Is Commuter Rail Green?

Robert Aloise, PE
Project Manager
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Green Factors

- Competing forms of Transportation
- Ridership
- Type of Rail Equipment
- Type of Emissions Considered
Pollutants

- EPA Tiers 0, 1, and 2 emission standards already in effect
- EPA Tiers 3 and 4 emissions standards coming on line in 2012 and 2015
- EPA – different standards for different transport modes makes head to head comparisons difficult
Emissions Comparison

Colorado Railcar Diesel Multiple Unit (DMU)

Ratio of emissions:
Highway Vehicle/Colorado Railcar Rider*

<table>
<thead>
<tr>
<th></th>
<th>CO$_2$</th>
<th>PM</th>
<th>NO$_x$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Carbon Dioxide</td>
<td>Particulate Matter</td>
<td>Nitrogen Oxides</td>
</tr>
<tr>
<td>Railcar 1</td>
<td>3.4</td>
<td>4.0</td>
<td>5.7</td>
</tr>
<tr>
<td>Railcar 2</td>
<td>4.3</td>
<td>5.2</td>
<td>7.3</td>
</tr>
</tbody>
</table>

Railcar 1 = single-level passenger car pulling a single-level trailer
Railcar 2 = double-level passenger car
* Single Occupancy Automobile, DMU at 26% ridership capacity
Evaluating Commuter Rail Emissions

- Emissions/Passenger Mile (Actual)
- Emissions/Seat Mile (Potential)
- Availability of emissions data
  - Carbon Dioxide (CO₂)
CO₂ Emissions

Average for US Transportation Modes (lbs/passenger-mile)

Based on actual occupancy rates except for Airplane (70% occupancy used)
Range of Rail CO\textsubscript{2} Footprints

<table>
<thead>
<tr>
<th>Type of Rail</th>
<th>(number of metros reviewed)</th>
<th>CO\textsubscript{2} (lbs/passenger mile)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commuter Rail (7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light Rail (19)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heavy Rail (14)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metro-North</td>
<td></td>
<td></td>
</tr>
<tr>
<td>San Diego</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cleveland</td>
<td></td>
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<tr>
<td>Pittsburgh</td>
<td></td>
<td></td>
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<tr>
<td>Newark</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Philadelphia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>US Avg. Single</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rail Average</td>
<td></td>
<td></td>
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</table>

(Includes Source of Emissions)
New Technology: How Clean Can We Travel?

- Toyota Prius*
- European Automobiles*
- US Automobiles**
- Colorado Railcar DMU*** (at capacity)
- Colorado Railcar DMU*** (26% capacity)
- Average US Commuter Rail

* 1.5 occupants per vehicle
** 1.5 occupants per vehicle, data for Ford auto fleet
*** Double-level passenger car
Going Green

“Transit expansions should be planned carefully to target areas with sufficient ridership” (FHWA)

- Where ridership is sufficient, commuter rail can be significantly ‘greener’ than automobile travel
- Metro-North CO₂ emissions (per passenger mile) are significantly less than that for Automobiles
- New EPA standards and Cleaner Rail Technology will result in ‘greener’ rail travel
Rail Passenger Service In Connecticut

• **New Haven Line**
  – Operated by MTA Metro-North
  – Main Line (New Haven to Grand Central Terminal)
  – Three Branch Lines (Waterbury, Danbury, New Canaan)

• **Shore Line East**
  – Operated by Amtrak
  – New London to New Haven, with additional express service to Bridgeport and Stamford

• **Amtrak**
  – Northeast Corridor/Acela along the shore, interior route from New Haven to Hartford and Springfield
Regional Ridership

Over 750,000 riders per day on region’s key commuter lines (Metro-North, Long Island RR, and MBTA)

Amtrak serves an additional 20,000 riders per day in the region
Connecticut’s Passenger Lines
New Haven Line

- Current Equipment Status
- Ridership Trend
- Supported with local bus service to employer locations at most stations

<table>
<thead>
<tr>
<th></th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
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</thead>
<tbody>
<tr>
<td>Electric Multiple-Unit (EMU) cars:</td>
<td>344</td>
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<tr>
<td>Connecticut-owned EMUs:</td>
<td>185</td>
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<td>Push-pull coaches:</td>
<td>36</td>
<td>36</td>
<td>44</td>
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<tr>
<td>Locomotives:</td>
<td>14</td>
<td>10</td>
<td>16</td>
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<tr>
<td>CT Stations:</td>
<td>36</td>
<td>36</td>
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<td>36</td>
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<tr>
<td>CT Towns:</td>
<td>22</td>
<td>22</td>
<td>22</td>
<td>22</td>
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<tr>
<td>Weekday Trains:</td>
<td>262</td>
<td>266</td>
<td>270</td>
<td>274</td>
<td>283</td>
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<td>Saturday Trains:</td>
<td>168</td>
<td>169</td>
<td>173</td>
<td>176</td>
<td>176</td>
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<tr>
<td>Sunday/Holiday Trains:</td>
<td>136</td>
<td>139</td>
<td>144</td>
<td>144</td>
<td>146</td>
</tr>
<tr>
<td>Annual Passenger Trips:</td>
<td>33,219,666</td>
<td>33,102,218</td>
<td>33,891,520</td>
<td>34,935,152</td>
<td>36,360,341</td>
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<tr>
<td>Connecticut Trips:</td>
<td>20,789,870</td>
<td>21,236,255</td>
<td>21,798,769</td>
<td>21,236,255</td>
<td>23,735,912</td>
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</tbody>
</table>
Shore Line East

- Current Equipment Status
- Ridership Trend
- Shore Line Express to Bridgeport and Stamford
- Commuter Connection bus service at New Haven and Stamford

<table>
<thead>
<tr>
<th></th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
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<tbody>
<tr>
<td>Push-pull coaches</td>
<td>22</td>
<td>22</td>
<td>34</td>
<td>28</td>
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<tr>
<td>Locomotives</td>
<td>6</td>
<td>8</td>
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<tr>
<td>CT Stations</td>
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<td>CT Towns</td>
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<tr>
<td>Weekday Trains</td>
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<td>21</td>
<td>21</td>
<td>21</td>
<td>23</td>
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<tr>
<td>Weekend Trains</td>
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<td></td>
<td></td>
<td>16</td>
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<tr>
<td>Annual Passenger Trips</td>
<td>385,501</td>
<td>405,436</td>
<td>423,470</td>
<td>458,480</td>
<td>483,743</td>
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(2008)
Major Capital Projects

• Rail Infrastructure
  – Catenary Replacement
  – Bridges
  – Facilities
  • Running Repair (Fall 2006)
  • NH Yard Maintenance Facilities for new M8s
Major Capital Projects
M8 Rail Cars

• M8 Rail Cars
  – Focus Groups: March/April 2006
  – Award: July 2006 to Kawasaki Rail Car
  – Delivery: 2009
  – Funded for 300 cars with option to 380
Stations

• Shore Line East Stations
  – State Street
  – Branford, Guilford, Clinton
  – Madison, Westbrook

• New Haven Line Stations
  – Bridgeport
  – Fairfield Metro Center
  – Stratford Parking Garage
  – West Haven/Orange
Planned / Programmed Initiatives

- New Haven-Hartford-Springfield Commuter Rail
- Rail Coach Rehabilitation
- West Haven Rail Station and Parking
- Branch Line Improvements:
  - Rail Station and Parking Improvements – New Haven Line
Planning Studies

- NHL Danbury Branch Rail Needs and Re-electrification Study
- West Haven/Orange Railroad Station Study
- New Haven – Hartford – Springfield Commuter Rail Service Implementation Program (coordinated with New Britain-Hartford Busway and BDL connection)
- NHL EMU Fleet Replacement Strategy
- CT Rail Station Governance Study
- Northeast Rail Operations Study (I-95 Corridor Coalition)
- Waterbury-New Canaan Needs and Feasibility Study
Intercity and Commuter Operations
Rail and Transit – Relevant Green Initiatives

National, Regional, and Local Efforts

Stephen Gazillo, AICP
Director of Transportation Planning
URS Corp. Rocky Hill, CT
Sustainability Initiative

- APTA represents rail and transit agencies across U.S. and internationally
- ConnDOT and CT Transit are members
Draft Principles for APTA members

- Make sustainability a strategic objective
- Identify a sustainability champion
- Undertake sustainability audit
- Establish outreach program
- Final Draft Expected January 2009
Blue Ribbon Commission on Sustainability and the MTA

- MTA – 5,000-square mile public transportation service area in the Greater New York metropolitan region
- Includes the Long Island Rail Road, MTA New York City Transit, MTA Bridges and Tunnels, Metro-North Railroad, Long Island Bus, MTA Capital Construction and MTA Bus Company
- Metro-North Railroad operates all commuter rail in Connecticut
Blue Ribbon Commission on Sustainability and the MTA

- CT Members include - Julie Belaga, Co-chair Connecticut League of Conservation Voters and former ConnDOT Commissioner Emil H. Frankel
- Objectives: identify ways to expand capacity of the region’s transit system; manage the MTA’s ecological footprint

www.mta.info/environment
Blue Ribbon Commission on Sustainability and the MTA

• Sustainability Working Groups cover:
  – **Energy/Carbon** (Energy Use, Fuel Consumption, Emissions)
  – **Facilities** (Building/facility design, construction O&M)
  – **Materials Flow** (Procurement, Waste Mgt., Recycling)
  – **Water Management** (Water Resources, Mgt., Conservation and Protection)
  – **Smart Growth/TOD** (Expansion planning, transit access, TOD)
TOD Projects and Responsible Growth

Incentive Fund – legislation passed in 2007
up to $5 million in bonds for TOD authorized

Pilot Projects: New London rail station, New Britain-Hartford Busway corridor, Windsor and Meriden stations on New Haven to Springfield line
Passed by CT General Assembly in 2007
Can be an indirect tool to promote TOD - provides grants to municipalities to create affordable housing and foster economic development in higher density urban centers
American Institute of Architects (AIA)  
Communities by Design  
Sustainable Design Assessment Teams (SDAT)

- SDAT program begun in 2005 – provides community assistance to cities focused on principles of sustainability  
- Technical assistance from multi-disciplinary team of professionals  
- Includes Transportation professional
Rail Technologies

David Chase, PE
Project Engineering Manager
URS Corp. Rocky Hill, CT
PRESENT EQUIPMENT

Locomotives are rolling electric power plants
- Low Sulfur Diesel Fuel
- EPA Emissions Standards
Shuts Down Diesel Engine
Reduces Fuel Consumption
Reduces Emissions
Reduces Noise Pollution
Restarts Diesel

Brookville Locomotive
HYBRID LOCOMOTIVE

Computerized control system routes stored energy for optimal fuel efficiency and horsepower needs.

Energy dissipates during braking.

Sophisticated batteries store that dynamic energy for later use.
HYBRID LOCOMOTIVE

- REGENERATION CAPABILITY
- Braking energy reclaimed
- On board Storage Batteries
- On Demand Power (up to 20000HP)

- Improve fuel consumption – 15%
- Reduce emissions 50%
ELECTRIFICATION

- Electric Power from Utility Companies
- Generation from multiple Sources
PANTAGRAPHER

- Picks up power from Overhead Catenary Wire
- With Regeneration, Power fed back into System
Regenerated Power is Redistributed at substations

Looking Ahead
• Battery Storage
• Capacitors
Solar Powered Switches

- Remote Locations
- New Haven & Stamford Yards
New Haven Shops
Provisions to Add Fuel Cells in the Future