**Project Name:** Electrical Distribution & Monitoring

**Name of Redesigned Course:**
ET-490 Power Engineering / Engineering Watch Standing

**Project Description:**
There are some pre-existing electrical load monitoring sensors in use around the Cal Maritime campus. This project’s aim would be to upgrade these systems around campus with new Energy Monitoring Products from E-Mon so that both the students and our Facilities Department can begin gathering energy usage data around campus. The electrical monitoring systems will all be digitally accessible with historical data trending capabilities. This data can then be used in the senior engineering technology capstone course: ET 490 - Power Engineering. With the ability to look at the campus’ energy usage and energy bill, students and facilities alike, could strategize around where on campus can we make the biggest energy improvements.

**Current Progress:**
- Facilities Operations have been installing E-Mon electric meters on Campus buildings
- Acquisition of necessary Project equipment & IT infrastructure development in progress
- Planning of Current Control Room

**Future Project Goals:**
- Development of a Centralized Facilities Control Room which was the Phase II component of this first CALL grant (similar to picture shown above).
- Continue working with Facilities Operations for installation of additional electric meters on campus buildings.
- Provide an opportunity for FET Juniors & Seniors to stand watch at the future Control Room since non-licensed track juniors & seniors cannot stand watch in the TS Golden Bear.

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**Project Name:** Solar Cell Testing Platform & Lab

**Name of Redesigned Course:**
ET-490L Engineering Technology Power Engineering Lab

**Project Description:**
The original project submission was for installation of a new solar installation on campus budgeted at about $100K. However, since funds were not available for this new installation we changed the project to focus our efforts on an existing solar system currently on campus. The current solar system serves an existing car charger. The focus of this project will be setup the solar charger system with appropriate instrumentation to be able to monitor the system performance and also connect the instrumentation to the data acquisition system funded as part of the first CALL grant.

**Current Progress:**
- Students are working on understanding existing current solar charging system
- Acquisition of necessary Project equipment & IT infrastructure development in progress
- Planning of Current Control Room Data Acquisition Process (PG&E Bill Analysis)

**Future Project Goals:**
- If there are leftover funds, we would use this money to install a control system.
- This would allow us to install a second electric car charger, tie into the building electrical system to charge the batteries at night, and to possibly work with another inverter to add on more solar or a future wind turbine.
- The control system, coupled with the data acquisition system, would allow students to track energy savings and carbon displacement activities with this solar project.
Learning Outcomes

- Describe proposed course in one sentence; including campus sustainability element
  - The course will focus on a solar installation that will provide real world experience to our students and offer them an outdoor classroom that we can all learn from.
- What specific skills will students learn? What knowledge will they gain?
  - The students will learn about solar power through the use of our current 10 panel solar array. They will learn about all the components that make up the system: charger/inverter, battery charge controller, and batteries.
- What Sustainability Outcomes does your team want the students to achieve?
  - This solar project will integrate an electrical sustainability project into the Engineering Technology Curriculum.
  - This project opportunity will provide students with foundational project and performance monitoring training that will encourage their integration and selection of green technologies as they embark on their professional career paths.
  - This project will specifically reduce PG&E imported power, the GHG associated with that power, and provide students an opportunity to monitor and
- What will you do to assess whether students have addressed Sustainability Outcomes?...

Connecting to CALL

- How does this proposed course align with CALL program objectives?
  - Reduction of GHG emissions to 1990 levels by 2020
  - Reduction GHG emission to below 80% below 1990 levels by 2040
  - Increase of on-site power generation
  - Procure 33% of energy from renewable sources by 2020
  - Monitoring monthly energy and utility use and provide necessary data to Chancellor’s Office
  - Developing and maintain energy a campuswide integrated strategic energy resource plan
- Which activities can CALL program support?
  - It is supporting our efforts in teaching our students about alternative energy projects here on campus.
  - Providing funding for needed resources related to equipment for this project (solar, metering, etc.)
- What is the team's vision for the next year as part of the CALL redesign program?
  - Students will be able to see the integration of campus energy usage data as well as solar data. Students would be able to calculate time-of-use savings as well.

Tracking Success

- How will you know if students achieved Sustainability Outcomes?
  - We will be measuring energy consumption via tools provided in class so we will be able to determine if we have achieved the Sustainability Outcomes by using these tools and comparing data, etc.
  - How will you know if this redesigned course is an improvement over the current version? How will you measure?
  - This will be evident once the course is done and the students present their projects. It will be easy to compare the quality of projects from the previous course to this newly redesigned course.

Taking Action

- What tasks/activities will the students perform?
  - Review of existing solar array
  - Look into expansion of solar array
  - Monitor performance and track changes in imported power from PG&E
  - Monitor and review PG&E bills to track savings over time
  - What role will facilities/sustainability officer have in redesign process and course delivery?
  - Facilities has been played an important role for this course. Facilities information is being gathered by Facilities (PG&E Billing information).
  - What kind of formative assessment/feedback along the way?:
  - Sequencing of assignments to be done by Professor and Facilities Staff.
  - Structure of assignments (group/solo):
  - Group assignments and solo assignments.
  - Structure of assignments (group/solo): Assignments will be both group assignments and solo assignments.
  - Sequencing of assignments: Assignments will be assigned in lab and tested in lecture.
  - What kind of formative assessment/feedback along the way?: Review of assignments to be done by Professor and Facilities Staff.
  - Assignment info needed to achieve goals of this course?: The information is being gathered by Facilities (PG&E Billing information).

Future Tasks

- Designing the assignments
  - Characteristics of the finished project: The finished project will be a student project that will use the information learned in this class.
  - How will you assess whether product demonstrates student learning?: The product should have the ability to be remotely monitored.
  - How will you assess whether students have addressed Sustainability Outcomes?: Part of the assignments will ask the students to refer and address the outcomes.
  - How will you describe assignment to students?: Students will be informed of assignments during class and will be shown the location of the solar array, related equipment and meters.