



**CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY**

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Project Title The Power Tower: Producing Electricity Using a Solar Chimney	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The goal of this experiment was to create a device that would harness solar radiation and convert it into electricity. Our hypothesis was that the temperature of the air exiting the solar chimney must reach a minimum of 212 degrees Fahrenheit for the propeller to rotate.</p> <p>Methods/Materials We constructed a metal chimney containing a propeller and generator attached to a wooden base and surrounded by a plastic greenhouse. This device, The Power Tower, uses a combination of the greenhouse effect and the chimney effect. We took readings over a 7 hour period using the Lab Quest instrument, which graphed the temperature of the air as it exited the chimney. We also recorded outside temperature, revolutions per minute (RPM), sun position, shadows, clouds, and other observations every fifteen minutes. On a different day, we graphed the electricity the tower produced.</p> <p>Results We observed that the propeller started turning at 11:30 a.m. when the temperature of the exiting air was 68.9 degrees Fahrenheit and the outside temperature was 61.3 degrees Fahrenheit. At this time half of the greenhouse was shaded. The propeller stopped rotating at 4:30 p.m., thirty minutes after the sun had gone down. The exiting air temperature was 62.5 degrees Fahrenheit and the outside temperature was 66.7 degrees Fahrenheit. Exiting air temperature and the propeller RPM reached their highest point of 101.1 degrees Fahrenheit and 209 RPM, respectively, at 3:00 p.m.</p> <p>Conclusions/Discussion Our hypothesis was proven incorrect. However, we learned from our data that when the exiting and outside air temperatures are the same, the propeller does not rotate. Therefore, the greater the difference between the exiting and outside air temperature, the greater the rate of rotation of the propeller. Our data proved that the minimum difference between the exiting and outside air temperature required to spin the propellers was approximately 7.6 degrees Fahrenheit. Future experiments will include improving the chimney design and testing it with different variables.</p>	
Summary Statement We created a solar chimney that harnesses solar radiation and converts it into electricity.	
Help Received Mothers supplied materials and assisted with editing; Fathers helped with brainstorming, using powertools, and scientific writing; Mr Akers provided the Lab Quest instrument and generator.	