Solar Energy Out on a Limb: A Novel Photovoltaic Energy

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In our experiment, Solar Energy: Out on a Limb, we are modeling photovoltaic cells (solar panels) into a tree-like figure in order to combine nature's way of solar energy cultivation, photosynthesis, with modern-day technology. We hypothesized that if we create a PVTree programmed to follow the sun's path and UV light and utilize low spectral directional angles then it will significantly increase the amount of solar energy collected in comparison to the conventional solar panel. In our design we plan on applying the natural structure, movement, and angles of trees. By replicating Fibonacci's Sequence, commonly found in North American deciduous tree growth patterns, we created a natural design. We plan on programming this to test 5 different branch angles and 5 different base angles (25 different test points) in 30 minute increments. To compensate for light change, we will be calculating the current collected and voltage collected in comparison to the UV index present during that time to normalize our data. The stationary Photovoltaic Tree also collected an increase of 44% more volts than the conventional solar panel. This supported the first half of our hypothesis that arranging the panels to low spectral directional reflection angles to allow for maximum energy capture increases the productivity of the tree. Potential sources of error could stem from imperfections from our LabQuest data collection system that is testing the current and voltage as well as incorrect readings on the average UV index detected during the trial. We will create a concept for a full sized tree and with possibility of grants construct the full scale model.

Awards Won:

Arconic Foundation: Sustainable Urban Design, Second Award of $1,500