# CALIFORNIA STATE SCIENCE FAIR
# 2012 PROJECT SUMMARY

**Name(s)**
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**Project Number**
**J0208**

**Project Title**
## Unlocking Nature's Secret to Green and Efficient Solar Energy

**Abstract**

**Objectives/Goals**
The objective of this experiment is to find the most efficient tree pattern for generating solar energy compared to flat panels using photovoltaic (PV) cells. In addition, this experiment studies the effect of the trees' natural habitats and seasonal changes on the energy generated by PV cells.

**Methods/Materials**
Tab the PV cells using solder and tabbing wire. Test the PV cells using a multimeter. Attach ten PV cells onto each tree model using double- sided tape. Record the voltages and current for each cell on all the five tree models (palm, plantain, evergreen, conifer, and flat panel at fifteen degrees incline), three times a day (9AM, Noon, 3PM) for ten days each in winter and early spring. Note the weather conditions (sunny, partly cloudy, cloudy) every time. Calculate the power (P=Voltage x Current) for each cell. Calculate the average power generated by each tree. Analyze the data to study the effects of season, weather condition, and time of day for each tree.

**Results**
This experiment was performed in the months of December, and late February. In December, the pattern of a conifer generated the most electricity. Palm and plantain followed the conifer, while flat panel was least efficient. However, the second set in the month of February the palm tree generated the most electricity. This change in results was due to change in the sun's angle to the horizon. The amount of power generated at 9 AM and 3 PM was almost same. The most power was generated at noon.

**Conclusions/Discussion**
The conifer tree's pattern allows PV cells to generate the most electricity in December, followed by palm and plantain. In the month of February, the palm/plantain generates the most energy. The flat panel generates the least energy in both the months.

In the tropics the sun's angle to the horizon is above sixty degrees for most of the year, the palm/ plantain pattern would generate more energy. At high latitudes, where the sun stays close to the horizon, PV cells arranged in conifer pattern, are able to absorb direct, indirect, and diffused sunlight.

The natural structure of the plant in its habitat absorbs the most solar energy. Arranging solar cells in the structure of trees' according to the habitat, will eliminate the cost of sun tracking technology. A solar tree that changes its structure automatically according to the season will be the ideal source for green and efficient solar energy.

**Summary Statement**
This experiment gives us an insight into nature's secret and demonstrates a way to customize the most efficient solar tree structure, according to the geographic location and seasons.

**Help Received**
I would like to thank my parents for teaching me how to solder the cells. I would like to thank Mr. Vikas Dabeer (Director: Global project management, Applied Solar) for helping me understand the working of the PV cells.