

Hydrogen & Fuel Cells

Store Energy and Power Vehicles with Hydrogen

Generate and utilize hydrogen on-site to sustainably store energy, power vehicles and fight through outages.

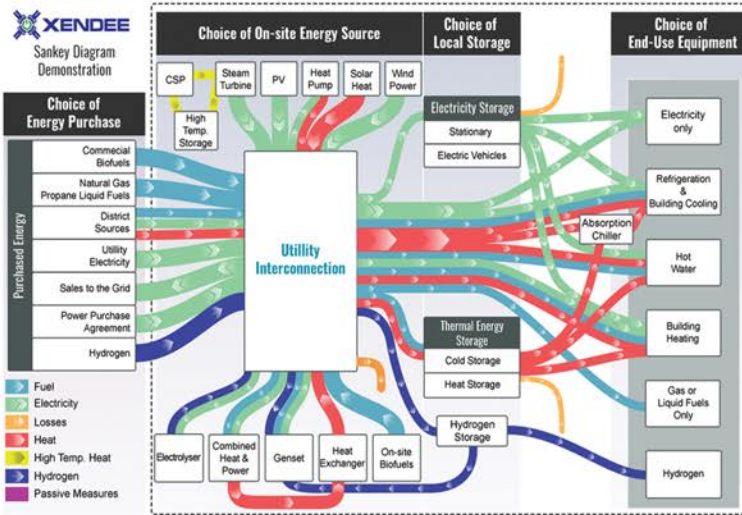
Hydrogen Energy

Major Use Cases:

- 1 **Sustainably Store & Use Energy**
Hydrogen is a zero carbon fuel that produces only water when it is consumed in a fuel cell.
- 2 **Rapidly Refuel Zero Emission Vehicles**
Unlike charging a battery, hydrogen is consumed by the fuel cell allowing vehicles to 'fill up their tank' like traditional gasoline.
- 3 **Generate Hydrogen & Make Sales**
Excess energy from renewable sources can be utilized to generate hydrogen for storage or be sold back to the market.

How is Hydrogen Used in XENDEE?

XENDEE can model hydrogen as part of (1) a fuel purchase, (2) electrolyzer production, and (3) the storage of hydrogen. First, as a fuel source, XENDEE can choose to purchase hydrogen fuel to help meet emission goals or resiliency requirements. Next, electrolyzer production is the on-site generation of hydrogen through an electrically induced chemical reaction. This is powered completely by sustainable resources, and can take advantage of excess production during the day, for instance during a sunny afternoon, to generate hydrogen from PV instead of curtailment. Finally, XENDEE can optimize the purchase, storage, and dispatch of hydrogen to ensure it is used most efficiently within the system. XENDEE will consider all of these variables during the Techno-Economic Analysis and help users quickly determine if hydrogen is a viable option for their project.



Make Use of Excess Renewable Energy

An ideal use case for hydrogen is when a Microgrid's renewable energy resources are generating an excess of power (typically solar or wind) needed to meet the building load. This often happens during the middle of the afternoon where solar capture is the highest but building load and energy needs are easily being met.



Generate Hydrogen with an Electrolyzer

In these cases, hydrogen can be generated and stored by the system through the use of an electrolyzer. This device runs electricity through water to separate the oxygen particles from the hydrogen, emitting oxygen and storing the hydrogen as a pressurized gas or frozen liquid.



Store On-Site

Store at your facility and use it during peak hours or sell it to make a profit.



Use in a Fuel Cell

Use hydrogen in a fuel cell to meet building loads and offset energy costs.



Power a Fleet

Power compatible vehicles including cars, trucks, and airplanes.

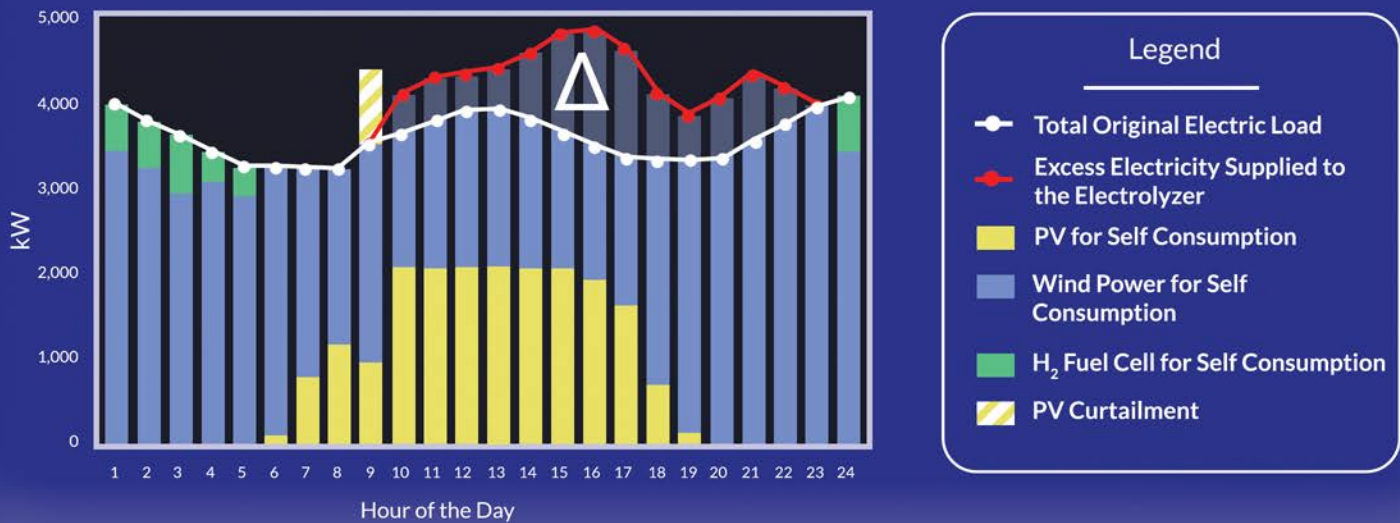


Modeling Hydrogen as a Competitive Microgrid Fuel

Discover Opportunities for Hydrogen Generation

The electrolyzer is driven by electricity, whose source is decided by XENDEE based on cost or other parameters set by the modeller. This typically comes from PV (or wind), as it can utilize otherwise curtailed energy to create and store hydrogen to then use in a fuel cell after sunset. In the example below, excess wind power from mid day is being used to provide electricity to the electrolyzer as expressed by the shaded delta (Δ) area.

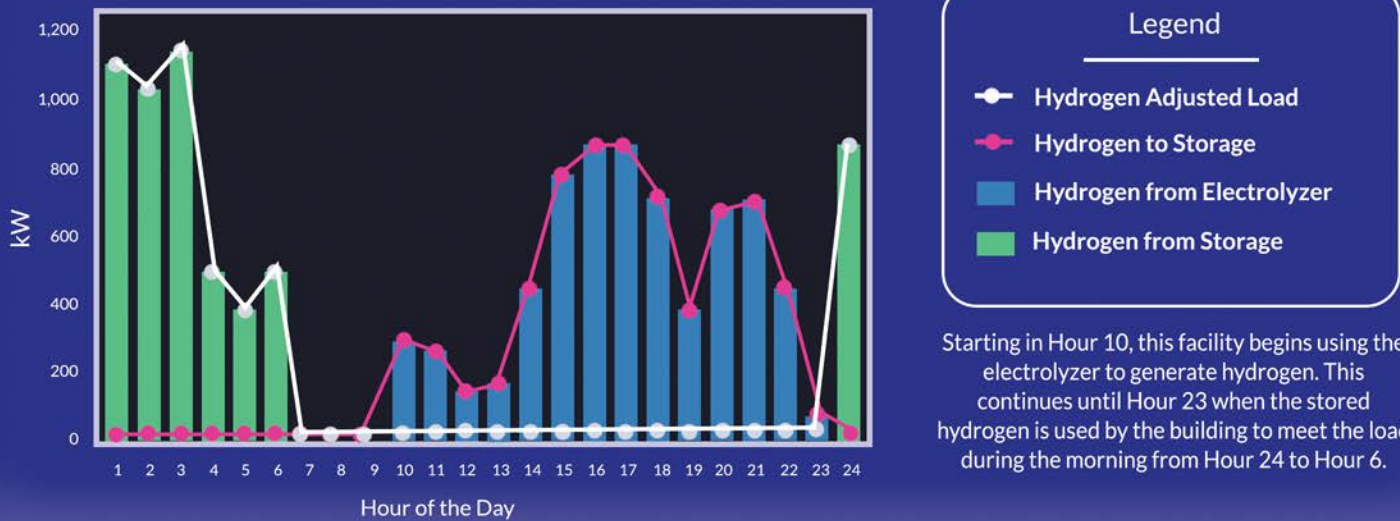
Electricity Dispatch | January Day



Optimize Hydrogen Dispatch to Maximize Energy Savings

The energy provided to the electrolyzer by the dispatch above is used to produce hydrogen, which is stored on-site in the dedicated storage optimized by XENDEE. The hydrogen is then discharged in the evening to run the on-site fuel cell. **Additionally, XENDEE users can run another analysis using batteries instead to easily determine if a hydrogen storage system or battery storage system would be most cost efficient or resilient for this specific design.**

Hydrogen Dispatch | January Day



Starting in Hour 10, this facility begins using the electrolyzer to generate hydrogen. This continues until Hour 23 when the stored hydrogen is used by the building to meet the load during the morning from Hour 24 to Hour 6.