



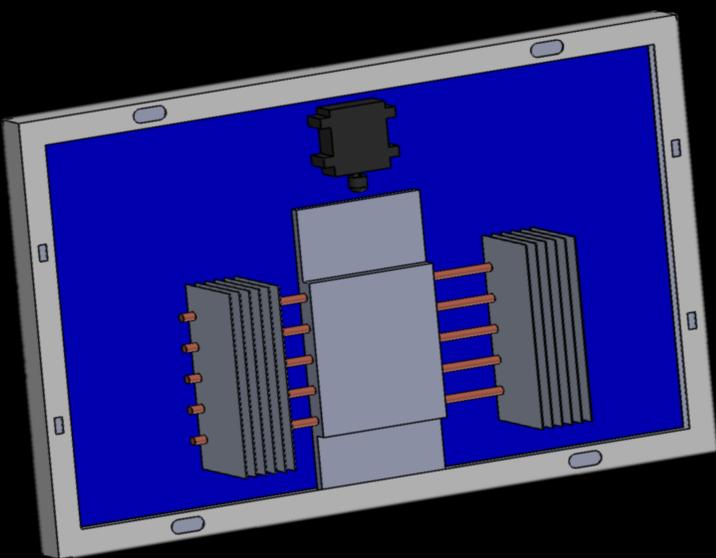
PV COOLING

HEAT PIPE VS PHASE CHANGE MATERIAL

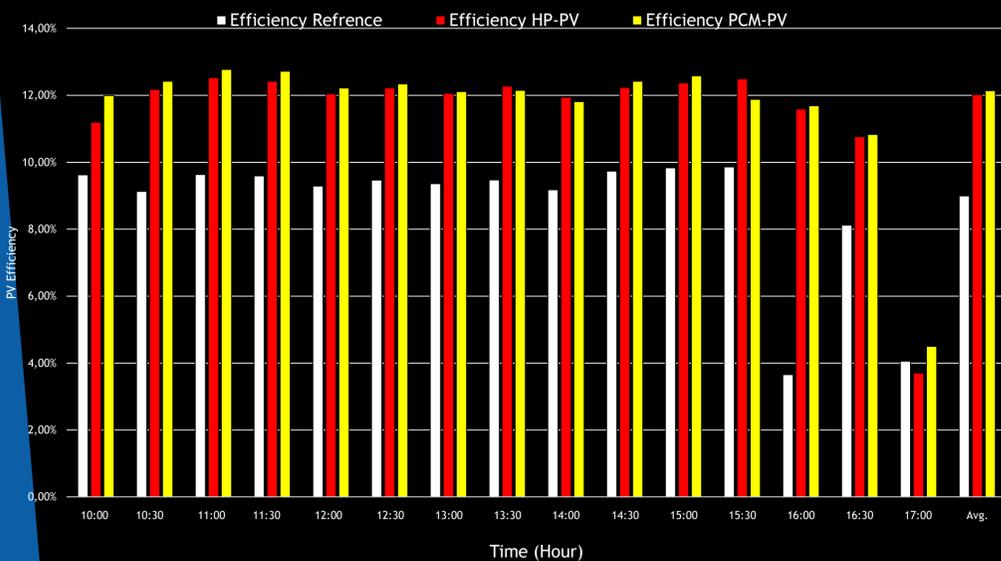


WHY COOL PV PANELS?

- ▶ The efficiency of Photovoltaic Panels (PV) decrease by 0.4% - 0.5% per degree Celsius as their Cell Operating Temperature increases throughout the day
- ▶ PV Cooling techniques are implemented to:
 - ▶ Remove Heat,
 - ▶ Keep the PV Panel at an Optimal Operating Temperature,
 - ▶ Maximize Efficiency,
 - ▶ Elongate working life of the PV Panel.

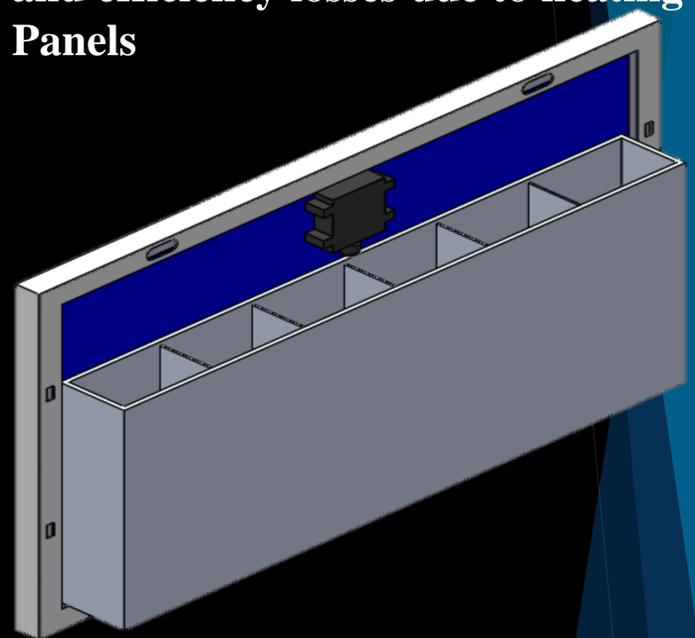


PV Efficiency

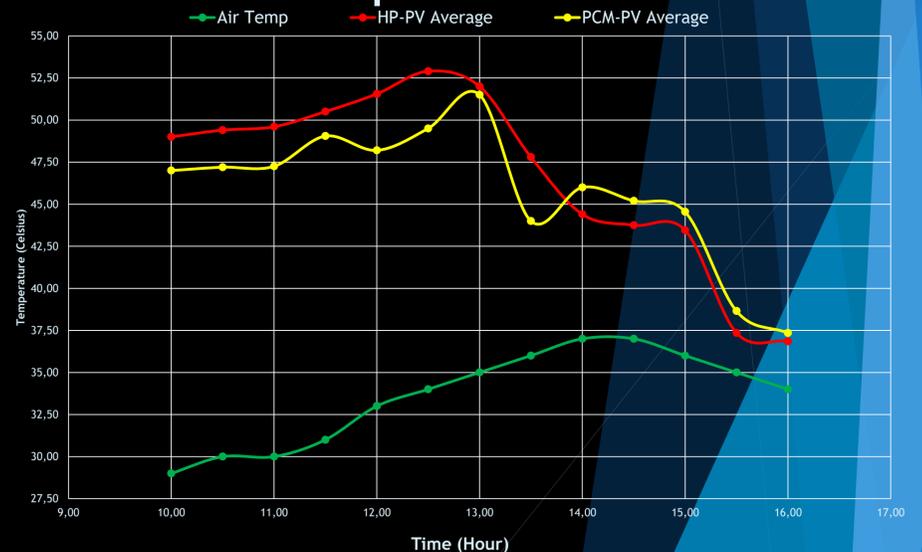


PROJECT OBJECTIVES

- ▶ To Design and compare two PV Panel Cooling System's effectiveness.
- ▶ Improve PV Panel's power output with regard to Manufacturing Costs and Heat Removal Rate.
- ▶ To decrease PV Panel's Operating Cell Temperature.
- ▶ To minimize the amount of solar energy and efficiency losses due to heating of PV Panels



PV Temperature over Time



DISCUSSION AND CONCLUSION

During comparison, the PCM-PV produced a higher overall efficiency than the HP-PV. It also exhibited more of a cyclic cooling nature due to the Phase Change Process only happening once, whereas the HP-PV system exhibited a steadier cooling nature as the Evaporative and Condensing process occurred multiple times. Up until the Phase Change Process, the PCM-PV's Power output was significantly larger than the HP-PV system therefore making the overall efficiency throughout the day in the PCM-PV's favour. Furthermore, the manufacturing and handling cost for the PCM-PV were about 25%, thus encouraging the utilization Heat Pipes for smaller scale applications and the Phase Change Material for larger applications.