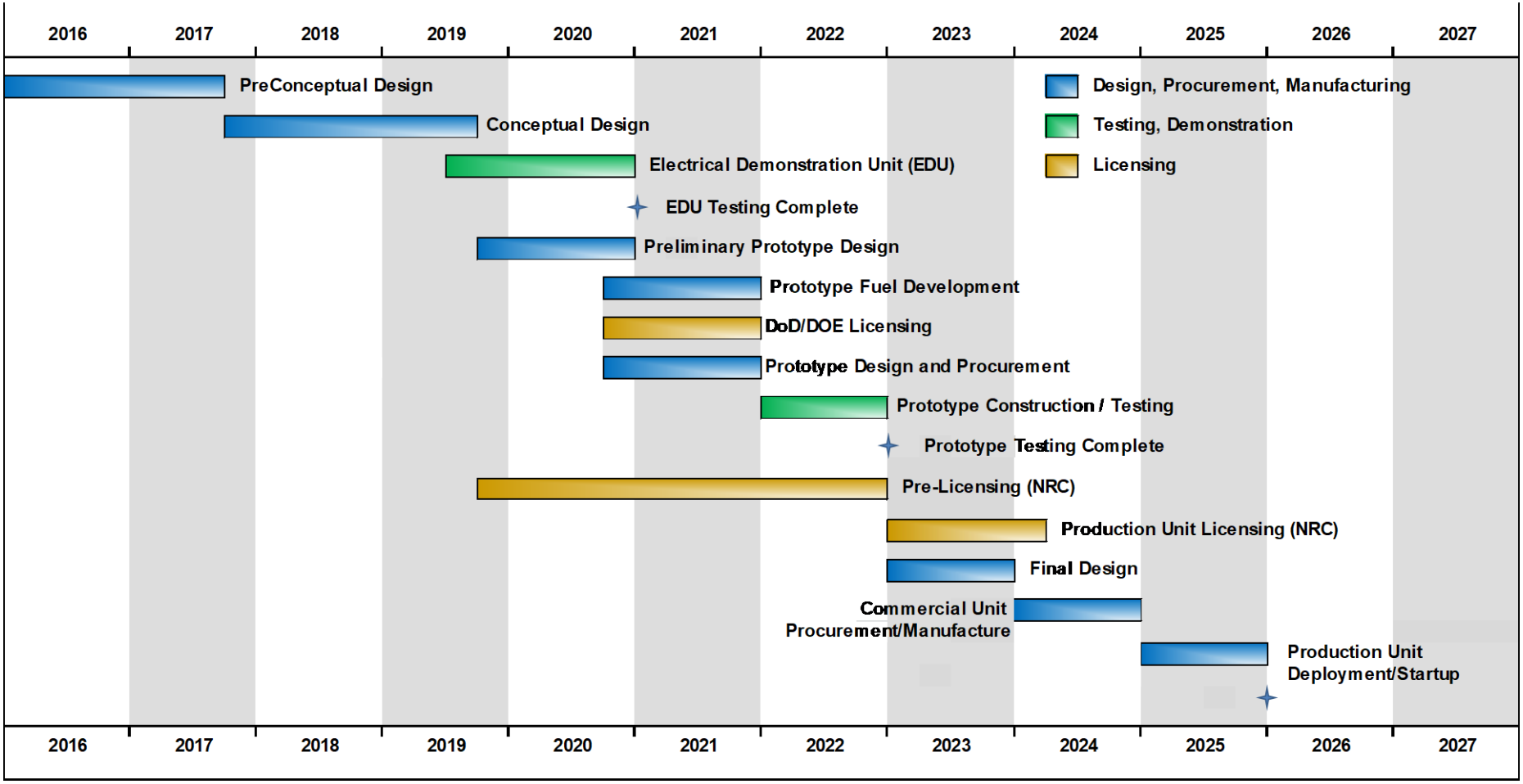
DeVinci Micro Reactor Team

Technology, Capabilities and Experience

Integrated Team:

- **Westinghouse** – Product Lead
- **Los Alamos National Laboratory (LANL)** – Heat Pipe Technology Provider
- **Idaho National Laboratory (INL)** –Modeling & Simulation, Fuel Engineering
- **Southern Company** – Remote Monitoring, Licensing Support
- **Power Secure** – Microgrid Interface
- **Brayton Energy** – Power Conversion System
- **University of Pittsburgh** – Instrumentation Provider

DeVinci Development Plan



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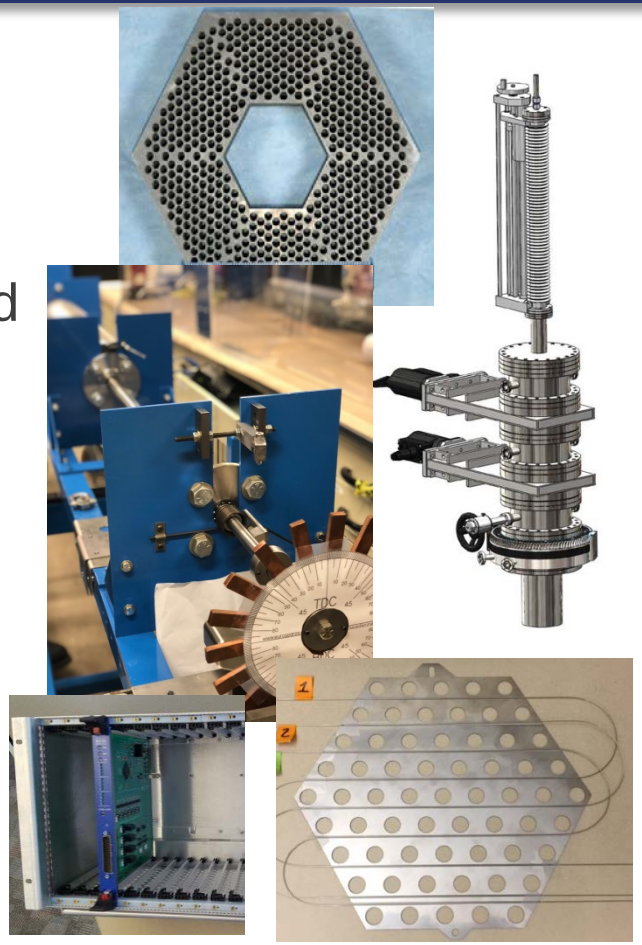
DeVinci Technology Advancements

- **Nuclear battery core and fuel design** – solid core, heat pipes and fuel
- **Heat pipe manufacturing** – for heat removal
- **Advanced manufacturing and testing** for solid core and heat exchanger
- **Control drums** – for basic operation
- **Autonomous Control System** – for inherent load follow capabilities
- **Fiber optic sensors** – for embedded temperature and pressure monitoring
- **Numerous Patents** – Manufacturing and design applications



Addressing design and manufacturing risk areas

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Developing Activities Underway

- **Government Program Participation**
  - $1.7M Technology Commercialization Fund (TCF) to develop a heat-pipe filling system in partnership with LANL
  - $7.8M from DOE ARPA-E MEITNER (Modeling-Enhanced Innovations Trailblazing Nuclear Energy Reinvigoration) program to simulate solid core block characteristics
  - $4.5M DOE ARPA-E OPEN award with LANL to evaluate advanced manufacturing on heat pipe reactors to improve economics
  - $12.8M DOE FOA-1817 award for design and testing activities related to nuclear demonstration readiness
  - $12M DoD SCO Phase IA
- **Active participation in Industry Organizations**
  - Nuclear Regulatory Commission (NRC) – Docketed Project in Pre-Application
  - Nuclear Energy Institute (NEI) – Micro Reactor and Advanced Reactor working groups
  - Electric Power Research Institute (EPRI) –Advanced Nuclear Technology participant

Ability to Deliver

- Westinghouse is the largest nuclear company in the U.S. with a proven record of delivering new commercial nuclear power plants over the last three decades
- Leveraging substantial research and design work done by Los Alamos National Laboratory on heat pipe reactors
- Substantial development effort with significant investment
- Initiated early testing in new dedicated facility
- POCs:

Micro Reactor Test Facility – Madison, PA

Mr. Alex Harkness
DeVinci Chief Engineer
+1 (724) 766-2226
aharkness@westinghousegovservices.com

Mr. Ryan Blinn
DeVinci Program Director
+1 (724) 814-4083
rblinn@westinghousegovservices.com

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