



**CALIFORNIA STATE SCIENCE FAIR  
2004 PROJECT SUMMARY**

<b>Name(s)</b> <b>Yanosh D. Cerovcevic</b>	<b>Project Number</b> <b>J0803</b>
<b>Project Title</b> <b>PEM Fuel Cell and Hydrogen: Pollution Free Energy Source of Today</b>	
<b>Abstract</b> <b>Objectives/Goals</b> Pollution is the greatest threat to our environment and health. The goal of this project is to find a good and an efficient way as an alternative of using fossil and nuclear fuels; also to create and store renewable energy and in the process produce less, or no pollution at all. The fuel being tested is hydrogen, the most abundant element in the universe. <b>Methods/Materials</b> A solar panel was used and reversible PEM Hydrogen Fuel Cell, to produce hydrogen and oxygen from distilled water. In a reversed process, these gases were forced through the fuel cell catalyst producing electricity. Experiments were recorded with a camera to have more accurate hydrogen volume readings, as well as time, voltage and current. Results were transferred to spreadsheets for computations and graphs were created. As a final test, a modified electric model car was powered with produced electricity. <b>Results</b> Voltage, current, hydrogen volume and time were measured. It took an average of 6min and 8sec to convert 11mL of hydrogen from the water using solar energy. Average current was 0.189A and voltage was 1.85V. In reverse process, 11mL of hydrogen created average voltage 0.57V and 0.421A current for 3min and 4sec with 1ohm load. Experiments were repeated with a 60W lamp. Solar energy proved to be better energy source, producing same volume of hydrogen for shorter period of time. In same time average efficiency (34%) was higher than using a 60W lamp (28%). The only byproducts created in the process were water and heat. <b>Conclusions/Discussion</b> Hydrogen as a fuel and PEM Fuel Cell are in combination much better energy source than most commonly used fossil and nuclear fuels. If electricity used to create hydrogen is produced from solar, wind or hydro energy source, energy created in a fuel cell is renewable, produces no pollution and have high efficiency rate. Because the only output of a fuel cell is water, the fuel cell used in conjunction with an electrolyzer (reversible fuel cell) is a true closed system, returning the water back to its source. Fuel cells do not have the efficiency limitations or the pollutant output of conventional power generators, because hydrogen and oxygen are converted into water, rather than combusted, as in internal combustion engines.	
<b>Summary Statement</b> The goal of this project is to find a good and an efficient way as an alternative of using fossil and nuclear fuels; also to create and store renewable energy and in the process produce less, or no pollution at all.	
<b>Help Received</b> My father purchased material and helped wire components.	