VOLPE center

The National Transportation Systems Center

The Role of Hydrogen in United States Rail Transit Future

U.S. Department of Transportation
Research and Innovative Technology Administration

Greg Ayres

Research & Innovative Technology Administration

U.S. Department of Transportation

4th International Hydrail Conference

Valencia, Spain

June 9, 2008

U.S. Volpe National Transportation Systems Center

- Vision: To Be the Leading U.S. Federal Center of Excellence for Innovative Transportation Systems Solutions
- Part of Research & Innovative Technology Administration
- Multimodal Research Center, est. 1970
- History of Successful Projects With U.S. Government Agencies and International Transportation Ministries
- Fee For Service

Outline

- Volpe Center's Role in U.S. Hydrogen Transit Research
- U.S. Fuel Cell Rail Projects
- Volpe Center's Work on U.S. Electric Drive Strategic Plan

Volpe Center's Role in U.S. Hydrogen Transit Vehicle Research

- Volpe Center Has Supported U.S. Fuel Cell Bus Programs for Many Years
  - Led By U.S. Federal Transit Administration
  - Demonstration & Deployment, Testing & Evaluation, Outreach & Coordination
  - Then (1998): First PEM Fuel Cell Public Bus (Chicago)
  - Today: Eight buses currently in service
  - Future: Up to 12 More Planned by 2012
- Results
  - Transit Research Tends to Influence Larger Markets
  - e.g., Hybrid Electric Buses
- Other Activities Under U.S. Hydrogen Fuel Initiative

U.S. Hydrogen Transit Vehicle Research: New Opportunities

- History of Successful U.S. Fuel Cell Bus Research and Development
- Opportunity to Transfer Fuel Cell Bus Technology to Rail Systems
  - Rail Vehicles Can Use Many FC Bus Components
  - New Electrified Rail Systems are Expensive
  - Overhead Wires are Undesirable, Inefficient
  - U.S. Grid Power is Not Always Clean
- U.S. Electric Drive Strategic Plan Now in Development
- Volpe Center is Helping to Lead This Activity

Survey of U.S. Fuel Cell Rail Research Projects and Proposals

- Growing Interest
- Not Currently Funded by U.S. Department of Transportation
- Fuel Cell Switcher Locomotive
- Fuel Cell Subway Maintenance Locomotive
- Stationary Fuel Cells for Traction Power Backup

Fuel Cell Switcher Locomotive

- U.S. Dept. of Defense and BNSF Railway
- Developed Quickly Using Hybrid Electric Switcher and Fuel Cell Bus Components
- Zero Emissions, Unlike Diesel Switchers
- Ideal for Stop-and-Go Cycles
- Fabrication Nearly Complete
- Demonstrations: Seaport and Army Base

Fuel Cell Subway Maintenance Locomotive

- Transport Workers and Machines During Maintenance Operations (Rails Unpowered)
- Longer Range than Battery Powered Vehicles; No recharging
- Designed for Safe Operation in Tunnels
- Concept Phase

Stationary Fuel Cell Tractive Power Generation

- Connecticut Department of Transportation
- Stationary Fuel Cells Could Provide Alternate Traction Power Source for Existing Electrified Commuter Rail Service
- Power Transmission Congestion in Connecticut Poses Risk of Service Disruptions
- Study Complete; More Analysis Needed

Hydrogen Streetcar Projects

- Several Cities Investigating Hydrogen Fuel Cell Powered Streetcars
- New Systems Where Overhead Wires Are Not Desirable
- Can Use Many Fuel Cell Bus Components
- Concept Phase

U.S. Electric Drive Strategic Plan: Objectives

- Identify & Prioritize Research Activities That U.S. Federal Transit Administration Could Perform to Support Transit Operators Adopting Electric Drive Technology
- 20 Year Timeframe (2010-2030)
- 5 Year Action Plan (Beginning 2010)
- 5-year Research Plan in a 20 Year Strategic Context
- Bus and Rail Focus

U.S. Electric Drive Strategic Plan: Outcomes

- Using Industry Input and Guidance, Develop a Viable Draft for the 2008 American Public Transportation Association Expo (October)
- Brief New U.S. Department of Transportation Secretary in 2009
- Provide Input for the Next Congressional Transportation Authorization

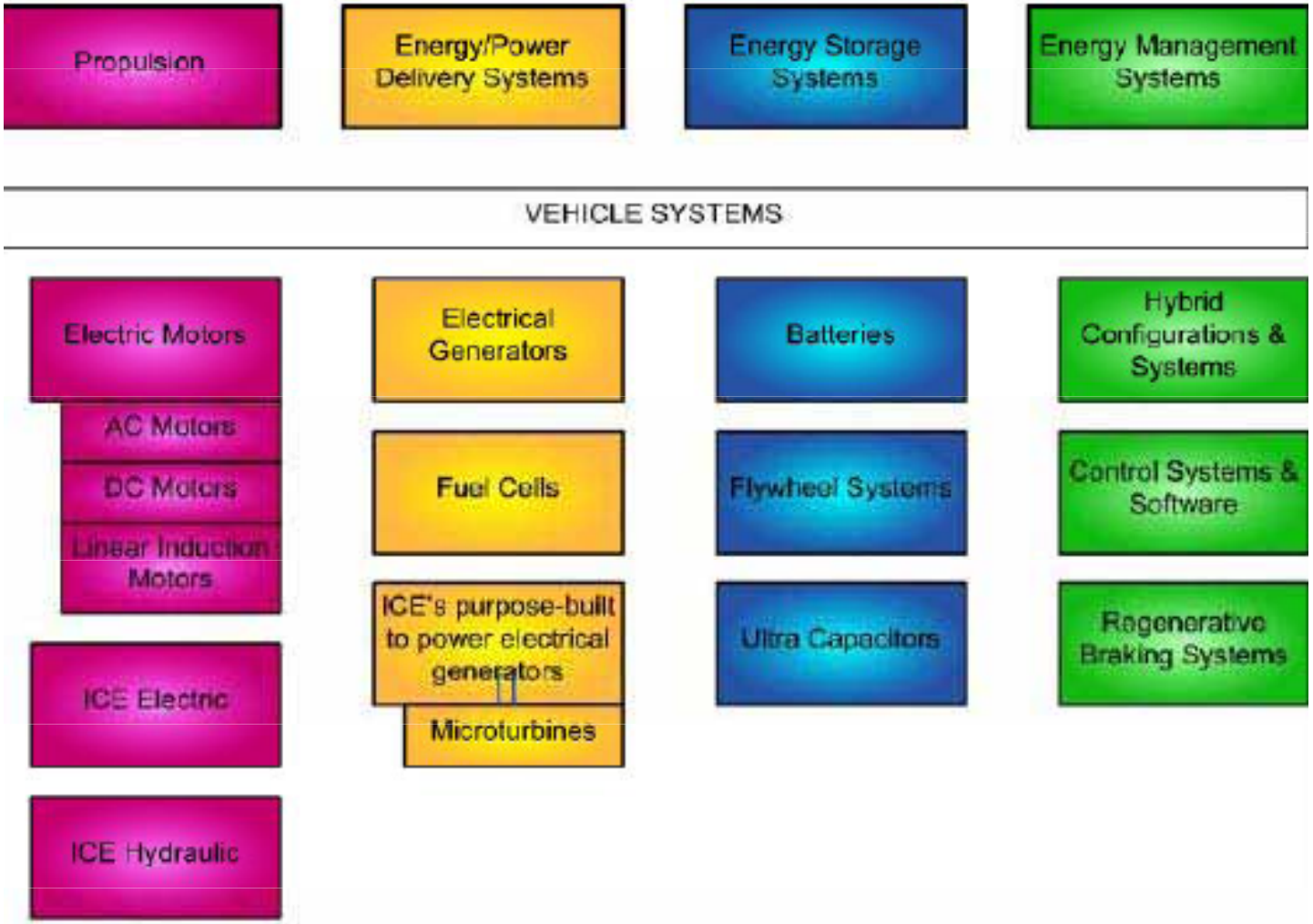
Volpe Center's Work on U.S. Electric Drive Strategic Plan

- Working with U.S. Federal Transit Administration, U.S. Federal Rail Administration and WestStart/CALSTART
- Helped Establish Steering Group Comprised of U.S. Industry, Academic, and Equipment Supplier Representatives
- Facilitating Group Discussions and Capturing Results
- Performing Technical Analyses and Asssessments
  - Technology Typology
  - Commercialization Plan
  - Survey of Complementary Research/Gap Analysis
- Writing and Editing Strategic Plan
- Public Outreach

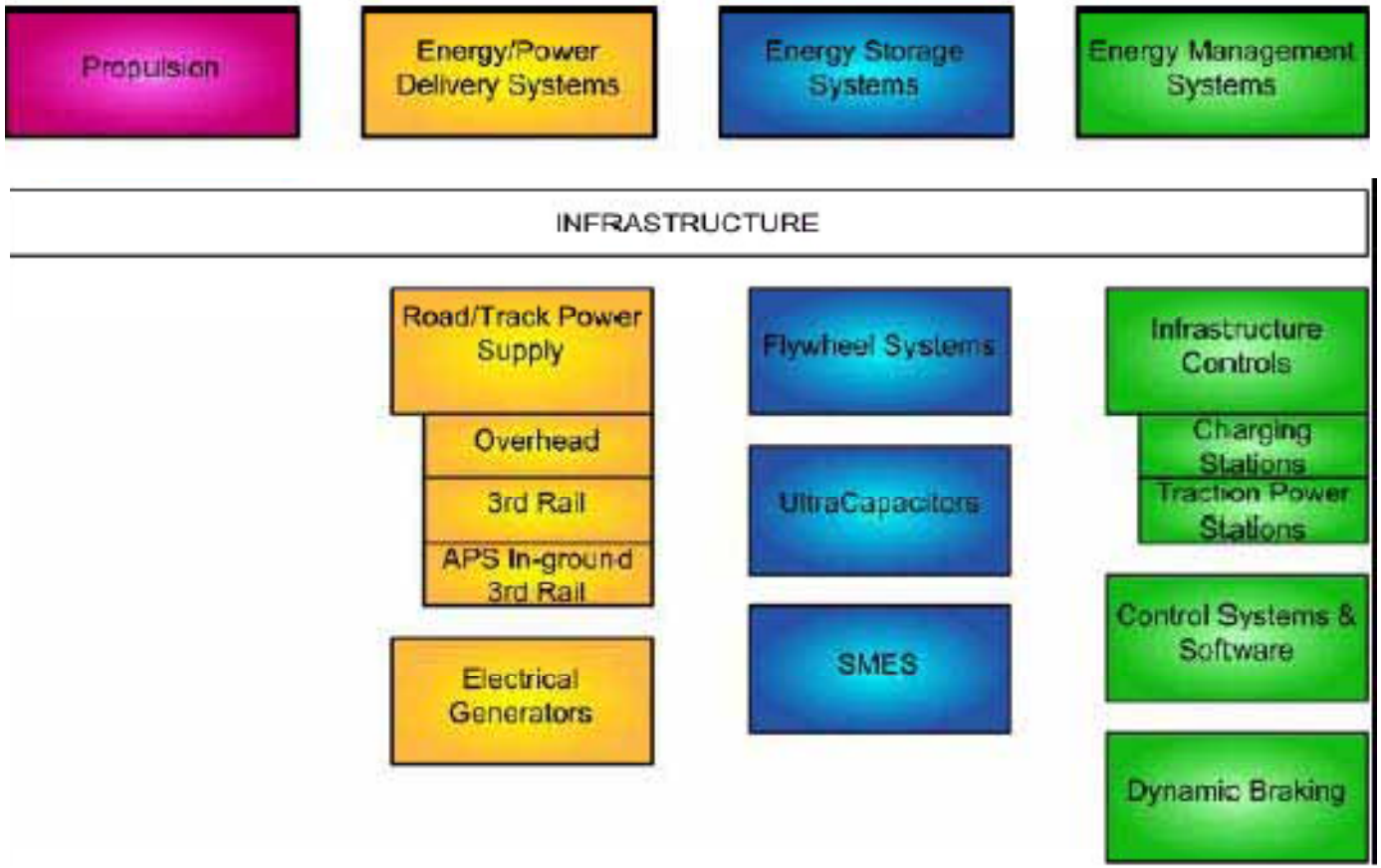
U.S. Electric Drive Strategic Plan: Rail Technology Pathways

- On-Board Energy Storage
- Trackside Energy Storage
- Hybrid-Electric Vehicles
- Fuel Cell Vehicles

Electric Drive Vehicle Typology



Electric Drive Vehicle Typology



Volpe Center Capabilities: Alternative Fuels Research

- Hydrogen Transit Research Support
  - Design and Operation Guidelines
  - Safety Analyses
  - Program Management Support
- Broad Alternative Fuels Program
  - Alternative Fuels Roadmap
  - Coordination With Industry Groups
  - Engagement With Codes & Standards Developers

For More Information

Greg Ayres
U.S. Department of Transportation/RITA
Volpe Center
55 Broadway
Cambridge, MA 02142
Ayres@volpe.dot.gov