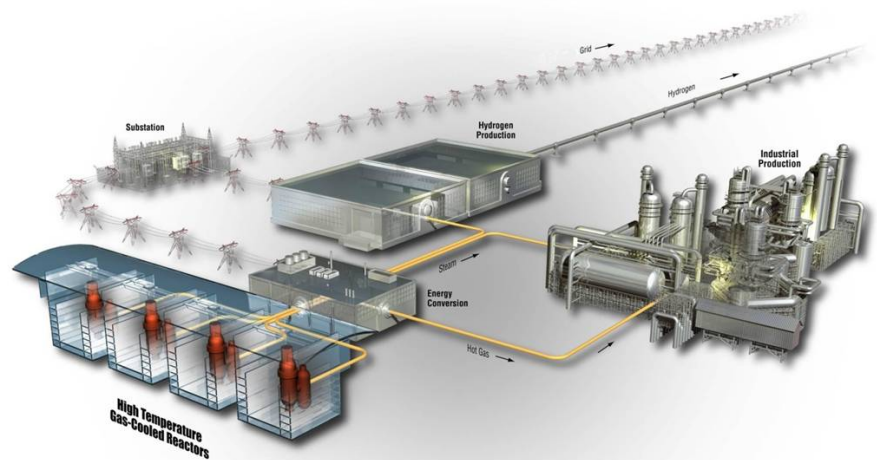


## Statement of Work

Project No(s): 29412, 23841

# INL ART AGR-5/6/7 PIE at Oak Ridge National Laboratory



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INL ART Program Statement of Work

**SIGNATURES**

Signature and Typed or Printed Name	Signature Code	Date (mm/dd/yyyy)	Organization/Discipline
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 John D. Hunn	A	06/01/2021	ORNL AGR PIE Technical Lead
 Paul A. Demkowicz	A	06/01/2021	C600/INL ART TRISO Fuel Director
 Michelle T. Sharp	C	06/01/2021	H330/ INL Quality Assurance

**P** For Preparer of the document.**A** For Approval: This is for non-owner approvals that may be required as directed by a given program or project. This signature may not be applicable for all uses of this form.**C** For documented review and concurrence.**Note** Applicable QLD: XXX

**Idaho National Laboratory**

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**REVISION LOG**

Rev.	Date	Affected Pages	Revision Description
0	10/09/2015	All	New issue
1	03/10/2016	5-7	Includes editorial changes and deletion of reference to Sec. 2.7 of NQA-1 2008, 1a 2009
2	10/24/2016	5	Updated applicable codes and references
3	11/06/2017	All	Updated
4	09/27/2018	All	Updated to include FY-19 workscope
5	09/23/2019	All	Updated to include FY-20 workscope
6	10/28/2020	All	Updated to include FY-21 workscope
7	06/01/2021	5-8	Updated to include plus-up workscope in FY-21

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## 1. INTRODUCTION

### 1.1 Background

Idaho National Laboratory (INL) Advanced Reactor Technologies (ART) is currently supporting a tristructural isotropic (TRISO) fuel development and qualification program, which includes fuel fabrication, test irradiations, and post-irradiation examination (PIE) and safety testing to assess fuel performance during normal irradiation and under potential accident conditions. PIE fuel work from the final test irradiation (Advanced Gas Reactor [AGR]-5/6/7) is expected to commence at INL in 2021, but the PIE preparations work began in FY2016. The work scope in this memorandum purchase order includes Oak Ridge National Laboratory (ORNL) providing technical input, preparations for PIE testing and analysis, receiving a shipment of AGR-5/6/7 fuel, and contributing general expertise to this effort.

### 1.2 Purpose/Objectives

The AGR-5/6/7 PIE work at ORNL identified includes:

- A. Providing project management, technical support, planning, and reporting.
- B. Receiving AGR-5/6/7 compacts from INL.
- C. Preparing the Core Conduction Cooldown Test Facility (CCCTF) furnace for heating tests.
- D. Renewing service contracts for SEM and EDS in preparation for future PIE.
- E. Support US involvement in the Generation IV International Forum (GIF) through organization of a workshop on TRISO fuel material properties.

### 1.3 Anticipated Benefits

The primary objective of this work scope is for ORNL to perform AGR-5/6/7 fuel compact PIE in parallel with the AGR-5/6/7 PIE that is performed at INL. The work scope is to (1) establish the basic structure to manage the planned AGR-5/6/7 PIE work scope that began at ORNL in FY2016 and will continue through the conclusion of PIE; (2) provide for receipt of compacts from INL; (3) prepare PIE equipment (e.g., CCCTF and gamma spectrometry systems) for future PIE and (4) support US involvement in the GIF.

## 2. APPLICABLE CODES AND REFERENCES

ASME NQA-1 2008/1a 2009, "Quality Assurance Requirements for Nuclear Facility Applications," Part I, American Society of Mechanical Engineers, 2008 and 2009.

PLN-2690, Revision 19, March 2020, "INL ART Quality Assurance Program Plan".

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PLN-3636, Revision 9, June 2020, “Technical Program Plan for INL Advanced Reactor Technologies Advanced Gas Reactor Fuel Development and Qualification Program”.

### 3. SCOPE

#### 3.1 Work to Be Performed

##### 3.1.1 Perform Oversight and Technical Support

ORNL will support the INL ART TRISO Fuels AGR-5/6/7 PIE effort by providing technical input, analysis, and expertise; evaluating new PIE methods and preparing evaluation reports as needed; performing PIE work scope as identified below; and participating in PIE activities as requested. This work scope includes the general oversight of ORNL PIE activities identified below, reporting on a bi-weekly and monthly basis as requested, and attending technical program meetings to present and discuss PIE data.

##### 3.1.2 Receive Compacts from INL

This task includes receipt and unloading of one (1) planned compact shipment. Up to four irradiated compacts will be sent from INL to ORNL per shipment, packaged in 9977 transportation packages. After receipt and unloading, the compacts will be visually inspected and the empty shipping packages will be returned to INL.

##### 3.1.3 Prepare CCCTF Furnace for Future Heating Tests

ORNL will upgrade the control system, acquire consumable replacement parts, and perform maintenance to prepare the furnace for future heating tests. A report documenting the upgrades to the CCCTF control system will be produced.

##### 3.1.4 Renewal of service contracts for SEM and EDS

ORNL will maintain service contracts for maintaining the equipment for future PIE.

##### 3.1.5 Organize and attend the 6<sup>th</sup> Workshop on TRISO Fuel Material Properties

ORNL staff will lead the technical organization of the 6<sup>th</sup> Workshop on TRISO Fuel Material Properties, to be held in 2021 in conjunction with the Generation IV International Forum (GIF) Very High-Temperature Reactor (VHTR) Fuel and Fuel Cycle (FFC) Project Management Board (PMB) annual meeting. The meeting is tentatively planned for October 2021 at the French Alternative Energies and Atomic Energy Commission (CEA) in Cadarache, France (date and location subject to change). Activity will involve preparing a call for abstracts based on input from the PMB, soliciting input from the international community, organizing review of submitted abstracts, and planning the meeting

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the agenda. The meeting will also be attended in person by ORNL staff members.

### **3.1.6 Prepare Gamma Spectrometry Systems for AGR-5/6/7 PIE**

ORNL will upgrade the gamma spectrometry software and related multichannel analyzer hardware used with the CCCTF and Irradiated Microsphere Gamma Analyzer systems to replace obsoleted software and equipment. A report documenting the upgrades will be produced.

## **3.2 Work Excluded**

All other work scope not specifically related to AGR-5/6/7 PIE is excluded from this statement of work.

## **3.3 Requirements**

### **3.3.1 Environmental**

Work will be performed in accordance with applicable ORNL environmental requirements.

### **3.3.2 Safety and Health**

Work will be performed in accordance with applicable ORNL safety and health requirements.

### **3.3.3 Quality Assurance**

ORNL will perform this work in accordance with its approved quality assurance program in compliance with NQA-1 2008/1a 2009 criteria. INL ART Quality Assurance may elect to perform work inspections of selected processes. The INL and ORNL technical leads will identify the selected processes for inspection. INL will supply the inspection checklist to ORNL approximately three weeks prior to the inspection.

## **3.4 Place of Performance**

Work will be performed at ORNL by ORNL staff. The respective ORNL and INL technical leads will coordinate other work locations if necessary.

## **3.5 Interfaces**

Interfaces will be between INL and ORNL technical representatives.

**Idaho National Laboratory**

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**3.6 Miscellaneous**

Preparations of presentations and reports, and travel will be included within this work scope to share information. This is expected and will be charged to the appropriate activity being supported.

**4. DELIVERABLES**

Activity Description	Completion Date	Deliverable	INL Milestone Level
Complete upgrade of CCCTF system at ORNL	9/9/2021	Report documenting the upgraded CCCTF system at ORNL	3
Complete upgrade of AGR PIE gamma spectrometry systems at ORNL	1/31/2022	Report documenting upgrades to ORNL gamma spectrometry systems used for PIE of AGR experiments	3

ORNL will provide input to INL for ART technical progress reports as needed and participate in bi-monthly AGR program teleconferences to discuss the latest progress and report any issues.

**5. SCHEDULE AND MILESTONES**

The associated milestone and its deliverable are listed above in Section **Error! Reference source not found.**

**6. COMPLETION CRITERIA AND FINAL ACCEPTANCE**

Review and acceptance of documentation provided by ORNL will be performed by INL.

**7. APPENDICES**

None

**8. ATTACHMENTS**

None