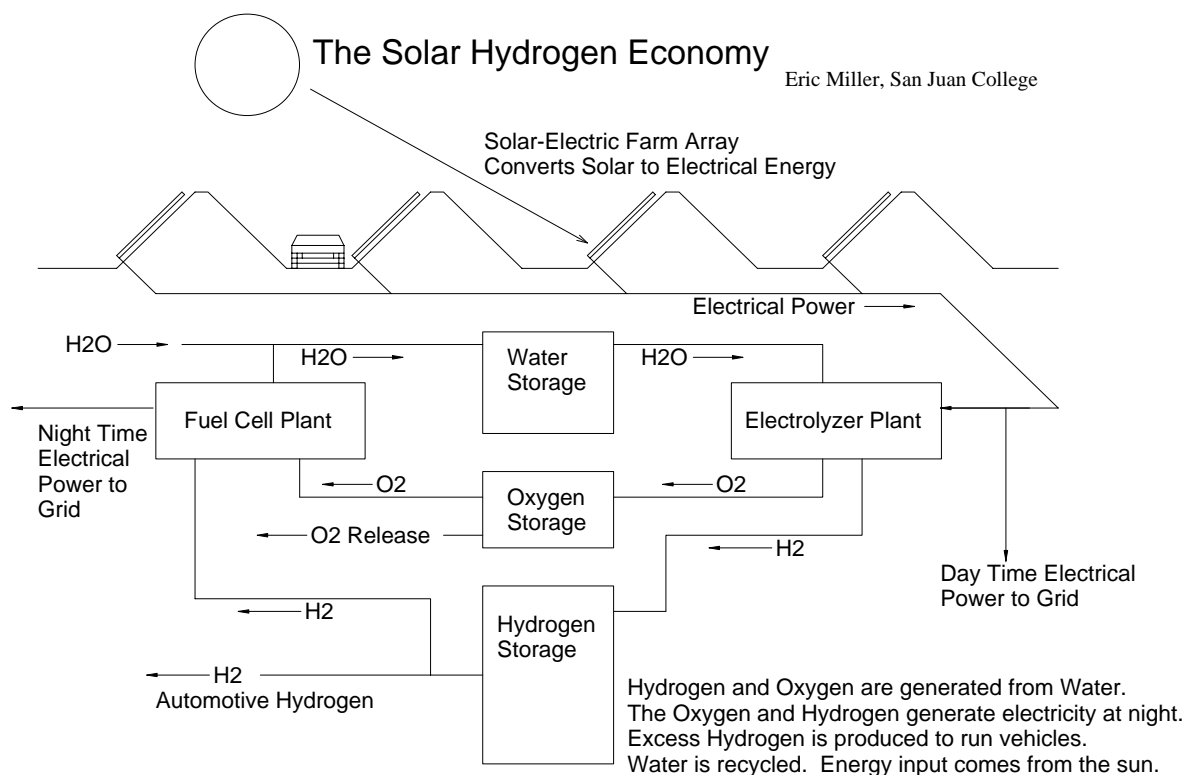


## Introduction to the Solar Hydrogen Economy

Dr. Miller's research is primarily focused on solar energy for the hydrogen economy. Overlapping areas include nanomaterials, ionic conductors, and nanobio interfaces. The majority of the research laboratory work is performed by undergraduate students in their sophomore year and is an excellent means of enhancing their education in science and technology.

The basic idea of the solar hydrogen economy is summed up by this drawing shown here.



In the solar hydrogen economy the sun, generates electricity. The electricity is used directly, and to generate hydrogen and oxygen from water in electrolyzers. The hydrogen and oxygen is then used as needed for fixed power (such as for electricity at night or low light levels) and mobile energy for vehicles. The generated hydrogen can be shipped in existing natural gas pipelines. Home furnaces could be converted from burning natural gas to hydrogen, both are explosive fuels. The environmental impact is theoretically very clean since there is a simple loop of hydrogen, oxygen and water in cycle, with the only input being energy from the sun. Of primary importance to the hydrogen economy is the conversion of sunlight to electricity. Using coal, oil, or nuclear power for this conversion is not economical or sustainable and should be avoided at all costs. It is important to emphasize the use of the sun for the primary energy input. For this reason we are focusing on the manufacture of low cost photovoltaic solar panels as key to the solar hydrogen economy.