

Project Description for R&D Internship on Solar Energy

Job Title: BIPV Smart Monitoring & Testbed Internship - NUS SDE4 Living Facade

Project description: The Building-Integrated Photovoltaics (BIPV) Group at the Solar Energy Research Institute of Singapore (SERIS) is developing advanced monitoring capabilities for BIPV systems deployed in real building environments. The project combines solar energy, sensors and instrumentation, data acquisition, Python-based analytics, and real-world experimentation to understand the long-term performance of BIPV facades under Singapore's tropical climate.

A key focus of this internship is the development of a living BIPV testbed at the NUS SDE4 building, which features a unique section of retractable facade where different BIPV technologies can be installed, exchanged and monitored directly on an operational building. This creates a rare opportunity to turn an actual building facade into an experimental platform for next-generation solar technologies.

The intern will first work with SERIS' existing outdoor BIPV testbed at Cleantech One, learning to operate and improve its monitoring infrastructure - including sensors, Raspberry Pi, data loggers, communication systems and data pipelines. The intern will then help transfer and adapt this monitoring capability to the NUS SDE4 facade, including system integration, commissioning, troubleshooting and data visualization.

This is a highly hands-on internship suited to someone who enjoys making real systems work. The intern will gain experience spanning solar technology, electronics and instrumentation, IoT/data acquisition, Python programming and building-scale experimental research, while taking significant ownership of a real BIPV monitoring platform.

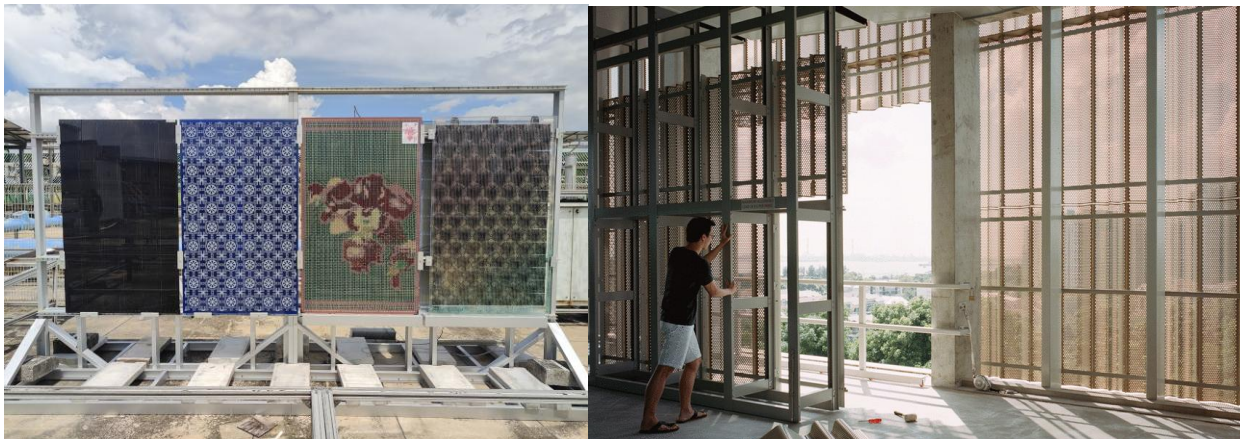


Figure 1 BIPV monitoring testbed at Cleantech One (left) and NUS SDE4 retractable façade (right)

Job description: We are inviting currently enrolled bachelor's/master's students with a strong interest in hands-on engineering and experimental research. Master's students are strongly encouraged to apply. We are particularly looking for someone who enjoys troubleshooting real hardware, working with instrumentation, and taking ownership of experimental systems. The intern will work on the following objectives:

- 1. BIPV Testbed Operation & Instrumentation:** Learn to independently operate and maintain SERIS' existing BIPV monitoring testbed at Cleantech One. Work hands-on with environmental and electrical sensors, Raspberry Pi, serial communication, and data acquisition systems measuring parameters such as PV power, voltage, current, module temperature, weather conditions and solar irradiance.

- 2. Monitoring System Development & Troubleshooting:** Understand and improve existing Python scripts, sensor interfaces and data acquisition workflows. Diagnose hardware and software issues, integrate new sensors or instruments, and improve the reliability and automation of long-term BIPV monitoring.
- 3. NUS SDE4 Living Facade Deployment:** Help translate the Cleantech One monitoring architecture to the BIPV testbed at NUS SDE4. Support system design, equipment selection, installation, integration and commissioning to establish a robust monitoring platform on an operational building facade.
- 4. Data Engineering, Visualization & Research:** Develop tools for automated data collection, processing and visualization using Python and cloud-based platforms. Analyse long-term BIPV performance and environmental data to identify trends, anomalies and research insights, including studies related to BIPV performance and the urban thermal environment.

Competencies gained during internship program:

- Hands-on experience with BIPV systems, sensors, instrumentation and data acquisition hardware in real outdoor environments.
- Practical experience integrating Raspberry Pi, serial communication, data loggers and Python-based monitoring systems.
- Experience in system commissioning and troubleshooting across hardware, software and instrumentation.
- Development of data pipelines, visualization tools and cloud-based monitoring for real-world engineering systems.
- Experience designing and deploying an experimental monitoring system on an operational building facade at NUS SDE4.
- Research skills in experimental design, long-term performance analysis, interpretation of field data and scientific communication.

Skill & requirements:

- Currently enrolled in a Master's or Bachelor's degree in engineering or a related technical discipline. Master's students are strongly encouraged to apply.
- Working knowledge of Python, including the ability to understand, modify and develop scripts for data acquisition and analysis.
- Hands-on experience with Raspberry Pi and serial communication.
- Strong interest in experimental, hands-on engineering work, including working with sensors, instrumentation and outdoor test systems.
- Able to work independently, troubleshoot technical problems systematically, and document technical work clearly.
- Able to undertake experimental work at both NUS and SERIS' Cleantech One facility as required by the project.

Strong advantages:

- Experience with data acquisition systems or data loggers such as Yokogawa, HOBO, Keysight, National Instruments or similar systems.
- Experience integrating environmental or electrical sensors.
- Experience with cloud platforms, databases, dashboards or remote monitoring systems.
- Basic knowledge of photovoltaic systems, electronics or electrical measurements.

Interested applicants should submit a CV to Dr Carlos Clement (carlos.clement@nus.edu.sg) and Rupendra Aryal (rupendra@nus.edu.sg) for review.