Hydro Cube

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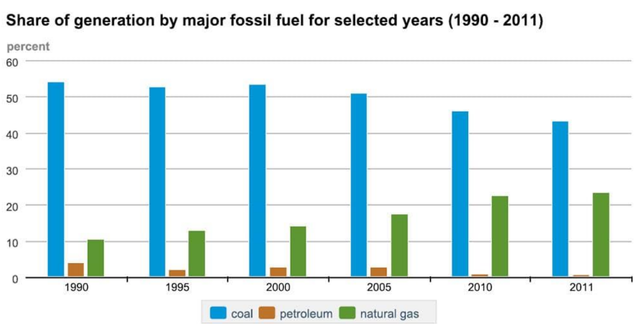
Background



eia **Source:** U.S. Energy Information Administration, *Monthly Energy Review* (July 2012), Table 7.2b.

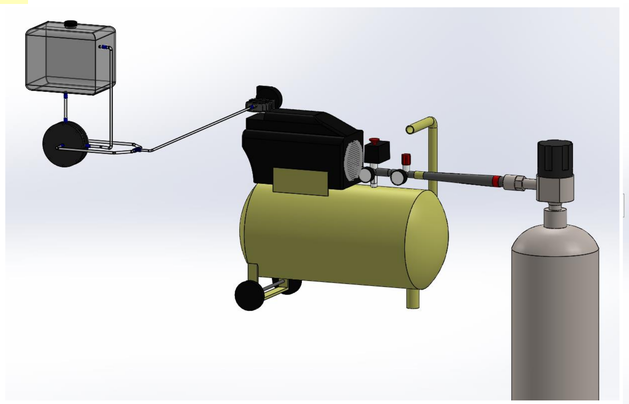
With an ever-growing demand for energy and very limited natural resources, there is a great demand to develop natural gas alternatives. Batteries have proven to efficiently store renewable energy such as solar. However batteries are not a good long-term alternative due to the toxic chemicals they contain. For this reason, the implementation of P2G systems is gaining more attention. Such systems use electricity to split water into hydrogen and oxygen then storing the hydrogen for later use in energy production or household application.

Objective

Develop an efficient long-term energy storage system by splitting water into its raw hydrogen and oxygen atoms using an electrolyzer stack. The stack will be powered with excess photovoltaic energy when a household solar panel battery is full. Therefore eliminating any waste of solar energy waste. Collected Hydrogen can then be used as a source of heat for energy production or for household appliances.

Goal

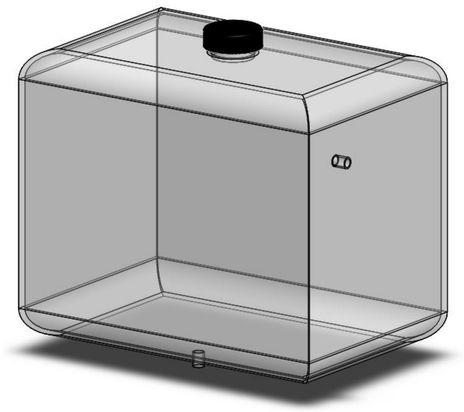
- Model the total energy consumption in a household
- Estimate the hydrogen production for week's worth of energy
- Model electrical and flow analysis simulations
- Analyze cost and energy savings



Design

Hydrogen Storage Tank

Electrolyzer Stack



Water Storage Tank Model

Timeline

Fall (Current Status)

November (16): Experimental group conducts photovoltaic cell testing to find necessary specifications for battery replacement.
November (05): New battery cells and casing ordered
October (18): Team formations and first draft of contract.

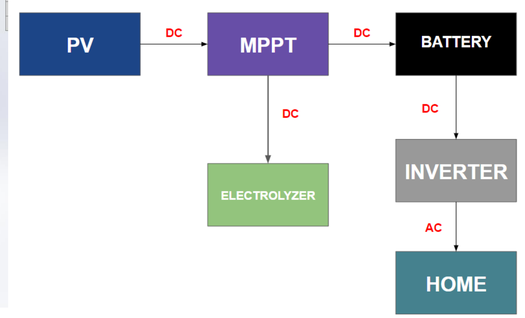
Winter (Next Steps)

Week 2: Begin fitment testing with purchased stack and solid works model
Week 3-4: Electrolyzer, pipe systems, and storage tanks assembled.
Week 5: Implement control sensors (pressure, temperature, and flow)

Spring (Future Steps)

Week 1-2: Assemble HydroCube
Week 3-5: Test controls under various scenarios
Week 6-10: Final project assembly and preparation of sensation

System Schematic



Environmental Impact

Our finalized product will have an immense positive environmental impact by providing electricity and gas to any solar-capable home, producing zero greenhouse gas emissions. According to a study conducted by the MIT mechanical engineering department, the average carbon emissions per person each year is between 8.5 and 20 metric tons. When compared to the global average of 4 tons the need for power to gas technology is clear.

Total Costs