SARTA FUEL CELL BUS AND FUELING PROJECT

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 2014
• 210 employees
• $18 million budget
• Operates express routes to Akron and Cleveland (the longest route in Ohio)
• 30 routes and countywide paratransit
• Extensive use of technology
SARTA Vehicle Types

- 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
- 40 buses use B5 bio diesel
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
SARTA Fuel Cell Bus
Fuel cell and converter
Bus at the Statehouse
Inside Fuel Cell Bus
Compressors
# Bus Specification

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
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<tbody>
<tr>
<td>Bus chassis/model</td>
<td>ElDorado Nacional 40' AXESS</td>
</tr>
<tr>
<td>Curb weight</td>
<td>34,800 lb (15,785 kg)</td>
</tr>
<tr>
<td>Seats/stands</td>
<td>37 plus driver/19 standees</td>
</tr>
<tr>
<td>Power plant</td>
<td>Ballard Power Systems FCvelocity®-HD6, 150 kW fuel cell</td>
</tr>
<tr>
<td>Hybrid system</td>
<td>BAE Systems Series HybriDrive® propulsion system</td>
</tr>
<tr>
<td>Electrical energy storage</td>
<td>200 kW, 11.2 kWhr nanophosphate Li-Ion energy storage</td>
</tr>
<tr>
<td>Accessories</td>
<td>Electronic alternator, electrically driven cooling systems, HVAC, power steering, and air compressor</td>
</tr>
<tr>
<td>Fuel storage</td>
<td>Gaseous hydrogen: 50 kg at 350 bar</td>
</tr>
<tr>
<td>Range</td>
<td>260 miles (418 Km) under typical urban transit cycle and loads</td>
</tr>
<tr>
<td>Length, width, height</td>
<td>493.5 in (12.5 m) L; 102 in (2.6 m) W; 139 in (3.5 m) H</td>
</tr>
</tbody>
</table>
Compressor Pad
Hydrogen compressors
Hydrogen Storage
# Project Goals for FTA/DOE

<table>
<thead>
<tr>
<th></th>
<th>Draft target</th>
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<tbody>
<tr>
<td>Bus Lifetime</td>
<td>12 years/500,000</td>
<td>Bus Avial</td>
</tr>
<tr>
<td>Powerplant Life</td>
<td>25,000 Hours, 6 years</td>
<td>Road Call frequency</td>
</tr>
<tr>
<td>Fuel Economy</td>
<td>8 Miles per Gall diesel</td>
<td>Operation time</td>
</tr>
<tr>
<td>Powerplant cost</td>
<td>$200,000</td>
<td>Range</td>
</tr>
</tbody>
</table>
No Emissions Bus Program

- SARTA, CALSTART, OSU, Sandia National Laboratory, National Renewal Laboratory Honda, Ballard, BAE, El Dorado are partner to bring 8 Fuel Cell buses to Ohio
- Sunline Transit in Palm Springs, CA
- FTA and ODOT awarded over $20 million
HSH Prince Albert II of Monaco
The Prince at OSU
Why Fuel Cells:

• Why did We get involved with fuel cells?
• What are our motivations? Expectations?
• Supply Chain
• Why should others support fuel cells?