Heavy-Duty CNG Vehicles in MOVES

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Background

• MOVES2014
  – Allows users to model Compressed Natural Gas (CNG) only for transit buses
  – Emission rates for CNG based on CNG transit bus data
    • Based on MY 1996-2004 model year CNG transit buses
    • Rates for 2007+ model years are based on scaling the base emission rates using engine certification data
  – Population of CNG transit buses provided in the default MOVES database
  – National average fraction of CNG vehicles for 2011+ model years in MOVES2014 is 15.8%
Interest in CNG

• MOVES users have expressed interest in modeling CNG in other vehicle types (e.g. refuse trucks)
• We recognize there is a significant use of CNG in other heavy-duty source types
• However, data are not as readily available on CNG vehicle populations for other source types
• For example, CNG in freight applications are mostly retrofitted after sale, making it difficult to track their market share

1. Remove CNG vehicles from default population in MOVES

   • The current national default CNG usage for transit buses does not reflect the actual CNG usage well in individual states, counties, and metropolitan areas

   • CNG usage varies significantly in different geographic regions across the US, due to:
     • Financial incentives to implement CNG usage vary by area
     • CNG is implemented by vehicle fleets (e.g. transit agencies, refuse haulers) which tend to either have a high % of CNG use or no CNG use
Dedicated CNG Medium- and Heavy-duty Vehicles by State

State fleet vehicles - CNG (2015)

2. Allow users to supply CNG use for all heavy-duty source types in MOVES, including:

- Intercity Bus
- Transit Bus
- School Bus
- Refuse Truck
- Single Unit
- Motor Homes
- Combination Trucks

- MOVES users can enter fraction of CNG-fueled vehicles by source type through the AVFT importer (Alternative Vehicle Fuel Table)
Use of County Data Manager

Users can create template and import CNG vehicles in the Fuel Tab of the County Data Manager (County-scale) and the Project Data Manager (Project-scale).
Use of AVFT

• Updates intercity bus (sourceTypeID 41) fuel fraction to 50% diesel (fuelTypeID 2) and 50% CNG (fuelTypeID 3) for model year 2015
3. Apply the current power-based CNG emission rates derived from CNG-fueled transit buses to newly-allowed heavy-duty CNG source types

- MOVES accounts for the differences in road type VMT distributions, average speed, duty cycles, vehicle weight, road load coefficients between different source types (e.g. long-haul combination truck vs. single-unit short haul)

- Transit buses and other truck vocations use same technology CNG engines; which is currently dominated by spark-ignited stoichiometric burn with 3-way catalyst
4. Update the CNG emission rates for 2007+ model year engines based on new certification data

   • In MOVES2014, the CNG base emission rates are based on emissions data from 1994-2004 model year transit buses
   • Used to cover two model year ranges: pre-2001 and 2002-2006
   • MOVES2014 used EPA emissions certification data from 2002-2006 and 2007-2012 model year CNG Urban Buses to scale the emission rates for 2007+ emission rates
   • We now have emissions certification data through model year 2017
     • Includes data for all heavy-duty CNG engines (light heavy-duty, medium heavy-duty, heavy heavy-duty) in addition to urban buses
The 2007-2012 certification data were split in two groups, 2007-2009 and 2010-2017

- Accounts for the 2010 Heavy-duty NOx standard

The proposed rates for each model year group are based on ALL CNG heavy-duty data from the EPA certification database, instead of just urban bus

<table>
<thead>
<tr>
<th>Model Year Group</th>
<th># of Engine Families</th>
<th>Certification (g/bhp-hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>NOx</td>
</tr>
<tr>
<td>2002-2006</td>
<td>25</td>
<td>1.21</td>
</tr>
<tr>
<td>2007-2012</td>
<td>11</td>
<td>0.29</td>
</tr>
<tr>
<td>2007-2009</td>
<td>30 (24 for PM)</td>
<td>0.61</td>
</tr>
<tr>
<td>2010+</td>
<td>155 (120 for PM)</td>
<td>0.11</td>
</tr>
</tbody>
</table>
Proposed CNG emission rates

- The proposed CNG emission rates for MY 2010+ compare well with the data from one heavy-duty CNG engine family (MY 2011) available from the Heavy-Duty In-Use Testing database (HDIUT)
QUESTIONS?