

# FUEL CELLS 101

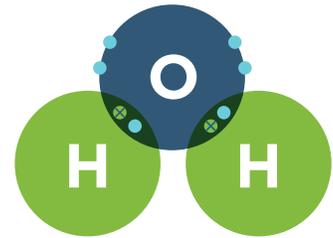
A fuel cell is a device that generates electricity through an electrochemical reaction, not combustion. In a fuel cell, hydrogen and oxygen are combined to generate electricity, heat, and water. Fuel cells are used today in a range of applications, from providing power to homes and businesses, to recharging consumer electronics, to moving a variety of vehicles including warehouse forklift fleets, buses, trucks, cars, and more.

## **BENEFITS OF FUEL CELLS**

Fuel cells generate clean power and can use a range of fuels. When hydrogen is used, the only byproduct is water. Beyond the environmental benefits, fuel cells are also an extremely efficient, reliable, and quiet source of power.

**Fuel cell technology brings innovation and ingenuity that can foster a new clean economy and economic growth.**

**On the next page, learn more about how fuel cells work.**



In hydrogen fuel cells, hydrogen molecules bond with oxygen to produce water.



A fuel cell vehicle's only tailpipe emission is water.

## PRACTICAL USES OF FUEL CELLS

Hydrogen fuel cells are widely used in both the private and public sectors. For example:

### STATIONARY POWER

Fuel cells are providing both primary power and back-up power to thousands of sites across the country in a range of applications, including data centers, utilities, hotels, grocery stores, retail sites, hospitals, telecommunication towers, and more.

### VEHICLES

Many of the world's leading automotive companies are selling, leasing, and developing fuel cell vehicles today. These zero-emission vehicles refuel in three to five minutes, with a range of 300 to 400 miles.

### MATERIAL HANDLING

Fuel cell-powered forklifts are currently in operation at manufacturing plants, distribution centers, freezer facilities, and grocery warehouses around the country, replacing incumbent battery-powered and combustion vehicles due to their advantages of longer runtime, faster refueling, and higher efficiency.

## HOW FUEL CELLS WORK

A fuel cell is an electrochemical energy conversion device – it utilizes hydrogen and oxygen to generate electricity, heat, and water.

- 1** The hydrogen atoms enter at the anode.
- 2** The atoms are stripped of their electrons in the cathode.
- 3** The positively charged protons pass through the membrane to the cathode and the negatively charged electrons are forced through a circuit, generating electricity.
- 4** After passing through the circuit, the electrons combine with the protons and oxygen from the air to generate the fuel cell's byproducts: water and heat.

