

COVER PAGE

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ACCOMPLISHMENTS

- **What are the major goals and objectives of this project?** (1) We will establish a student mentoring program to involve undergraduate and graduate students through consecutive summer internships at ORNL and a private fusion company, where they will gain hands-on experience with cutting-edge research and commercial applications of fusion technology. Students will also benefit from continued mentorship in the form of career guidance and professional development during academic semesters. (2) We will collectively develop a series of new courses and special-topic modules to be implemented at participating universities, which will be shared publicly with the broader academic community. This curriculum development effort will be guided by private fusion companies and national lab leaders, reflecting the needs and recent advancements in fusion engineering and technology. (3) To promote the sustainability of the project efforts, we will create an inaugural entrepreneurship and innovation-focused bootcamp – the Fusion Innovation Bootcamp (FIB) – designed for sustained training and participation of students in fusion engineering.

- What was accomplished towards these goals?

- During this reporting period, per the first objective of the project, our first major activity was student recruitment for the summer 2025 internship at ORNL. In coordination with the consortium team regarding the intern selection timeline, the PI's at Tuskegee University (TU) made every concentrated effort, given the short timeline, to recruit one student for the internship by advertising it through posting flyers, sending mass emails to all engineering students, visiting classrooms in person and talking to students about the significance and challenges of fusion engineering and the internship opportunity. The PIs reviewed the applications submitted by TU students and recommended three applicants to advance to the next selection step, which was conducted by ORNL mentors. A student from TU was selected. Following that, the PIs worked with the student and the relevant business offices at TU to ensure the student's timely pay and safe accommodation. We also continued to provide guidance to the student in coordination with his mentor at ORNL.

Following that, the PIs worked on the second objective: developing tutorials and presentations introducing TU students to fusion engineering. Two courses were selected to introduce the developed materials into the curriculum: Manufacturing Processes, a junior-level course offered in the Mechanical Engineering Department, and Engineering Ethics, a junior-level course required by all students across the different disciplines in the College of Engineering (Mechanical, Chemical, Electrical, Computer, and Aerospace). The module developed for the Manufacturing processes is titled "Additive Manufacturing of Tungsten for Nuclear Fusion Reactors" and provides background information about all aspects of fusion with a focus on the significance of tungsten as a material for the harsh environment of fusion reactors and the benefits additive manufacturing offers, compared to traditional manufacturing, for the functionality and performance of tungsten in fusion reactions. The Engineering Ethics course presentation.....will consist of selected content from reputable resources guided by the PI in an open discussion format to explore the ethical and sustainability issues surrounding nuclear fusion and how it compares to nuclear fission.

The course "Manufacturing Processes" is offered only in the spring semester, while "Engineering Ethics" is offered in both semesters. The Engineering ethics presentation is scheduled for late November. The first delivery of the manufacturing module and subsequent survey will be conducted in Spring 2026.

- **What do you plan to do during the next reporting period to accomplish the goals and objectives?**

In alignment with the three project objectives listed above, we will be recruiting two TU students to participate in the summer 2026 IGNITE fusion engineering internship at ORNL. Based on our experience from the previous summer, we plan to more aggressively recruit students to participate in the internship and to start the process earlier than we did last year due to the grant processing delays. This effort will be achieved by expanding the IGNITE summer internship advertising recipient pool to all College of Engineering students, promoting the 2026 summer Fusion Innovation Bootcamp, make multiple in-class announcements, and speak to strong candidates on a one-on-one basis. We plan to leverage the power of demonstrated personal interest in promoting our students' awareness and understanding of the benefits of considering careers in Fusion and fusion energy-related occupations.

Towards this effort, the Manufacturing Processes module and the Engineering Ethics presentation will assist in this recruiting effort.

- **What opportunities for training and professional development were provided for participants?**

In the summer of 2025, one Tuskegee University student, Logan Oneal, was selected to participate in the IGNITE internship at ORNL under the mentorship of Dr. Venugopal Varma. The project description was "In Situ Repair of a PFC Component" under the supervision of Dr Venugopal Varma, ORNL Fusion Energy Division (FED). The project was a two-month in-person effort which culminated in a poster presentation by the intern

describing his research on the repair of fusion reactor ties using additive manufacturing.

Also, the PI's had the opportunity, through this project, to learn, on their own, about fusion engineering thus expanding their knowledge of the field and how it relates to the various aspects of mechanical engineering curriculum at Tuskegee University.

- How have the results been disseminated to communities of interest? In particular, provide details for any dissemination not reported in the research product section of this report. NOTHING TO REPORT

PRODUCTS

The products shown below include only Publications with a 'Published' status and Intellectual Properties with a 'Granted' status. Products with other statuses are not included in this report. The Revision Type indicates whether a product is New (newly added), Updated (existing product modified), or No Change (existing product reported without modifications) during the current budget period. Note that 'Updated' statuses may appear more frequently as products progress through the publishing process. All products listed have been reported for the current project period of this award.

PUBLICATIONS

There are no publications to report.

INTELLECTUAL PROPERTIES

There are no intellectual properties to report.

PARTICIPANTS AND OTHER COLLABORATING ORGANIZATIONS

The table below only contains participants who have identified an affiliation with the Awardee Institution. Participants from any associated subawards may not be included in this count.

PARTICIPANTS DETAIL

| Project Role | Number of People | Total Person Months Worked |
|---|------------------|----------------------------|
| Co-Investigator | 1 | 1 |
| Principal Investigator/Project Director | 1 | 1 |
| Total Responses | 2 | 2 |

PARTNERS DETAIL

There are no partners to report.

IMPACT

- What was the impact on the development of the principal discipline(s) of the project? NOTHING TO REPORT
- What was the impact on other disciplines? NOTHING TO REPORT
- What was the impact on physical, institutional, and information resources that form infrastructure? NOTHING TO REPORT
- What was the impact on technology transfer?
 - Describe ways in which the project made an impact, or is likely to make an impact, on commercial technology or public use. NOTHING TO REPORT
 - Include transfer of results to entities in government or industry, instances where the research has led to the initiation of a start-up company, and adoption of new practices. NOTHING TO REPORT
- What was the impact on society beyond science and technology? NOTHING TO REPORT
- **What was the impact on the development of human resources?** The summer internship provided one TU student an opportunity to conduct research under the supervision of an ORNL scientist in the area of fusion, specifically in the repair of Tungsten ties via additive manufacturing. The student had the opportunity to do research and present his research results to ORNL scientists at the end of the internship. This exposure to research will likely result in the student developing an interest in research in the area of fusion engineering going forward. In addition, the implementation of the modules developed is expected to expose about 100 TU students annually to fusion engineering in general with the focus on fusion manufacturing-related and ethical sustainability/safety challenges. The ethics module will be implemented in the later part of Fall 2025 and Spring 2026 while the Manufacturing module will be implemented in Spring 2026 (the manufacturing course at TU is only offered in the Spring semester).
- What percentage of the award's budget was spent in foreign country(ies)? 0%