INL engineers tackle graphite challenge with innovative new device

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Employees at the U.S. Department of Energy's Idaho National Laboratory recently reached an important milestone in developing the nation's next generation of nuclear reactors by the completion of the first of six planned Advanced Graphite Capsule (AGC) tests.

A critical step in developing new Very High Temperature Reactors (VHTR) is certifying the graphite that is to be used in many parts in the reactor's core. In recent years, it has become necessary to develop new nuclear grade graphites that must be tested and certified for use in the next generation of gas cooled nuclear reactors. This graphite must be tested so that the American Society for Testing and Materials and the American Society of Mechanical Engineers can certify it for use in the design and construction of the reactors.

The AGC experiment will allow researchers to measure the effects of irradiation, temperature and compression simultaneously on a very large number of graphite samples in real-time, while they are still inside the reactor. The unique design provides the capability of monitoring and controlling the experiment and obtaining real time-data prior to removing it from the reactor, and will provide a more complete understanding of the properties of about 430 samples of graphite.

The capsule is a long tube with two major sections: a smaller diameter piece containing the graphite samples will be inserted into the core of INL's Advanced Test Reactor, while the larger diameter section containing pneumatic and electric equipment will sit above the reactor

core.

Technically, the device is a showpiece of modern engineering that employed much local ingenuity. Of the many innovations, one is 13 super-precise welds on the 14-foot-long section that will enter the reactor core with the graphite samples.

The welds were made using one of the world's most accurate automated welders. Made by a local company called AMET (Rexburg, Idaho), the welder allowed project workers to maintain an impressive level of accuracy. The capsule is extremely straight with less than 20 thousandths of an inch variation from one end of the stainless-steel experiment core section to the other.

The capsule is set to enter INL's Advanced Test Reactor this month, where it will remain for two years. Five similar AGC experiments will follow at different temperatures. Graphite testing will continue until 2020 and provide much-needed information that will help America along its path to a brighter energy future.

Provided by Idaho National Laboratory