

Safety Research & the GT-MHR

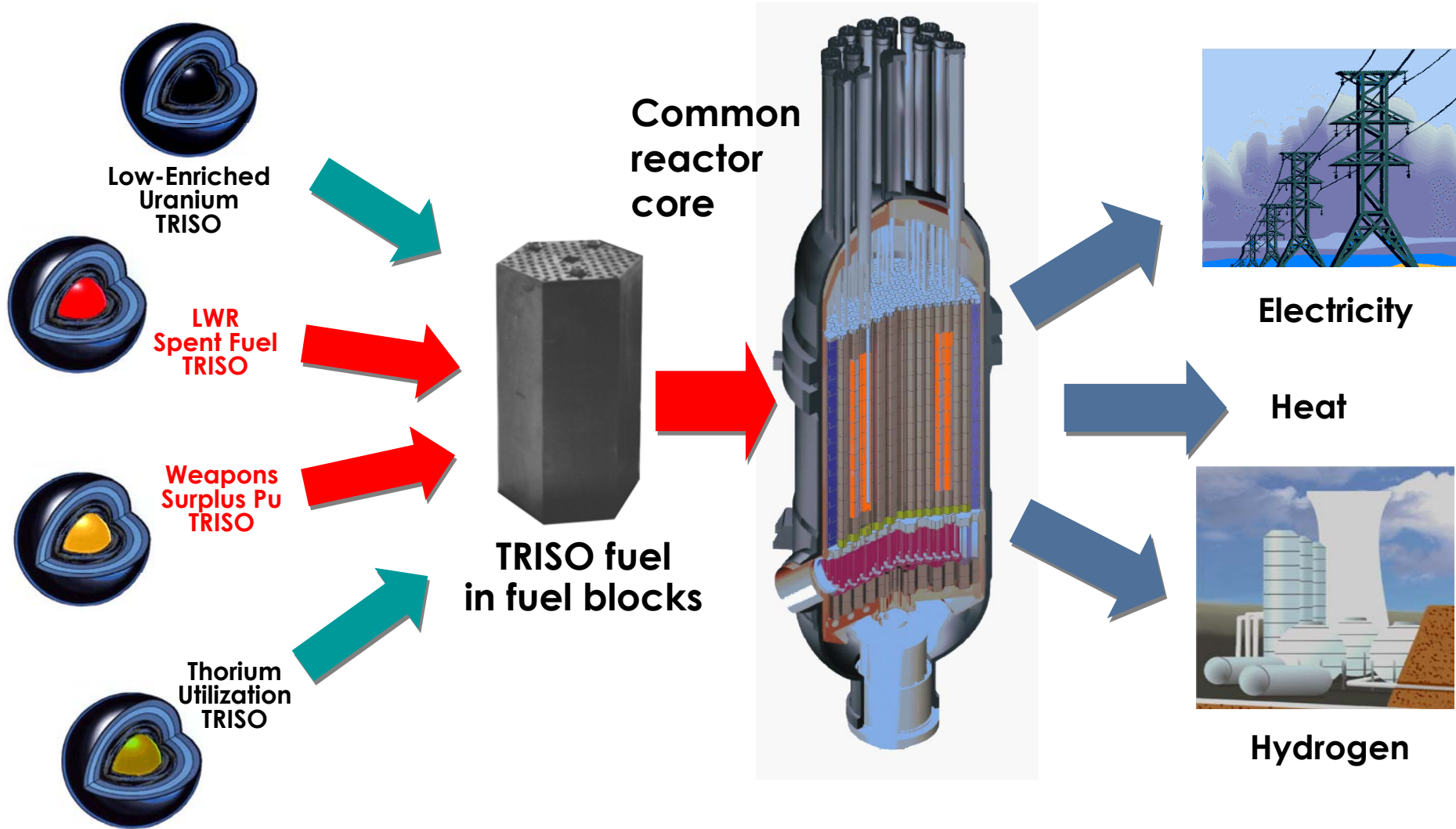
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Advanced Reactors – GEN IV

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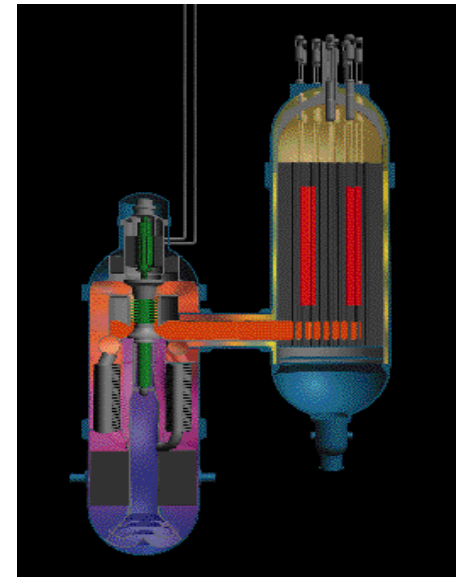
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Modular Helium Reactors – A Major Component of a Nuclear Future



Safety Issues Driving Schedule Being Pursued in Collaborative Efforts

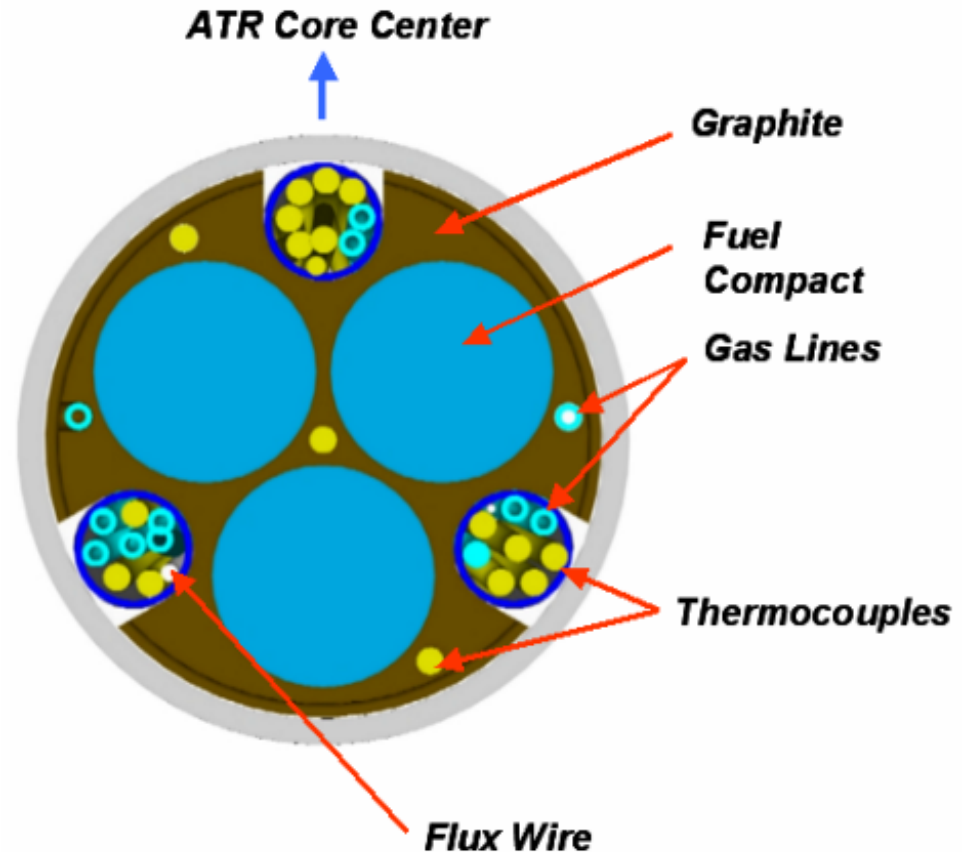
- **Fuel & Fission Product Technology**
 - DOE's AGR Fuel & Fission Product Program
 - U.S. / Russian Plutonium Disposition Program
- **Safety impacts of coupled hydrogen production**
 - Korean (KAERI) collaboration
- **Licensing approach**
 - ANS 28
 - NEI Framework



Advanced Gas Reactor (AGR) Program on Track to Begin UCO Irradiations in Fall

Key Elements of Program

- Reestablish UCO kernel fabrication, coating, and compacting technology
- Fabricate fuel for testing
- Conduct irradiation followed by heating tests to qualify fuel for normal and accident conditions
- Validate fuel performance models
- Establish fuel product and process specifications for NGNP fuel
- Develop and validate fission product transport and source term codes



INEEL Figure

High Burnup TRISO-Coated UO_2 / PuO_{2-x} In Russia Also Set to Begin Irradiation



Pu Kernel Formation



Coater

TRISO fuel now being fabricated in the bench-scale facility at VNIINM (Moscow)



Kernel Sintering

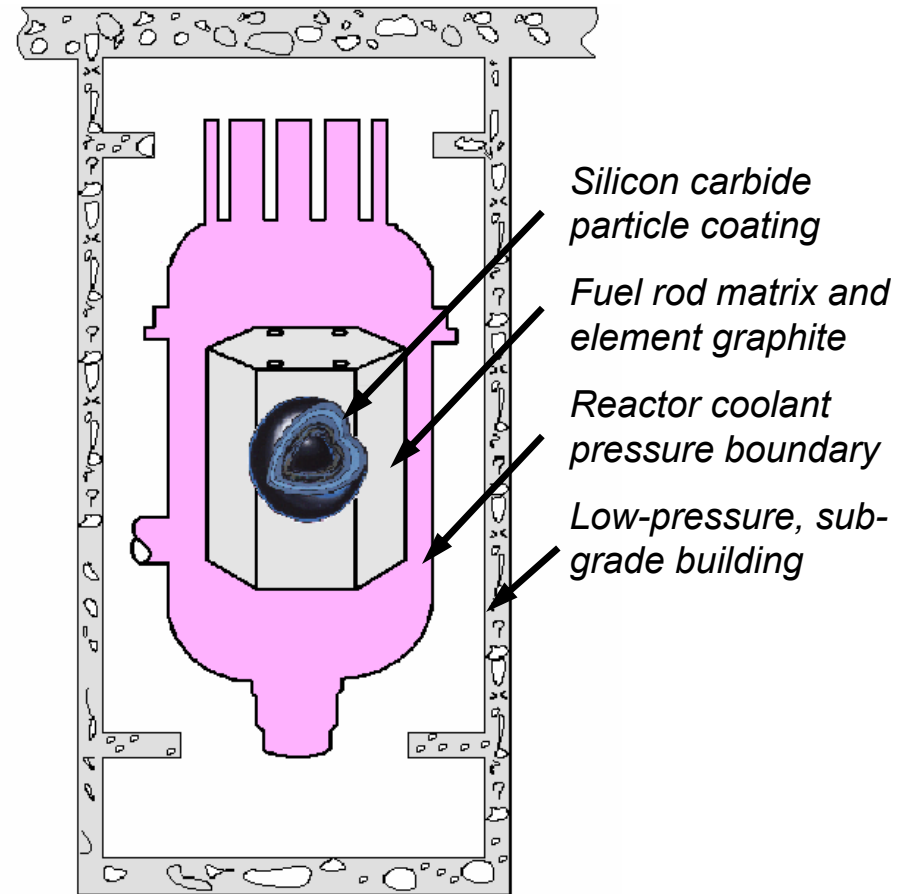
Irradiation planned at NIAR (Dimitrovgrad) next year



Compact Heat Treatment

Tests Starting in Russia on Other Barriers & Transport

- Experimental data to better quantify adsorptivity for both silver and cesium started
- Out-of-pile, single-effects tests and integral in-pile loop tests planned
 - Worker safety
 - 2ndary source but predominant (though limited) release mechanism in module reactors



GT-MHR Multiple Barrier Containment System

Nuclear Hydrogen – Special Considerations

- **Last year Korea initiated a \$1 Billion Nuclear Hydrogen Development and Demonstration (NHDD) Project:**
 - Korea has 15 PWRs producing 40% of its electricity supply
 - Little experience with gas reactor technology.
 - KAERI / GA NHDD collaboration signed
- **Initial collaboration in safety aimed at unique considerations for hydrogen production**
 - **Assessing tritium in product (H₂) stream**
 - **Later**
 - Plant safety
 - Fuel fabrication

Licensing Seen As Important Uncertainty

- **GA active in defining licensing approach to advanced reactor**
 - Follow NEI / NRC efforts
 - ANS 28 standard development
- **Promote a “systems engineering” based approach similar to that developed in DOE’s MHTGR program of 1980’s**
 - Responsive to top-level regulatory criteria
 - Risk informed
 - Technology neutral / adaptable to new technology
 - Permitting alternate design approaches