UNC CHARLOTTE

The WILLIAM STATES LEE COLLEGE *of* ENGINEERING

Senior Design Project Description

Company Name	Orano Federal Services, LLC	**Date Submitted**	July 16, 2018
Project Title	Design of Improved Opening System for Dry Storage Canisters containing Used Nuclear Fuel (ORANO_FUEL)	**Planned Starting Semester**	Fall 2018

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project. 250 hours are expected per person. Complete the following table if this information is known, otherwise the Senior Design Committee will develop based on the project scope:

Discipline	Number	Discipline	Number
Mechanical	5	Electrical	
Computer		Systems	
Other ( )			

Company and Project Overview:

Headquartered in Washington, D.C., Orano USA is a leading technology and services provider for decommissioning shutdown nuclear energy facilities, used fuel management, federal site cleanup and closure, and the sale of uranium, conversion, and enrichment services to the U.S. commercial and federal markets. With its parent company Orano, Orano USA has more than 30 years' experience in decontaminating and dismantling nuclear facilities, and more than 50 years' experience securely transporting and storing used nuclear fuel (UNF). Prior to a global rebranding in January 2018, Orano USA was AREVA Nuclear Materials.

The Orano Federal Services business – formerly AREVA Federal Services (AFS) – combines the capabilities, technologies and resources from multiple Orano companies to serve the United States Department of Energy (DOE) and its subcontractors in all phases of the nuclear fuel cycle. Orano Federal Services provides key services as an active member in various projects that support DOE's five strategic services**:** Environmental Management (EM)**,** Nuclear Energy (NE)**,** Office of Science (SC)**,** Office of Energy Efficiency & Renewable Energy (EERE) **and** National Nuclear Security Administration (NNSA)**.** Orano Federal Services currently is a contract team member of the following significant projects: the Mixed Oxide Fuel Fabrication Facility (MFFF) at the Savannah River Site; the High Burnup (HBU) Demonstration Project; the Atlas railcar designed to ship UNF in transportation casks; the Yucca Mountain repository program (dormant); the Tank Operations Contract (TOC) at Hanford; et al.

Project Requirements:

This project will examine the means for opening up welded canisters containing UNF in hot cells

and/or under water. Currently the nuclear packaging industry credits an operation involving a skiving device to open up these welded canisters, but currently there is no reason to cut open these canisters and hence, this process is rarely exercised much less optimized. Other options exist for opening up these canisters and they include, but are not limited to cutting wheels, diamond cable cutters, and laser cutters. In this project, Senior design students are asked to: (i) identify the options for opening up welded canisters in dry or wet environments; (2) contrast the options with respect to: safety, operator dose, waste types and volumes produced, cost, duration, and damage done to canister; (3) propose optimized operations; (4) contrast the differences in the performance of opening a canister at a nuclear reactor site versus at a facility dedicated to the handling of UNF (e.g., hot cell); (5) establish if gas sampling (e.g., for hydrogen) is required prior to the opening activity; (6) establish viability of performing as a remote/robotic operation without need for human interaction; and (7) develop means for handling the canister before and after the canister has been opened up. Orano will provide several experts to support this project and will arrange a tour of a nearby nuclear plant with these canisters (subject to plant availability) to provide context and access to operators with expertise in performing handling and welding operations associated with these canisters. The students are encouraged to examine innovative approaches to the opening of these dry storage canisters and make use of graphics software and/or 3D printing capabilities to demonstrate their recommended approach(s). Ideally the students would complete the project by first demonstrating a remote welding process (ideally either through 3D printing or graphically) and then demonstrate their optimal means for opening the canister (ideally either through 3D printing or graphically).

Expected Deliverables/Results:

- Report covering each of the 7 points above.
- Graphics/3D rendering of “optimized” operations

Disposition of Deliverables at the End of the Project:

Deliver report after the conclusion of the Expo.

List here any specific skills, requirements, knowledge needed or suggested (If none please state none):

- Experience with welding/metal cutting activities would be beneficial
- Experience with graphics software illustrating operational flows would be beneficial
- Familiarity with heavy load crane (temporary or permanent) operations would be beneficial