

## AGR-3/4 Fuel Irradiation

### Fission Product Migration Status

The Next Generation Nuclear Plant (NGNP) Project is working to develop high temperature gas-cooled reactor (HTGR) technology that will meet the commercial needs of a wide range of industrial end users. Idaho National Laboratory (INL) manages the research and development of NGNP for the Department of Energy.

Designed-to-fail (DTF) fuel particles for use in fission product transport testing

incorporated reference kernels with 10 to 15  $\mu\text{m}$  thick pyrocarbon seal coatings. These coatings failed early in the irradiation and provided a known source of fission products. This multi-monitored test train combining AGR-3 and -4 included compacts of unaltered “driver” fuel particles seeded with DTF fuel particles. For one of the capsules, the sweep gas not only contains a mixture of helium and neon necessary to

provide thermal control of the experiment but also gaseous impurities (e.g., CO, H<sub>2</sub>O) typically found in the primary circuit helium of HTGRs. This allows an assessment of the effect of impurities on intact and DTF fuel performance and subsequent fission product transport.

The test train was designed to provide data on fission product diffusivities in fuel kernels and sorptivities and dif-

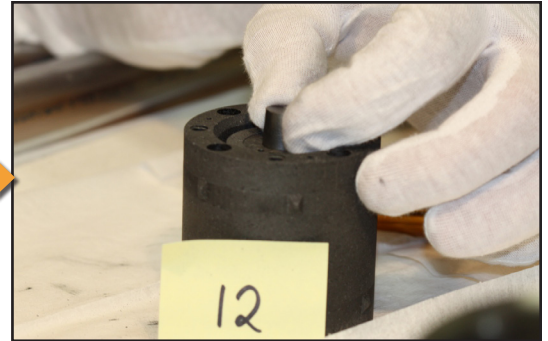
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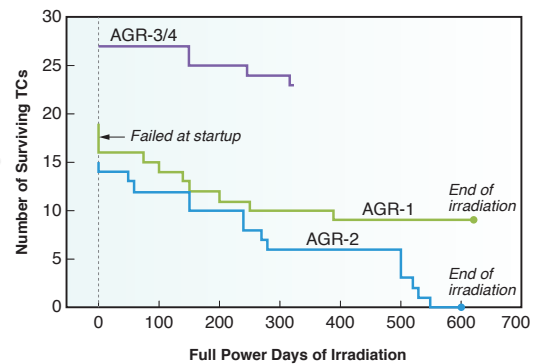
fusivities in compact matrix and graphite materials for use in upgrading fission product transport models. AGR 3/4 also provides irradiated fuel performance data on fission product gas release from failed particles and irradiated fuel samples for safety testing and PIE. The in pile gas release, PIE, and safety testing data on fission gas and metal release from kernels will be used in the development of improved fission product transport models.

- Irradiation of experiment began December 2011
- Irradiation expected to complete in about April 2014.

*Fuel Compact being loaded into matrix ring*



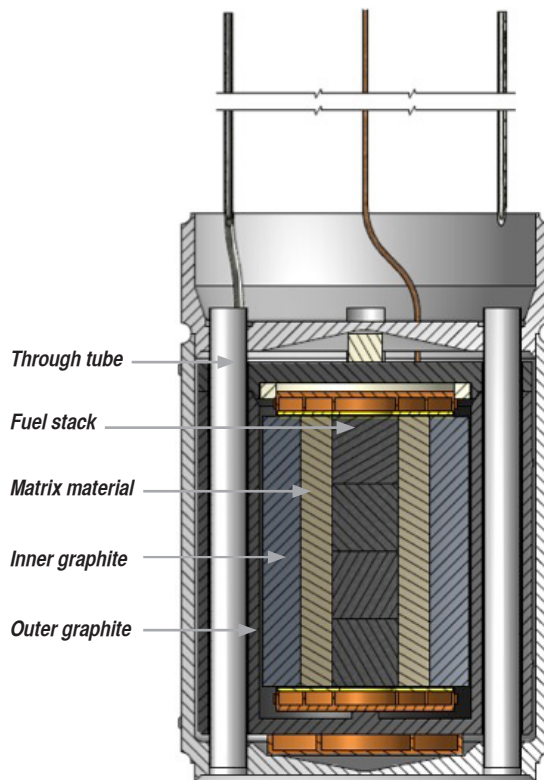
*AGR-3/4 thermocouple performance compared to AGR-1 and AGR-2*



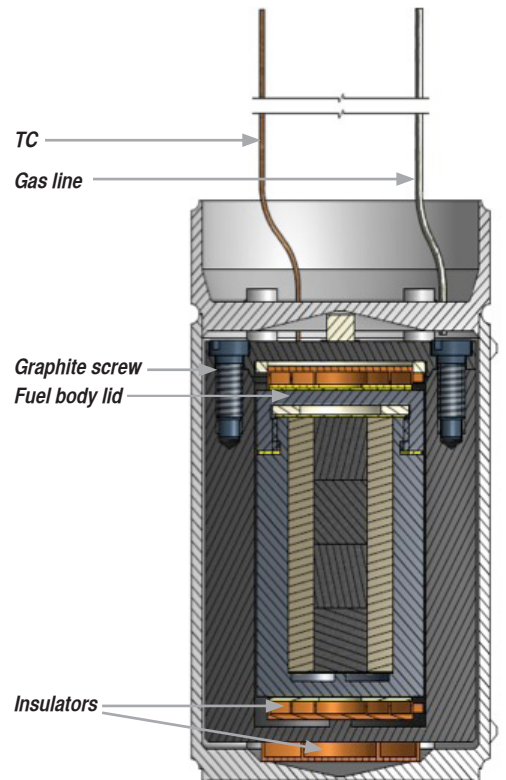
**For more information**

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*AGR-3/4 standard capsule*



*AGR-3/4 fuel body capsule*