UNC CHARLOTTE
*The* WILLIAM STATES LEE COLLEGE *of* ENGINEERING

# Senior Design Project Description

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| **Company Name** | EPRI | **Date Submitted** | June 30, 2017 |
| **Project Title** | New Design and Manufacturing Techniques for Pipe Fittings to Improve Corrosion Resistance (EPRI_PIPE) | **Planned Starting Semester** | Fall 2017 |

## 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 | 6 | Electrical | |
| Computer | | Systems | |
| Other ( ) | | | |

## Project Overview:

Piping systems are a crucial component of infrastructure in power generation and many other process industries. Piping transition pieces (Elbows, Tees, Reducers, etc.) can be subject to higher levels of fluid corrosion because of the differences in geometry compared to straight pieces of pipe.

Current transition geometries have been developed based on traditional engineering and manufacturing capabilities. The goal of this project is to use the opportunities provided by advanced design tools, such as Computational Fluid Dynamics (CFD) software, combined with advanced manufacturing methods such as Powdered Metallurgy-Hot Isostatic Processing (PM-HIP) and additive manufacturing (AM, often referred to as 3D Printing) to design a better piping components. Team will research both design and manufacturing methods to identify new techniques that can be used to create new designs that yield lower corrosion susceptibility.

## Initial Project Requirements:

As a target for the design effort, the subject of this project will be to design one or two piping transition pieces (such as an elbow or pipe size enlarger) to prevent the fluid corrosion phenomena that often happens in high temperature deoxygenated water systems made from carbon steel, including Flow Accelerated Corrosion and Erosion Corrosion.

Currently the design of these types of components has been generally based on what has been relatively easy to manufacture with traditional techniques. Advanced manufacturing techniques offer the opportunity to create all new designs.

The student team will endeavor to design components resistant to the degradation phenomena by potentially changing some of the current design parameters (particularly overall shape and internal design), while still meeting some key physical requirements, such as the ability to withstand pressures and temperature, not unduly restrict flow, and being able to mate with other ASME standard components for welding and installation.

Team will make polymer prototypes of the designs and provide test or analysis data that demonstrates improvement.

## Expected Deliverables/Results:

Upon completion of the design using advanced design tools, the team will create polymer prototypes of the components using advanced prototyping techniques, such as 3D printing.

## Disposition of Deliverables at the End of the Project:

Hardware to be provided to the Technical Supporter at the conclusion of the Expo, unless the Supporter intends to do a follow-on project using this equipment.

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

- CFD
- FEA