

Laboratory 3  
**Alternative Energy Resources**

**I'm addicted, you're addicted, we're all addicted, so now what do we do?**

In 2006, President George W. Bush publicly announced that Americans are addicted to oil, an addiction that is neither sustainable nor cheap. How is oil presently used in the United States? What makes our use of oil unsustainable? What are the potential alternatives to our addiction to oil?

Two potential alternatives to carbon-based fuels are hydrogen fuel cell systems and photovoltaic solar electric generation. Diagram how each of these systems would work and note all the required inputs and outputs (including energy and wastes) for the operation of these systems. How might these systems substitute for our current uses of oil? Explain how hydrogen fuel cells and photovoltaic solar electric generation minimize pollution and are sustainable sources of energy.

Look at the model Fuel Cell system. Diagram the system and explain how each component operates. Set the lamp to shine on the solar panel and generate hydrogen gas to feed to the fuel cell and make this system functional.

In your group, discuss the methods to be used to make the following evaluations (basic instructions are attached):

Evaluate the rate of hydrogen gas production when the lamp is oriented at different angles to the solar panel (try  $90^\circ$ ,  $60^\circ$  and  $30^\circ$ ). What is the angle at which gas production rate is greatest? Predict the differences in daily energy harvesting of a fixed position solar panel compared to a solar panel that tracks (follows the movement of) the sun.

How would a system like the one in front of you minimize the pollution presently created by fossil fuel energy resources?

What are the barriers (scientific, social, political, economic) to the adoption of solar panels and fuel cells as alternatives to fossil fuel use?