



# Hydrogen and Fuel Cell Early Markets:

## Ohio's Perspective

September 12, 2007



# The Third Frontier Project



## Third Frontier Project Description

- The Third Frontier Project was initiated in February 2002.
- The project is the Ohio's largest-ever commitment to expanding the state's high-tech research capabilities and promoting start-up companies and the expansion of existing companies through the application of technology.
- Designed to encourage collaboration among and between industry, government and universities.

# Third Frontier Project Description

- The Third Frontier Project is a 10-year, \$1.6 billion technology-based economic development initiative designed to:
  - Build world-class research capacity
  - Support early stage capital formation and the development of new products
  - Finance advanced manufacturing technologies to help existing industries become more productive.

# Ohio's Fuel Cell Initiative

- Announced on 5/9/02
- \$103 million, 3 year effort
- Extended in 2005 for additional 3 years, \$100 M
- Core focus areas:
  - 1) Expand the state's research capabilities;
  - 2) Participate in demonstration projects; and
  - 3) Expand the fuel cell industry in Ohio

# Ohio's Fuel Cell Initiative

## Strategy

- Size of the Industry
- R&D Strengths
- Supply Chain
- Work Force
- Fuel Cell Roadmap
- Cache

## Public Support

- Federal R&D Monies
- State R&D Monies
- Economic Development Programs
- Demonstration Projects
- Company Attraction
- Point Person

## Advocacy

- Ohio Fuel Cell Coalition
- Ohio Fuel Cell Symposium
- Ohio Congressional Strength

# Ohio's Fuel Cell Roadmap



- The Mission
  - Create a Vigorous Fuel Cell Industry
- The Goals
  - 1) Grow the Fuel Cell Cluster
  - 2) Stimulate Early Market Demand

# Ohio's Fuel Cell Roadmap

## Goal 1: Grow the Fuel Cell Cluster

- Support Technology Development
- Support Current Companies
- Build Future Value Chain
- Attract New Companies

## Goal 2: Stimulate Early Market Demand

- Demonstrate Innovative Technologies
- Support Early Adoption Market

# State Funding

- In the past four years, the State of Ohio has invested over \$63 million in various fuel cell-related projects throughout the State
  - \$19.6 million: Wright Fuel Cell Group
  - \$27 million: Third Frontier Fuel Cell Program grants
  - \$7.4 million: Fuel Cell Demonstration grants
  - \$2 million: Fuel Cell Prototyping Center
  - \$2 million: Photovoltaic Electricity & Hydrogen
  - \$1.5 million: Biomass to Electricity System
  - \$500,000: Coal-to-Hydrogen grants

## Case Study: Cellex

- Project Title: “Hydrogen Fuel Cell Solutions for Use in Industrial Vehicles”
- Collaborators: The BOC Group; OKI Systems Limited
- Award Amount: \$1 million
- Project Description: A 4-month beta test consisting of 12 fuel cell powered rider pallet trucks in two Wal-Mart distribution centers in Ohio.

# Target Market: Electric Lift Trucks



Class 3



Class 2



Class 1

- North American customers want transparent fuel cell products to power the various OEM models in their lift truck fleets
- Cellex has been focused on class 3 pallet truck first

# Market Driven Value Proposition

- Cellex has lead position with high value/early adopter customers with compelling economic value proposition.

WAL\*MART



- Class 3 pallet truck application (Cellex's Product CX-P150) is the earliest commercial opportunity
  - Lowest cost – highest value product
  - Lowest risk entry point
  - Highest strategic value (represent 65% - 70% of the largest customer fleets)
- Class 3 market is the gateway to the complete lift truck market (class 2, class 1 and ICE trucks)



# Customer Value Proposition

- **Labor Savings**
  - Eliminate labor costs associated with changing batteries – operator downtime and maintenance personnel
- **Increased Productivity**
  - Extended on-floor truck time due to faster and less frequent fueling
  - Consistent voltage of Cellex's fuel cell unit eliminates battery and speed droop
  - Productivity and Operator Incentives are in place to quantify economic benefits
- **Reduced lift truck motor maintenance**
  - Maintenance cost savings expected
- **Battery Room Eliminated**
  - Valuable cubic warehouse space becomes available
- **Improved Safety and Environmental Benefits**
  - Removal of lead and acid improves workplace safety and lower CO<sub>2</sub> emissions when compared to grid in most locations

# Beta Trial Success at Wal-Mart

- 12 Cellex units operated for 4-months at 2 Wal-Mart DCs in Ohio
- Over 18,500 operational hours logged
- Over 100 operators and maintenance staff trained
- Service provided by OKI Systems (an Ohio based lift truck dealer) - trained by Cellex
- Productivity tracked by Wal-Mart to validate value proposition
- Positive feedback from operators and management
- Trials concluded November 2nd, 2006

# Beta Trial Success at Wal-Mart

- Over 2,100 hydrogen fueling events logged
- Lift truck operators fueled themselves
  - Safely and quickly
- Extended run times versus batteries confirmed
  - 16 hours order picking, 9 hours hauling
- ODOD funding allowed Cellex and Linde BOC to design and test indoor refueling dispensing system
- Operator refueling is the critical economic driver of the value proposition



# Beta Refueling System



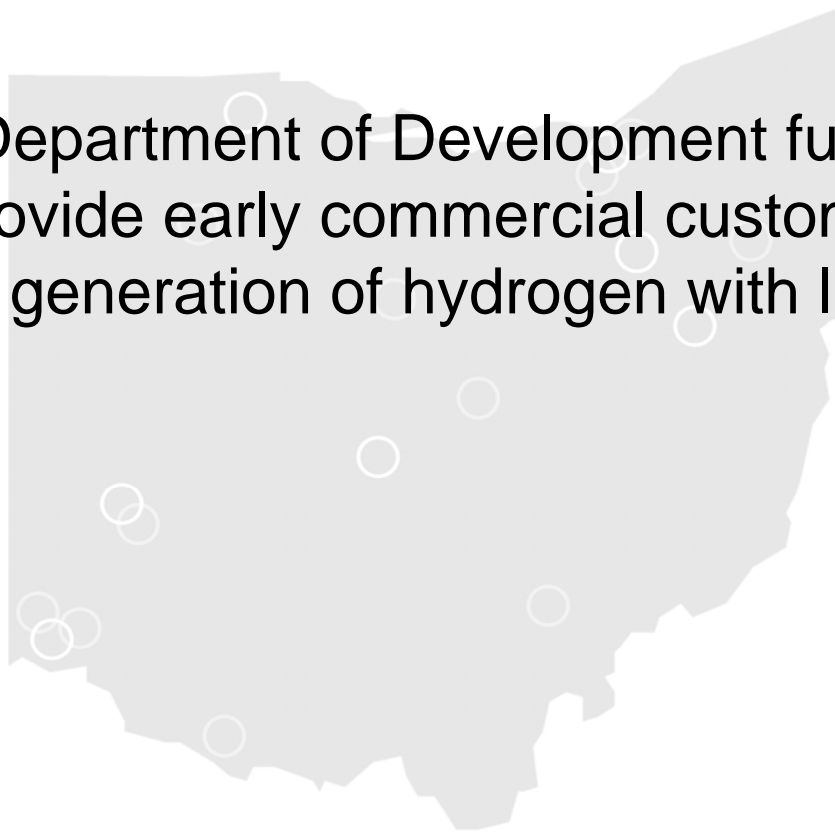
Fueling Infrastructure  
Located Outside

# Indoor Fueling Stations



## Next Steps

- New Ohio Department of Development funding will allow Cellex to provide early commercial customer (Wal-Mart) with on-site generation of hydrogen with liquid back up.



## FY08 Third Frontier Fuel Cell Program

- RFP Expected Release in October 2007
- Awards Likely Announced in April 2008
- Available Funding: up to \$12 million
- Grant Awards: \$250,000 to \$1 million
- Cost Share: 1:2
- Project Period: up to 24 months

## FY08 Third Frontier Fuel Cell Program

- Proposals must be a collaborative effort
- Teams with stronger commercialization structures will be viewed more favorably than teams without access to the commercial market.
- Out-of-state applicants are eligible to receive awards but they must commit to establish a principal place of business in Ohio before any funding is released and within 6 months of award notification
- Economic benefit and value to the state of Ohio is the #1 evaluation criteria.

## Ohio Fuel Cell Initiative

"Ohio's history of fuel cell development work; its large number of fuel cell-related companies; its strong university research tradition; and strong government support, led by your governor, combine to make Ohio a true fuel cell center. There can be no doubt that you have placed your bet on the right horse."

*- Mark Maddox, Acting Asst. Sec. for Fossil Energy, US Department of Energy. Keynote remarks on May 25, 2004 at the 2004 Ohio Fuel Cell Symposium*

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