Solar Pathfinder Pre Lab Questionnaire

Student's name_____ Student ID_____

1. Which month has the most day light hours?
    a. Dec
    b. Jan
    c. April
    d. June
    e. September
2. What objects would a scientist consider when installing solar panels?
    a. Horses
    b. Clouds
    c. Birds
    d. Trees
    e. Cars
3. What time of the day would you expect a solar panel to receive the most sunlight?
    a. 7-9AM
    b. 9-11AM
    c. 11AM-1PM
    d. 1-3PM
    e. 3-5PM
4. Which of the following months has the earliest sunrise?
    a. January
    b. March
    c. April
    d. June
    e. December
5. Which of the following months has the earliest sunset?
    a. January b. March c. April d. June e. December

University of California at Santa Cruz
Jack Baskin School of Engineering

EE-80J: Renewable Energy Sources

Solar Pathfinder Laboratory Experiment

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Student's name_____ Student ID_____ Grade _____ / _____

ABSTRACT

In this experiment, students will obtain knowledge about solar cells, electric power motors, construct IV curve, and calculate maximum power and resistance at a maximum power point on a plot. They will also build a motor which will be powered by solar power.

INTRODUCTION

Choosing the correct site to install a solar panel can greatly impact its power output. Obviously, a solar panel in an open field will receive more power than one in the shade of a forest. The sun's path varies significantly throughout the year (Figure 1) and it can be challenging to understand when an area will be shaded during different seasons and what impact of that shade will have on the overall production of the solar panel.

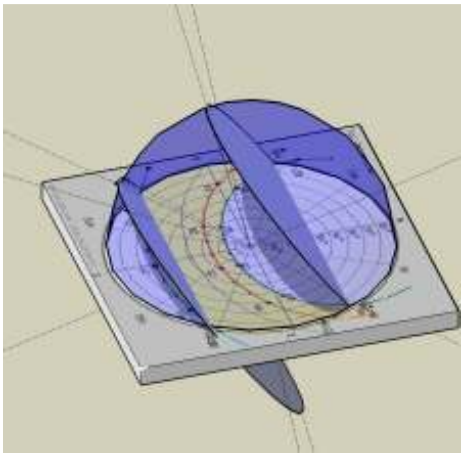

Figure 1 A chart depicting a 3D extraction of a solar path diagram and the sun's path at the extremes of summer and winter solstice

The solar pathfinder is used for shade analysis. Any trees, buildings, or other objects that could cast shadows on a particular area are reflected in a plastic dome, clearly showing shading patterns at the site. An underlying diagram specific to your latitude includes data on time of year and sun angle. Using a wax pencil, you will trace the reflected shadows on the sunpath diagram, giving an indication of the sunlight expected at different times of year and day. With this information, you will assess a site's suitability for a solar panel. In this lab you and a partner will assess a site's suitability and use a solar cell to take actual readings and compare with your expected values.

LIST OF MATERIALS

1) Solar pathfinder
2) Solar cell

PROCEDURE

1. Watch DVD movie.
2. The TA will assign a location to each group.
3. The pathfinder works on true north, not magnetic north, so an adjustment must be made to the magnetic north found by the compass. Before setting up the pathfinder, go to http://www.ngdc.noaa.gov/geomagmodels/struts/calcDeclination and enter your zip code and click "Get Location". Type in the current date and click "Compute Declination" to receive the magnetic declination for your location. Round the declination angle minutes to the nearest degree.
4. Set up the tripod.
    a. Insert the legs into the grommets on the base
    b. Slide out the inside tripod leg sections.
    c. Adjust the height such that the dome will be 15" below your eye when looking down at the solar pathfinder.

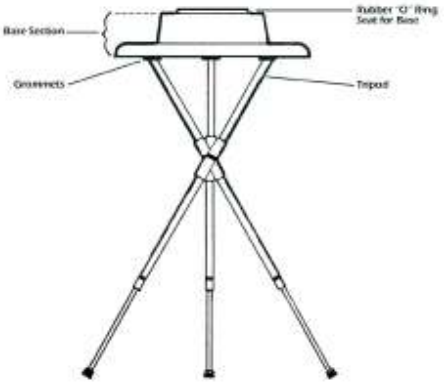

Figure 2 Tripod for the solar pathfinder

5. Insert the paper Sunpath diagram over the center pivot of the diagram platform of the instrument section.
    a. Adjust the pathfinder for magnetic declination. Rotate the sunpath diagram counterclockwise on the central pivot to adjust for magnetic declination to the angle directed at the website. Adjust the tripod such that the compass points south (**red pointer of the compass points north**). Your solar path diagram should now be configured for true north.

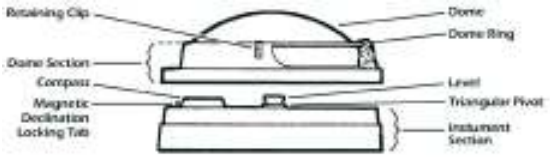

Figure 3 the instrument and dome sections of the solar pathfinder.

6. Place the dome on top of the instrument section.
7. View the pathfinder dome from 12-18" above.
8. Use the opening on the side of the dome (opposite the compass) to outline the reflected image of shadowing structures.

Figure 4 Magnetic Declination for 11 degrees East of North

9. Using the solar pathfinder chart, estimate the percentage of solar energy that is available to a solar cell at this location at summer time.

   Percentage=_____

10. Using the solar pathfinder chart, estimate the percentage of solar energy that is available to a solar cell at this location at winter time.

    Percentage=_____

11. Using the solar pathfinder chart, estimate the percentage of solar energy that is available to a solar cell at this location today.

    Percentage=_____

12. From today's date, compare recorded percentages from the other two groups.

    Percentage from group 1=_____

    Percentage from group 2=_____

13. Which location is the best location for the solar panel? and why?

Disclaimer:

This laboratory experiment procedure may contain parts of Solar Pathfinder Instruction Manual to assist students in assembling and using Solar Pathfinders products, manufactured by Solar Pathfinder ™.

Solar Pathfinder Post Lab Questionnaire

Student's name_____ Student ID_____

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