INDUSTRIAL SOLUTIONS LABORATORY

Company Information

Company Name	*EPRI*	**Date Submitted**	*11/7/2022*
Project Title	*Design of a Solar Panel Cleaning Robot* ***(EPRI_SOLAR)***	**Planned Starting Semester**	*Spring 2023*

Senior Design Project Description

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	

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 technology related to solar power

Project Requirements:

Photovoltaic (PV) solar panels must obviously be located outdoors to generate power. In various locations throughout the world, PV panels can be subjected to various weather conditions to include dust, rain, snow, and other natural or litter debris. Additionally, solar plants and distributed energy solar are typically located where staffing is minimal, or they are difficult to reach (rooftop). When dust, debris, or snow cover the panel, their efficiency can be degraded very quickly. Some robots exist that can clean debris from large, industrial sized panels, but their performance can be variable from vendor to vendor. Not many options are available for consumer, rooftop solar panel installations.

Expected Outcome: Analysis of marketplace to determine other makes/models of PV panel cleaning robots including lessons learned and/or known issues. Development of key features, requirements, and design considerations for a residential/consumer grade application. Paper design of the robot inclusive of key features and design requirements. This will be Phase 1 of a multi-phase project where Phase 2 could be actual building, testing, and refinement.

Expected Deliverables/Results:

Develop a solar panel cleaning robot (design) that is scalable between industrial applications and consumer applications. The robot could be the following:

- Battery powered with a way to recharge
- Made from materials with maintenance and environmental conditions in mind
- Developed for a regional use-case (i.e. Midwest US for snow, leaf, and debris removal, MENA region for sand and dust removal, etc.)
- Be able to move across a string of panels with panel gaps or bridges
- Accommodate the use of solar panel trackers (motors that change the angle of the panel to track the sun)
- Method to take commands and communicate status, trouble, or failures using wired or wireless communications methods.
- Incorporate safety and efficiency devices (sensors, limit switches, etc.) to ensure robots do not fall off panels and are effective.

Disposition of Deliverables at the End of the Project:

Students are graded based on their display and presentation of their team's work product. It is mandatory that they exhibit at the Expo, so if the work product was tested at the supporter's location, it must be returned to campus for the Expo. After the expo, the team and supporter should arrange the handover of the work product to the industry supporter. This handover must be concluded within 7 days of the Expo.

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

- Interest is sustainable energy
- ECGR4161 Introduction to Robotic as a course co-requisite for the EE/CPE .