

Senior Design Project Description

Company Name	<i>EPRI</i>	Date Submitted	<i>11/18/2020</i>
Project Title	<i>Development of Alternate NDE Method for Steam Generator Tubes</i> (EPRI STEAM)	Planned Starting Semester	Spring 2021

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills:

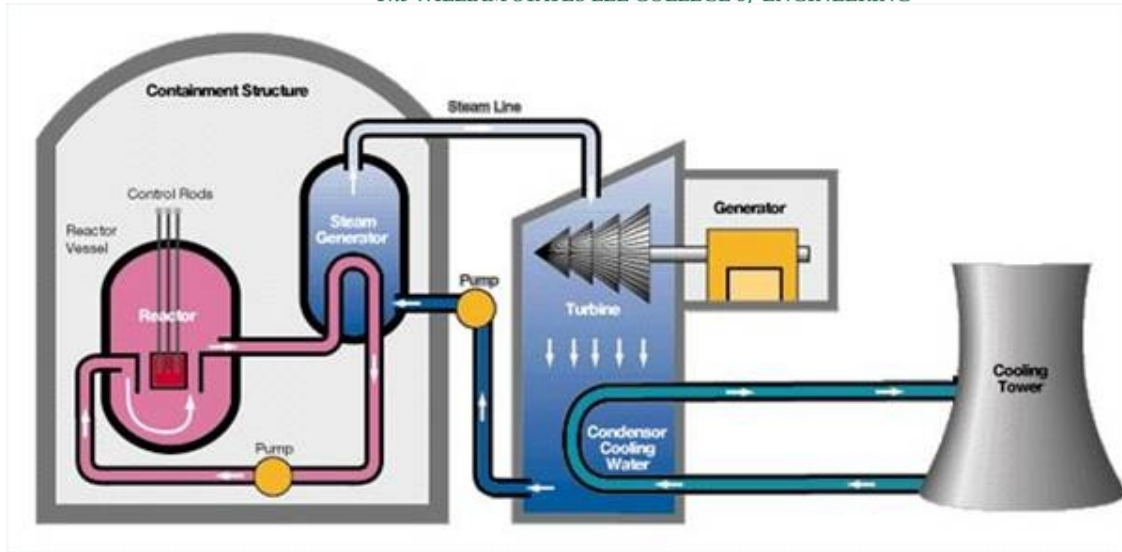
Discipline	Number	Discipline	Number
Mechanical	3	Electrical	1
Computer	1	Systems	
Other ()			

Company and Project Overview:

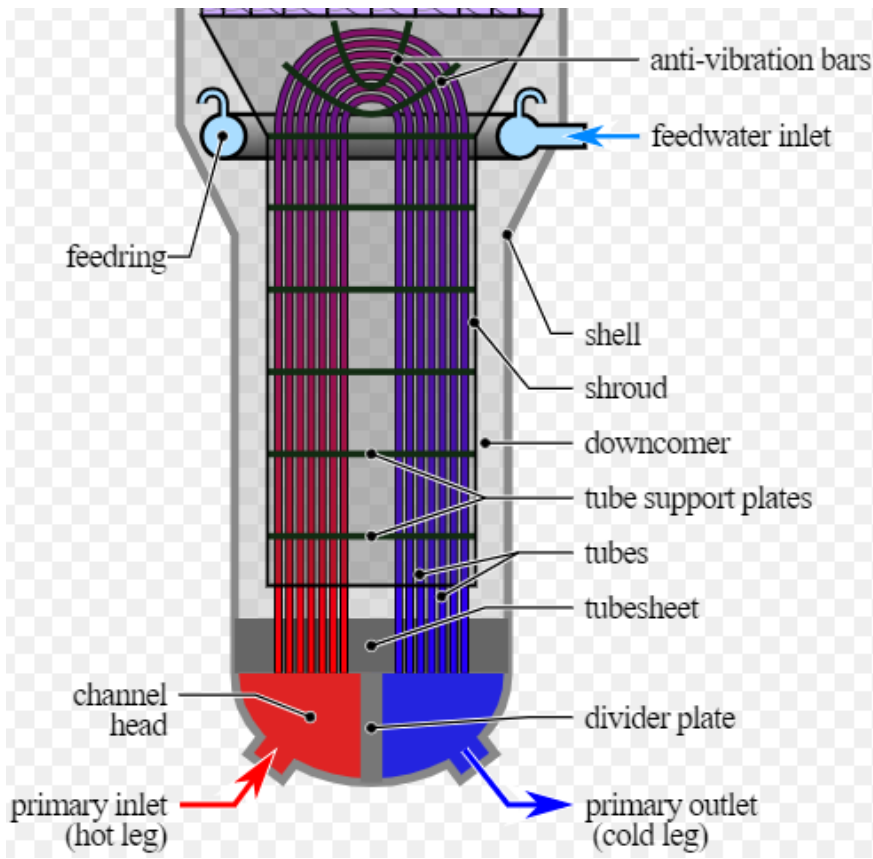
The Electric Power Research Institute (EPRI) conducts research, development, and demonstration projects for the benefit of the public in the United States and internationally. As an independent, nonprofit organization for the public interest, we focus on electricity generation, delivery, and use in collaboration with the electricity sector, its stakeholders and others to enhance the quality of life by making electric power safe, reliable, affordable, and environmentally responsible. EPRI has collaborated with the electricity sector and its stakeholders since 1972 and our membership has grown to represent approximately 90% of the electric utility revenue generated in the United States and extends to participation in more than 35 countries. The worldwide membership that supports our work comprises more than 1,000 organizations. While most members are electric utilities, others are businesses, government agencies, regulators and public or private entities engaged in some aspect of the generation, delivery, or use of electricity. Through their advisory roles in EPRI, its research sectors and programs, EPRI members help inform the development of EPRI's annual research portfolio, identify critical and emerging electricity industry issues, and support the application and technology transfer of EPRI's research and development. This project will be related to examining new methods for conducting Non-Destructive Examination (NDE) testing on steam generation tubes.

Project Requirements:

The diagram below provides an overview of an electrical generation system using a steam turbine:



A key piece of equipment in this system is a steam generator which contains long bundles of densely packed (gap between tubes is $<0.2''$) tubes that range in diameter from 0.625 to 0.875". Tube bundles can contain between (3500 to 10,000) individual tubes. The figure below shows a more detailed view of the steam generator:



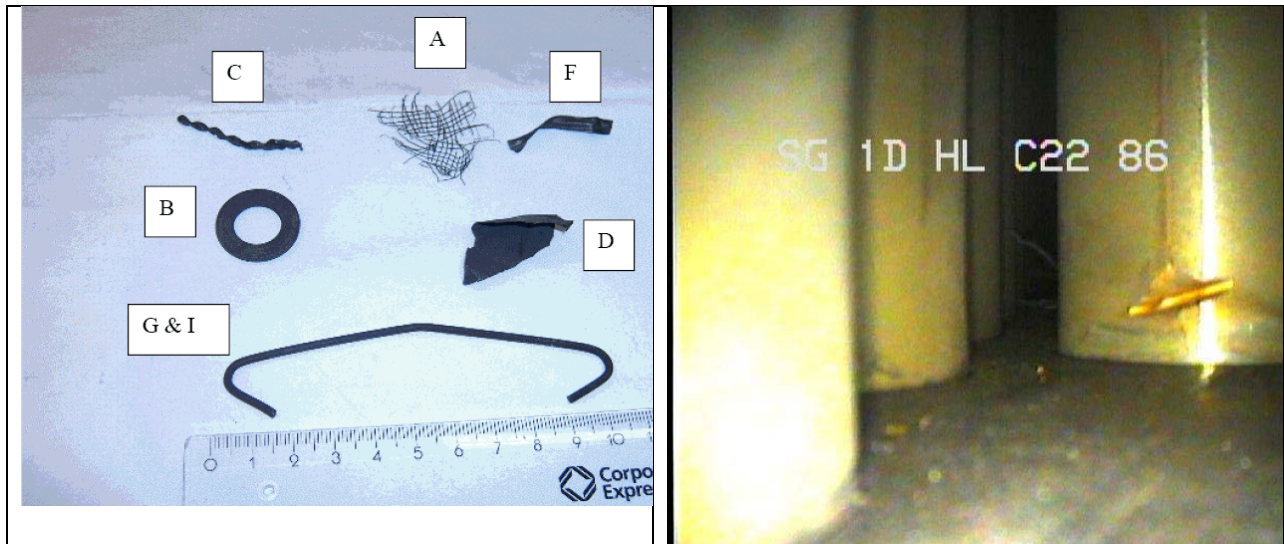
Foreign material can get into the tube bundle areas and damage the tubes. Periodic inspections are made to look for foreign material and damage that may be caused by foreign material when



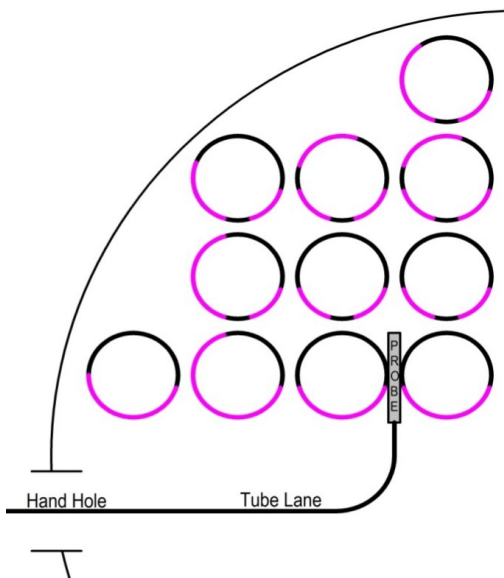
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primary side inspections are not scheduled. See pictures below of foreign material and tubes damage:



During refueling outages, utilities sometimes perform visual inspections of the tube bundles to look for foreign objects. This technique is called Foreign Object Search and Retrieval (FOSAR):



If tube wear is identified visually it becomes essential to determine whether the tube in question requires repair or if it can be left in service. Currently this determination is only possible with Eddy Current Testing (ECT) techniques performed from the primary side of the tube, these inspections quantify dimensions of the wear flaw (e.g., length, width, depth). No such non-destructive examination(NDE) technique has been developed to perform this determination from secondary side visual inspection results.



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A feasibility study is needed to determine if a methodology or new technology could be developed that would allow quantifying flaw parameters from secondary side visual inspections.

Expected Deliverables/Results:

- Research on Non-Destructive Testing alternatives to ECT.
- Feasibility study for alternative methods
- Proof of concept testing for alternative methods

Disposition of Deliverables at the End of the Project:

Hardware developed is the property of the Industry Supporter. The work product will be displayed at the last Expo then immediately handed over to the supporter unless arrangements have been made to deliver at a future date.

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

- Energy concentration
- Interest in power generation
- Interest in non-destructive testing and materials analysis