

Connecticut's Hydrogen & Fuel Cell Industry Status



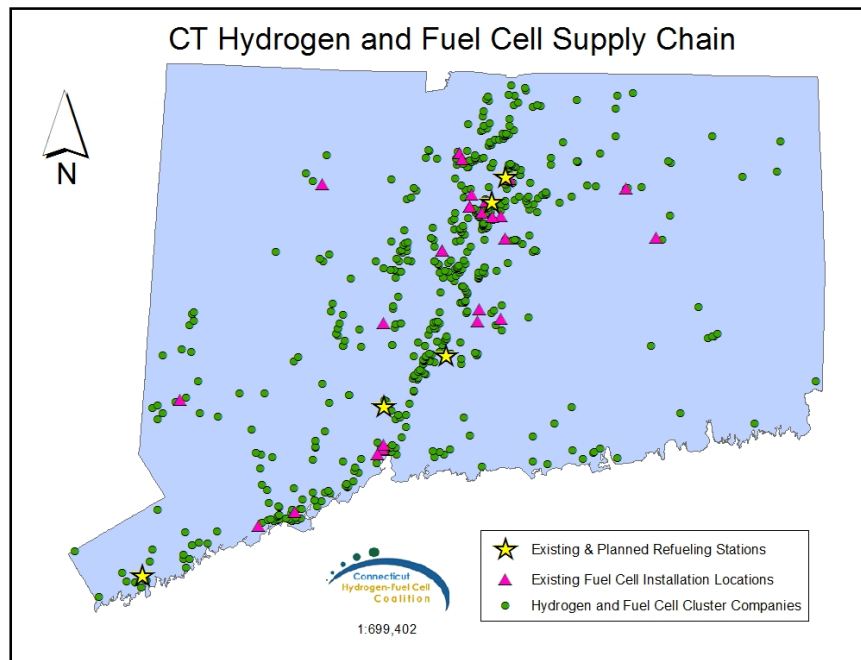
Key Connecticut Statistics

Total Employment: **2,693**

Total Revenue/ Investment: **\$605 Million**

OEM Revenue/Investment: **\$312 Million**

Total Supply Chain Companies : **601**








Important Facts






- ◆ Connecticut's hydrogen fuel cell companies directly employ approximately **1,000 high-tech workers**. Although Connecticut lost approximately 70 direct employees in 2013, it is expected that these jobs will be recovered and surpassed with increased manufacturing and production.
- ◆ Connecticut's hydrogen fuel cell companies **employ approximately 28%** of the total U.S. workforce in this industry and **approximately 8% of the total global workforce in this industry**.
- ◆ Connecticut's hydrogen fuel cell companies and OEMs were awarded over **\$490 million in federal grants and contracts** in the last 5 years.
- ◆ Connecticut's hydrogen fuel cell companies **generated \$211 million in direct labor income impacts and contributed \$22 million in state and local tax revenue**.

CONNECTICUT'S HYDROGEN FUEL CELL INDUSTRY DIRECTION

Market Drivers

-  Increased energy reliability
-  **Jobs and economic development**
-  Energy Storage
-  Reduced emissions of GHGs and air pollutants
-  High output capacity to meet demands

Market Barriers

-  Education/Awareness
-  **Cost**
-  Financing
-  Internalization of value
-  Competition

Transportation

Transportation is a significant market for the hydrogen and fuel cell industry. Due to a zero-emission vehicle (ZEV) mandate and other government policies, Connecticut companies are primed to take advantage of technological advancements and growing interest in the industry. The US Department of Energy projects that between **15.1 million and 23.9 million** light duty FCEVs will be sold each year by 2050 and **347 million** light duty FCEVs in use by 2050. Over 80,000 electric and hydrogen FCEVs are estimated to be in use in Connecticut by 2025.

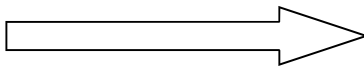


*Replacement of current vehicles with FCEVs would result in **savings** per year of:*

Type of Vehicle	Pounds of CO ₂	Gallons of Gasoline	Cost Savings (\$)
Passenger	10,170	230	885
Light Duty Truck	15,770	485	1,866
Bus	182,984	4,390	17,560

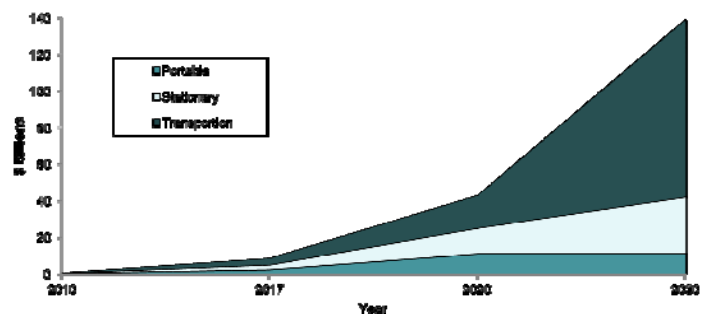
Stationary Power

Hydrogen and fuel cell technologies can meet the needs of end-users seeking distributed **energy solutions** to improve energy reliability, reduce energy cost volatility, and reduce emissions. The development of **low cost hydrogen production** and storage technologies is widely recognized as a **major business opportunity** and a **potential source of economic growth**.



Upper bounds of market potential could exceed **\$139 billion** annually by 2030.

Market Growth 2010-2030



Applications for Fuel Cells

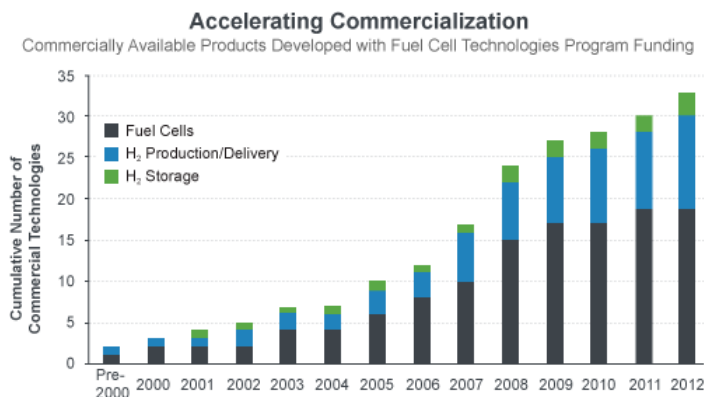
Education • Food Sales • Food Services • Inpatient Healthcare • Lodging • Public Order and Safety

HYDROGEN FUEL CELL INDUSTRY DETAILS

Hydrogen and fuel cell technologies have made significant strides in demonstrating reliability and durability, reducing system costs, and serving emerging markets. Fuel cells can operate 24/7, are NOT dependent on the sun or wind to produce power, and are an effective way to meet Connecticut's RPS standards. Hydrogen can be produced from renewable energy and domestic fuel sources, and can be used to power fuel cells to create electricity for homes, businesses, and automobiles.

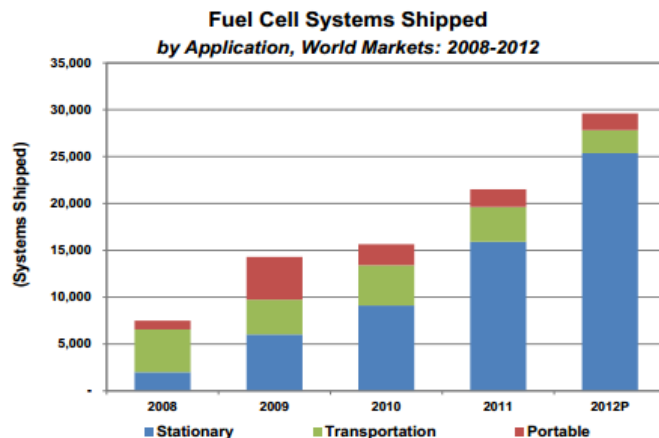
Commercialization

Fuel cell marketability continues to rise due to commercialization of hydrogen fuel cell technologies such as stationary power systems and fueling stations.



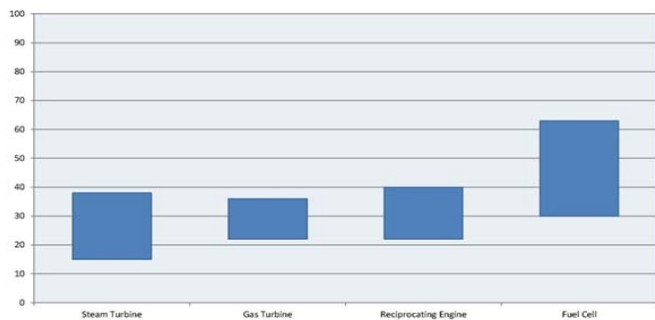
Exports

In 2012, approximately 29,000 fuel cell units were shipped, a significant increase from 22,000 in 2011.



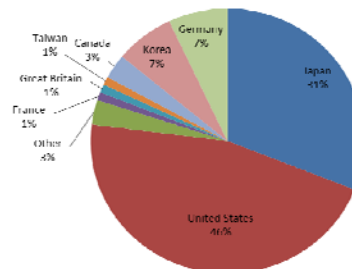
System Efficiency

Fuel cell generation technology can achieve energy efficiencies of 85 percent in combined heat and power applications.



Patents

Fuel Cell Patents Geographic Distribution 2002 - 2011



Over a thousand hydrogen and fuel cell patents were issued worldwide in 2012. The fuel cell industry made up 34% of total global renewable energy patents held by the United States in 2012.

System Cost

As production increases, the average cost per kW decreases.

