Versatile Test Reactor Project Status

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Advancing U.S. Nuclear Research and Development – A Briefing and Discussion on the VTR
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There is a Clear and Compelling Mission for VTR

**SCIENCE & TECHNOLOGY**
- Fast reactor physics
- Materials in extreme environments
- Neutrino science

**COMMERCIAL**
- Accelerated testing for fuels, materials & sensors for advanced reactors: Na, Pb, LBE, MS, He
- Accelerated testing for materials
- Clean energy market share

**NATIONAL SECURITY**
- Safeguard detectors/safeguards by design
- Global safety and security policies
- Export of reactors and reactor services

VTR is a state-of-the-art TEST REACTOR to enable continuous innovation in advanced nuclear energy technologies during its 60 years lifetime.
VTR Major Milestones to Date

1st Major Milestone

Critical Decision 0 achieved in 2019, focused on needs of:

• Commercial developers of advanced nuclear energy technologies
• National security interests
• Scientific community

2nd Major Milestone

Critical Decision 1 achieved in September 2020, focused on:

• Analysis of alternatives
• Conceptual design and conceptual safety design
• Cost and schedule ranges
National Environmental Policy Act

- **Aug. 5, 2019**: Notice of Intent published in the Federal Register
- **Aug. 27-28, 2019**: DOE hosts public scoping meetings via webinar
- **Aug. 17, 2020**: Draft Environmental Impact Statement (EIS) undergoing DOE review
  - EIS will look at:
    - No Action Alternative, Build VTR at INL and Build VTR at Oak Ridge National Lab
    - Will also look at fuel fabrication at INL and Savannah River Site
- **Nov. 2020**: Draft EIS will be published and public review begins
  - Public Review of Draft EIS:
    - At least 45-day comment period
    - At least one public (via Webinar) meeting required with 15 days advanced notice
- **Spring 2021**: DOE releases final EIS
  - Respond to oral and written comments on the Draft EIS
  - 30 day waiting period (after EPA Notice of Availability is published)
- **Summer 2021**: DOE issues record of decision
  - Reactor site
  - Fuel fabrication site
### Conceptual Design Approved at CD-1

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Target</th>
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<tbody>
<tr>
<td>High fast neutron flux (&gt;0.1 MeV)</td>
<td>$\geq 4 \times 10^{15} \text{ n/cm}^2\text{-s} $</td>
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<td>High fluence</td>
<td>$\geq 30 \text{ dpa/yr}  $</td>
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<td>High test volume in the core</td>
<td>$\geq 7 \text{ L/test location (multiple locations)} $</td>
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<td>Representative testing height</td>
<td>$\geq 0.6 \text{ m}  $</td>
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<td>Flexible test environment Loops</td>
<td>(Na, Pb, LBE, He, Salt) Rabbit</td>
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<td>Driver fuel life cycle management</td>
<td>Existing facilities as much as possible</td>
</tr>
<tr>
<td>Schedule: Available ASAP</td>
<td>Target Date: 2026</td>
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<tr>
<td>COST(capital + operating):</td>
<td>Minimal</td>
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- 300 MWth pool-typed sodium cooled reactor
- Core design optimized for meeting testing requirements (National Laboratories)
  - Driver Fuel: U-20Pu-10Zr
- GEH PRISM A for the balance of the reactor (GEH-Bechtel subcontract)
- Innovative experimental vehicle designs (National Labs, Universities, Industry)
### CD-1 Cost and Schedule Range

<table>
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<tr>
<th>Project Cost Range ($B)</th>
<th>Milestone</th>
<th>Fiscal Year</th>
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<tbody>
<tr>
<td>Point Estimate</td>
<td>CD-0</td>
<td>FY 2019, Q2</td>
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<td></td>
<td>CD-1</td>
<td>FY 2020, Q4</td>
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<tr>
<td>Upper Bound</td>
<td>CD-2/3</td>
<td>FY 2023 Q2 (target)</td>
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<tr>
<td>Lower Bound</td>
<td>CD-4</td>
<td>FY 2026, Q4 – FY 2031, Q4</td>
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- Point estimate includes ~20% contingency and management reserve
- Cost range includes +60% and -30% for uncertainty range
Versatile Test Reactor Partnership

• 2018 –Department of Energy establishes VTR program after several studies highlight need.
• 6 national labs, 19 universities & 10 industry partners
• DOE 413.3B – Process for development of major systems projects.

The Blanket Master Contract for the Engineering Design and Construction phase of the project is being negotiated with Bechtel National, Inc (TerraPower and GE-Hitachi partners)
Summary & Conclusions

• When operational, VTR will be the world’s premier fast spectrum test reactor allowing technology developers and scientists access to state-of-the-art capabilities.

• VTR will provide the missing piece of research and development infrastructure and will help re-establish U.S. as the global leader in nuclear energy innovation.

• Even in the early design phase, VTR already is making an impact on nuclear energy innovation.
  ➢ e.g. Integrated Digital Engineering framework

• VTR will be authorized and operated under the DOE authority, working closely with the Nuclear Regulatory Commission (NRC).
  ➢ MOU signed in September 2019

• There is considerable international interest among our nuclear energy allies.
  ➢ France, Japan collaborations