Fusion and Fission Energy and Science Directorate

Nuclear Energy and Fuel Cycle Division

Document Number : FCCT-SOW-01

STATEMENT OF WORK:

COBALT-60 IRRADIATOR

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Oak Ridge, Tennessee 37831

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REVIEW AND APPROVAL SUMMARY

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REVISION HISTORY

Revision	Date	DESCRIPTION OF CHANGE	REVISION TYPE	
			Major	Minor
0	05/16/2025	Initial Issue	☐	☐
			☐	☐
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1 INTRODUCTION

The Nuclear Energy and Fuel Cycle Division (NEFCD) is acquiring a new irradiator featuring a larger sample chamber, significantly expanding the types of materials that can be studied. This irradiator uses a shielded cobalt-60 gamma ray source to conduct material irradiation experiments, helping researchers better understand how radiation affects material properties and processes. During operation, samples are placed in the chamber, sealed, and lowered toward the source for a specified exposure period. This well-characterized gamma source provides substantial benefits across various DOE programs

2 SCOPE

This statement of work (SOW) applies to the design, fabrication, inspection, testing, delivery and installation of a gamma irradiation device. The irradiator shall be manufactured in accordance with the technical and performance specification (reference the document

3 APPLICABLE DOCUMENTS

See Technical Specifications Document.

4 PERFORMANCE REQUIREMENTS

See Technical Specifications Document.

5 PROJECT MANAGEMENT

5.1 KICKOFF MEETING

A project kickoff meeting will be held no later than 3 weeks after the award of the subcontract. The primary purpose of the project kickoff meeting will be to meet the principal participants; ensure the scope, expectations, terms and conditions of the purchase order, SOW, and technical specification are understood; and review the draft project summary.

5.1.1 AGENDA

- ORNL: Irradiator system requirements
- ORNL: project management and documentation requirements
- Seller: review presentations, illustrations, and diagrams as relevant
- Seller: overview of manufacturing processes, draft project summary

5.1.2 ACTION ITEMS

The Seller will prepare and submit a kickoff meeting summary to the technical project officer (TPO) within approximately 5 working days of the meeting. A copy of the kickoff meeting presentation material and a list of resulting action items, action item owners, and action item due dates are an acceptable substitute for formal meeting minutes. The Seller is expected to take initiative in resolving open action items and communicating results to the ORNL TPO.

5.2 PROJECT SUMMARY

The Seller shall prepare a project summary to define how the Seller will integrate all technical specifications and project management requirements, including the following:

A. PROJECT SCHEDULE

- Project kickoff meeting
- Key and long–lead time component, subcomponent, and material procurements
- Fabrication and/or assembly
- Agreed ORNL and Seller hold or inspection points, if applicable
- Validation, inspection, and test plan timing
- Document submission timing for all required documents in the "Submittals" section of this document.
- Ready-for-shipment notification to ORNL
- Crating/packaging
- Shipment departure/arrival
- Installation time frame
- Training schedule

B. QUALITY VERIFICATION ITEMS

- Summary of quality management system
- Existing regulatory or compliance certifications (ISO 9001, AWS, American Society of Mechanical Engineers [ASME], American Society for Quality)
- Incoming inspection criteria
- System quality validation tests, judgment criteria, and final results
- Packaging and shipping plan

C. BILL OF MATERIALS

Assembly parts list

The Seller shall furnish with each assembly a copy of an assembly parts list giving the part number and serial or lot control number of each part incorporated, including any components or subassemblies furnished by the Company. The bill of material / assembly parts list shall include the following:

- Component part numbers
- Component sub suppliers/vendors
- Serial/lot numbers, as applicable

D. MANUFACTURING SPECIFICATIONS

- System drawings, specifications, wiring diagrams, etc.
- Layout, equipment size, and configuration options

5.3 PROJECT COMMUNICATION

A. CONTACTS: The Seller shall designate an official single point of contact to work with the Company's TPO and procurement officer. Technical issues shall be discussed with the Company's TPO. Subcontract administration issues shall be discussed with the Company's procurement officer.

B. LANGUAGE: All documentation shall be in the English language

C. UNITS: All dimensions and parameters shall be reported in SI units (e.g., mm, kg, N, MPa, °C) as the primary units.

D. MEETINGS: Progress meetings shall be scheduled at a frequency mutually agreed upon by the ORNL TPO and the Seller until the Seller notifies ORNL of shipping readiness. The Seller will prepare meeting minutes and submit them to the TPO within 5 business days of each meeting. Additional meetings can be called by the TPO's or the Seller's point of contact at any time with reasonable notice.

E. ON-SITE VISITS: If requested by ORNL, the Seller shall arrange for a tour of the facility(s) where Irradiator fabrication and assembly will occur. ORNL reserves the right to witness any fabrication and/or inspection event. The Seller shall notify ORNL of the final fabrication, assembly, and inspection event dates at least 8 weeks prior to align with ORNL travel requirements.

F. REFERENCE NUMBER: All communication regarding this project must cross-reference the purchase order number or technical specification, *(Lab 125 Gamma Irradiator – Technical Specifications).*

G. WRITTEN NOTIFICATIONS: The TPO shall be notified in writing (or by email) upon any of the following events:
- Receipt of key materials and subcomponents
- Start of fabrication processes
- Start of assembly processes
- Completion of quality validation activity and, if applicable, factory acceptance tests
- Start of packaging
- Ready to ship

6 SYSTEM DOCUMENTATION

6.1 OPERATING/MAINTENANCE MANUAL

Documents shall be submitted that contain the operational procedures, instructions, maintenance, spare parts list, and handling precautions.

6.1.1 INSTALLATION MANUAL

For future use at ORNL, a manual detailing the installation instructions, technical criteria, externally interfacing part specifications, and any other installation requirements such that equipment relocation can be performed if needed. The manual will cover the following subjects:

- Connecting to power
- Control cable requirements
- Mounting requirements

- Relevant bolt torque tightness
- Externally interfacing hardware
- Coolant requirements (water and/or air)
- Electrical diagrams
- Ambient operating temperature requirements
- Vacuum system requirements

6.1.2 MANUAL

An operation manual with instructions for safe, efficient, and effective operation of the system and its related components, including the following:

- End-user operation of the system, its components, and related control interfaces
- Interpretation and proper management of internal warnings and/or fault signals
- Critical safety information such as lock, tag, and verify methods

6.1.3 MAINTENANCE MANUAL

A maintenance manual containing comprehensive requirements that ensure consistent performance, minimal downtime, and optimal lifespan, including the following:

- Manufacturer's recommended preventive maintenance plan for inspection and/or replacement of consumable parts (item, frequency, instructions, diagrams, part numbers, etc.)
- Instructions to perform preventive maintenance procedures, with diagrams/illustrations, where applicable
- Software or firmware updates
- System, component, and instrumentation calibration frequency and instruction
- Spare parts list for both consumable/scheduled replacements and long–lead time items that are difficult to acquire or may lead to long machine downtimes

6.1.4 FUNCTIONAL TEST REPORT

This report of as-installed subsystems and systems indicates the functional operability of the systems to design requirements. This report shall contain the signature and title of the authorized representative of the organization performing the tests and shall be sent to the Company for review and acceptance.

Prior to shipment, the Seller will provide the TPO, and procurement contact with a certificate of conformity for the Irradiator that includes the following information:

- Seller name, address, phone number, and email
- System serial number or identification details
- Statement from the Seller attesting that the final , as sold, conforms to the requirements within statement of work, *(Lab 125 Irradiator – Statement of Work)*, and technical specification, *(Lab 125 Gamma Irradiator – Technical Specifications)* provided through the procurement process and documentation

- List including each regulatory, worker health, manufacturing, quality, or environmental standard and revision level with which the Irradiator complies
- Declaration or attached documentation regarding the parts and labor warranty period for the system and its subcomponents, including on-site support at the Company or travel requirements
- Date and signature of the seller's authorized representative

6.2 PRODUCT DATA SHEETS

Collectively, product data sheets are a technical summary of the Irradiator which can be included within a maintenance manual or separately. At a minimum, product data sheets include the following:

- Inlet and outlet flange types and sizes
- Cooling methods and requirements
- Dimensional layout
- Noise levels when idle and during operation
- Voltages
- Coupling methods
- Pumping speed and curves
- Fluid specifications
- Rated power
- System weight and component weights, where relevant
- Heat load
- Instrumentation data sheets
- Testing data sheets

7 QUALITY ASSURANCE

7.1 QUALITY PROGRAM

The Seller shall have a quality assurance program (QAP) that, at a minimum, is ISO 9001 certified or equivalent. The prospective supplier shall have an established, documented, and effectively implemented QAP describing controls for work processes, personnel training and qualification, document and records control, design, procurement, inspection, and testing, including the use of measuring and test equipment when applicable, corrective action, and issues management.

The Seller's QAP shall be implemented and sufficient to ensure that the quality of items produced, or services provided will meet all the requirements as stated in this document and as contracted. Changes to the program that could affect the items or services must be approved by ORNL in advance.

Prior to the award of the subcontract, the Seller's QAP shall be evaluated to determine the degree of effective implementation of the quality program. Deficiencies identified

during the evaluation, if any, shall be addressed and corrected to the satisfaction of ORNL and shall occur before award.

All suppliers/sub-tier suppliers, subcontractors, and fabricators (as applicable) shall have QAPs that meet or exceed the requirements listed above.

7.1.1 SUSPECT/COUNTERFEIT ITEMS PREVENTION

The Seller's QAP must include a suspect/counterfeit items (S/CI) program that is compliant with US Department of Energy (DOE) Order 414.1D.

7.2 SELLER-REQUESTED DEVIATIONS

The Seller shall propose any deviations from the specifications, drawings, or other technical requirements during the review of specifications and shall obtain ORNL's approval before invoking the deviation. Any deviation requests arising during shall adhere to the Seller's quality program procedure and must be approved by ORNL.

The Company's TPO will evaluate the technical aspects, document a recommendation in writing, and provide the recommendation to the procurement contact, who will communicate acceptance or disapproval to the Seller. If time is a consideration, the Seller may communicate the proposed deviation directly to the TPO via email correspondence, in which case the Seller must also send a copy to the Company's procurement contact.

The acceptance of a deviation request in no way limits or affects the warranty provision of the product or service provided. Such a request shall not establish a precedent or obligation to accept existing or future items not conforming to all purchase order requirements.

7.3 NONCONFORMING ITEMS

The Company expects to receive equipment items, components, materials, and documentation that conform to all codes, standards, specifications, and procedures in the subcontract. The Seller may use its own nonconformance program to identify, report, and recommend dispositions of all nonconformances, but dispositions that would leave any remaining nonconformity must be submitted to the Company for approval. The request should identify the affected item(s) by name and serial number and should cite the drawing and/or specification number and revision number of the drawing/specification containing the specific requirement that has not been met. The request should state the number of nonconforming items being reported. The request should include a description of the nonconformity and identify requirement(s) not met. The Seller may attach a description of the cause and a corrective action plan and schedule, if pertinent. The issuance and acceptance of such a request in no way limits or affects the warranty provision or other rights or remedies of this agreement. Such a request shall not establish a precedent or obligation to accept existing or future items not conforming to all provisions of the subcontract.

When a nonconforming condition is identified and the Seller proposes to rework or repair the defect and use the reworked/repaired item within this procurement scope, then the Seller shall document the condition, perform the following steps, and bring the issue to closure using their nonconformity system requirements.

The Seller shall perform the following:

- Stratify and segregate nonconforming items to prevent unintentional use or shipping.
- Stop work on the item until a product disposition is made.
- As soon as possible but no longer than 5 business days from discovery, provide written notification of the nonconformance and occurrence date (via email, copy of nonconformance report form) to the TPO and provide a courtesy copy to the procurement officer and quality representative.
- After the investigation process is complete, provide any additional details, proposed dispositions, and justifications (as necessary) to the Company in a nonconformance report.

If the Seller chooses to scrap, discard, or dispose of the nonconforming component, material, or item such that it is not used within the scope of this procurement and there is no risk to quality, cost, delivery schedule, or safety related to this procurement, then the nonconformity does not have to be reported to ORNL.

The issuance and acceptance of such a request in no way limits or affects the warranty provision or other rights or remedies of this agreement. Such a request shall not establish a precedent or obligation to accept existing or future items not conforming to all provisions of the subcontract.

7.4 NATIONALLY RECOGNIZED TESTING LABORATORY CERTIFICATION

A Nationally Recognized Testing Laboratory (NRTL) is an independent organization that is recognized by the Occupational Safety and Health Administration (OSHA) to ensure equipment is tested, verified, and certified for its safe use in work. DOE requires that ORNL comply with OSHA requirements. Equipment to be provided by the Seller must pass NRTL inspections and must be certified by the Company's directorate electrical safety officer and qualified electrician. The equipment and main components should be properly recorded and marked after NRTL certification.

8 PACKAGING AND TRANSPORTATION

8.1 PACKAGING

The Seller shall package and prepare the electron beam, power supplies, and control cabinets for shipment to the ORNL site in Oak Ridge, Tennessee, USA. The packaging shall protect the equipment from any conditions (e.g., shock, impact, weather) which could cause damage resulting in nonconformity with applicable requirements.

8.1.1 PACKAGING AND SHIPPING

The Seller is responsible for all packing and shipping provisions to ensure that the system arrives at the Company's site in an undamaged, working condition. The Seller shall inform the Company of shipping plans 2 weeks before actual shipment.

8.2 SHIPMENT DOCUMENTATION

The Seller is required to mark each package with the following:

- Purchase order number
- Delivery address
- Consignor (Seller's name, address, and contact information)
- Package number (as identified on the packing list)
- Gross weight (kg)
- Net weight (kg)
- Handling instructions
- Lifting/lashing/jacking points
- Center of gravity (in three dimensions)
- Compliance marks (e.g., NRTL, ISPM-15 [International Standards for Phytosanitary Measures No. 15], CE) (if applicable)

8.3 DELIVERY ADDRESS

UT-Battelle LLC

Oak Ridge National Laboratory (ORNL)

for the US Department of Energy

1 Bethel Valley Road

Oak Ridge, Tennessee 37831

Contact

Goods Recipient/Invoice Approver: Richard Mayes

Email: mayesrt@ornl.gov

8.4 DELIVERY DATE

The Seller shall notify ORNL prior to shipping. Additionally, the Seller shall immediately notify the TPO and procurement officer in writing of any actual or potential change to the agreed-upon date of shipment.

8.5 OVERSIZE LOADS

For loads exceeding the US Department of Transportation standard freight weight and/or dimensions such that the load is classified as oversized/overweight and an escort is required, the Seller must notify the TPO prior to shipment to make special arrangements for receiving and handling through ORNL transportation and/or material-handling teams.

8.6 SHIPPING

For highly sensitive components/systems, the Seller should consider if accelerometers, shock labels, or similar monitoring devices are beneficial and necessary.

9 DELIVERABLES

The following deliverables shall be submitted according to the agreed-upon schedule.

9.1 IRRADIATOR SYSTEM

One Irradiator will be provided per the attached technical specification.

9.2 INSTALLATION AND STARTUP

The Seller will complete installation of the Irradiator on-site at ORNL in conjunction with ORNL Facilities and Operations (F&O) staff, test and verify all systems are operational to the satisfaction of the TPO or designee, and provide on-site training for ORNL operators, technicians, and maintenance staff to achieve proficiency on the following system elements:

- In-depth system operation
- Operator-level fault recovery and fundamental operator troubleshooting
- Technician-level troubleshooting of the system and its subsystems, components, and software
- Preventive maintenance activities

9.2.1 FINAL ACCEPTANCE

Final acceptance of the system shall be based on testing of the product to the technical requirements of the specification after installation at the Company’s site is completed.

9.3 DOCUMENTATION

The documents in the technical specification, and the subcontract shall be submitted per the schedule unless exempted in writing by the TPO.

9.4 WARRANTY DECLARATION

Documented warranty period with inclusions and exclusions for system function/operation, parts, labor, travel, per diem, and so forth.

10 OPTIONAL HARDWARE AND SERVICES

The following products and services are optional. ORNL may or may not elect to exercise these options.

10.1 SERVICE CONTRACT

- Option 1: Irradiator annual service contract considering a service frequency and length that supports the on-time completion of all preventive maintenance inspections and activities and includes defined coverage for parts, labor, software updates/revisions, and so forth for post-warranty repairs
- Option 2: operation, troubleshooting, and maintenance training

11 SUBMITTALS

The submittals for this SOW are listed in the table below.

Document	Document Name	Section
1	Project kickoff meeting summary with action items	5.1
2	Project summary	5.2
3	Progress meeting summary with action items	5.1.2
4	Notification: receipt of key materials and subcomponents	5.3-G
5	Notification: start of fabrication processes	5.3-G
6	Notification: start of assembly processes	5.3-G
7	Notification: completion of quality validation	5.3-G
8	Notification: ready to pack	5.3-G
9	Notification: ready to ship	5.3-G
10	Certificate of conformity (Seller verification that all specs are met)	6.2
11	Installation manuals	6.1.1
12	Operation manuals	6.1.2
13	Maintenance manuals with preventative maintenance schedule and spare parts lists	6.1.3
12`	Product data sheets (if not included in required manuals)	6.3
15	Seller's quality management system manual	7.1
16	Existing program compliance certificates (ISO, ASME, AWS, etc.)	5.4
17	Deviation requests (if applicable)	7.2
18	Nonconformance reports (if applicable)	7.3
19	Quality validation results	5.2-B
20	Calibration certificates and report (summary)	7.4-D
21	Warranty declaration	9.4
22	NRTL certification and equipment labeling	7.4