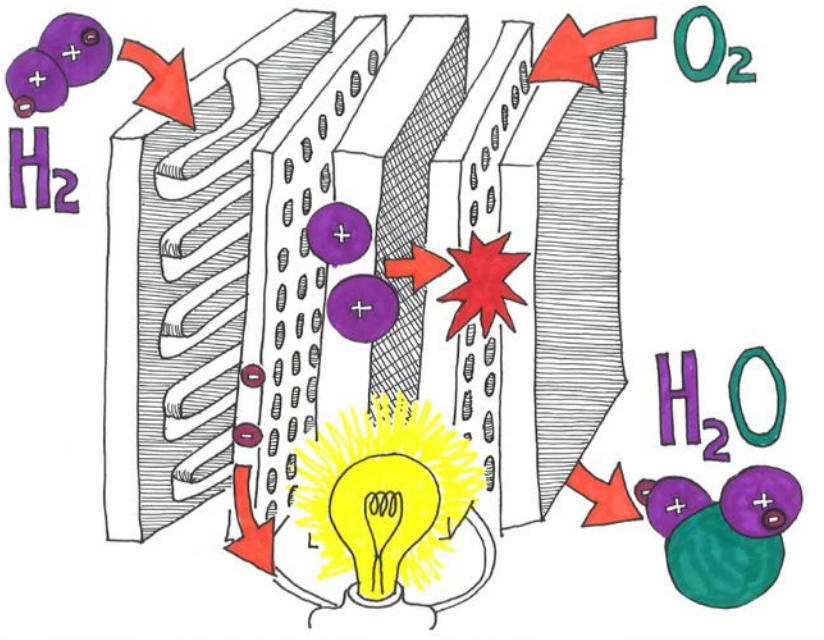
How does a fuel cell work?

A hydrogen fuel cell, the type we are most likely to find in future daily life, depends on a nearly magical filter called a proton exchange membrane (PEM). This material has electrical properties such that when we push hydrogen atoms through it, it allows positively charged protons through and rejects the negative electrons. A conducting catalyst anode helps to strip the electrons from the atoms and passes them to a wire that provides electricity for the load, or job we want performed. The protons, having passed through the PEM, meet up at a catalyst cathode with oxygen from the air, and electrons that have made the complete circuit from anode to load to the cathode, where they join up again to form water.



So where does the energy come from? Energy is required to isolate hydrogen from whatever compound in which it is harvested, typically petroleum or water. We think of this as being like winding up a spring. When the protons rejoin electrons and oxygen, it is similar to burning a mixture of hydrogen and oxygen without the bang. The catalyst helps this process along nonviolently. This is like releasing our wound-up spring.

7/17