

Senior Design Project Description

Company Name	EPRI	Date Submitted	June 30, 2017
Project Title	Remote Electrical Distribution Pad mount Transformer Monitoring (EPRI_REMOTE)	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	2	Electrical	2
Computer	2	Systems	
Other ()			

Project Overview:

Distribution pad mounted transformers are used in the most critical locations on the distribution systems. These transformers feed hospital, large retail and industrial customers, airports, and other high visibility customers. In the past, health monitoring on these critical assets has not been performed due to high cost of deployment of such system and they were not able to currently deploy to provide remote monitoring of key asset health characteristics. The design and development of a low-cost prototype system for monitoring these critical distribution assets is the scope of this project.

Initial Project Requirements:

The purpose of this project is to develop a low-cost PTO system that can be easily integrated onto a pad mount transformer and report key parameters using an inexpensive cellular system communicating to a web server.

- Condition Based Maintenance:** Some utilities have deployed sensing on almost all distribution network transformers in their fleet. These sensing technologies report oil temperature, pressure, and level (PTO) remotely. Trends which emerge over periods of time can help determine transformer problems which are not found during inspection such as slow leaks, indicated by slowly decreasing oil pressure. The temperature and pressure should also track with each other over time which if they do not track would be an indication that an issue may be occurring. Issues may present when the pressure is too high, too low, or remaining perfectly constant which can indicate a faulty sensor or that the tank can breathe such that the tank pressure doesn't



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change. This has drastically reduced their number of network transformer failures since the implementation of this program. Using a similar approach to network transformers could allow a utility to determine if a critical pad mounted transformer has an issue and plan the replacement of the transformer. Also, this may prevent the need for a rounds inspection of pad mounted equipment.

- **Environmental Impacts:** Remote oil level monitoring could help to prevent leaking pad mount transformers from spilling its oil prompted an increasing importance resulting from more stringent regulations.
- **Transformer Life Expectancy:** Continuous monitoring of a transformer could make it possible to estimate the remaining useful life of the transformer.

Physical Security: Many pad mounted transformer installations are out in the public where it is possible that the transformer could either be vandalized or hit by a vehicle. The most worrisome situation would be if the transformer was damaged due to. The gunshots could cause the transformer to leak oil. Another possible cause of physical damage is that if a vehicle backs into the pad mounted equipment or if during the winter months a snow plow causes the transformer to be moved which places a stress on the underground power connections.

Expected Deliverables/Results:

Prototype system with demonstrates the functionality defined above.

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):

- Team should include students that have a knowledge of sensors, integration into wireless communications and development of a web interface to collect and present data.