The Renewable Energy Experimental Facility (REEF) is a net-zero energy consumption facility located at the DRI Reno campus. The facility consists of a 1200 ft² house and a 600 ft² workshop. The electricity, heating, and cooling of the facility is accomplished through the use of solar energy and wind energy.

### Facility Layout

The physical layout of the facility is shown in Figure 1. Electricity is provided by solar energy, through photovoltaic (PV) panels, and wind energy through wind turbines. The electricity can be used directly, or stored in batteries and the production of hydrogen.

During time periods without wind or sunshine, the hydrogen is combusted in an engine that drives a generator to produce electricity.

While the house and workshop are located adjacent to one another, the two wind turbines and four PV arrays are more widely dispersed. These components are connected electrically through underground channels shown in Fig 2.

### REEF House

Heating and cooling of the facility is driven by solar thermal energy, using both liquid and air collectors. The energy is stored in hot water tanks used to heat the facility, by employing liquid-air heat exchangers. The house is cooled in the summer by using the hot water to drive an absorption chiller air conditioning unit. The workshop uses an evaporative cooler that is powered with the wind turbines and PV.

Fig 4 is the absorption chiller, located in the utility room of the house. This unit provides air conditioning more efficiently than a conventional residential A/C unit. A schematic of the system plumbing is shown in Fig 5.

### REEF Workshop

The south facing roof of the workshop, (Figure 7), contains a site-built solar air collector used for space heating and cooling.

Stored hot water is used to heat the hydronic floor. A schematic of the system is shown in Fig 8.

Hydrogen is being stored in two 2.5 m³ cylinders next to the electrolyzer unit. The electrolyzer produces hydrogen by splitting water into hydrogen and oxygen.

### Future Use of the REEF

The REEF is a test facility in which new renewable energy and energy efficient technologies can be tested and demonstrated.