



**CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY**

Name(s) Thien T. Doan	Project Number J1014
Project Title How Do Different Chimney Heights Affect the Amount of Energy a Solar Updraft Tower Can Produce?	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals This experiment's objective was to determine the effects of different chimney heights on the solar updraft tower in generating energy.</p> <p>Methods/Materials The solar updraft tower was constructed based on "The Driving Force for the Stack Effect" and "The Flow induced by the Stack Effect" equations. A 56 x 56 inches wooden base collector area was constructed with three 1 x 10 inches input air vents on each side. At the center lies a wooden chimney base measuring five inches in height and connected to a three inches diameter aluminum chimney with adjustable height. A miniature DC generator was mounted at the collar of the chimney base. The collector area's floor was painted with a flat black color. Inside the wooden collector area lie approximately two hundred Mexican Beach pebbles evenly spread at the bottom. The collector area was enclosed with one sixteenth of an inch thick clear plastic sheet.</p> <p>The sun heated the rocks, which heated the air in the collector area and created the stack effect (the warm air to rise and rush through the chimney). This air flow causes the propeller to turn and generate energy.</p> <p>The experiments were conducted and data was recorded for three different chimney heights (28.5, 49.5 and 57.5 inches) with the digital multimeter connected to the DC generator and three temperature probes were placed to collect the data (in the chimney area, in the collector area and outside of the project).</p> <p>Results The data shows that the tallest chimney height generated greater stack effect, but not enough to turn the generator.</p> <p>Conclusions/Discussion My hypothesis is correct. There were a few unexpected issues encountered during the design and experimental phases. The materials that were required were unobtainable due to budget issues. The ¼" thick steel base collector area along with a special design metal construct steel/mirror formation was replaced with ¼" wooden base and Mexican Beach pebbles rock. The two inches diameter ceramic chimney was replaced with three inches diameter aluminum chimney. The miniature low torque RPM DC generator was replaced with a used high RPM motor. The outside air temperature was below the minimum required temperature of 90°F. Due to these undesired modifications, the results were not as efficient as expected.</p>	
Summary Statement My project is about a homemade solar updraft tower that generates energy by incorporating three fundamental concepts: the greenhouse effect, the stack effect, and the wind turbine.	
Help Received My father assisted me in buying materials and using electric equipment.	