



# South Carolina's Hydrogen and Fuel Cell Initiatives

**Shannon Baxter-Clemmons, PhD**

Executive Director of the South Carolina Hydrogen and Fuel Cell Alliance

**Friday, November 4, 2011**

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- A non-profit Public/Private Partnership of academic, government and business coordinating resources in South Carolina to advance commercialization of hydrogen and fuel cells.
- Areas of focus:
  - Education and Outreach
  - Infrastructure Development
  - Policy Development and Implementation
  - Research and Technology Transfer



# Partners



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# Top 5 Fuel Cell State: 2010 and 2011

## State of the States: Fuel Cells in America

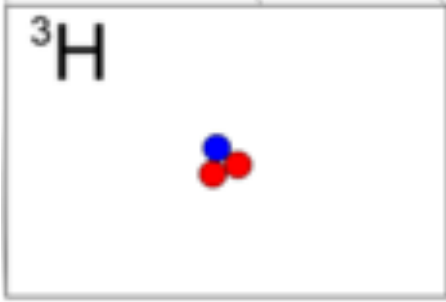


2010 & 2011 Top 5 Fuel Cell States  
(alphabetical order):

California, Connecticut,  
New York, Ohio, and  
**South Carolina**



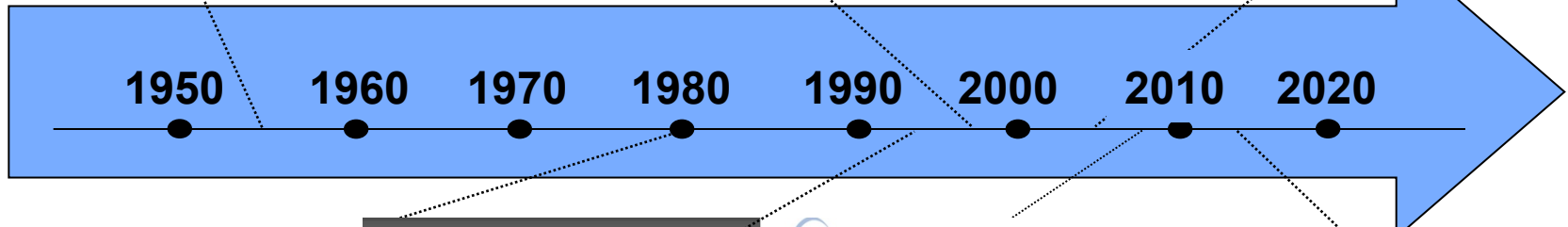
# SRNL Hydrogen Timeline



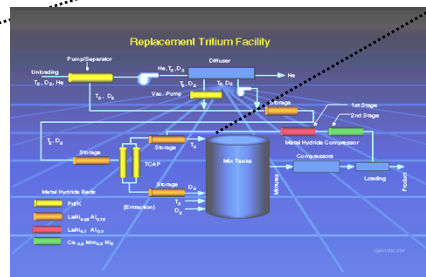
Tritium an isotope of hydrogen  
1st produced at SRS

SRNL hydrogen vehicle  
demonstrations

Center for Hydrogen Research



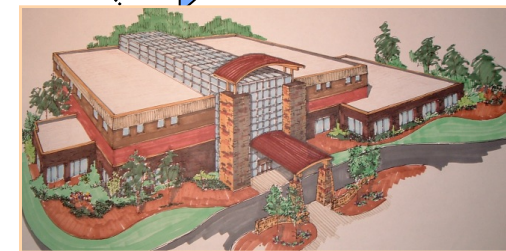
First metal hydride  
system tested at SRS



New Tritium Facility  
Started up with 5 metal  
hydride applications



SRNL named  
DOE's Engineering  
CoE for H2 Storage



National Hydrogen  
Science  
and Technology Center

**R&D 100 Award**

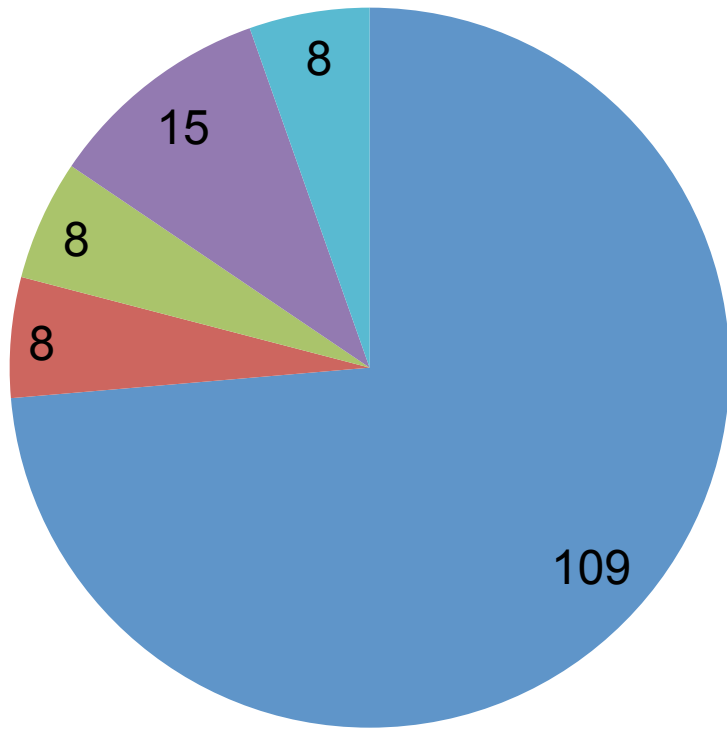


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# New Jobs Created by Location



- 229 jobs exist in the “SC Hydrogen & Fuel Cell Cluster”
- Over a five year span, 148 jobs were created resulting in a growth of 65% percent
- The “SC Hydrogen Fuel Cell Cluster” is defined as an organization involved directly with the research/development, production/implementation or education of hydrogen and fuel cells for the purpose of alternative energy

- Columbia
- Orangeburg
- Charleston
- Aiken
- Greenville/Spartanburg/Clemson



## Jobs and Investment Growth 2004-2009

Number of SC based, hydrogen and fuel cell related start-up companies: 8

Through direct state appropriations and support of the South Carolina Centers of Economic Excellence program, South Carolina has invested over \$12 million in hydrogen.

This has spurred over \$115 million in non-state investments, meaning that our state is leveraging its hydrogen investment dollars at a rate of more than 10 to 1.

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- In early 2010, Proterra, Inc. announced plans to build a full scale R&D center in Greenville
- Over the next five years, Proterra, Inc. plans to construct more than 1,500 buses per year and grow to 1,300 employees – currently, Proterra, Inc. employs about 120 people



# Weylchem

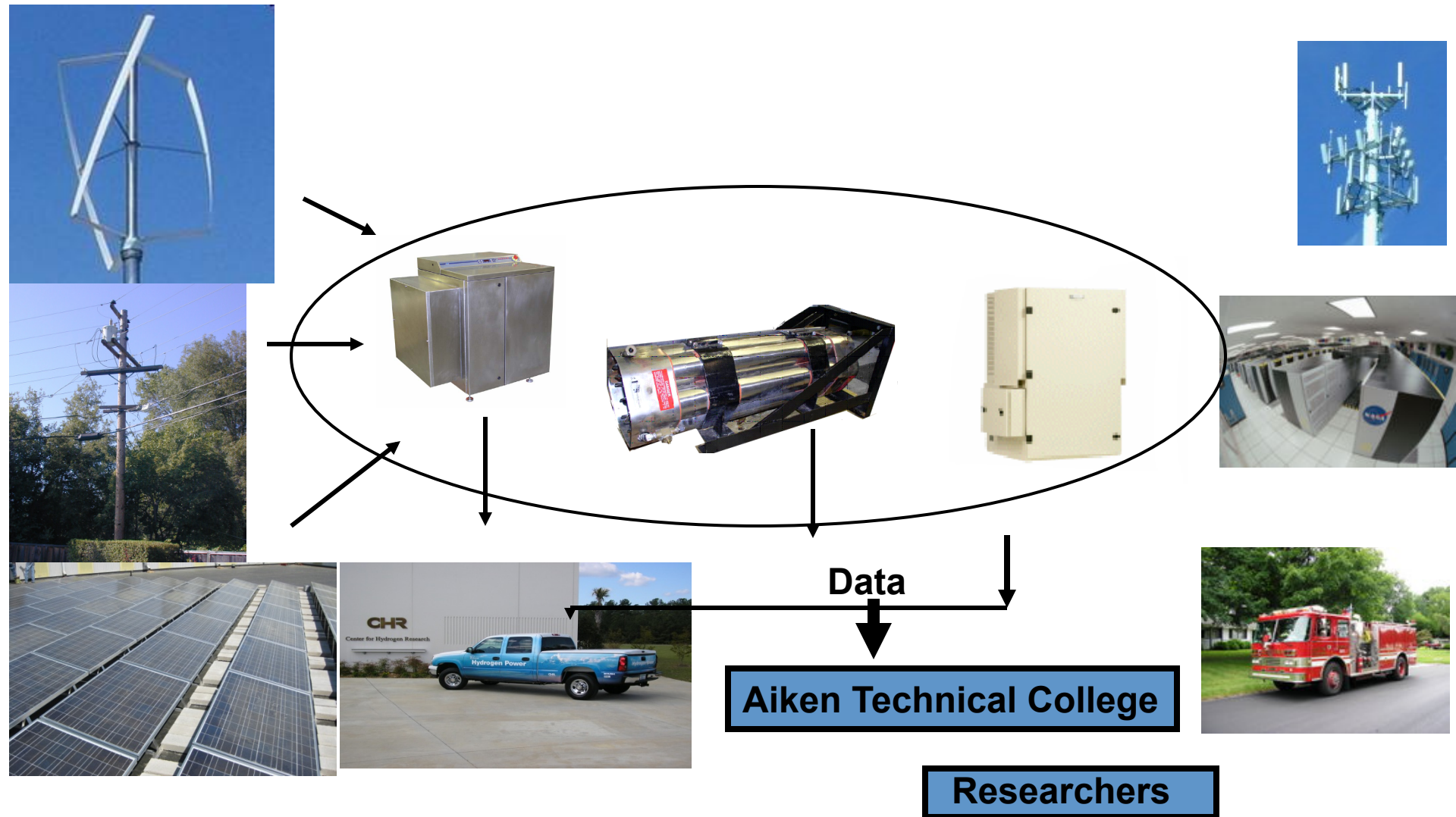
Weylchem Sustainable Materials producing

Ammonia Borane

# Logan Energy Carolinas

Building inverters and mobile fuel cell systems

# Education, Training and Development Laboratory





# Redefining the Cluster

## South Carolina Hydrogen and Fuel Cell Economic Development Strategy 2011 Project

**Objective:** Develop a Blueprint that will document and strategize the production and use of low/no carbon fuels such as hydrogen and the manufacture and use of power producing fuel cells within the Cluster.

**Deliverables:**

1. Blueprint Report, including a detailed strategic Action Plan
2. Cluster map, including a visual representation
3. Supply Chain Map
5. Communication and Marketing plan
6. Database of Cluster jobs and investments

**Sponsors:** U.S. Department of Commerce Economic Development Administration  
AdvanceSC  
SCHFCA Partners

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# US Department of Energy: Hydrogen 101

The Hydrogen 101 program aims to educate state and local government officials as well as business decision makers on the importance and benefits of hydrogen and fuel cells to their communities and organizations.

## Goals:

- encourage adoption and fostering of the technology
- create favorable policy and regulatory structure

## Goals are met by:

- conducting one-on-one meetings
- large in-person seminars
- online webinar presentations
- distribution of informational materials through the website

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# Lift Truck Deployments

## Bridgestone/Firestone

43 Class 1 Lift Trucks

23 adopted in 2007, 20 additional in 2009

On-site hydrogen tube trailer delivery

## GENCO

27 Class 1 Lift Trucks

Adopted in 2010

Liquid Storage from Sage Mill Hydrogen Station

## BMW

Phase 1

86 Units – Mixed Classifications

Phase 2

2<sup>nd</sup> fleet using Reformed Landfill Gas

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## Market Value Proposition: Hydrogen Fuel Cell FORKLIFTS

We can meet with potential new customers and show:

- Examples of very satisfied customers with deployments
- Rules of Thumb for a successful MVP
- Baseline case study
- Cash flow analysis



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- In a 24/7 heavy operation as few as 35 trucks can make a positive case due to battery life
- In lighter usage, about 40-50 trucks are a good starting point to consider switch
- High labor costs are a strong driver for economics
- Hydrogen price comes down with use and is essential to economics
- Need high tax burden to take full advantage of federal tax rebates after 2010
- Payback can be less than 5 years in current market
- Cost of capital could add expenses if financed

# SC Hydrogen and Fuel Cell Permitting Law

Passed into law in June of 2010

Places the authority and responsibility of permitting hydrogen and fuel cells in SC in the jurisdiction of the Office of the State Fire Marshal.

### Benefits:

1. Increases public safety by creating a state expert at the Office of the State Fire Marshal
2. Creates a better business environment for the placement of hydrogen and fuel cell facilities
3. Raises South Carolina's profile as a progressive place for hydrogen and fuel cells
4. Helps local communities recognize hydrogen as a transportation fuel



**South Carolina is the first state in the US to permit hydrogen and fuel cell deployments at the state level using existing internationally recognized codes and standards.**

## **SC Tax Exemption**

South Carolina offers a sales tax exemption for “any device, equipment, or machinery operated by hydrogen or fuel cells, any device, equipment, or machinery used to generate, produce, or distribute hydrogen and designated specifically for hydrogen applications or for fuel cell applications, and any device, equipment, or machinery used predominantly for the manufacturing of, or research and development involving hydrogen or fuel cell technologies.”



## Policy Development & Implementation

# Hydrogen Infrastructure Development Fund

SC taxpayers who contribute to the Fund receive 25% of the donation as a credit against their SC income tax, license fees, or insurance premium tax.

Funds will be distributed in the form of Grants used to promote the development and deployment of hydrogen production, storage, distribution and dispensing infrastructure.

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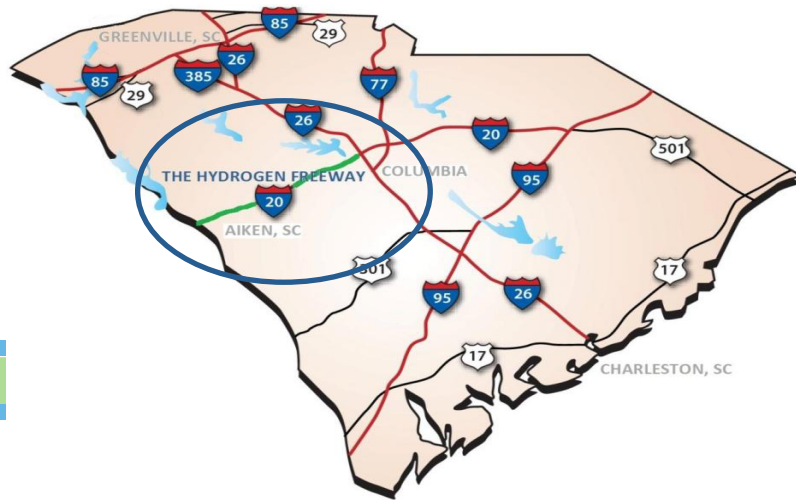
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## Reducing Stranded Investment Through Cooperation

Stations are utilized by H<sub>2</sub> ICEVs,  
FCs on-road and FCs off-road

### South Carolina's Hydrogen Freeway:

- Sage Mill Hydrogen Station  
(Capacity: 80 kg/day)
- Columbia Hydrogen Station  
(Capacity: 120 kg/day)



## Fuel Cells and Solar



## Landfill Gas – to – Hydrogen Production for Use in Industrial Material Handling Fleet



**August 23, 2011**

**SC Hydrogen and Fuel Cell Cluster met with Sec. Chu and Rep. Clyburn**



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## Finding Opportunities

In 2010, the SCHFCA took over management of the ***Fuel Cell Seminar & Exposition***, a premier International tradeshow in North America



The 2012 FCS&E will be in Connecticut,  
November 5<sup>th</sup> – 8<sup>th</sup> at the *Mohegan Sun*.

<http://www.fuelcellseminar.com/>  @FuelCellSeminar

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# Contact Information

## Check-out South Carolina!



**Shannon Baxter-Clemmons, PhD**

*Executive Director*

*1225 Laurel St, Suite 428*

*Columbia, SC 29201*

*803-545-0189*

[baxterclemmons@schydrogen.org](mailto:baxterclemmons@schydrogen.org)

[www.schydrogen.org](http://www.schydrogen.org)

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