

Senior Design Project Description

Company Name	EPRI Technology Innovation	Date Submitted	Nov 8, 2017
Project Title	Thermal Energy Storage Prototype (EPRI_STORE)	Planned Starting Semester	Spring 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	5	Electrical	
Computer		Systems	
Other ()			

Project Overview:

Conventional power plants (coal, natural gas and nuclear) are increasingly called on to cycle through low and high loads, and in the case of coal and natural gas plants to shut down over night and start up the next morning. This thermal and pressure cycling subjects the steam generation equipment to fatigue damage. In addition, operating off of the full load point results in less efficient use of fuel.

An alternative to subjecting steam-based power plants to cycling is to use a thermal energy storage device. During periods of lower power demand, steam produced by the power plant would be diverted to the thermal energy storage device, and during periods of peak power demand the heat stored in the device would be used to produce additional steam for power generation.

Project Requirements:

This project will develop a small prototype for a thermal energy storage device which will use steam as the input and output medium. The design team must select a low cost material for storing the thermal energy (concrete and sand are two logical options) and must design a flow pathway for the steam that will result in highly effective heat transfer between the steam and the storage medium. The device must be able to withstand thousands of thermal cycle without deteriorating, and a final criterion will be the “round-trip energy efficiency” defined as the power generated from the steam produced from the thermal energy storage device divided by the power which would have been generated by the steam used to heat up the device.



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Expected Deliverables/Results:

- Technical Report that defines the design, cost and performance for a Utility scale system
- Small scale prototype of the system to verify the design performance

Disposition of Deliverables at the End of the Project:

Sponsor to advise if the prototype is to be transferred to EPRI, discarded or donated to UNC Charlotte for possible uses such as STEM outreach and discarded after it no longer has that purpose.

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

- None