VERSATILE TEST REACTOR

Experimental Capabilities: Driving Nuclear Innovation

VTR SYNERGY

The VTR is already helping to address challenges faced by reactor innovators today through development of innovative sensors and monitoring systems, digital engineering approaches, enhanced modeling, and new measurement techniques.

WHAT EXPERIMENTAL CAPABILITIES WILL THE VTR PROVIDE?

The VTR provides a platform to accelerate nuclear technology development for today's light water reactors and tomorrow's advanced reactors by conducting research in eight key areas:

- Molten Salt Reactors
- Gas-cooled Fast Reactors
- Lead-cooled Fast Reactors
- Sodium-cooled Fast Reactors
- Structural Materials Testing
- Rabbit Systems (for rapid specimen/test insertion and retrieval)
- Digital Engineering & Virtual Design and Construction
- Instrumentation & Controls

WHAT ARE THE VTR TEST VEHICLES?

There will be four test vehicle types, or methods, of inserting experiments into the VTR:

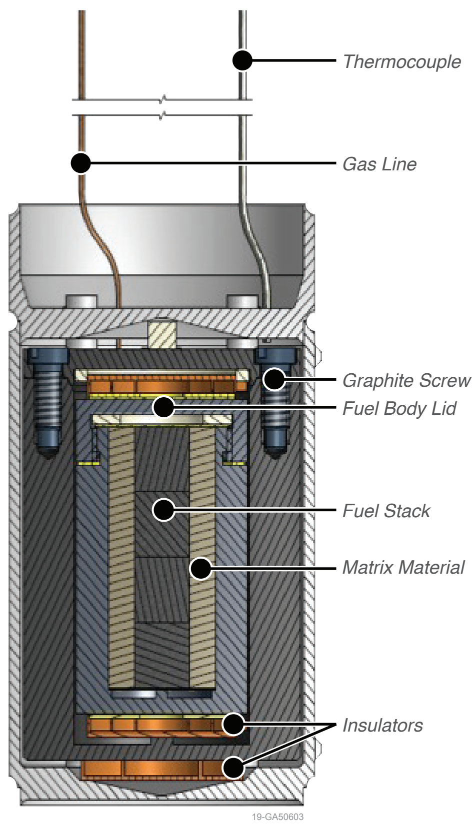
- Un-instrumented test assemblies: include fuels and/or materials tests embedded in VTR fuel assemblies. Also ideal for "drop-in" type tests and can accommodate materials, fuels, etc. Open to the reactor/primary sodium coolant.
- Fully instrumented test assemblies: contain various sensors and instruments and capable of manipulating the test environment (temperature, flow, etc.) during the test. Open to the reactor/primary sodium coolant.
- Fully instrumented cartridge loops: contains a coolant system segregated from the reactor/primary sodium coolant. The loop coolants and/or fuel can be molten salt, gas, lead/lead bismuth, sodium, or others.
- Rabbit, or rapid shuttle system for short term irradiations: ideal for irradiating samples for short periods of time and extracting them quickly.

VTR test vehicles will have large irradiation test volumes—up to 10 liters per vehicle—that will be available to all users. The VTR will be able to accommodate up to ten test vehicles described above that can be operated at high temperatures (>800°C) if needed. Many more test positions will be available for experiments embedded in VTR fuel assemblies, e.g., inserts, lead-test pins, etc.

HOW DOES THE VTR WORK WITH PARTNERS TO ADVANCE EXPERIMENT CAPABILITIES?

Twenty universities, ten private entities/industry partners and six national laboratories are collaborating within the eight key areas. Each area is led by a national laboratory technical expert and is supported by other national laboratory personnel, university partners and industry partners.

The objective is to cover the wide range of potential experiment designs that meet the needs of relevant stakeholders and potential users.



A typical example of a test vehicle

The United States has long been a leader in the development of nuclear technologies. However, as there is currently no fast neutron testing capability in the U.S. to support advanced reactor research and development, U.S. industry has gone overseas for this capability. The Versatile Test Reactor (VTR) is intended to fill this long-standing gap, leveraging previous and existing U.S. government and industry investments in nuclear reactors to accelerate the design and construction process, using proven nuclear reactor technology to create a world-class test facility.

HOW WILL RESEARCHERS BE ABLE TO ACCESS VTR CAPABILITIES?

In general, the VTR will operate as a national user facility. Users will be provided access to the VTR, technical expertise from experienced scientists and engineers, and assistance with experiment design, assembly, safety analysis and examination. Access to user facilities is typically provided through open and competitive review processes. The Nuclear Science User Facility (NSUF) will be used as the model for scientific experiments. However, not all proposed experiments will be subject to a peer reviewed competitive process.

Experiments important to national programs and important to addressing emerging needs in the nuclear industry will receive a higher priority. International experiments covered under international collaboration agreements will also be a priority.

Other users will be accommodated with full cost-recovery based on availability of experimental positions.

University Partners

Abilene Christian University
Colorado School of Mines
Fort Lewis College
Georgia Tech
Idaho State University
Illinois Institute of Technology
Massachusetts Institute of Technology
North Carolina State University
Oregon State University
Purdue University
Texas A&M University
University of California, Berkeley
University of Idaho
University of Michigan
University of New Mexico
University of Pittsburgh
University of Utah
University of Wisconsin-Madison
Virginia Commonwealth University
Yale University

National Laboratory Partners

Argonne National Laboratory
Idaho National Laboratory
Los Alamos National Laboratory
Oak Ridge National Laboratory
Pacific Northwest National Laboratory
Savannah River National Laboratory

Industry Partners

The Cameron Group
Columbia Basin Consulting Group
EPRI
Framatome
GE-Hitachi/Bechtel
General Atomics
HDF Group
Orano
TerraPower
Westinghouse

U.S. Department of Energy

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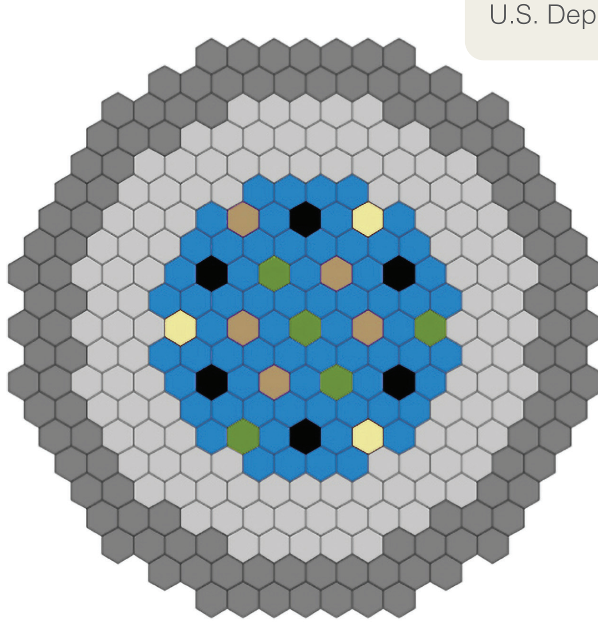

VTR Core Map

- *Driver fuel rods (66)*
- *Control rod (6)*
- *Safety rod (3)*
- *Instrumented/cartridge loop/ rabbit test location*
- *Un-instrumented test location*
- *Reflector*
- *Shield*

VTR VERSATILE TEST REACTOR

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