



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Samuel A. Johnson	Project Number J0719
Project Title Fuel Cells: The Power of the Future	
Objectives/Goals Abstract My experiment focuses on two of these types of fuel - the Polymer Electrolyte Membrane (PEM) and the Direct Methanol (DM) Fuel cell cell. These are the most promising of the six types for powering small electronic devices. The goal is to find out which one is better for running small appliances such as electric motors. My hypothesis is that the PEM is more efficient because it is more widely used. In my experiment, I measured the power generated by each of the two fuel cells. Energy sources like batteries provide power by supplying a current and voltage to a circuit that contains some sort of load, or in other words, an obstacle that needs work to overcome. For electrical circuits, the load is usually a resistor or a small device like a motor. I set up a test circuit connected to the fuel cells. With this circuit, I could connect different resistances (this my variable) and measure the currents and voltages in the circuit. I generated a # power curve# for each fuel cell by varying the resistor (load) and calculating the power for each load. The power curve is plot of the current used to generate power. The power is found by multiplying the current and voltage together. I also added small electric motors and measured the current needed to produce enough power to run them (either 35 or 100 mW). The power curves for each fuel cell was different, even though both cells provided about the same amount of voltage when no load was put on them The PEM produced much more power as the same amount of current or needed less current to make a certain amount of power. This was true for the motors too. The conclusion is that the PEM is a better fuel cell because is more efficient using current o produce power. However, current efficiency is not the same thing as fuel efficiency. Fuel efficiency measures the amount of fuel used to produce the current or power. From the background information, both the PEM and the DM were rated at approximately the same fuel efficiency # about 35 to 50%. Measuring fuel efficiency when the fuel is something like hydrogen is difficult to do and takes a lot of time. In the future, I would like measure fuel efficiency too.	
Summary Statement i wanted to know what type of low heat fuel cell was better, more effcent, for powering small electronics.	
Help Received my mom helped type the report and my father helped me aquire the materials and helped me to write the report	