CNG AND HYDROGEN FUEL CELLS

CLEANER

SARTA

GREENER

CNG
Proline Ridership Profile

Proline Origin Locations - October 2009
- Within 1/4 mile of SARTA Fixed Route
- More than 1/4 mile from SARTA Fixed Route

Source: October 2009 Proline Data
SARTA Key Facts

• Transport 2.8 million passengers in 2016
• 212 employees
• $22 million budget
• Operates express routes to Akron and Cleveland (the longest route in Ohio)
• 30 routes and countywide paratransit
• Extensive use of technology
History of Innovation

• Conducted Evaluation of Diesel Electric Hybrids
• Evaluation of duel fuel CNG
• Largest Solar Array in Ohio
• First system in Ohio to have own app
• LEED certified buildings
SARTA Vehicle Types

- 7 H2 Fuel Cell buses
- 11 CNG Paratransit
- 11 CNG MV1
- 8 GNG transit buses
- 3 CNG Honda Civics
- 3 CNG Chrysler Town & County
- 4 Diesel Electric Hybrids
- 1 Diesel/CNG Duel Fuel
- 33 buses use B5 bio diesel
SARTA Initiatives

Going GREEN – Hybrid Vehicles, Bike Racks on Buses
**Diesel Electric Hybrid**

<table>
<thead>
<tr>
<th></th>
<th>Hybrid Average</th>
<th>Conventional Average</th>
<th>Hybrid Improvement</th>
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<tbody>
<tr>
<td><strong>January - July</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calculated MPG</td>
<td>5.44</td>
<td>4.68</td>
<td><strong>14.10%</strong></td>
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<tr>
<td>Fuel Cost per Mile</td>
<td>0.44</td>
<td>0.52</td>
<td><strong>16.25%</strong></td>
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<tr>
<td>CO₂ Emissions Per Bus (in lbs)</td>
<td>4101.65</td>
<td>5411.76</td>
<td><strong>24.21%</strong></td>
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SARTA CNG Usage

• OVER 15,000 PUBLIC USES PER YEAR
• 600,000 DGE
• Busiest public CNG facility in Ohio
• Public transactions are by credit card
• Users: Kimble, Pepsico, Hometown Ice, Earth & Wood, and Waste Management
Public Station
CNG Compound
Site Work
Pipe Layout
Pipes and More Pipes
Digging up everything...
CNG Compound
National Fuel Cell Bus Program

- Part of a $90 million Federal Transit Administration program
- Goal is to demonstrate fuel cell buses
- Set goals for performance and demonstration of vehicles
- Deployed vehicles IN NY, CA, MA, and SC
- 2 fuel cell buses will be in Canton
- Total federal funding is $5.54 million
Reliability Testing

- Second bus will be put through FTA’s required durability test at Altoona,
- This is required for any vehicle to be offered commercially as a production vehicle.
- Both buses should start production later in 2015.
SARTA Fuel Cell Bus
Bus at the Statehouse
What is a fuel cell?
System Layout

- Hydrogen Tanks
- Fuel Cell Supply Unit
- Fuel Cells
- Air Condition
- Transmission
- Electric Motor
- Auxiliary Components
Fuel cell and converter
Hydrogen compressors
Compressor Pad
Station Controls
No Emissions Bus Program

- SARTA, CALSTART, OSU, Sandia National Laboratory, National Renewal Laboratory Honda, Ballard, BAE, El Dorado are partner to bring 5 Fuel Cell buses to Ohio
- Sunline Transit in Palm Springs, CA
- FTA awarded $8.9 million and ODOT assisting with $4 million
NOLO Proposal

• This will be the largest order of American fuel cell buses produced in the nation
• Will be the interim step between demonstration and a production model.
• Also drives down the cost curve toward commercialization
• Provides the transit industry a heavy duty zero emissions vehicle.
Hydrogen Station at UC Irvine
Fuel Cell Car
Bio Digester
De-Sulfur
Retail Focus at Existing Service Stations

Existing gasoline stations will be “modernized” with a hydrogen dispenser for a look and feel that is retail-like and customer friendly.
Duck Curve